Do Conscious Thoughts Cause Behavior?

Roy F. Baumeister, E. J. Masicampo,
and Kathleen D. Vohs

Department of Psychology, Florida State University, Tallahassee, Florida 32306;
email: baumeister@psy.fsu.edu

Key Words

consciousness, action, control, automaticity, dual process

Abstract

Everyday intuitions suggest full conscious control of behavior, but evidence of unconscious causation and automaticity has sustained the contrary view that conscious thought has little or no impact on behavior. We review studies with random assignment to experimental manipulations of conscious thought and behavioral dependent measures. Topics include mental practice and simulation, anticipation, planning, reflection and rehearsal, reasoning, counterproductive effects, perspective taking, self-affirmation, framing, communication, and overriding automatic responses. The evidence for conscious causation of behavior is profound, extensive, adaptive, multifaceted, and empirically strong. However, conscious causation is often indirect and delayed, and it depends on interplay with unconscious processes. Consciousness seems especially useful for enabling behavior to be shaped by nonpresent factors and by social and cultural information, as well as for dealing with multiple competing options or impulses. It is plausible that almost every human behavior comes from a mixture of conscious and unconscious processing.

Contents

INTRODUCTION

Consciousness is one of the defining features of human life and experience, yet a perennial challenge to explain. In recent years there has been a sharp rise in evidence of unconscious, automatic processes that has led some to question whether conscious thought has any influence on behavior at all. The assumption that conscious thought is an epiphenomenon was asserted aggressively during the behaviorist era and has had a resurgence due to recent studies of automaticity and the brain.

The detractors have dominated recent debates about consciousness. Dijksterhuis et al. (2007) asserted that the question of "what behavior requires a conscious decision and what behavior does not" has been resoundingly answered: "Behavior does not originate with a conscious decision" (p. 52). In their model of behavior, they assign "no role for consciousness" (p. 52). A similarly negative assessment led Bargh (1997a) to speculate, "there ultimately is no future for conscious processing in accounts of the mind, in the sense of free will and choice" (p. 52). Wilson (2002) summarized a widespread view by saying, "The causal role of conscious thought has been vastly overstated" (p. 107), and although he stopped short of saying it is zero, he clearly thought it was slight. As to how slight, only Bargh (1997b) has been bold enough to furnish a precise estimate: "Our psychological reactions from moment to moment... are 99.44% automatic" (p. 243).

What then is conscious thought all about? Thomas Huxley articulated the "steam whistle hypothesis" over a century ago (1874). It says conscious thought resembles the steam whistle on a train locomotive: It derives from and reveals something about activity inside the engine, but it has no causal impact on moving the train. This view was echoed by Wegner & Bargh (1998): "Conscious intentions signal the direction of action—but without causing the action" (p. 456), though elsewhere these authors took a more nuanced view. Wegner (2002) revived the steam whistle hypothesis but with a different metaphor: "Just as compass readings do not steer the boat, conscious experiences of will do not cause human actions" (p. 318). Dijksterhuis et al. (2005) calculated that conscious thought cannot accomplish much in comparison to the unconscious mind. They concluded that "strictly speaking, conscious thought does not exist" (p. 81) because what seems to be conscious thought is merely some calculations performed unconsciously that happen to cross into awareness. Jeannerod (2006) concluded that in relation to action, consciousness is "a post hoc phenomenon," being too slow to initiate or control action and therefore mainly useful "for the cognitive rearrangement after the action is completed, e.g., for justifying its results"; like the steam whistle, "it reads behavior rather than starting it" (pp. 36–37).

Skepticism about consciousness was particularly fueled by Libet's (1985) research. In his studies, participants watched a highly precise clock and recorded when they made a conscious decision to initiate a finger movement. Brain wave activity showed a sharp increase prior to the conscious decision. Although the interpretations of these findings have been debated sharply (e.g., Mele 2009), many have taken them as further support for the steam whistle theory. Roediger et al. (2008), for example, said Libet's findings contradict the "naïve view" that "conscious intention causes action. Clearly conscious intention cannot cause an action if a neural event that precedes and correlates with the action comes before conscious intention" (2008, p. 208). Writing in a volume entitled *Does Consciousness Cause Behavior?*, Pockett (2006) said Libet's work leads to the "reasonable conclusion that consciousness is not the immediate cause of this simple kind of behavior" (p. 21) and then went on to say it does not cause complex behavior either.

Another line of work suggests that conscious thoughts may have effects on behavior, but these are largely maladaptive or at best unreliable. For example, many emotion theories still assume that the purpose of emotion is to instigate behavior directly, but evidence of such effects is weak and ambiguous, and many of the effects suggest that emotion makes people do impulsive, stupid, and self-defeating things (see Baumeister et al. 2007a).

Thus, the conscious mind seemingly has many enemies and few friends in today's psychology. Although the skeptics and critics have been highly vocal, evidence supporting a causal role for consciousness has quietly accumulated in various places. The present review undertakes to assemble the best such evidence that we could cover within the space allocated and then evaluate it. If the evidence we could find can be dismissed, then perhaps victory should be conceded to the skeptics. If our review does provide valid evidence of conscious causality, then perhaps the next generation of theory can build on this evidence to understand how conscious thoughts cause behavior.

The question of conscious influence is important in multiple spheres. Philosophical and psychological efforts to understand the mind turn heavily on whether conscious thought is the commanding force, an occasional resource, or a mere steam whistle. Moral and legal judgments of responsibility sometimes depend on whether there was conscious causation. C.D. Cameron, B.K. Payne, & J. Knobe (unpublished data) found that participants mostly condemned people whose judgments and decisions were tinged by racial bias, but such condemnation was muted among participants who had been led to regard racial bias as unconscious.

DEFINITIONS AND THEORETICAL ISSUES

Some debates become interminable because questions are ambiguously phrased and concepts inadequately defined, so that debaters talk past each other. Although our limited space precludes a rigorous consideration of all concepts, several points are crucial to our approach.

First, nearly all theories about consciousness distinguish two forms or levels. The more basic one, phenomenal awareness, corresponds roughly to what humans share with most other mammals, including subjective experience (e.g., of sensations). The other, conscious thought, is assumed to be mostly unique to humans, and it includes reflection, reasoning, and temporally extended sense of self. Our focus is on conscious thought. Functions of phenomenal awareness have been discussed elsewhere (e.g., Morsella 2005).

Second, we suspect conscious processes work in concert with unconscious ones. The proximal causes of muscle movements are neuronal firings, which are unconscious. More broadly, the argument that "if unconscious thoughts cause X, then conscious thoughts do not" is fallacious. The proper question is whether the conscious processes can play any causal role. A related point concerns indirect causation (control) of behavior. Many criticisms have focused on whether conscious thoughts, choices, and intentions directly cause behavior.

We searched for both direct and indirect causation.

Third, any evidence that conscious thoughts are themselves the results of other causes (presumably including unconscious processes and brain events) is irrelevant. We are skeptical of uncaused causes. Hence arguments of the sort exemplified by the above quotation from Roediger et al. (2008)—that if a brain event precedes the conscious thought, then the conscious thought is not a cause of the subsequent behavior—are fallacious. The question is whether the conscious thought is a vital link in the causal chain as opposed to being merely a signal or side effect of the true causes. It is quite plausible, for example, that impulses to act generally originate in the unconscious, but the behavioral outcome depends crucially on what happens when they are contemplated consciously. Libet (e.g., 2004) proposed that action begins outside of consciousness, but the conscious self can stop an action before it happens. Mele (2009) indicated the fallacy in the Roediger interpretation by making the analogy of a fuse: The existence of a previous and correlated cause (lighting the match) does not rule out a causal role for the fuse in setting off the bomb.

Therefore, the steam whistle hypothesis is the true null hypothesis in the present review because it treats conscious thoughts as wholly effects and not causes. We looked specifically for causation of behavior. We counted muscle movements as behavior, plus speech acts and choices. Hypothetical behaviors ("What would you do?") were excluded, insofar as they may have only a weak relation to actual behavior. Self-reports of behavior were accepted reluctantly in some cases, especially when direct observation was impractical. We mention nonbehavioral evidence occasionally to fill in gaps, but our emphasis was on actual behavior.

Our emphasis on causing behavior ruled out many findings in which conscious processes influence other conscious events, including perceptions, judgments, emotions, and even physiological states. Causing behavior is not the only possible function of conscious thought, and conscious thought is worth studying regardless of it. Yet behavior does have special importance. Most theorists accept that conscious events can cause other conscious events, but whether conscious events cause behavior has been much more controversial. Causation of one conscious event by another does not contradict the steam whistle hypothesis: The steam whistle may have plenty of ongoing processes that affect its own workings, but it still does not help move the train. Hence we focus on behavior. Moreover, the question of behavioral impact is relevant to the issue of whether consciousness evolved to confer a functional advantage or was merely an accidental byproduct of other adaptations. In order to confer a functional advantage in natural selection (presumably by improving reproductive success), conscious thought would almost certainly have had to alter behavior.

To establish causation, we restricted our coverage to experimental designs. Specifically, we searched for studies in which the independent (manipulated) variable was a conscious event, such as when the experimenter instructs participants to think about something. The manipulation could either pit conscious thought against the absence thereof or could pit two different conscious thoughts against each other, because both designs indicate causation by conscious thoughts. Because these research designs directly manipulate conscious thought, they establish a causal role for conscious thought, even if these may exert their influence by means of (downstream) unconscious mediators. Random assignment of participants among conditions was considered essential, insofar as it equalizes treatment groups and therefore permits causal conclusions.

What determines whether something is conscious? Reportable inner states constitute the usual criterion, but for manipulations the determination is trickier. One issue is whether manipulations of conscious events also simultaneously manipulate unconscious events, which could then account for the behavioral effects. With the most difficult borderline cases, we sometimes fell back on the research conclusion that the unconscious can take in visual and single-word information but cannot apparently

process sentences (e.g., Baars 2002). Hence the manipulations of self-awareness that relied on a mirror or video camera, although widely used and productive of extensive behaviors, did not qualify because it was just possible that the manipulations produced their effects by means of purely unconscious processes.

The question of whether consciousness causes behavior is contentious, and our review may not convince everyone. Still, we regard it as quite unlikely that conscious thoughts cause behavior but in ways completely different from what we have covered. Our intent was to furnish a review that both the skeptics and proponents of conscious causation could use to inform their further work.

MENTAL SIMULATION, MENTAL PRACTICE

We begin with studies on whether conscious thoughts of a particular action can affect whether or how that action will be performed later. One theme has been that imagining oneself doing something can increase the likelihood or efficacy of doing it, especially on some future occasion. Anderson (1983) showed that imagining oneself doing something led to an increased intention to do it. Behavioral evidence was furnished by Gregory et al. (1982). In their most relevant study, some participants imagined themselves getting and using a cable television service. These were later more likely than controls to accept a promotional offer of a week's free service and, two to three months later, were more likely actually to be subscribing to the service. Control participants had been provided with the same information about the service but had not imagined themselves being subscribers.

Several similar findings have been recorded. A study of psychotherapy intake patients randomly assigned the patients either to be told about the benefits of remaining in therapy or to imagine themselves remaining in therapy for four weeks and also to explain why they did remain. The latter remained longer in therapy (Sherman & Anderson 1987).

The effects of simulation often depend on focusing the person on what he or she will do to carry out the action rather than, for example, motivating the person by making the prospect of success vivid or creating a self-fulfilling prophecy. Pham & Taylor (1999) randomly assigned students to mentally simulate doing well on an exam, either by imagining themselves finding out that they had gotten a very high grade or by imagining themselves studying hard and answering the questions on the test. Only the latter condition produced significant improvement in actual test grades. Along the same lines, mental simulation helped reduce the planning fallacy, increasing the proportion of students who actually finished their assignment on time (Taylor et al. 1998).

Imagining oneself voting can increase the likelihood of actually voting in a subsequent election. The evidence for this is mixed, possibly varying among different elections (see Greenwald et al. 1987, Nickerson & Rogers 2010, Smith et al. 2003). Libby et al. (2007) found the simulation effect to work best if people imagined themselves from a third-person perspective rather than first person. The authors suggested that seeing oneself from a third-person perspective led to making dispositional attributions, thereby making voting seem to reflect the person's character and values.

Another category of simulating future actions is mental practice, which usually consists of imagining oneself performing a physical, artistic, or athletic skill effectively. Mental practice combined with physical practice of golf produced performance that was better than physical practice alone (Brouziyne & Molinaro 2005). It improved table tennis performance, especially if the mentally simulated practice focused on muscle movements rather than imagining the trajectory of the ball (Caliari 2008). The latter finding suggests that the individual using mental practice has to imagine the motor movements and muscle control required for performance, not simply think about any aspect of the game.

A well-designed early study of mental practice on golfing started by obtaining a baseline

measure of putting from college student participants. Next, by random assignment, some visualized a successful putt; others visualized just barely missing the hole; and a control group was told to visualize putting without any specific instructions. (It is likely that this manipulation led to imagining both process and outcome differently.) The participants who had visualized success then showed dramatic improvement as compared to the control group. Those who had visualized failure via a near miss showed a drop in performance (Woolfolk et al. 1985). The last effect suggests that conscious processes are not always beneficial.

A review of research on mental practice by Grouios (1992) concluded that mental practice combined with physical practice was generally found to be more effective than either by itself, suggesting that both contribute to learning. It concluded also that mental practice is mostly helpful during the early stages of learning (thus useful for acquiring rather than maintaining skills) and should focus on the muscle movements needed for successful performance. If Grouios is correct, the fact that conscious simulation is most beneficial at the early stages points toward a general pattern in which things move from initially conscious to gradually being more automatic. Consciousness is thus for acquisition of new behaviors. A large meta-analysis by Driskell et al. (1994) found that mental practice improved performance significantly, especially when tasks included a cognitive component and the performance was not long after the mental practice. They did conclude that physical practice worked better than mental practice (but see Cooper et al. 2001, Wohldmann et al. 2008).

A more recent review by Kosslyn & Moulton (2009) noted that researchers have studied mental practice in almost every conceivable sport, from dart throwing and table tennis to football, soccer, basketball, gymnastics, and even weight lifting. It has also been shown to be beneficial in playing a musical instrument (Theiler & Lippman 1995), landing an airplane (Prather 1973), and training basic surgical skills (Sanders et al. 2004). In general, these studies show that it does reliably improve performance. A report of the National Academy of Sciences concluded that mental practice was one of the few allegedly performance-enhancing activities that is genuinely effective (Druckman & Swets 1988).

There is even some evidence that mental simulation can help satisfy and satiate, as if substituting for actual consumption (Morewedge et al. 2009). Participants who imagined eating a large amount of candy later went on to eat less of the same candy during an ostensible taste test, as if they had already gorged on candy and had become tired or sick of it. The control conditions, all of which ate more of the target candy during the taste test, included imagining oneself eating a small amount of that candy, eating some other food, and a no-food condition.

Thus, conscious simulation does contribute to later behavior, but it seemingly needs to focus on behavioral process, not just outcome. It functions as a kind of mental rehearsal rather than merely stimulating motivation.

ANTICIPATING, PLANNING, INTENDING

One of the best-documented patterns in which conscious events cause behavioral outcomes is via specific plans in the form of implementation intentions. These translate general, abstract intentions into specific behavioral plans, of the form "If X happens, then I will do Y." Dozens of careful studies have confirmed that these cause changes in behavior over and above merely intending, desiring, goal setting, and valuing. For example, among women who all held the goal of performing breast self-examinations, 100% of those who were randomly assigned to form specific implementation intentions to perform them actually did so, as compared to only half of the others (Gollwitzer 1999; admittedly, these results reflect self-reports rather than direct observation, for obvious reasons). In another study, a motivational and informational exhortation to engage in vigorous exercise raised the rate of exercising only slightly, but an implementation intention to perform the exercise more than

doubled the rate (Gollwitzer 1999). A recent meta-analysis found that implementation intentions improved the rate of goal achievement over and above goal intentions by a medium to large effect size (Gollwitzer & Sheeran 2006).

One possible interpretation of implementation effects is that they help create an association between the cue and the behavior, so that when the cue is encountered, the behavior is automatically triggered. Although that may be part of it, recent evidence suggests there is more than that. A recent study that contrasted implementation intentions with procedures to strengthen the association between cue and behavior found that both were effective in the short run, but after a week's delay, the implementation intentions were more effective than the cue-behavior association for maintaining the behavior (Papies et al. 2009).

Anticipated emotion, especially anticipated regret, has been shown to motivate people and change behavior. Anticipated regret changes decision processes toward greater vigilance and information gathering (Janis & Mann 1977), promotes risk avoidance and loss avoidance (Tetlock & Boettger 1994), and makes people choose options that can be justified most easily, such as products with well-known name brands or guaranteed discounts (Simonson 1992). Anticipating how one might feel after unsafe sex led to a reduction in risky sexual behavior, as compared with a control group that merely considered their current feelings about unsafe sex (Richard et al. 1996). Risen & Gilovich (2007) showed that the thought of exchanging a lottery ticket makes you think that the one you relinquish might win, and this anticipated regret produced a behavioral result of buying more insurance. Anticipated regret can also make people avoid making a decision so as not to make a wrong one (Beattie et al. 1994; see also Anderson 2003).

Thus, multiple strands indicate that anticipated regret pushes people to make subjectively safe choices and avoid risky, regrettable ones. Confirmation that anticipated emotion depends on conscious processing was supplied by Drolet & Luce (2004). They showed that framing a decision in terms of potential losses instead of gains caused people to favor safe options, but that this effect disappeared under high cognitive load.

Anticipated regret has been the focus of an ambitious research program summarized by Zeelenberg & Pieters (2009). For example, in some studies people must choose between a safe versus a risky gamble, and the experimenter varies which outcomes people expect to learn (alongside the one they chose). Knowing they will learn the outcome of a gamble even if they do not choose that gamble makes people tend to choose that gamble, because people do not want to find out they would have done better had they chosen differently (Zeelenberg et al. 1996). This can even overcome the tendency for anticipated regret to favor safe choices overall. Many other similar effects have been shown, indicating that the possibility of regret alters decisions. For example, knowing that one will later find out a negotiating opponent's minimal acceptable offer makes one offer less (Zeelenberg & Beattie 1997; see also Larrick & Boles 1995).

Other anticipated emotions also seem effective. Lindsey (2005) manipulated the anticipation of guilt in connection with a campaign for bone marrow donations. For example, some saw a story about a child who died waiting for a donation and were told to imagine how bad they would feel if they had decided not to help. The manipulations effectively increased anticipatory guilt and, as a result, increased self-reported behaviors aimed at donating (e.g., arranging to have the blood test to join the registry).

Indeed, the assumption that conscious emotional states directly cause behavior is widespread among psychologists and, if it were correct, would constitute substantial evidence for the causal power of conscious events (albeit not necessarily voluntary ones, insofar as emotions are largely involuntary). A meta-analysis of articles in social psychology's premier journal found that tests for mediation by emotion were common, but the vast majority yielded null results (C.N. DeWall, B.J. Bushman &

R.F. Baumeister, manuscript submitted). In contrast, anticipation of emotion, though studied far less, had a high rate of significant mediation. Thus, on present evidence, the anticipation of future emotional outcomes seems to cause behavior more reliably than currently felt emotion.

A thorough review of repetitive thought by Watkins (2008) included correlational as well as causal studies and indicated both positive and negative consequences. The correlational nature of many research designs precluded causal inferences, but some experimental designs included random assignment to engage in specific conscious thoughts, so these findings do indicate causality. The combined pattern of effects linked to repetitive thoughts is impressive, and some conclusions stand out as highly relevant. First, there were no behaviors listed among the negative, unconstructive effects of repetitive thought, which instead featured depression, anxiety, and other emotional states. Among the beneficial effects, Watkins (2008) found that repetitive thoughts that were focused on planning tended to improve later performance and outcomes. Repetitive thoughts about what could go wrong helped some people (defensive pessimists) but not others. In the wake of misfortune, repetitive thoughts about attributions tended to impair coping, whereas thoughts about concrete steps to solve problems led to better coping. Watkins (2008) also found that the impact of repetitive thoughts depended on several properties of the thoughts, such as whether they were good or bad and abstract or concrete. Concrete and good thoughts, respectively, were the most likely to bring about beneficial consequences.

REPLAYING, INTERPRETING, REFLECTING ON PAST EVENTS

An assortment of evidence shows that assigning people to think about past events, or to think about them in certain ways, can alter future behavior and other outcomes. Simply writing or talking about unpleasant, traumatic experiences seems to provide assorted benefits, including health benefits. Pennebaker's research program (for overview, see Pennebaker & Chung 2007) showed that having people write or speak about traumatic personal experiences caused them to experience improvements, including fewer visits to physicians (along with fewer self-reported illnesses and less self-reported aspirin consumption) over subsequent months. Some studies have found that academic test performance improved also. These benefits appear to come from organizing and analyzing the trauma.

In contrast, merely rehearsing and reliving the event can prolong the unpleasant aspects rather than diminish them (Lyubomirsky et al. 2006). Ray et al. (2008) showed that people randomly assigned to ruminate about an anger-provoking event showed more anger and more sympathetic nervous system activation as compared to those who were assigned to reinterpret the event. Behavioral consequences in the form of higher displaced aggression (toward a new target who provoked the person again) were shown by Bushman et al. (2005) to result from ruminating about the recent provocation, as opposed to distraction or positive mood induction. In these cases, the conscious thought does not take in any new information from the environment but rather processes information it already has, thereby prolonging affective and other inner consequences, which in turn influence behavior.

The difference between reliving an event and analyzing it was studied in a slightly different way by Markman et al. (2008). Their participants took two anagram tests. In between they were randomly assigned to think about their first performance using either upward or downward counterfactuals (i.e., thinking about how it could have been better versus worse) and also to use either a reflective style focused on re-experiencing the event or an evaluative one that emphasized analysis and comparison. Performance on the second test was determined by interactive effects of the two thought manipulations. The evaluative style led to longer persistence and better performance when combined with the upward counterfactuals. The reflective approach yielded better results with

the downward counterfactuals. Ellis & David (2005) found that Israeli soldiers improved performance more after reflecting on both what to change and what not to change than after after reflecting only on what to change.

Conscious reflection on feedback or outcomes can shape subsequent behavior. Anseel et al. (2009) provided participants with task feedback on an Internet-based work simulation task. Some were taught to go back and review their thoughts and actions, while others weren't. The combination of reflection plus feedback led to significant improvements in later performance. Reflection without feedback brought no benefit, as others have also concluded (see Mayer 2004 on the uselessness of reflection without external guidance or feedback). Feedback without reflection was likewise unhelpful. N.J. Ciarocco, K.D. Vohs, & R.F. Baumeister (unpublished data) had people experience an initial failure and then randomly assigned them to reflect on what they might have done wrong, or on the implications of the failure about themselves in general, or on task-irrelevant information. Only the first of these led to improvements on subsequent performance. Thus, conscious thoughts following failure affect how well you perform the next time.

Cognitive load can also be used to prevent reflection. Dretsch & Tipples (2008) showed that a high cognitive load impaired performance on the Iowa Gambling task. Under low load, people typically learned which decks offered better outcomes in general. Under high load, people seemed to base their choices on the most recent outcomes. Thus, the benefit of conscious processing is to integrate feedback over time to discover broad patterns. Similar impairments were shown by Hinson et al. (2002), who also recorded that control participants exhibited high skin conductance prior to risky moves, whereas those under cognitive load did not. Thus, the load seemingly prevented people from realizing the risk they were taking, based again on aggregated outcomes. Sequential integration seems to be one of the structural advantages of conscious over un-

conscious thought (Baumeister & Masicampo 2010). When consciousness is preempted, people respond only to relatively immediate inputs.

Replaying and interpreting things as they happened constitutes only one way of thinking about past events. Counterfactual replays are also common. Epstude & Roese (2008) provided an overview and theoretical integration of how counterfactual replays affect later behavior. They provided evidence that counterfactual replays have two sorts of effects. First, they stimulate specific intentions to behave differently in similar situations subsequently, and these intentions do influence subsequent behavior. Second, they can have more general, content-neutral effects such as by altering mindsets and motivational states, which can then affect behavior. Roese (1994) showed that after an initial anagram task, engaging in upward counterfactual replays caused improvements in subsequent performance, whereas downward counterfactual replays did not improve performance relative to a neutral control. Kray et al. (2009) manipulated the type of counterfactuals that people used after a negotiation exercise. Additive ones ("If only I had...") led to performance gains on subsequent negotiation exercises, as compared to subtractive counterfactuals ("If only I had not...") and the baseline control condition.

Not only counterfactual replays but also perspective changes can make a difference. Libby et al. (2005) had people use either a first-person or third-person perspective while recalling a time when they had been socially awkward. Later, their interactions with a confederate were observed and evaluated. Those who had recalled their awkwardness in the third person behaved less awkwardly than those who had relived it in first person. This was apparently mediated by perceptions of self-change. Replaying the event in third person made it easier for people to believe they had changed considerably since that earlier occasion, possibly by increasing subjective distance between the self now versus then.

A different sort of motivational consequence of replaying the past was shown by Khan

& Dhar (2006). In their view, when people believe they have done something virtuous, this furnishes them an excuse or "license" to behave in a more self-indulgent manner. In their first study, some participants imagined that they had volunteered to spend three hours a week working for charity, chose which of two charities they would work for, and elaborated their reasons for that choice. Later, participants made a hypothetical choice between a utilitarian product (a vacuum cleaner) and a luxury one (designer jeans). Those who had imagined volunteering were more likely than controls to choose the luxury product. These findings were all based on imagination, thus neither replaying actual events nor making an actual decision. But another study in their investigation found that real donations to charity were reduced among people who had agreed to help a foreign student with studying, as compared to people who had not been asked to help, and so in this case the conscious act of considering and agreeing (all said yes) to help did change actual behavior subsequently. Another study in their set emphasized the voluntary nature of the good deed as crucial to the licensing effect: Those who imagined doing community service as court-ordered punishment for a traffic violation did not indulge themselves later.

Reflection on the present as well as the past was manipulated by Slatcher & Pennebaker (2006). Participants engaged in expressive writing about either their daily activities or about their deepest feelings and thoughts regarding their current romantic relationship. Those who wrote about their relationship were more likely than the controls to still be dating the same partner three months later, which is a remarkable long-term effect on behavior. In the short run, writing about the romantic relationship caused people to increase their usage of positive emotion words when talking with their partners.

Even false memories can influence behavior, as shown by Geraerts et al. (2008). By random assignment, some participants were falsely told that as children they had gotten sick after eating egg salad. Later in the session, these people ate less egg salad than the control group. Four months later, at another taste test, the ones who had believed the false memory still avoided egg salad. Eating of other foods was not affected.

REASONING, DECIDING, SOLVING PROBLEMS

A promising but contentious sphere of behavior involves performance on logical reasoning problems and other problems. Some theorists have asserted that logical reasoning depends on mental systems that use conscious thought (e.g., Lieberman et al. 2002, Smith & DeCoster 2000). Others have asserted that the unconscious has superior capacity and makes better, more logical choices and decisions (Dijksterhuis & Nordgren 2006).

Empirical evidence for the logical superiority of unconscious thought has been provided mainly by Dijksterhuis et al. (2006), based on having participants make a selection among options for which information has been provided piecemeal but adds up to indicate more favorable features for one rather than the other. Thus, reasoning is not required, but simply addition of features, and indeed the possibility that people might choose one option based on one heavily weighted feature that outweighs multiple other disadvantages was not considered. Other evidence of the ostensible logicalness of unconscious thought was provided by Lee et al. (2009), who showed that transitive properties were better respected in a multitude of choices when made automatically (under cognitive load) rather than with conscious deliberation. Again, this suggests simple consistency of preference rather than integrative reasoning, however. Nordgren & Dijksterhuis (2009) likewise found greater consistency with unconscious thought rather than conscious deliberation, though again the task was a matter of consistent preferences (in this case, rating the attractiveness of Chinese ideograms) rather than actual reasoning.

Multiple articles have challenged the ostensible superiority of unconscious thought. The initial findings have been shown to depend on methodological peculiarities such as using

artificially imposed and improper time limits (Payne et al. 2008). Some efforts at replication have failed (Calvillo & Penaloza 2009; see Acker 2008 for replication and meta-analysis). Another recent set of studies failed to replicate the unconscious thought advantage and found that conscious thought outperformed unconscious thought on some measures (Waroquier et al. 2009). A review article concluded that the claims for superior reasoning in unconscious thought are conceptually flawed and empirically unsubstantiated (Gonzalez-Vallejo et al. 2008).

Our view is that unconscious processes may indeed be superior to conscious thought for some mental processes but perhaps not for true logical reasoning. Some evidence for this was provided by De Neys (2006). He used arguments that were logically valid but, because of false premises, produced conclusions that conflicted with daily experience. Under cognitive load, people were seduced into making logic errors based on practical knowledge, whereas when not under load, people performed better at evaluating the logic. If one accepts the standard assumption that cognitive load mainly preempts conscious processing while allowing unconscious and automatic processes to proceed essentially unimpaired, these findings indicate that logical reasoning depends on conscious thought.

Similar but more extensive studies were reported by DeWall et al. (2008). Increasing the conscious motivation to be logical (e.g., telling people they would have to explain their results and would get a reward for right answers) improved performance. Furthermore, cognitive load to preoccupy conscious thought impaired performance. In contrast, subtly priming the goal of being logical made the idea of logic more accessible but failed to improve performance on logic problems. Unconscious load also failed to impair performance. These findings strongly suggested that logical reasoning depends on conscious processing.

Problem-solving processes have sometimes been studied by asking participants to verbalize their thought processes while solving. If conscious thought interferes with otherwise superior unconscious thought processes, then think-aloud instructions should impair performance. Occasional results of this sort have been obtained, but mainly with insight problems and holistic tasks that depend on a novel solution emerging from the unconscious (Penney 1975, Schooler et al. 1993).

In many other studies, however, verbalizing has been neutral or even helpful. An early study by Gagne & Smith (1962) used a problem akin to the Tower of Hanoi, which involves moving disks from one stack to another with the stipulation that larger ones can never be placed atop smaller ones. Participants who were required to verbalize a reason for each move performed better than others who did not verbalize. Expecting to have to furnish a generalized rule afterward did not help. Thus, justifying one's acts while deciding seems to have produced the greatest benefit. Those who justified their moves also were better at articulating general principles afterward.

A meta-analytic review of a large number of think-aloud studies concluded that performance outcome in general was unaffected, either for better or worse, by merely having participants express their thoughts (M.C. Fox, K.A. Ericsson, & R. Best, unpublished data; cf. Kim 2002). That is, people did not perform any better or worse at solving problems when they were verbalizing their thoughts, as compared to control groups who worked quietly on the same problems. The verbalizing did slow down the process to some degree, so if researchers set time limits near the average solution time, then think-aloud conditions will yield fewer solutions than the silent control condition. In general, these findings fit the view that thinking is closely related to talking. People perform about the same whether thinking silently or aloud, with the possible exception of certain problems that depend less on systematic reasoning than on an insight emerging spontaneously.

Perhaps a more interesting conclusion than the null effect of simply thinking aloud was the effect of requiring participants to explain their thought processes. These slowed the

performance down much more than simply verbalizing thoughts, but significantly improved overall performance, according to the meta-analysis by M.C. Fox, K.A. Ericsson, & R. Best (unpublished data). The requirement to explain can be considered a strong demand for conscious thought, insofar as people must verbalize not only their thoughts and steps but also the reasons behind them. The finding that explanation improves performance is consistent with evidence that conscious thought contributes generally to logical thinking and problem solving.

Even just expecting to have to explain one's actions (often manipulated under the rubric of accountability) can stimulate conscious thought and alter behavior. In a group decision task, this expectation of accountability caused members to bring up more information that they alone knew and ultimately caused groups to make better decisions (Scholten et al. 2007). In other work, it stimulated negotiators to discover more common ground and avoid fixed-pie stalemates, thus leading to better joint outcomes (De Dreu et al. 2000). Accountable negotiators (again based on expecting to explain) were found to be less contentious, more prone to solve problems, and more likely to engage their partner in a cooperative or trusting manner (De Dreu et al. 2006). Accountable group leaders, however, seem to show more competitive ingroup favoritism than either group members or unaccountable leaders (Pinter et al. 2007). Accountability thus makes leaders more responsive to the interests of their own group.

Actually giving explanations seems to improve learning by the explainer. A small meta-analysis on group learning activities concluded that giving someone the correct answer or other low-level help has little benefit to the help-giver, whereas giving an explanation helps the explainer learn better (Webb 1989). Seifert (1993) showed that students learned more after answering "why?" questions after reading a passage of prose as compared to students who read the same passage and merely underlined important sentences. Woloshyn et al. (1990) found that answering "why?" questions stimu-

lated learning even better than answering questions about self-relevance.

Asking people to articulate reasons can also be taken as evidence as to whether the processes are conscious, in the sense that they are available for introspection. Using a task involving searching and evaluating strings of letters, Haider et al. (2005) concluded that strategy shifts are not automatic but rather depend on voluntary and conscious processes. When people change strategies, they typically can give an apt reason and can even correctly judge whether the new strategy will work for various kinds of problems. Strategy shifts may be particularly important for understanding the functions of conscious thought, insofar as the relatively inflexible automatic system can efficiently implement a proven strategy but may be flummoxed when the problems or challenges change so as to render that standard strategy ineffective. This is supposedly the very thing that the flexibility of conscious, controlled processes is needed for (Shiffrin & Schneider 1977).

COUNTERPRODUCTIVE, MALADAPTIVE EFFECTS

The question of whether conscious processes cause behavior is not restricted to beneficial effects. To be sure, detrimental effects pose a puzzle insofar as evolution would mainly select in favor of beneficial effects. Nonetheless, the possibility that some effects of conscious thought will be counterproductive or maladaptive must be considered.

The idea that conscious thinking is detrimental has wide, counterintuitive appeal, which may encourage some to overlook methodological issues in order to embrace such a conclusion. As noted above, the supposed superiority of unconscious deliberation over conscious thought has been vigorously asserted, but skeptics with better control conditions have questioned the basis for such assertions (see Gonzalez-Vallejo et al. 2008, Payne et al. 2008). Likewise, it has been popular to assert that creativity is an unconscious process and that the conscious self is an impediment to the creative process (for

summary of such views, see Wegner 2002), but laboratory studies by Baumeister et al. (2007b) found creativity to be reduced under cognitive load, whereas conscious goals to be creative enhanced creativity.

Elsewhere we have suggested that conscious thoughts can stoke motivation, but it seems they can also sap it. In a study by McCrea (2008), participants took two tests. After the first, some participants were induced to engage in upward counterfactuals by making excuses (self-handicapping attributions) about their performance, such as "I could have done better if I had had more time to study." On the second test, these participants attempted and solved fewer problems than controls. Thus, the conscious act of making an excuse seemed to reduce the motivation to improve after failure. In a similar study with students taking actual exams, Forsyth et al. (2007) sent messages to all students who received a C grade or worse on the first exam. Some students received only review questions, but for others the review questions were accompanied by messages encouraging them to keep their self-esteem high. The self-esteem-bolstering group showed a substantial and significant decline in performance on the final exam, unlike the neutral message controls. In another laboratory demonstration, Vaughn et al. (2006) made people feel uncomfortable during task performance but then encouraged some of them to make an external attribution for these feelings. Those with the external attribution were less likely to make corrections later, again suggesting that making an excuse reduced the motivation to improve subsequently.

Participants in a study by Zitek et al. (2010) described a time in life when they felt life was unfair, while others wrote about a time when they felt bored. Later, those who had written about unfairness were less willing to provide help when requested. To be sure, it seems likely that some unconscious processes contributed to causal links between writing about a prior experience and responding to a new request for help. Still, conscious reflection on previous, irrelevant unfairness reduced current prosocial behavior.

Conscious thought impairs performance in the "verbal overshadowing" effects shown by Schooler et al. (1993). Some participants were interrupted while working on insight problems and asked to verbalize their approach. They performed worse than others who were interrupted and distracted or controls who were not interrupted. Verbalization during the task (rather than interruption) also interfered. These effects, however, were specific to insight problems and did not generalize to other sorts of problems. The authors suggested that verbalization interfered with nonreportable inner processes that contribute to solve insight problems.

The view that conscious attention can interfere with automatic processes, to the detriment of successful performance on highly automatized (well-learned) tasks, was asserted in an early article by Kimble & Perlmuter (1970). It offers one possible explanation for certain paradoxical performance effects, such as choking under pressure, in which high incentives and high motivation to perform well cause decrements in performance. Evidence for this was provided in experiments by Baumeister (1984). In several studies, participants who were instructed to attend to their process of skilled performance (and to report on it afterward) performed worse than those whose attention was directed to other aspects of performance (e.g., focus on the ball) or others who were given no attentional instructions. Beilock & Lyons (2009) review multiple studies showing that distracting attention from the performance process impairs the performance of novices but not experts, whereas directing attention to the process of performance impairs experts but not novices (e.g., Beilock et al. 2004, Gray 2004). They note that such effects have been shown with multiple sports, including golf, baseball, and soccer. The implication is that novices have to attend to the performance process because they are learning, but when a high level of skill has been attained, performance is best if left to the unconscious and automatic processes, and injecting conscious thought into the process can impair the smooth execution of these skills.

The increased use of cell phones has been controversial, and some states have banned phone use while driving. Using a driving simulation task, Drews et al. (2008) showed that talking on cell phones distracted drivers and caused an increase in driving errors. Talking to a passenger in the car had no effect, partly because the passenger shared situation awareness and therefore modified the conversation in response to traffic developments, such as by talking about traffic and keeping the conversation simpler. Thus, the physical activity of talking was the same, but whether the conversation's shared understandings do versus do not include the traffic scene seems to alter performance. In practical terms, these findings also suggest why hands-free devices do not fully reduce the dangers of drivers talking on cell phones. It is the deployment of conscious attention, not of hands, that is decisive.

Detrimental effects of consciousness have been easier to find with nonbehavioral than with behavioral measures. As this review is focused on behavior, we mention these only briefly. First, Watkins's (2008) review of repetitive thought covered a wide assortment of findings indicating that ruminating about bad things can make some people feel depressed, especially if already vulnerable to such feelings. Randomly assigning people to worry about a self-chosen concern led to depressed feelings even among normal participants (for review, see Borkovec et al. 1998). Rumination about personal concerns made people who already felt bad feel even worse (more anxiety, dysphoria, and depressed mood). It also had some quasi-behavioral effects, such as impairing social problem solving (Lyubomirsky et al. 1999).

Rumination is widely viewed as causing negative effects, though behavioral effects are scarce. Lyubomirsky et al. (2003) did show performance decrements on proofreading and reading comprehension among students who had been randomly assigned to ruminate about themselves prior to the tasks, as compared to others who had been distracted, but the effect was obtained only among students who had scored high on a subclinical depression measure.

Last, a strong and impressive research program by Wilson and colleagues has established that analyzing reasons can mislead, especially when the person must analyze reasons for things (e.g., personal preferences) that may be poorly understood. The implication is that trying to offer a reason for one's preferences distorts the person's feeling about it. In general, though, these have not produced behavioral consequences. The closest was a finding by Wilson & Schooler (1991) showing that analyzing reasons for taking a course caused students to enroll in classes that had received lower ratings by previous students, although this was only significantly different from one of the two control conditions. Further work may investigate whether the misleading effects of misguided introspection include behavioral decrements.

MENTALLY SIMULATING OTHERS' PERSPECTIVES

The term "theory of mind" is widely used to refer to understanding that other members of one's species have inner mental states similar to one's own. Although most experts now suggest that this ability is not uniquely human, it is far more advanced and more widely used in humans than in other species, and indeed it may be a crucial cognitive basis for human culture (e.g., Tomasello et al. 2005). Tests for it typically require the participant to simulate the knowledge, feelings, or motives of another. Given that humans simulate each other's mental states relatively often and that this may powerfully facilitate human social life, it is plausible that performing these simulations is one of the core functions of consciousness.

Extensive literatures link empathy and perspective taking to positive social functioning (e.g., Eisenberg et al. 1996). However, most of these rely on individual differences in the independent variable and hence do not rule out the steam whistle problem. We therefore focus

on an assorted smattering of findings that do establish causality.

Perspective taking was manipulated by Galinsky et al. (2008b) by telling some participants to adopt the perspective of a protagonist in a story they then listened to (in some studies) or wrote (in others). Other participants were told to think about the protagonist in a nonstereotypical manner or in an objective manner, and yet others were given no special instructions. Across multiple studies, the subsequent behavior of the participants in the perspective-taking condition conformed more than those in other conditions to the stereotypes about the protagonist. Thus, when the protagonist was a professor or a cheerleader, perspective takers performed better or worse, respectively, than controls on analytical problems. In a prisoner's dilemma game, they became either more or less cooperative after taking the perspective of an elderly person or an African American, respectively. The authors suggest that perspective taking enables people to coordinate their behavior with others, so they start behaving similarly to the stereotype of the person whose perspective they adopt. To be sure, the conforming was presumably mediated mainly by unconscious processes, and we assume participants were not aware of changing their own behaviors to match their stereotypes about other people. Nonetheless, the conscious process of taking a perspective altered their behavior.

A similar set of findings by Ackerman et al. (2009) had people identify with the perspective of someone who was exerting self-control, as opposed to merely reading the story about that person without perspective taking. Perspective takers later acted as if their own self-regulatory resources had been depleted: They expressed higher willingness to pay for consumer goods and performed worse on a word-making task.

Perspective taking can also reduce racial bias and improve interpersonal interactions between members of different races (A.R. Todd, G.V. Bodenhausen, J.A. Richeson, & A.D. Galinsky, unpublished data). White participants who had taken the perspective of an African American later interacted more favorably and positively with a different African American.

Recent work has sought to contrast taking another's perspective with empathy. Galinsky et al. (2008a) randomly assigned participants to consider the world from the viewpoint of their negotiation opponent, or to try to connect emotionally with that person, or simply to focus on their own needs. Perspective taking led to significantly better negotiation results than did the other conditions, including because people would discover hidden possibilities for agreement and because they found ways to create more resources. Both individual and joint outcomes were superior in the perspective-taking condition.

A related distinction was explored by Batson (2009), who focused on studies that compared imagining what another person feels with imagining how oneself would feel if one were in the other's place. Sometimes there is more helping in the imagine-self condition; other times, the imagine-other condition elicits more helping. Perspective taking is thus not an infallible stimulus to unselfish, altruistic motivations, and indeed some evidence indicates that taking the other's perspective can increase self-serving responses, at least when dealing with interaction partners who may be tempted to exhaust a common resource (e.g., Epley et al. 2006). Nonetheless, all of this may be adaptive, and so it seems safe to conclude that perspective taking is broadly useful for negotiating.

MANIPULATIONS OF SELF-REGARD, SELF-AFFIRMATION

There is a long tradition of seeking to alter the self-concepts of research participants, such as by giving them bogus feedback from a personality test. Such communications are conscious and depend on conscious processing. They have been shown to alter behavior.

The Barnum effect involves the ostensible willingness of laypersons to accept as valid the descriptions of their personalities given them by a clinician or other expert, even if the

description was in fact randomly assigned (Meehl 1956). Social psychologists adapted this procedure to alter self-concepts and behavior. For example, Aronson & Mettee (1968) found that behavior changed in response to receiving good versus bad personality evaluations.

Although subsequent studies have found various effects of giving bogus personality feedback, the interpretations have varied. It does not seem safe to conclude (especially without evidence) that such evaluations reduce self-esteem or stimulate motivations to behave in undesirable ways so as to confirm one's badness. Baumeister & Jones (1978) found that people responded to the profile mainly when they were told that others knew about it. Hence the inner process seems to be driven more by strategic concern over how one is regarded by others than by a wish to confirm a newly lowered self-esteem.

Some similar findings have been obtained merely by having people think about good or bad words in relation to the self. Sachdeva et al. (2009) assigned people to write a randomly assigned trait word and think about how the word might apply to the self. Later they were asked for a donation to a charity of their choice. People who had thought about good traits applying to themselves donated relatively small amounts, whereas high donations came after thinking about bad traits in connection with the self. Thinking about those traits applying to someone else had no effect. These are obviously not consistency effects, because they went in the opposite direction (e.g., bad traits led to good behavior). Rather, thinking of one's shortcomings motivated people to prove their goodness by doing a good deed. And thinking of one's good qualities reduced the motivation to do further good deeds.

Similarly, a conscious thought that depicts the self as free from undesirable prejudices increases people's willingness to act in ways that could be regarded as prejudiced. Monin & Miller (2001) showed that participants who could explicitly disagree with prejudiced statements on a questionnaire later voted to hire white males. Others who did not have the initial opportunity to show themselves as free from prejudice were later more likely to vote for hiring a woman or minority candidate.

The greater context is that people have identity goals and respond to conscious appraisals as to whether they are reaching these goals or not. Wicklund & Gollwitzer (1982) reported multiple studies that manipulated telling people they did or did not resemble successful people with identity goals similar to theirs, thereby making them feel that they were succeeding or failing at becoming the sort of person they wanted to be. Those given failure feedback exhibited increased desires to do additional things to claim the desired identities. For example, aspiring guitarists who were told they resembled successful guitarists showed relatively little desire to give guitar lessons to others, but those who were told they were different from successful guitarists became eager to give many lessons, so as to shore up their identity claims.

Research on so-called self-affirmation effects has yielded a rich set of consequences of conscious thought. The empirical findings have outstripped the psychological theory about just what these effects are. Some procedures seem to have nothing to do with either self or affirmation, though that umbrella term is used for a wide assortment of findings. In particular, the most common manipulation involves having people rank their values and reflect on what they value most highly, which usually turns out to be interpersonal relationships with family or close friends. Thinking favorable thoughts about the self (e.g., remembering an event in which you were kind; Epton & Harris 2008) is also sometimes used as a self-affirmation.

Regardless of the precise form of the manipulation, self-affirmation research has consistently shown that thinking positive thoughts about the self and/or its core values changes behavior. The most common pattern is that it reduces defensive responses to threats. Task performance suffers as a result of stereotype threat (that is, when people fear that they will perform badly and thereby confirm stereotypes), but self-affirmation eliminates this effect (Cohen et al. 2006, Martens et al. 2006).

Sexually active students who watched a fear-enhancing video about AIDS typically avoided buying condoms, presumably reflecting a denial of the risk to themselves, but self-affirmation greatly increased their willingness to buy the condoms (Sherman et al. 2000). In a similar vein, smokers who read threatening material about the health risks of smoking often avoid subsequent information about how to quit, but self-affirmation reduced that effect and promoted seeking information about quitting (Armitage et al. 2008).

When people experience noncontingent success, they often self-handicap as a way of providing themselves with an excuse for anticipated subsequent failure, but self-affirmation eliminated this effect (Siegel et al. 2005). Narcissists tend to be highly defensive and therefore prone to aggression, but self-affirmation (in this case, thinking about personal values) reduced their aggressive responses to criticism (Thomaes et al. 2009). Many people are threatened by the successes of their friends and may seek to undercut the friends' performance, but this pattern was eliminated by self-affirmation (Tesser & Cornell 1991). Some people are threatened by merely hearing about the successes of others and respond by striving to perform better, but self-affirmation eliminated this effect (Johnson & Stapel 2007). Self-affirmation seems to bring people to think in high-level terms, and this can improve self-regulatory performance among people whose resources have been depleted in prior tasks (Schmeichel & Vohs 2009).

MENTAL FRAMING AND GOAL SETTING

A growing body of research has suggested that by consciously adopting a particular interpretive frame or goal, the person can alter behavior, presumably in most cases by altering one's subjective approach. For example, women sometimes do poorly on math tests because they are aware of themselves as members of a low-performing group (i.e., women). McGlone & Aronson (2007) improved female performance by instructing the women to think of themselves as members of a high-performing group (private university students). Such effects almost certainly depend on interplay between conscious and unconscious processes.

People can approach tasks in different ways, and the different framings alter performance. When they adopt a goal of performing well, they do not learn as thoroughly as when they adopt a goal of mastering the material. The advantages of mastery goal frames are most apparent when people encounter uncertainty or resistance, such as having someone disagree with them (Darnon et al. 2007a). The same advantage pertains to having an approach rather than an avoidance frame (Darnon et al. 2007b).

Interpersonally, adopting a prosocial mindset tends to produce better outcomes for a group task than does adopting a proself mindset, especially when people are accountable (De Dreu et al. 2006). The prosocial mindset ("think of the other person as a partner") reduced contentious behaviors, fostered trust and cooperation, and led to better problem solving, as compared to thinking of the other person as an opponent.

The benefits of integrative thinking about goals were shown by Oettingen et al. (2001). In their study, participants were randomly assigned to think about their current status, such as their mathematical ability, to fantasize about the desired future states and goals, or to contrast the desired future states with current status. The contrast condition led to the highest effort and persistence at math, as rated by teachers. The benefits of the contrast condition point to the integrative power of consciousness, insofar as the benefits came from contrasting present versus desired future rather than simply thinking about one or the other.

COMMUNICATION AND MUTUAL UNDERSTANDING

The benefits of thinking can be argued easily, but it is difficult to make a strong case for what advantage thoughts gain by being conscious. Why could not the same thought produce the

same behavior unconsciously? Two responses explored by Baumeister & Masicampo (2010) are as follows. First, thoughts need to be conscious in order to be communicated to other people (insofar as talking is conscious, and unconscious thoughts by definition cannot be reported to others). Second, complex sequences of ideas must be constructed consciously in order to be understood. Both of these suggest that consciousness would facilitate communication and mutual understanding.

Above we noted evidence that the unconscious can take in single words but not sentences (e.g., Baars 2002). Further evidence that consciousness is needed to interpret complex communications has been provided by Gordon et al. (2002). Cognitive load interfered much more with reading comprehension of syntactically complex sentences than simple ones. Larigauderie et al. (1998) found that a cognitive load interfered with detecting syntactic and semantic errors but not with detecting typographical and spelling errors. The implication was that working memory is needed for understanding syntax.

Conscious thought is useful for other forms of social comprehension as well. Cognitive load impairs classifying facial expressions of emotion (Phillips et al. 2008). Likewise, participants under load can detect simple and obvious similarities between images, such as the same person appearing in them, but they cannot detect more abstract sorts of resemblances (e.g., two images depicting helpful actions) (Waltz et al. 2000).

The apparently wholesale absence of intentional teaching in other species could be linked to animals' inability to simulate each other's mental states. Even humans communicate less effectively when conscious simulation of others' mental states is impaired. Roβnagel (2000) showed that under low load, participants could effectively modify the instructions they gave for assembling a model plane as a function of whether they were instructing a 7-year-old or a university student. Under high load (here, having to work from memory rather than seeing the model), however, they failed to make such adjustments.

Educational theory has recently emphasized discovery learning, by which children discover principles for themselves rather than being instructed by a teacher. A well-designed experiment by Klahr & Nigam (2004) found, however, that direct, explicit instruction by teachers produced much better learning, including a generalization exercise after a week's delay, than did discovery learning.

The facts that communication changes behavior and improves group performance are sufficiently basic and obvious that most journals would not publish simple demonstrations, but they are noteworthy as evidence on how conscious thought can affect behavior. For example, Fazio et al. (2004) had participants play a game in which they chose which beans to eat, only some of which reinforced the eating by providing valuable energy points. Participants soon learned to eat only the helpful ones. However, when the experimenter provided bogus tips as to which beans were good, participants began eating those and avoiding the ones the experimenter had disparaged.

One classic demonstration that communication can improve group performance was provided by Jorgenson & Papciak (1981). Their participants played a commons dilemma game in which individuals can take from a collective resource that renews based on how much is left after each round. Thus, mutual restraint is required in order to maximize long-term gain. Communication and feedback each contributed significantly to maintaining the resource pool for longer and thus increasing the ultimate outcomes of all members. Indeed, whereas noncommunicating groups routinely exhausted the resource in short order, groups who communicated and who received feedback after each trial generally managed to maintain the resource for the entire 50 trials, thus technically eliminating the usual bad outcome. It was not communication alone, but rather communication with helpful information that improved group outcome.

The general finding that communication increases cooperation has been well established

(Dawes et al. 1977). Research in behavioral economics has found that so-called cheap talk (i.e., nonbinding communication among players prior to an incentive game) increased cooperation and trust. Such communication also increased the total payoff that all involved got, although some of the communication was clearly deceptive (including explicit promises that were then broken) so that the total net gains from communication were unequally distributed, sometimes in favor of liars (e.g., Charness 2000, Charness & Dufwenberg 2006). In a game centered on coordinating the efforts of multiple workers, managers obtained better results with communication than by altering incentives (Brandts & Cooper 2007), a finding that was somewhat at odds with traditional economic emphasis on incentives.

An ambitious experimental study of communication during team competition by Sutter & Strassmair (2009) concluded that intragroup communication intensified team effort, not least by reducing free riding. Communication between competing teams sometimes led to collusion, thereby reducing competitive effort (but arguably indicating that intergroup communication promotes intergroup cooperation). Halevy et al. (2008) likewise found that intragroup communication increased willingness to make cooperative sacrifices for the benefit of their group.

To be sure, not all communication produces prosocial outcomes. In the antagonistic trucking game studied by Deutsch & Krauss (1960), individual players used communications to threaten and bully each other. In many groups, especially with selfish individuals, communications contain misrepresentations, distortions, and even outright lies (De Dreu et al. 2008). Such cases reflect the fundamental truth that people use communication to pursue their own goals. When their own goals coincide with those of the group, as often happens, communication will bring benefits. The general conclusion is that conscious thought for communicative purposes is widely used to benefit individuals in group settings.

OVERRIDING AUTOMATIC RESPONSES

Even those who believe that most actions are driven by automatic and unconscious impulses sometimes concede that conscious processing can override, interrupt, and prevent these actions (e.g., Libet 2004, Wegner & Bargh 1998). Lambie (2008) theorized that emotions seem irrational because many emotional impulses are prone to errors. When people are aware of emotions, however, people can adaptively prevent themselves from acting on them. Lambie concluded that emotions can contribute to rational actions, but only insofar as people are aware of their emotions and can correct their errors with conscious thought.

Supporting Lambie's conclusion, Krieglmeyer et al. (2009) showed that communicated information can be used to override aggressive impulses. Participants who received negative feedback were more angry and behaved more aggressively toward their evaluator relative to control participants. However, if participants learned that the evaluator accidentally misread the rating scale (and had therefore intended to deliver a positive evaluation), aggressive behavior was significantly reduced. This information did not reduce anger, so participants were still irked by the original negative evaluation. But they were able use the new information to resist the impulse to act on that emotion.

Unconscious desires take precedence when the conscious mind is preoccupied or impaired, but conscious thought can override these. Friese et al. (2008) noted that people may have conflicts between their conscious and unconscious attitudes toward foods such as chocolate (appealing but unhealthy) and fruit (healthy but variably appealing). When under the cognitive load of rehearsing an eight-digit number, people chose snacks based on unconscious attitudes. Conscious attitudes prevailed under low load (memorizing a single digit).

Thus, cognitive load seems to release automatic impulses to dictate actions that conscious reflection would veto. Shiv & Fedorikhin (1999) offered participants a choice between

chocolate cake and carrots. Cognitive load shifted their choices heavily in favor of the cake. Ward & Mann (2000) showed that dieters ate more when under cognitive load than when under no load, at least when food cues were present.

In a vivid demonstration by Von Hippel & Gonsalkorale (2005), Australian white students were offered chicken feet by a Chinese experimenter and given high or low pressure to consume this ostensible delicacy from her culture. Under cognitive load and high pressure, people voiced the most socially inept objections, such as describing the snack as "bloody revolting."

A recent program of research by Fiedler et al. (2009) showed that many responses that have been assumed to be automatic and immune to conscious control can in fact be altered by conscious control. This may be considered a useful counterweight to research programs such as Bargh's (1997a), which show that many behaviors that are assumed to depend on conscious processing can be elicited automatically and without full conscious recognition.

Others have likewise begun to show that automatic responses can be overridden. In the identifiable victim effect, people donate more money to requests featuring specific needy victims than to requests based on abstract statistics. Small et al. (2007) replicated this effect but also counteracted it by having people deliberate for a time about their decision to donate. Likewise, stereotype threat effects often take the form of impaired performance caused by believing that one's group is expected to perform poorly on a particular test (e.g., women taking math tests). Johns et al. (2005) eliminated this effect simply by teaching women about it. Sherman et al. (2009) likewise reduced or eliminated self-affirmation effects by telling people about the effect or even just telling them that the manipulation was designed to bolster self-esteem. Savitsky & Gilovich (2003) counteracted the detrimental effects of speech anxiety on performance by informing people about the illusion of transparency. That is, when people were told that listeners could not discern how worried or anxious they were, their speeches were higher in quality than in a neutral control and in a simple reassurance condition that told people not to worry about other people's impressions. Such effects were almost certainly mediated by unconscious responses, but the role of the conscious input was clearly causal, possibly indispensable.

Variations in risk aversion were explored by Abele et al. (2004), who had people perform a single turn of a two-person economic game. They were randomly assigned to choose before, after, or simultaneously with the other player. Risk aversion was highest among simultaneous choosers and lowest among those who chose after their partner had chosen. All these inherently irrational effects were eliminated, however, by instructing people to think carefully about their choices. The implication is that the choice-timing manipulation activated various schemas about what the partner would likely do, but conscious reflection brought other possibilities to mind and therefore freed people from the bias caused by the timing manipulation.

More broadly, many social psychologists have shown that behavior is often influenced by situational forces and subtle cues, and the operation of these outside of awareness probably lies behind the remarks by Bargh (1997b) (quoted above) to the effect that daily reactions are mainly automatic. However, consciousness seems to reduce the power and influence of many of these situational influences. Van Leeuwen et al. (2009) taught participants to make a finger movement either in response to seeing an X or seeing an image of another person's finger making that movement. The latter response is simple mimicry and thus may be automatic. Under cognitive load, the mimicry response was faster than the response to the X, but this difference was eliminated under low load. Likewise, participants in studies by Roberts et al. (1994) performed an antisaccade response, which requires shifting one's gaze away from a novel stimulus. Under the cognitive load of doing arithmetic, performance was poor, indicating the dominance of the normal response of automatically orienting toward the novel stimulus (instead of away, as instructed). Performance

was better under low load. They concluded that working memory (akin to conscious thought) is needed to overcome reflex responses.

Consciousness can moderate the impact of cues on smoking (Westling et al. 2006). Under high cognitive load, smokers smoked more in response to prosmoking cues (e.g., cigarette ads) and less in response to antismoking cues (e.g., quit-smoking posters). In contrast, the effect of these cues was significantly weaker when people were under low load and thus had more conscious resources available to override the automatic responses.

Like situational cues, habits guide behavior automatically. Verplanken et al. (2008) showed that consciously held environmental values had only a modest effect on whether people used their cars for commuting—if the people had established habits. When the habits were disrupted by relocating, however, the environmental values had a significantly stronger effect.

Even direct experience can be overcome by conscious thoughts communicated by an experimenter. In an early demonstration, Colgan (1970) exposed participants to flashing lights followed sometimes by electric shock. As in classical conditioning, they soon exhibited physiological arousal in response to the lights. Then the experimenter instructed some participants that certain light patterns would not be followed by shock, and their physiological responses to the other lights were immediately attenuated. The verbal instructions thus counteracted the conditioned learning.

DISCUSSION

The evidence for conscious causation of behavior is profound, extensive, adaptive, multifaceted, and empirically strong. Recent criticisms have questioned the efficacy of conscious thought for direct control of behavior. But these criticisms are largely irrelevant to the possibility of offline and indirect effects on later behavior, which constituted the bulk of the present findings.

The evidence reviewed here indicates that conscious thought influences behavior through diverse mechanisms. It can activate and stimulate motivations—or satiate and reduce them. Thinking about the self in various connections altered motivations (as in the licensing, self-affirmation, and self-completion effects). Likewise, remembering events, counterfactual thinking, and reflection stimulated or reduced various motivations. When the person has multiple motivations that produce competing, incompatible impulses, consciousness may help decide which one takes precedence. Nothing indicated motivations originating in consciousness—instead, conscious thoughts interacted with existing motivations.

Consciousness serves integrative functions that can have downstream effects on behavior. It seems to bridge general, abstract ideas to specific actions, possibly because the unconscious works best with highly specific directives whereas human culture and social interaction often provide abstract information, broad values, and general rules and principles. Implementation intentions' effects seem based on this principle of translating abstract values and intentions into specific acts. Likewise, mental practice and simulation seemingly work best with highly specific, concrete thoughts. Diverse findings also showed that cognitive load prevented people from detecting patterns spread across time (e.g., understanding syntax or detecting patterns in sequential outcomes), suggesting that consciousness is helpful for temporal integration.

Many findings suggested altering behavior in response to nonpresent contingencies and consequences. Consciousness was useful for replaying past events (including counterfactually), reflecting on feedback over past performances, inferring implications of recent events, anticipating future outcomes and emotions, and planning. Many of the effects in which conscious thought overrides automatic impulses also suggest its usefulness in overcoming short-term inclinations and temptations so as to advance long-term goals, thus again treating the present as means toward a desired future. Consciousness thus helps integrate current behavior into longer time frames, thereby connecting

past, present, and future and even building a coherent self.

The unconscious can process single words but not sentences, so consciousness is needed for both speaking to and understanding others. It is ironic that many researchers who claim to demonstrate the relative impotence or dispensability of conscious thought have usually still used conscious communication to give their participants crucial instructions and impart vital information, thus relying heavily on that very faculty that they ostensibly discredited.

Some information can be taken in without much conscious processing, perhaps, but conscious thought is often useful for integrating it and reflecting on it. Much of conscious thought is thus not for importing new information but rather for processing information one already has. Logical reasoning exemplifies the value of conscious thought for working with information already known so as to reach novel conclusions. Some findings that neither reflection nor communication was useful by itself—instead being valuable in combination with valuable feedback or other information—suggest that the role of consciousness is for elaboration and other processing. Elaborating, explaining, and answering "why?" questions improved learning and subsequent performance. Conscious thought belabors and extracts implications from information that is already in the mind from earlier events.

Many findings were based on the importance of conscious thought for verbal communication and understanding others, and indeed the findings on negotiation, perspective taking, perceiving emotion, and intentional teaching may point to social phenomena that depend crucially on conscious thought. These findings fit the view that conscious thought is for facilitating social life and culture rather than for direct control of action (Baumeister & Masicampo 2010).

Indeed, this review was stimulated in part by Libet's (1985) evidence suggesting that consciousness does not directly cause behavior. Yet the evidence we present does not indicate direct causation and thus can be reconciled with his findings. In many cases (such as the framing, planning, and manipulated self-regard effects) the experimental manipulation of conscious state simply imports a thought or possibility into the mind, and the eventual effect on behavior is almost certainly a result of extensive mediation by unconscious processes. This point deserves emphasis, because nearly all the effects we reviewed had substantial gaps between the conscious manipulation and the behavior, and so it is likely that unconscious processes helped mediate. In many cases (the self-affirmation, counterproductive, and licensing effects, among others) it seemed unlikely that the person consciously realized the effect that the conscious thoughts had on later behavior.

Moreover, the findings that brought the conscious intervention closest to the behavior tended to produce some of the few negative, maladaptive effects. In verbal overshadowing and choking under pressure, for example, the person seeks to intrude conscious control directly into a well-learned or otherwise automatic response sequence, which ends up impairing performance.

In retrospect, consciousness may be ill suited for direct control of physical behavior, not least because it is at best imprecisely linked to the present moment in time. That is, external events are represented in consciousness only after some delay caused by neuronal transmission from sense organs to brain and also by (extensive) preconscious processing of sensory input. There is some evidence that the conscious mind seeks to compensate for these delays by projecting into the very near future (Shariff & Peterson 2005), but such conscious projection is obviously just educated guesswork. Given these deviations in both directions from the objective present, it is not surprising that multiple findings indicate imprecision in conscious awareness of time. The conscious self cannot even note the precise time at which it does something, needing instead to infer and reconstruct it (Banks & Isham 2009; Gomes 1998, 2002; Moore & Haggard 2008; Sarrazin et al. 2008).

What happens when precise coordination with objective time is essential? In such cases,

we think, people rely on unconscious processing. One example in which precise temporal coordination is needed would be joint musical performance, such as when an ensemble or orchestra must play different parts exactly simultaneously. Experimental evidence indicates the importance of unconscious processing to accomplish that, however, even while the understanding of the shared goal is presumably conscious. Baumeister et al. (2007b) found that experienced musicians were able to keep the beat (and stay within key) despite the heavy cognitive load of counting backward by six, which seriously impaired melodic improvisation. In music, crudely put, melody is conscious while rhythm is unconscious. This suggests that consciousness relies on an unconscious timer when precise temporal coordination is needed, whereas the unconscious needs the collaboration of conscious thought to integrate across time so as to produce melody.

Our strict methodological restrictions entailed skipping many other possible benefits from conscious thought. By restricting our review to studies that manipulated conscious states, we eliminated the many studies on individual differences in conscious orientation, such as differences in self-consciousness and empathy. Studies in which conscious processes contributed to coping with misfortune were also kept out, unless the coping itself was randomly assigned. Even studies with randomly assigned coping were eliminated if they lacked behavioral measures. As an intriguing example of the last, Holmes et al. (2009) showed that playing Tetris after watching gruesome images of injury and death reduced intrusive memories and other clinical symptoms during the subsequent week. As an example of the coping process, J.V. Petrocelli & S.J. Sherman (unpublished data) showed that detailed feedback on initial performance on a gambling task led to upward counterfactuals, which fully mediated subsequent willingness to gamble again on that task.

There are two forms of the view that consciousness is an epiphenomenon. One is that all conscious processes lack causal efficacy. This review has sought to assemble the best available evidence against that view. The other form suggests that the conscious experience itself is irrelevant to the causal effects of thoughts. In other words, the thoughts may have effects, but they would have the same effects if they were unconscious. This review has little to say about that. The present findings are, however, consistent with the main responses that have been proposed elsewhere, namely that conscious experience is useful for sharing information across different brain and mind sites, for enabling thoughts to be communicated socially, and for constructing meaningful sequences of thoughts too complex for purely unconscious processing (Baars 1997, Baumeister & Masicampo 2010, Morsella 2005).

Several patterns we expected and searched for but failed to find may indicate possible directions for future research or even mistaken assumptions. The great upsurge of research on attributions in the 1970s was based in part on the assumption that attributions helped cause behavior, but we found precious little evidence of attributions causing behavior. [The classic Storms & Nisbett (1970) finding on insomnia may have benefited from an anomalous baseline condition, and Kellogg & Baron (1975) failed to replicate the finding.] Likewise, social psychologists often deceive participants on the assumption that if they know about an effect, it will disappear or change, but we found only scattered bits of evidence that conscious awareness of typical response patterns eliminates them.

The present evidence points to four broad conclusions about how conscious thought influences behavior. First, it integrates behavior across time. A great many findings showed that consciousness is helpful for enabling present or imminent behavior to benefit from past and future events, and for present and recent events to influence future behavior. Evidence of such temporal integration includes mental practice, mental simulation, anticipation, planning, intending, interpreting or reflecting on past events, and overriding short-term impulses in favor of long-term considerations.

Second, conscious thought allows the individual's behavior to be informed by social and cultural factors. This function is evident in many lines of evidence, including sharing information with and understanding others, perspective taking, negotiating, accountability, and dealing with social norms and others' expectations (e.g., in stereotype threat). Human social life depends on shared understandings that may require some conscious processing.

Third, conscious thoughts are influential in situations that present multiple alternative possibilities. In many cases, the causal flow of events is leading in one direction, but an alternative is structurally possible. Conscious thought can simulate alternative realities and by imagining them increase the likelihood that they will come true. Studies of overriding automatic processes, mental practice, and self-control indicate the importance of replacing one imminent future with another, more appealing one. Studies of implementation intentions, counterfactual thinking, and mental framing are based on the fact (of situation structure) that there are multiple possible alternatives that could happen. Negotiation studies, which show up in many different subsections above, by definition entail situations in which multiple alternative outcomes are all possible, and the adaptive value of consciousness is to be found in socially obtaining a reasonably favorable outcome for one's own side. A vital function of consciousness may be to comprehend the multiplicity of possibilities so as to facilitate bringing about a preferable one.

Fourth, most and possibly all human behavior emerges from a combination of conscious and unconscious processes. Nothing we have reviewed would prove that any behavior emerged from exclusively conscious processes. Likewise, ostensible evidence of unconscious causation is typically compromised by extensive reliance on conscious processes too, such as for giving instructions and focusing attention; the participant is merely unconscious of one particular link in the causal chain. Past efforts to decide whether a given behavior was produced by conscious or unconscious thought may have been based on a false dichotomy. Future research should focus more on how conscious and unconscious processes interact and complement each other rather than trying to label each behavioral outcome as due to conscious or unconscious processes.

In sum, conscious thoughts are far more than a steam whistle or epiphenomenon. Human conscious thought may be one of the most distinctive and remarkable phenomena on earth and one of the defining features of the human condition. Our results suggest that, despite recent skepticism, it may have considerable functional value after all. A person whose behavior did not stem at least in part from conscious thoughts would be far less than a fully functioning person.

DISCLOSURE STATEMENT

ACKNOWLEDGMENTS

LITERATURE CITED

Abele S, Bless H, Ehrhart K. 2004. Social information processing in strategic decision-making: why timing matters. *Organ. Behav. Hum. Decis. Process.* 93:28–46

Acker F. 2008. New findings on unconscious versus conscious thought in decision making: additional empirical data and meta-analysis. *Judgment Decis. Making* 3:292–303

Ackerman JM, Goldstein NJ, Shapiro JR, Bargh JA. 2009. You wear me out: the vicarious depletion of self-control. *Psychol. Sci.* 20:326–32

Anderson CA. 1983. Imagination and expectation: the effect of imagining behavioral scripts on personal influences. *J. Personal. Soc. Psychol.* 45:293–305

Anderson CJ. 2003. The psychology of doing nothing: Forms of decision avoidance result from reason and emotion. *Psychol. Bull.* 129:139–67

Anseel F, Lievens F, Schollaert E. 2009. Reflection as a strategy to enhance task performance after feedback. *Organ. Behav. Hum. Decis. Process.* 110:23–35

Armitage CJ, Harris PR, Hepton G, Napper L. 2008. Self-affirmation increases acceptance of health-risk information among UK adult smokers with low socioeconomic status. *Psychol. Addict. Behav.* 22:88–95

Aronson E, Mettee DR. 1968. Dishonest behavior as a function of differential levels of induced self-esteem. *J. Personal. Soc. Psychol.* 9:121–27

Baars BJ. 1997. *In the Theater of Consciousness: The Workspace of the Mind*. New York: Oxford Univ. Press

Baars BJ. 2002. The conscious access hypothesis: origins and recent evidence. *Trends Cogn. Sci.* 6:47–52

Banks WP, Isham EA. 2009. We infer rather than perceive the moment we decided to act. *Psychol. Sci.* 20:17–21

Bargh JA. 1997a. The automaticity of everyday life. See Wyer 1997, 10:1–61

Bargh JA. 1997b. Reply to the commentaries. See Wyer 1997, 10:231–46

Batson CD. 2009. Two forms of perspective taking: imagining how another feels and imagining how you would feel. See Markman et al. 2009, pp. 267–79

Baumeister RF. 1984. Choking under pressure: self-consciousness and paradoxical effects of incentives on skillful performance. *J. Personal. Soc. Psychol.* 46:610–20

Baumeister RF, Jones EE. 1978. When self-presentation is constrained by the target's knowledge: consistency and compensation. *J. Personal. Soc. Psychol.* 36:608–18

Baumeister RF, Masicampo EJ. 2010. Conscious thought is for facilitating social and cultural interactions: how mental simulations serve the animal-culture interface. *Psychol. Rev.* In press

Baumeister RF, Schmeichel BJ, DeWall CN, Vohs KD. 2007a. Is the conscious self a help, a hindrance, or an irrelevance to the creative process? *Adv. Psychol. Res.* 53:137–52

Baumeister RF, Vohs KD, DeWall CN, Zhang L. 2007b. How emotion shapes behavior: feedback, anticipation, and reflection, rather than direct causation. *Personal. Soc. Psychol. Rev.* 11:167–203

Beattie J, Baron J, Hershey JC, Spranca M. 1994. Determinants of decision attitude. *J. Behav. Decis. Making* 7:129–44

Beilock SL, Bertenthal BI, McCoy AM, Carr TH. 2004. Haste does not always make waste: expertise, direction of attention, and speed versus accuracy in performing sensorimotor skills. *Psychon. Bull. Rev.* 11:373–79

Beilock SL, Lyons IM. 2009. Expertise and the mental simulation of action. See Markman et al. 2009, pp. 21–34

Borkovec TD, Ray WJ, Stoeber J. 1998. Worry: a cognitive phenomenon intimately linked to affective, physiological, and interpersonal behavioral processes. *Cogn. Ther. Res.* 22:561–76

Brandts J, Cooper DJ. 2007. It's what you say, not what you pay: an experimental study of manager-employee relationships in overcoming coordination failure. *J. Eur. Econ. Assoc.* 5:1223–68

Brouziyne M, Molinaro C. 2005. Mental imagery combined with physical practice of approach shots for golf beginners. *Percept. Mot. Skills* 101:203–11

Bushman BJ, Bonacci AM, Pedersen WC, Vasquez EA, Miller N. 2005. Chewing on it can chew you up: effects of rumination on triggered displaced aggression. *J. Personal. Soc. Psychol.* 88:969–83

Caliari P. 2008. Enhancing forehand acquisition in table tennis: the role of mental practice. *J. Appl. Sport Psychol.* 20:88–96

Calvillo DP, Penaloza A. 2009. Are complex decisions better left to the unconscious? Further failed replications of the deliberation-without-attention effect. *Judgment Decis. Making* 4:509–17

Charness G. 2000. Self-serving cheap talk: a test of Aumann's conjecture. *Games Econ. Behav.* 33:177–94

Charness G, Dufwenberg M. 2006. Promises and partnership. *Econometrica* 74:1579–601

Cohen GL, Garcia J, Apfel N, Master A. 2006. Reducing the racial achievement gap: a social-psychological intervention. *Science* 313:1307–10

Colgan DM. 1970. Effects of instructions on the skin resistance response. *J. Exp. Psychol.* 86:108–12

Cooper G, Tindall-Ford S, Chandler P, Sweller J. 2001. Learning by imagining. *J. Exp. Psychol.: Appl.* 7:68–82

Darnon C, Butera F, Harackiewicz J. 2007b. Achievement goals in social interactions: learning with mastery versus performance goals. *Motiv. Emot.* 31:61–70

Darnon C, Harackiewicz JM, Butera F, Mugny G, Quiamzade A. 2007a. Performance-approach and performance-avoidance goals: when uncertainty makes a difference. *Personal. Soc. Psychol. Bull.* 33:813–27

Dawes RM, McTavish J, Shaklee H. 1977. Behavior, communication, and assumptions about other people's behavior in a commons dilemma situation. *J. Personal. Soc. Psychol.* 35:1–11

De Dreu CKW, Beersma B, Stroebe K, Euwema MC. 2006. Motivated information processing, strategic choice, and the quality of negotiated agreement. *J. Personal. Soc. Psychol.* 90:927–43

De Dreu CKW, Koole SL, Steinel W. 2000. Unfixing the fixed pie: a motivational information-processing approach to integrative negotiation. *J. Personal. Soc. Psychol.* 79:975–87

De Dreu CKW, Nijstad BA, Van Knippenberg D. 2008. Motivated information processing in group judgment and decision making. *Personal. Soc. Psychol. Rev.* 12:22–49

De Neys W. 2006. Dual processing in reasoning: two systems but one reasoner. *Psychol. Sci.* 17:428–33

Deutsch M, Krauss RM. 1960. The effect of threat upon interpersonal bargaining. *J. Abnorm. Soc. Psychol.* 61:181–89

DeWall CN, Baumeister RF, Masicampo EJ. 2008. Evidence that logical reasoning depends on conscious processing. *Conscious. Cogn.* 17:628–45

Dijksterhuis A, Aarts H, Smith PK. 2005. The power of the subliminal: subliminal perception and possible applications. In *The New Unconscious*, ed. R Hassin, J Uleman, JA Bargh, pp. 77–106. New York: Oxford Univ. Press

Dijksterhuis A, Bos MW, Nordgren LF, van Baaren RB. 2006. On making the right choice: the deliberation-without-attention effect. *Science* 311:1005–7

Dijksterhuis A, Chartrand TL, Aarts H. 2007. Effects of priming and perception on social behavior and goal pursuit. In *Social Psychology and the Unconscious: The Automaticity of Higher Mental Processes*, ed. JA Bargh, pp. 51–132. Philadelphia, PA: Psychol. Press

Dijksterhuis A, Nordgren LF. 2006. A theory of unconscious thought. *Perspect. Psychol. Sci.* 1:95–109

Dretsch MN, Tipples J. 2008. Working memory involved in predicting future outcomes based on past experiences. *Brain Cogn.* 66:83–90

Drews FA, Pasupathi M, Strayer DL. 2008. Passenger and cell phone conversations in simulated driving. *J. Exp. Psychol.: Appl.* 14:392–400

Driskell JE, Copper C, Moran A. 1994. Does mental practice enhance performance? *J. Appl. Psychol.* 79:481–92

Drolet A, Luce MF. 2004. The rationalizing effects of cognitive load on emotion-based trade-off avoidance. *J. Consum. Res.* 31:63–77

Druckman DE, Swets JA. 1988. *Enhancing Human Performance: Issues, Theories, and Techniques*. Washington, DC: Natl. Acad. Press

Eisenberg N, Fabes RA, Murphy B, Karbon M, Smith M, Maszk P. 1996. The relations of children's dispositional empathy-related responding to their emotionality, regulation, and social functioning. *Dev. Psychol.* 32:195–209

Ellis S, Davidi I. 2005. After-event reviews: drawing lessons from successful and failed experience. *J. Appl. Psychol.* 90:857–71

Epley N, Caruso E, Bazerman MH. 2006. When perspective taking increases taking: reactive egoism in social interaction. *J. Personal. Soc. Psychol.* 91:872–89

Epstude K, Roese NJ. 2008. The functional theory of counterfactual thinking. *Personal. Soc. Psychol. Rev.* 12:168–92

Epton T, Harris PR. 2008. Self-affirmation promotes health behavior change. *Health Psychol.* 27:746–52

Fazio RH, Eiser JR, Shook NJ. 2004. Attitude formation through exploration: valence asymmetries. *J. Personal. Soc. Psychol.* 87:293–311

Fiedler K, Bluemke M, Unkelbach C. 2009. Exerting control over allegedly automatic associative processes. In *The Psychology of Self-Regulation: Cognitive, Affective, and Motivational Processes. The Sydney Symposium of Social Psychology*, ed. J Forgas, RF Baumeister, D Tice, pp. 249–69. New York: Psychol. Press

Forsyth DR, Kerr NA, Burnette JL, Baumeister RF. 2007. Attempting to improve the academic performance of struggling college students by bolstering their self-esteem: an intervention that backfired. *J. Soc. Clin. Psychol.* 26:447–59

Friese M, Hofmann W, Wanke M. 2008. When impulses take over: moderated predictive validity of explicit and implicit attitude measures in predicting food choice and consumption behavior. *Br. J. Soc. Psychol.* 47: 397–419

Gagne RH, Smith EC. 1962. A study of the effects of verbalization on problem solving. *J. Exp. Psychol.* 63:12–18

Galinsky AD, Maddux WW, Gilin D, White JB. 2008a. Why it pays to get inside the head of your opponent: the differential effects of perspective taking and empathy in negotiations. *Psychol. Sci.* 19:378–84

Galinsky AD, Wang CS, Ku G. 2008b. Perspective-takers behave more stereotypically. *J. Personal. Soc. Psychol.* 95:404–19

Geraerts E, Bernstein DM, Merckelbach H, Linders C, Raymaekers L, Loftus EF. 2008. Lasting false beliefs and their behavioral consequences. *Psychol. Sci.* 19:749–53

Gollwitzer PM. 1999. Implementation intentions: strong effects of simple plans. *Am. Psychol.* 54:493–503

Gollwitzer PM, Sheeran P. 2006. Implementation intentions and goal achievement: a meta-analysis of effects and processes. *Adv. Exp. Soc. Psychol.* 38:69–119

Gomes G. 1998. The timing of conscious experience: a critical review and reinterpretation of Libet's research. *Conscious. Cogn.* 7:559–95

Gomes G. 2002. Problems in the timing of conscious experience. *Conscious. Cogn.* 11:191–97

Gonzalez-Vallejo C, Lassiter GD, Bellezza FS, Lindberg MJ. 2008. "Save angels perhaps": a critical examination of unconscious thought theory and the deliberation-without-attention effect. *Rev. Gen. Psychol.* 12:282–96

Gordon PC, Hendrick R, Levine WH. 2002. Memory-load interference in syntactic processing. *Psychol. Sci.* 13:425–30

Gray R. 2004. Attending to the execution of a complex sensorimotor skill: expertise differences, choking and slumps. *J. Exp. Psychol.: Appl.* 10:42–54

Greenwald AG, Carnot CG, Beach R, Young B. 1987. Increasing voting behavior by asking people if they expect to vote. *J. Appl. Psychol.* 72:315–18

Gregory WL, Cialdini RB, Carpenter KM. 1982. Self-relevant scenarios as mediators of likelihood estimates and compliance: Does imagining make it so? *J. Personal. Soc. Psychol.* 43:89–99

Grouios G. 1992. Mental practice: a review. *J. Sport Behav.* 15:42–59

Haider H, Frensch PA, Joram D. 2005. Are strategy shifts caused by data-driven processes or by voluntary processes? *Conscious. Cogn.* 14:495–519

Halevy N, Bornstein G, Sagiv L. 2008. In-group love and out-group hate as motives for individual participation in intergroup conflict: a new game paradigm. *Psychol. Sci.* 19:405–11

Hinson JM, Jameson TL, Whitney P. 2002. Somatic markers, working memory, and decision making. *Cogn. Affect. Behav. Neurosci.* 2:341–53

Holmes EA, James EL, Coode-Bate T, Deeprose C. 2009. Can playing the computer game "Tetris" reduce the build-up of flashbacks for trauma? A proposal from cognitive science. *PLoS ONE* 4:e4153

Huxley T. 1874. On the hypothesis that animals are automata, and its history. *Nature* 10:362–66

Janis IL, Mann L. 1977. *Decision Making: A Psychological Analysis of Conflict, Choice and Commitment*. New York: Free Press

Jeannerod M. 2006. Consciousness of action as an embodied consciousness. See Pockett et al. 2006, pp. 25–38

Johns M, Schmader T, Martens A. 2005. Knowing is half the battle: teaching stereotype threat as a means of improving women's math performance. *Psychol. Sci.* 16:175–79

Johnson CS, Stapel DA. 2007. No pain, no gain: the conditions under which upward comparisons lead to better performance. *J. Personal. Soc. Psychol.* 92:1051–67

Jorgenson DO, Papciak AS. 1981. The effects of communication, resource feedback, and identifiability on behavior in a simulated commons. *J. Exp. Soc. Psychol.* 17:373–85

Kellogg R, Baron RS. 1975. Attribution theory, insomnia, and the reverse placebo effect: a reversal of Storms and Nisbett's findings. *J. Personal. Soc. Psychol.* 32:231–36

Khan U, Dhar R. 2006. Licensing effect in consumer choice. *J. Marketing Res.* 43:259–66

Kim HS. 2002. We talk, therefore we think? A cultural analysis of the effect of talking on thinking. *J. Personal. Soc. Psychol.* 83:828–42

Kimble GA, Perlmuter LC. 1970. The problem of volition. *Psychol. Rev.* 77:361–84

Klahr D, Nigam M. 2004. The equivalence of learning paths in early science instruction: effects of direct instruction and discovery learning. *Psychol. Sci.* 15:661–67

Kosslyn SM, Moulton ST. 2009. Mental imagery and implicit memory. See Markman et al. 2009, pp. 35–51

Kray LJ, Galinsky AD, Markman MD. 2009. Counterfactual structure and learning from experience in negotiations. *J. Exp. Psychol.* 45:979–82

Krieglmeyer R, Wittstadt D, Strack F. 2009. How attribution influences aggression: answers to an old question by using an implicit measure of anger. *J. Exp. Psychol.* 45:379–85

Lambie JA. 2008. On the irrationality of emotion and the rationality of awareness. *Conscious. Cogn.* 17:946–71

Larigauderie P, Gaonac'h D, Lacroix N. 1998. Working memory and error detection in texts: What are the roles of the central executive and the phonological loop? *Appl. Cogn. Psychol.* 12:505–27

Larrick RP, Boles TL. 1995. Avoiding regret in decisions with feedback: a negotiation example. *Organ. Behav. Hum. Decis. Process.* 63:87–97

Lee L, Amir O, Ariely D. 2009. In search of homo economicus: cognitive noise and the role of emotion in preference consistency. *J. Consum. Res.* 15:173–87

Libby LK, Eibach RP, Gilovich T. 2005. Here's looking at me: the effect of memory perspective on assessments of personal change. *J. Personal. Soc. Psychol.* 88:50–62

Libby LK, Shaeffer EM, Eibach RP, Slemmer JA. 2007. Picture yourself at the polls: Visual perspective in mental imagery affects self-perception and behavior. *Psychol. Sci.* 18:199–203

Libet B. 1985. Unconscious cerebral initiative and the role of conscious will in voluntary action. *Behav. Brain Sci.* 8:529–66

Libet B. 2004. *Mind Time: The Temporal Factor in Consciousness.* Cambridge, MA: Harvard Univ. Press

Lieberman MD, Gaunt R, Gilbert DT, Trope Y. 2002. Reflection and reflexion: a social cognitive neuroscience approach to attributional inference. *Adv. Exp. Soc. Psychol.* 34:199–249

Lindsey LL. 2005. Anticipated guilt as behavioral motivation. *Hum. Comm. Res.* 31:453–81

Lyubomirsky S, Kasri F, Zehm K. 2003. Dysphoric rumination impairs concentration on academic tasks. *Cogn. Ther. Res.* 27:309–30

Lyubomirsky S, Sousa L, Dickerhoof R. 2006. The costs and benefits of writing, talking, and thinking about life's triumphs and defeats. *J. Personal. Soc. Psychol.* 90:692–708

Lyubomirsky S, Tucker KL, Caldwell ND, Berg K. 1999. Why ruminators are poor problem solvers: clues from the phenomenology of dysphoric rumination. *J. Personal. Soc. Psychol.* 77:1041–60

Markman KD, Klein WMP, Suhr JA, eds. 2009. *The Handbook of Imagination and Mental Simulation.* New York: Psychol. Press

Markman KD, McMullen MN, Elizaga RA. 2008. Counterfactual thinking, persistence, and performance: a test of the reflection and evaluation model. *J. Exp. Soc. Psychol.* 44:421–28

Martens A, Johns M, Greenberg J, Schimel J. 2006. Combating stereotype threat: the effect of self-affirmation on women's intellectual performance. *J. Exp. Soc. Psychol.* 42:236–43

Mayer RE. 2004. Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction. *Am. Psychol.* 59:14–19

McCrea SM. 2008. Self-handicapping, excuse making, and counterfactual thinking: consequences for self-esteem and future motivation. *J. Personal. Soc. Psychol.* 95:274–92

McGlone MS, Aronson J. 2007. Forewarning and forearming stereotype-threatened students. *Comm. Educ.* 56:119–33

Meehl PE. 1956. Wanted—a good cookbook. *Am. Psychol.* 11:262–12

Mele AR. 2009. *Effective Intentions: The Power of Conscious Will.* New York: Oxford

Monin B, Miller DT. 2001. Moral credentials and the expression of prejudice. *J. Personal. Soc. Psychol.* 81:33–43

Moore J, Haggard P. 2008. Awareness of action: inference and prediction. *Conscious. Cogn.* 17:136–44

Morewedge CK, Huh YE, Vosgerau J. 2009. *Thought for Food: Top-Down Processes Moderate Sensory-Specific Satiation.* Presented at Annu. Meet. Soc. Personal. Soc. Psychol., 10th, Tampa, FL

Morsella E. 2005. The function of phenomenal states: supramodular interaction theory. *Psychol. Rev.* 112:1000–21

Nickerson DW, Rogers T. 2010. Do you have a voting plan? Implementation, intentions, voter turnout, and organic plan making. *Psychol. Sci.* 21:194–99

Nordgren L, Dijksterhuis A. 2009. The devil is in the deliberation: thinking too much reduces preference consistency. *J. Consum. Res.* 36:39–46

Oettingen G, Hyeon-ju P, Schnetter K. 2001. Self-regulation of goal setting: turning free fantasies about the future into binding goals. *J. Personal. Soc. Psychol.* 80:736–53

Papies EK, Aarts H, de Vries NK. 2009. Planning is for doing: Implementation intentions go beyond the mere creation of goal-directed associations. *J. Exp. Soc. Psychol.* 45:1148–51

Payne JW, Samper A, Bettman JR, Luce MF. 2008. Boundary conditions on unconscious thought in complex decision making. *Psychol. Sci.* 19:1117–22

Pennebaker JW, Chung CK. 2007. Expressive writing, emotional upheavals, and health. In *Handbook of Health Psychology*, ed. H Friedman R Silver, pp. 263–94. New York: Oxford Univ. Press

Penney CG. 1975. Modality effects in short-term verbal memory. *Psychol. Bull.* 82:68–84

Pham LB, Taylor SE. 1999. From thought to action: effects of process- versus outcome-based mental simulations on performance. *Personal. Soc. Psychol. Bull.* 25:250–60

Phillips LH, Channon S, Tunstall M, Hedenstrom A, Lyons K. 2008. The role of working memory in decoding emotions. *Emotion* 8:184–91

Pinter B, Insko CA, Wildschut T, Kirchner JL, Montoya RM, et al. 2007. Reduction of interindividual-intergroup discontinuity: the role of leader accountability and proneness to guilt. *J. Personal. Soc. Psychol.* 93:250–65

Pockett S. 2006. The neuroscience of movement. See Pockett et al. 2006, pp. 9–24

Pockett S, Banks W, Gallagher S, eds. 2006. *Does Consciousness Cause Behavior?* Cambridge, MA: MIT Press

Prather DC. 1973. Prompted mental practice as a flight simulator. *J. Appl. Psychol.* 57:353–55

Ray RD, Wilhelm FH, Gross JJ. 2008. All in the mind's eye? Anger rumination and reappraisal. *J. Personal. Soc. Psychol.* 94:133–45

Richard R, Van Der Pligt J, de Vries N. 1996. Anticipated regret and time perspective: changing sexual risk taking behavior. *J. Behav. Decis. Making* 9:185–99

Risen JL, Gilovich T. 2007. Another look at why people are reluctant to exchange lottery tickets. *J. Personal. Soc. Psychol.* 93:12–22

Roberts R, Hager LD, Heron C. 1994. Prefrontal cognitive processes: working memory and inhibition in the antisaccade task. *J. Exp. Psychol.: Gen.* 123:374–93

Roediger HL, Goode MK, Zaromb FM. 2008. Free will and the control of action. In *Are We Free? Psychology and Free Will*, ed. J Baer, J Kaufman, R Baumeister, pp. 205–25. New York: Oxford Univ. Press

Roese NJ. 1994. The functional basis of counterfactual thinking. *J. Personal. Soc. Psychol.* 66:805–18

Roβnagel C. 2000. Cognitive load and perspective taking: applying the automatic-controlled distinction to verbal communication. *Eur. J. Soc. Psychol.* 30:429–45

Sachdeva S, Iliev R, Medin DL. 2009. Sinning saints and saintly sinners: the paradox of moral self-regulation. *Psychol. Sci.* 20:523–28

Sanders CW, Sadoski M, van Walsum K, Bramson R, Wiprud R, Fossum TW. 2004. Comparing the effects of physical practice and mental imagery rehearsal on learning basic surgical skills by medical students. *Am. J. Obstet. Gynecol.* 191:1811–14

Sarrazin JC, Cleeremans A, Haggard P. 2008. How do we know what we are doing? Time, intention, and awareness of action. *Conscious. Cogn.* 17:602–15

Savitsky K, Gilovich T. 2003. The illusion of transparency and the alleviation of speech anxiety. *J. Exp. Soc. Psychol.* 39:618–25

Schmeichel BJ, Vohs KD. 2009. Self-affirmation and self-control: affirming core values counteracts ego depletion. *J. Personal. Soc. Psychol.* 96:770–82

Scholten L, van Knippenberg D, Nijstad BA, De Dreu CKW. 2007. Motivated information processing and group decision-making: effects of process accountability on information processing and decision quality. *J. Exp. Soc. Psychol.* 43:539–52

Schooler JW, Ohlssen S, Brooks K. 1993. Thoughts beyond words: when language overshadows insight. *J. Exp. Psychol.: Gen.* 122:166–83

Seifert TL. 1993. Effects of elaborative interrogation with prose passages. *J. Educ. Psychol.* 85:642–51

Shariff AF, Peterson JB. 2005. Anticipatory consciousness, Libet's veto and a close-enough theory of free will. In *Consciousness and Emotion: Agency, Conscious Choice and Selective Perception*, ed. R Ellis, N Newton, pp. 197–215. Amsterdam: John Benjamins

Sherman DAK, Nelson LD, Steele CM. 2000. Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personal. Soc. Psychol. Bull.* 26:1046–58

Sherman DK, Cohen GL, Nelson LD, Nussbaum AD, Bunyan DP, et al. 2009. Affirmed yet unaware: exploring the role of awareness in the process of self-affirmation. *J. Personal. Soc. Psychol.* 97:745–64

Sherman RT, Anderson CA. 1987. Decreasing premature termination from psychotherapy. *J. Soc. Clin. Psychol.* 5:298–312

Shiffrin RM, Schneider W. 1977. Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. *Psychol. Rev.* 84:127–90

Shiv B, Fedorikhin A. 1999. Heart and mind in conflict: the interplay of affect and cognition in consumer decision making. *J. Consum. Res.* 26:278–92

Siegel PA, Scillitoe J, Parks-Yancy R. 2005. Reducing the tendency to self-handicap: the effect of self-affirmation. *J. Exp. Soc. Psychol.* 41:589–97

Simonson I. 1992. The influence of anticipating regret and responsibility on purchase decisions. *J. Consum. Res.* 19:105–18

Slatcher RB, Pennebaker JW. 2006. How do I love thee? Let me count the words. *Psychol. Sci.* 17:660–64

Small DA, Loewenstein G, Slovic P. 2007. Sympathy and callousness: the impact of deliberative thought on donations to identifiable and statistical victims. *Organ. Behav. Hum. Decis. Process.* 102:143–53

Smith ER, DeCoster J. 2000. Dual-process models in social and cognitive psychology: conceptual integration and links to underlying memory systems. *Personal. Soc. Psychol. Rev.* 4:108–31

Smith JK, Gerber AS, Orlich A. 2003. Self-prophecy effects and voter turnout: an experimental replication. *Polit. Psychol.* 24:593–604

Storms M, Nisbett R. 1970. Insomnia and the attribution process. *J. Personal. Soc. Psychol.* 16:319–28

Sutter M, Strassmair C. 2009. Communication, cooperation and collusion in team tournaments—an experimental study. *Games Econ. Behav.* 66:506–25

Taylor SE, Pham LB, Rivkin ID, Armor DA. 1998. Harnessing the imagination: mental simulation, self-regulation, and coping. *Am. Psychol.* 53:429–39

Tesser A, Cornell D. 1991. On the confluence of self processes. *J. Exp. Soc. Psychol.* 27:501–26

Tetlock PE, Boettger R. 1994. Accountability amplifies the status quo effect when change creates victims. *J. Behav. Decis. Making* 7:1–23

Theiler AM, Lippman LG. 1995. Effects of mental practice and modeling on guitar and vocal performance. *J. Gen. Psychol.* 122:329–43

Thomaes S, Bushman BJ, Orobio de Castro B, Cohen GL, Denissen JJA. 2009. Reducing narcissistic aggression by buttressing self-esteem: an experimental field study. *Psychol. Sci.* 20:1536–42

Tomasello M, Carpenter M, Call J, Behne T, Moll H. 2005. Understanding and sharing intentions: the origins of cultural cognition. *Behav. Brain Sci.* 28:675–735

Van Leeuwen ML, van Baaren RB, Martin D, Dijksterhuis A, Bekkering H. 2009. Executive functioning and imitation: increasing working memory load facilitates behavioural imitation. *Neuropsychologia* 47:3265–70

Vaughn LA, O'Rourke T, Schwartz S, Malik J, Petkova Z, et al. 2006. When two wrongs can make a right: regulatory nonfit, bias, and correction of judgments. *J. Exp. Soc. Psychol.* 42:654–61

Verplanken B, Walker I, Davis A, Jurasek M. 2008. Context change and travel mode choice: combining the habit discontinuity and self-activation hypotheses. *J. Environ. Psychol.* 28:121–27

Von Hippel W, Gonsalkorale K. 2005. "That is bloody revolting!" Inhibitory control of thoughts better left unsaid. *Psychol. Sci.* 16:497–500

Waltz JA, Lau A, Grewal SK, Holyoak KJ. 2000. The role of working memory in analogical mapping. *Mem. Cogn.* 28:1205–12

Ward A, Mann T. 2000. Don't mind if I do: disinhibited eating under cognitive load. *J. Personal. Soc. Psychol.* 78:753–63

Waroquier L, Marchiori D, Klein O, Cleeremans A. 2009. Methodological pitfalls of the unconscious thought paradigm. *Judgment Decis. Making* 4:601–10

Watkins ER. 2008. Constructive and unconstructive repetitive thought. *Psychol. Bull.* 134:163–206

Webb NM. 1989. Peer interaction, problem-solving, and cognition: multidisciplinary perspectives. *Int. J. Educ. Res.* 13:1–119

Wegner DM. 2002. *The Illusion of Conscious Will*. Cambridge, MA: MIT Press

Wegner DM, Bargh JA. 1998. Control and automaticity in social life. In *Handbook of Social Psychology*, ed. D Gilbert, S Fiske, G Lindzey, 1:446–96. New York: McGraw-Hill. 4th ed.

Westling E, Mann T, Ward A. 2006. Self-control of smoking: When does narrow attention help? *J. Appl. Soc. Psychol.* 36:2115–33

Wicklund RA, Gollwitzer PM. 1982. *Symbolic Self-Completion*. Hillsdale, NJ: Erlbaum

Wilson TD. 2002. *Strangers to Ourselves: Discovering the Adaptive Unconscious*. Cambridge, MA: Harvard Univ. Press

Wilson TD, Schooler JW. 1991. Thinking too much: Introspection can reduce the quality of preferences and decisions. *J. Personal. Soc. Psychol.* 60:181–92

Wohldmann EL, Healy AF, Bourne LE Jr. 2008. A mental practice superiority effect: less retroactive interference and more transfer than physical practice. *J. Exp. Psychol.: Learn. Mem. Cogn.* 34:823–33

Woloshyn VE, Willoughby T, Wood E, Pressley M. 1990. Elaborative interrogation facilitates adult learning of factual paragraphs. *J. Educ. Psychol.* 82:513–24

Woolfolk RL, Parrish MW, Murphy SM. 1985. The effects of positive and negative imagery on motor skill performance. *Cogn. Ther. Res.* 9:335–41

Wyer RS Jr, ed. 1997. *The Automaticity of Everyday Life: Advances in Social Cognition*. Mahwah, NJ: Erlbaum

Zeelenberg M, Beattie J. 1997. Consequences of regret aversion 2: additional evidence for effects of feedback on decision making. *Organ. Behav. Hum. Decis. Process.* 721:63–78

Zeelenberg M, Beattie J, Van Der Pligt J, de Vries NK. 1996. Consequences of regret aversion: effects of expected feedback on risky decision making. *Organ. Behav. Hum. Decis. Process.* 65:148–58

Zeelenberg M, Pieters R. 2009. On the consequences of mentally simulating future forgone outcomes: a regret regulation perspective. See Markman et al. 2009, pp. 417–28

Zitek EM, Jordan AH, Monin B, Leach FR. 2010. Victim entitlement to behave selfishly. *J. Personal. Soc. Psychol.* 98:245–55

**Annual Review of
Psychology**

Volume 62, 2011

Contents

**Psychophysiological Disorders and Psychological Dimensions
on Medical Disorders**

Research Methodology

Indexes

Errata

An online log of corrections to *Annual Review of Psychology* articles may be found at
http://psych.AnnualReviews.org/errata.shtml