

## Why People Are Reluctant to Tempt Fate

Jane L. Risen  
University of Chicago

Thomas Gilovich  
Cornell University

The present research explored the belief that it is bad luck to “tempt fate.” Studies 1 and 2 demonstrated that people do indeed have the intuition that actions that tempt fate increase the likelihood of negative outcomes. Studies 3–6 examined our claim that the intuition is due, in large part, to the combination of the automatic tendencies to attend to negative prospects and to use accessibility as a cue when judging likelihood. Study 3 demonstrated that negative outcomes are more accessible following actions that tempt fate than following actions that do not tempt fate. Studies 4 and 5 demonstrated that the heightened accessibility of negative outcomes mediates the elevated perceptions of likelihood. Finally, Study 6 examined the automatic nature of the underlying processes. The types of actions that are thought to tempt fate as well as the role of society and culture in shaping this magical belief are discussed.

*Keywords:* tempt fate, magical thinking, accessibility, negativity

It is an irony of the post-Enlightenment world that so many people who don't believe in fate refuse to tempt it. Why are people afraid to comment on a streak of success if they reject the notion that the universe punishes such modest acts of hubris (Ferm, 1989; Will, 2002)? Why do people feel that if they exchange a lottery ticket it will become more likely to win, even when they cannot cite any conceivable mechanism by which the odds could change (Risen & Gilovich, 2007)? Why do so many people feel that it's more likely to rain if they don't bring their umbrella or that a maddeningly slow checkout line at the grocery store is likely to speed up the moment they leave it in search of a speedier line (Miller & Taylor, 1995)? It is to these questions that the present research was addressed.

Although these beliefs are puzzling in many respects, considerable insight into their nature is provided by recent “two systems” accounts of everyday judgment (Epstein, Lipson, Hostein, & Huh, 1992; Evans, 2007; Kahneman & Frederick, 2002; Sloman, 1996; Stanovich, 1999). Such accounts explain how people can be “of two minds” about such beliefs and propositions. People's rational faculties, aided by formal education, tells them that there is no mechanism by which, say, a television announcer's comment about a basketball player's streak of consecutive free-throws can cause the player to miss his next shot. Nevertheless, a set of associations built up and stored by the intuitive system can give people a very strong “gut feeling” that such comments do in fact bring bad luck. Perhaps the most clear-cut manifestation of this

conflict between intuition and reason comes from participants who knowingly choose a dominated option. In one notable study, participants explicitly stated that they knew they had a better chance of drawing a red jelly bean from an urn with one red jelly bean and nine white jelly beans than they did of drawing it from an urn with 8 red beans and 92 white beans—but still couldn't help themselves from drawing from the urn with 8 potential winners (Denes-Raj & Epstein, 1994).

The belief that it is bad luck to tempt fate reflects, for most people, the same dualism. They believe that “there is no such thing” as bad luck, and yet they have a strong intuition, or “feeling,” that bad things happen to people who tempt fate. For example, students who were asked to respond rationally stated that an exchanged lottery ticket was no more likely to win than any other ticket. Students who were asked to respond intuitively, however, reported that exchanging a ticket made it more likely to win (Risen & Gilovich, 2007). How do such intuitions arise?

We contend that the belief that it is bad luck to tempt fate is largely the result of two automatic mental processes. The first is the tendency for people's thoughts and attention to be drawn disproportionately to negative stimuli and prospects over positive stimuli and prospects. This tendency is reflected in the phenomenon of loss aversion (Kahneman, Knetsch, & Thaler, 1991; Kahneman & Tversky, 1979); in the tendency for scowling faces to “pop out” of arrays of happy faces (Hansen & Hansen, 1988; see also Dijksterhuis & Aarts, 2003); in the longer latency to name the color of negative adjectives in a Stroop task (Pratto & John, 1991); and, more generally, in the tendency for negative stimuli to pack a bigger psychological punch than positive stimuli (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001).

Our argument is that people correctly anticipate that they would feel bad if they were caught in an agonizingly slow line at the grocery store or if they were caught in a thunderstorm without an umbrella. And they anticipate, again correctly, that they would feel even worse if they had moved to a slow checkout line from another or if they had thought about bringing an umbrella but chose not to (Gilovich & Medvec, 1995; Roese & Olson, 1995; Zeelenberg, van

---

Jane L. Risen, Graduate School of Business, University of Chicago; Thomas Gilovich, Department of Psychology, Cornell University.

This research was conducted as part of Jane L. Risen's PhD dissertation and was supported by National Science Foundation Grants SES0542486 and SES0241638. We thank Megan Roberts, Allison Katz-Mayfield, Rachel Wechsler, Elizabeth Mcquilkin, and Natasha Kostek for their help conducting the studies. We also thank Dennis Regan for commenting on an earlier version of the article.

Correspondence concerning this article should be addressed to Jane L. Risen, Graduate School of Business, University of Chicago, 5807 South Woodlawn Avenue, Chicago, IL 60637. E-mail: jane.risen@chicagogsb.edu

Dijk, Manstead, & van der Pligt, 2000). We contend that because potential outcomes such as these would be particularly aversive, they are particularly likely to capture one's attention and imagination.

Second, having captured the imagination, the subjective probability of such outcomes is enhanced. Past research has established that merely imagining an event makes it seem more likely to occur (Carroll, 1978; Gregory, Cialdini, & Carpenter, 1982; Sherman, Cialdini, Schwartzman, & Reynolds, 1985). Imagining an outcome increases its accessibility and lends it a feeling of fluency that enhances its subjective likelihood (Kelly & Jacoby, 1998; Schwarz et al., 1991; Tversky & Kahneman, 1973). Putting these two phenomena together, we contend that negative outcomes that (would) result from actions that tempt fate are anticipated to be particularly aversive and therefore (a) capture the imagination and, (b) having done so, are seen as more likely than negative outcomes that result from actions that don't tempt fate.

Miller and Taylor (1995) advanced a similar analysis to explain why people are reluctant to take certain actions that depart from the status quo. They argued that people refrain from such things as switching answers on a multiple-choice test or changing lines at the grocery-store checkout counter for two reasons. First, they anticipate how much they would regret doing so if the action turned out badly and so they avoid acting to avoid having to kick themselves for their mistake. Second, because they do indeed kick themselves whenever they take such actions and they turn out badly, experiences of acting and being punished for doing so tend to become overrepresented in memory. Thus, people end up believing that bad outcomes are more likely to happen if they take action than if they stick with the status quo.

Our analysis builds on that of Miller and Taylor (1995) in two ways. First, we note that it is not just negative outcomes that follow from actions that depart from the status quo that are experienced as particularly aversive. One can tempt fate in other ways. And when any action that tempts fate goes awry, whether it involves a departure from the status quo or not, it is experienced as especially negative. In its broadest sense, to tempt fate is "to do something that is risky or dangerous" (McKean, 2005). Thus, one can tempt fate by leaving one's house unlocked, skateboarding without a helmet, or serving as a photojournalist in a war zone. In this sense, one can tempt fate simply by leaving oneself exposed (i.e., not being prepared for what the universe may throw at you). But the term also applies to actions whose risk comes from the possibility of offending the gods (reflected in the phrase "to tempt God," recorded as far back as the 1300s), the universe, or fate (with the phrase "to tempt fate" appearing around 1700; Simpson & Weiner, 1989). As we elaborate further in the general discussion, one is most frequently seen as tempting fate when one is unusually arrogant (e.g., by being presumptuous about the future). Commenting on a streak of success, for example, can be seen as a reflection of hubris and presumptuousness rather than simply a departure from the status quo, and when it precedes a downturn in performance, that downturn is especially salient and especially painful. And, like actions that depart from the status quo, calling attention to ongoing success is thought to be something of a jinx (Ferm, 1989; Risen, Gilovich, Kruger, & Savitsky, 2007; Will, 2002).

Our analysis also differs from Miller and Taylor's (1995), in that their account involves psychological processes that occur over

time and retrospectively. That is, past departures from the status quo that went awry are particularly salient and memorable, which distorts one's intuitive database and makes it seem as if future departures from the status quo are especially risky. Our account, in contrast, involves psychological processes that operate prospectively and apply to possible courses of action never before taken or even considered. A student who has never failed to do the reading for class merely has to imagine what it would be like to be called on by the instructor without being properly prepared to get a sense of how aversive it would be. Picturing such an aversive outcome, furthermore, elevates its subjective likelihood. This leads to the impression—consciously denied by some but not others—that one is more likely to be called on in class if one has not done the reading than if one has.

In the six studies reported here, we examined the belief that actions that tempt fate increase the likelihood of negative outcomes. We also examined the psychological processes that we argue are largely responsible for such a belief.

## Overview of Studies

We contend that people overestimate the likelihood of negative outcomes following behaviors that tempt fate because people are drawn to think more about negative possibilities, which makes those possibilities easier to imagine and therefore more accessible. The greater accessibility of such outcomes is then used as a cue to their likelihood, which enhances their subjective probability of occurrence. Studies 1 and 2 examined whether participants believe that negative outcomes are more likely following behaviors that tempt fate. Study 3 used the scenarios from Studies 1 and 2, but instead of asking participants to rate the perceived likelihood of the pertinent negative outcomes, we examined the accessibility of those imagined outcomes. Study 4 investigated whether accessibility mediated participants' likelihood judgments and Study 5 examined, experimentally, the causal role of accessibility on likelihood judgments. Finally, in Study 6, we used a cognitive load manipulation to disrupt effortful processing and determine whether System 1 is responsible for the effects of negativity and accessibility on judgments of likelihood.

### Study 1

Study 1 was designed to examine whether people believe that negative outcomes are more likely following a behavior that tempts fate. Participants read either that Jon tempted fate by acting presumptuously or that he acted cautiously and avoided tempting fate. We predicted that participants would judge the likelihood of the negative outcome to be higher when Jon tempted fate than when he did not.

#### *Method*

*Participants.* Sixty-two Cornell undergraduates were randomly approached on campus and asked to participate.

*Materials and procedure.* Participants read a scenario in which Jon recently finished applying to graduate school and that Stanford was his top choice. The scenario specified that, typical of Jon's mother's optimistic nature, she sent him a Stanford T-shirt in the mail. Participants read either that Jon decided to stuff the shirt

in the bottom of the drawer while awaiting Stanford's decision or that he decided to wear the shirt the next day. Participants were then asked to indicate how likely they believed it was that Stanford would offer Jon acceptance by circling a number between 0 and 10, with 0 labeled *not at all likely* and 10 labeled *extremely likely*.

### Results and Discussion

As predicted, participants believed that Jon was less likely to be accepted to Stanford if he tempted fate by wearing the Stanford T-shirt ( $M = 5.19, SD = 1.35$ ) than if he stuffed it in the drawer ( $M = 6.13, SD = 1.02$ ),  $t(60) = 3.01, p < .01, d = 0.78$ . We contend that they believe Jon is less likely to be accepted when he acts presumptuously because participants anticipate that it would feel particularly aversive to be rejected after donning the Stanford shirt and, precisely because it is more aversive, it jumps to mind more readily and therefore seems especially likely. To ensure that people do indeed anticipate that a given outcome would be more painful when it follows an action that tempts fate, we had a separate group of participants evaluate how someone would feel after being rejected. We found that 90% of participants thought that a person would be more upset by being rejected from Stanford after having worn a Stanford shirt than after having stuffed the shirt in the drawer,  $\chi^2(1, N = 20) = 12.80, p < .001$ .

We contend that the difference in likelihood judgments reflects participants' true feelings about what is likely to happen to Jon. It is possible, however, that participants' judgments reflect what they want to happen rather than what they think is actually likely to happen. That is, participants may prefer that Jon be denied admission if he is cocky enough to wear the shirt, and they may have expressed this desire in their likelihood judgments.

We tested this possibility in Study 2 by having some participants imagine themselves tempting fate and other participants imagine someone else doing so. Because people do not want to see themselves punished, if participants believe that negative outcomes are more likely to happen when they themselves tempt fate, it suggests that their likelihood judgments reflect their beliefs about what will happen rather than their desires.

### Study 2

Participants were randomly assigned to imagine their own behavior or the behavior of a random student in class (Jon). Half of the participants in each condition were randomly assigned to imagine that they (Jon) had tempted fate and the other half imagined that they (Jon) had not. We predicted that participants who imagined a student tempting fate would more easily call a pertinent negative outcome to mind and would therefore judge the negative outcome to be more likely compared with participants who did not imagine the student tempting fate. We predicted that this would be equally true for participants imagining their own actions or the actions of someone else.

### Method

**Participants.** One hundred twenty Cornell undergraduates were randomly approached on campus and asked to participate.

**Materials and procedure.** Participants read one of four scenarios and answered the likelihood question that followed. The

scenario had participants imagine themselves or another student (Jon) in a large lecture class and to further imagine that they (or Jon) had done the reading for class or had not. The scenario went on to describe the professor asking the class a question, but no answer was given. The class was described as sitting in silence for 2 min before the professor explained that if no one volunteered, he would choose someone randomly. Participants were then asked to indicate how likely they believed it was that they (Jon) would be called on by circling a number between 0 and 10, with 0 labeled *not at all likely* and 10 labeled *extremely likely*.

### Results and Discussion

As predicted, a 2 (behavior: had read vs. had not read)  $\times$  2 (protagonist: self vs. Jon) analysis of variance (ANOVA) yielded the predicted main effect of behavior. Participants believed that students were more likely to be called on if they had not done the reading ( $M = 3.43, SD = 2.34$ ) than if they had ( $M = 2.53, SD = 2.24$ ),  $F(1, 116) = 4.60, p < .05, d = 0.39$ . There was no effect for protagonist nor an interaction,  $F_s < 1$ . Furthermore, looking just at judgments for the self, the results reveal that participants believed that they would be more likely to be called on by the professor when they had not done the reading ( $M = 3.77, SD = 2.43$ ) than when they had done the reading ( $M = 2.47, SD = 2.19$ ),  $t(58) = 2.18, p < .05, d = 0.56$ . Because it is unlikely that participants want to be called on when they are unprepared, this suggests that the likelihood judgments reflect participants' beliefs about what is likely to occur, not their desires.

Together, the results of Studies 1 and 2 indicate that people believe that negative outcomes are more likely following behaviors that tempt fate. Participants thought that Jon was less likely to be accepted when he wore the T-shirt than when he stuffed it in his drawer and that it was more likely that students would be called on when they did not do the reading than when they did. Furthermore, because people believe that they themselves would suffer negative consequences if they tempted fate, this belief appears to reflect participants' intuitions about what would happen and not what they would like to see happen.

### Study 3

We contend that the beliefs documented in Studies 1 and 2 are due to the fact that people know that a negative outcome that follows an action that tempts fate will be experienced as particularly negative. Because such an outcome would be so negative, it captures imagination and, having captured one's imagination, it becomes highly accessible. The negative outcome's enhanced accessibility, in turn, makes it seem especially likely (Kahneman, 2003; Kelly & Jacoby, 1998; Schwarz et al., 1991; Tversky & Kahneman, 1973).

As a first step in testing this account, we measured the accessibility of negative outcomes in Study 3. Participants read stories in which the protagonist did or did not tempt fate and then were asked to indicate as quickly as possible whether a one-sentence ending fit the story they just read or whether it constituted a non sequitur. To the extent that reading the story led participants to call to mind the subsequently presented ending, it should be highly accessible, and as a result, participants should be quick to indicate that it constituted a sensible ending to the story (Higgins, 1996;

Neely, 1977; Srull & Wyer, 1979). Conversely, to the extent that the story did not activate a particular ending, participants should be slow to indicate that it made sense.

### Method

*Participants.* Two hundred eleven Cornell undergraduates participated in exchange for earn course credit in their psychology or human development courses.

*Materials and procedure.* Participants were presented with 12 short stories in a random order on the computer and were asked to determine, for each one, whether the ending that appeared on a follow-up screen was a logical conclusion to the story or a non sequitur. Participants were encouraged to read each story carefully and to take as much time as they needed to understand each one. However, once they advanced to the next screen, they were to determine as quickly and as accurately as possible whether the one-sentence ending was a logical conclusion to the story. Participants pressed the "Yes" key if they believed that the ending made sense, however likely or unlikely it might seem to them, and pressed the "No" key if they believed that the ending did not make sense (i.e., was a non sequitur). Participants read two practice stories and their corresponding endings (one had an ending that made sense and one had an ending that did not make sense) and were told the correct answers to the practice stories before beginning the actual task.

There were 2 target stories in the set of 12 taken directly from those used in Studies 1 and 2. That is, participants read either that Jon wore or did not wear a Stanford T-shirt while awaiting word about admission and read either that they or another random student (Greg) had done or had not done the reading for class. The endings to these 2 stories were always sensible and negative. Thus, after reading the Stanford story, participants read that, "A month later, Jon receives a rejection letter from Stanford." After the classroom story, participants read that "After several moments of silence, the professor calls on you (Greg)." If reading the story had earlier encouraged participants to call the negative ending to mind, as we contend is likely in the tempting fate version of the target stories, then that negative ending should have been highly accessible and participants should have been quick to recognize that it made sense.

Of the 10 filler stories, 5 had endings that did not make sense and 5 had endings that did make sense. When the ending did not make sense, it changed either the topic or main character of the story. For example, participants read one story about threatening weather conditions at the time of a cousin's outdoor wedding followed by "The surprise party goes off without a hitch. Your dad is completely surprised." After participants completed all 12 stories, they were thanked and debriefed.

### Results

Because the response latencies were skewed, we used natural log transformations in all response time analyses, but we report the raw means for ease of interpretation. Furthermore, to reduce within-group variance, we calculated each participant's average response time to the endings of the filler stories for which he or she responded correctly (e.g., stated that a nonsensical ending was

indeed a non sequitur) and used it as a covariate in the following analyses.<sup>1</sup>

*Stanford.* We predicted that participants who imagined that Jon wore the Stanford shirt would be faster to indicate that the negative ending, "Jon receives a rejection letter from Stanford," made sense than those who imagined that he stuffed the shirt in his drawer because those who read that Jon tempted fate by wearing the shirt would have already spontaneously imagined his rejection. As predicted, participants who read that he wore the shirt were faster to indicate that the ending made sense ( $M = 2,671$  ms,  $SD = 1,113$ ) than those who read that he stuffed the shirt in the drawer ( $M = 3,176$  ms,  $SD = 1,573$ ),  $F(1, 171) = 11.01$ ,  $p = .001$ ,  $d = 0.53$  (see Figure 1).

*Classroom.* We predicted that participants would be faster to recognize the ending "The professor calls on you (Greg)" if they imagined an unprepared student than if they imagined a prepared student. As predicted, a 2 (behavior: has read vs. has not read)  $\times$  2 (protagonist: self vs. Jon) ANOVA on the response latencies revealed a main effect of behavior. Participants more quickly recognized that the ending made sense if the student had not done the reading ( $M = 2,879$  ms,  $SD = 1,149$ ) than if the student had done the reading ( $M = 3,112$  ms,  $SD = 1,226$ ),  $F(1, 184) = 7.50$ ,  $p < .01$ ,  $d = 0.26$  (see Figure 1). There was also a main effect of protagonist, such that participants were faster to recognize the ending if the story was about themselves than if it was about Greg,  $F(1, 184) = 15.58$ ,  $p < .001$ ,  $d = 0.42$ . The main effects were not qualified by an interaction,  $F < 1$ . As in Study 2, the tempting fate behavior influenced participants' responses even when they imagined their own behavior and their own outcomes. That is, participants were faster to recognize the negative ending when they read that they tempted fate ( $M = 2,657$  ms,  $SD = 874$ ) than when they read that they hadn't ( $M = 3,000$  ms,  $SD = 1,298$ ),  $F(1, 99) = 6.23$ ,  $p = .01$ ,  $d = 0.34$ .

### Discussion

As predicted, participants were faster to recognize that a negative outcome was a sensible conclusion to each story if they had read that the protagonist had engaged in an action that tempted fate. Their faster reaction times suggest that reading about an action that tempts fate automatically calls to mind a negative outcome and makes such an outcome cognitively accessible. For both stories, the speed to recognize that the ending made sense paralleled the likelihood judgments made by participants in Studies 1 and 2. Of course, to contend that people believe a negative outcome following an action that tempts fate is more likely be-

<sup>1</sup> The degrees of freedom differed for each analysis because the number of participants who answered correctly differed for each scenario. In the Stanford scenario, 174 participants (82%) correctly answered that the ending made sense. Participants who read that Jon wore the shirt were equally likely to answer correctly as those who read that Jon stuffed the shirt in the drawer (82% and 84%, respectively). In the classroom scenario, 189 participants (90%) correctly answered that the ending made sense. Participants were equally likely to answer correctly if they imagined that the reading had been done or not done (90% in both cases). Of the participants who imagined that they were in class, 102 (94%) answered correctly. Of the participants who imagined that Greg was in class, 87 (84%) answered correctly.



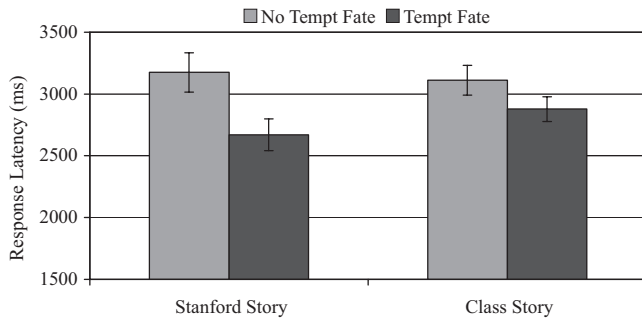


Figure 1. Response latency in Study 3 to indicate that a negative ending made sense, following a story in which the protagonist tempted fate or did not. Error bars represent standard errors.

cause such an outcome is more accessible, it is necessary to measure accessibility and likelihood judgments in the same set of participants and examine whether accessibility mediates likelihood judgments. Study 4 was designed for this purpose.

#### Study 4

To determine whether it is the enhanced accessibility of negative outcomes that mediates the tendency to view them as particularly likely following actions that tempt fate, we had participants read the Stanford T-shirt story from Studies 1 and 3 and measured both accessibility and likelihood. In addition, to be sure that behaviors that tempt fate disproportionately bring to mind negative outcomes, we had half of the participants evaluate a negative ending and half evaluate a positive ending. We predicted an interaction for both reaction times and likelihood judgments. Specifically, we predicted that after reading that Jon tempted fate, participants would be faster to recognize the negative ending (replicating Study 3) but that they would be slower to recognize a positive ending. Similarly, we predicted that participants would judge the likelihood of Jon being accepted to be lower when they read that he tempted fate (replicating Study 1) but that they would judge the likelihood of Jon being rejected to be higher when they read that story. Moreover, we predicted that participants' likelihood judgments would be mediated by their speed to recognize that the ending in question made sense.

#### Method

**Participants.** Ninety-six Cornell undergraduates participated in exchange for course credit in their psychology or human development courses.

**Materials and procedure.** Participants read four short stories presented on the computer and were asked to determine, for each one, whether the ending that appeared on a follow-up screen was a logical conclusion to the story or a non sequitur. As in Study 3, participants were encouraged to read each story carefully and to take as much time as they needed to understand each one. However, once they advanced to the next screen, they were told to indicate as quickly and as accurately as possible whether the one-sentence ending was a logical conclusion to the story. Participants pressed the "Yes" key if they believed that the ending made sense, however likely or unlikely it might seem to them, and

pressed the "No" key if they believed that the ending did not make sense (i.e., was a non sequitur). If the ending made sense, participants were then asked to indicate how likely they believed it was that such an ending would actually occur on a 9-point scale, anchored at 1 with *not at all likely* and at 9 with *extremely likely*. Participants read two practice stories and their corresponding endings (one had an ending that made sense and one had an ending that did not make sense) and were told the correct answers to the practice stories before beginning the actual task.

The first three stories were filler stories and were presented to all participants in the same order. Two fillers had endings that did not make sense and one had an ending that did make sense. The critical story involved Jon applying to graduate school. Participants read a version in which Jon either wore the Stanford shirt or stuffed it in the drawer. Half of the participants who read each version evaluated the negative ending, "A month later, Jon receives a rejection letter from Stanford," and half evaluated the positive ending, "A month later, Jon receives an acceptance letter from Stanford." After determining whether the negative or positive ending made sense, participants rated the likelihood that the outcome would occur. After participants completed all four stories, they were thanked and debriefed.

#### Results

**Response time.** Because the response latencies were skewed, we used natural log transformations for all response time analyses, but, as before, we report the raw means for ease of interpretation. In addition, to reduce within group variance, we calculated each participant's average response time to the endings of the filler stories for which he or she responded correctly and used it as a covariate.

A 2 (behavior: wear shirt vs. stuff shirt)  $\times$  2 (outcome: rejection vs. acceptance) ANOVA of participants' response latencies revealed a significant interaction,  $F(1, 87) = 15.43, p < .001$ .<sup>2</sup> Replicating Study 3, participants who read that Jon had worn the shirt were faster to indicate that a rejection was a sensible end to the story ( $M = 3,196$  ms,  $SD = 1,348$ ) compared with those who read that Jon had stuffed the shirt in the drawer ( $M = 4,324$  ms,  $SD = 2,194$ ),  $F(1, 41) = 9.13, p < .01, d = 0.93$ . However, participants who read that Jon had worn the shirt were slower to indicate that the acceptance ending made sense ( $M = 3,551$  ms,  $SD = 1,432$ ) compared with those who read that Jon had stuffed the shirt in the drawer ( $M = 2,995$  ms,  $SD = 1,175$ ),  $F(1, 45) = 6.07, p < .05, d = 0.73$ . In other words, Jon's decision to tempt fate by wearing the shirt made rejection more accessible but made acceptance less accessible.

**Likelihood.** A 2 (behavior: wear shirt vs. stuff shirt)  $\times$  2 (outcome: rejection vs. acceptance) ANOVA of participants' ratings of the likelihood of the outcome's occurrence yielded a main effect of outcome,  $F(1, 92) = 12.35, p = .001$ , indicating that participants believed that Jon was more likely to be ac-

<sup>2</sup> Four participants (2 from the reject-wear and 2 from the reject-stuff conditions) answered incorrectly and were excluded from all analyses that involved the response time to determine whether the ending made sense. Because all participants were prompted to answer the likelihood question, their responses were included in the likelihood analyses. The pattern for the likelihood analyses remained the same whether or not they were included.

cepted than rejected. However, the main effect was qualified by the predicted interaction,  $F(1, 92) = 10.49, p < .01$ . Participants who read that Jon had worn the shirt believed that Jon was significantly more likely to be rejected ( $M = 5.79, SD = 1.53$ ) than did those who read that he had stuffed the shirt in the drawer ( $M = 4.79, SD = 1.56$ ),  $t(46) = 2.24, p < .05, d = 0.66$ . In contrast, those who read that he had worn the shirt believed that he was significantly less likely to be accepted ( $M = 5.88, SD = 1.51$ ) than did those who read that he had stuffed the shirt in the drawer ( $M = 6.83, SD = 1.31$ ),  $t(46) = 2.35, p < .05, d = 0.69$ .

**Response time and likelihood.** As predicted, there was a significant negative correlation between participants' latency to indicate that the ending in question made sense and their rating of its likelihood ( $r = -.31, p = .001$ ), indicating that the faster a participant responded that the acceptance or rejection made sense, the more likely he or she believed the ending to be.

We contend that people believe that negative outcomes are more likely following actions that tempt fate because negative outcomes readily spring to mind under such circumstances, and their enhanced accessibility enhances their perceived likelihood. To test this claim, we used procedures outlined by Baron and Kenny (1986) to assess mediation. For the sake of clarity, we will address the responses to the rejection and acceptance endings separately (see Figure 2).<sup>3</sup>

**Rejection.** As reported above, the tempting fate manipulation—whether or not Jon wore the shirt—significantly predicted participants' ratings of the likelihood that Jon would be rejected from Stanford ( $B = -0.50, SE = .22, p < .05$ ) and the latency to indicate that the rejection ending made sense ( $B = 0.15, SE = .05, p < .01$ ). In addition, the latency to indicate that the rejection made sense significantly predicted participants' ratings of his likelihood of being rejected ( $B = -2.00, SE = .66, p < .01$ ). Finally, when both Jon's choice to wear the shirt or stuff it in the drawer and participants' response times were included in the same equation predicting participants' likelihood judgments, the former dropped to nonsignificance and the latter remained significant ( $B = -0.15, SE = .25, p = .54$ , and  $B = -1.80, SE = .74, p < .05$ , respectively). The results of a Sobel (1982) test confirmed the significance of this mediated relation ( $z = 1.96, p = .05$ ).

**Acceptance.** The tempting fate manipulation—whether or not Jon wore the shirt—also significantly predicted participants' ratings of the likelihood that Jon would be accepted to Stanford ( $B = 0.48, SE = .20, p < .05$ ) and the latency to indicate that the acceptance ending made sense ( $B = -0.10, SE = .04, p < .05$ ). In addition, the latency to indicate that the acceptance ending made sense significantly predicted participants' ratings of his likelihood of being accepted ( $B = -2.50, SE = .64, p < .001$ ). Finally, when both Jon's choice to wear the shirt or stuff it in a drawer and participants' response times were included in the same equation predicting participants' likelihood judgments, the former dropped to nonsignificance and the latter remained significant ( $B = 0.27, SE = .20, p = .17$ , and  $B = -2.17, SE = .67, p < .01$ , respectively). The mediated relation was supported by a marginally significant Sobel (1982) test ( $z = 1.91, p = .057$ ).

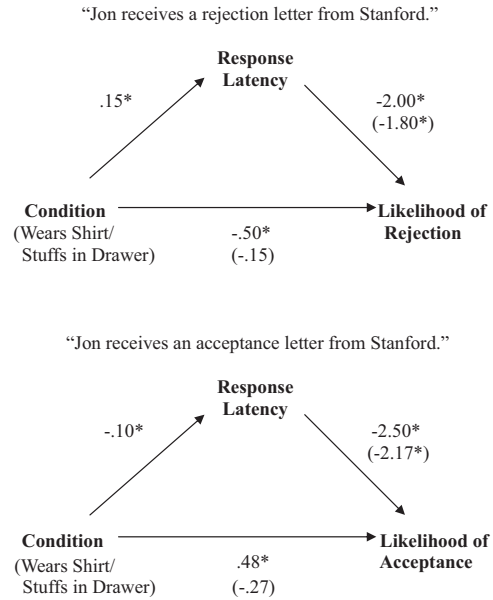


Figure 2. Pattern of mediation for the rejection (top) and acceptance endings (bottom) in Study 4. Values represent the unstandardized betas for the regression equations. Numbers in parentheses represent the betas when condition and response latency are included in the same equation predicting likelihood judgments. As asterisk indicates that the variable is a significant predictor ( $p < .05$ ).

## Discussion

The results of Study 4 support our contention that actions that tempt fate are more likely to call to mind the prospect of a negative outcome than actions that do not tempt fate. This, in turn, increases the accessibility and perceived likelihood of such an outcome. First, participants thought that Jon was more likely to be rejected if he tempted fate than if he did not.

<sup>3</sup> We also tested for mediated moderation by pooling the rejection and acceptance data and using outcome (rejection or acceptance) as a moderator. We found that the moderator (outcome: rejection or acceptance) affected the magnitude of the treatment effect (behavior: wear or stuff shirt) on the mediator (response latency). In other words, participants who read that Jon tempted fate judged the rejection ending as more likely and the acceptance ending as less likely compared with those who read that he did not tempt fate because the idea of rejection was more accessible and the idea of acceptance was less accessible for those participants. This was supported by the procedures outlined by Muller, Judd, and Yzerbyt (2005). First, we found that the outcome that participants evaluated moderated the effect of Jon's behavior on likelihood ratings ( $B = 0.44, SE = .16, p < .01$ ) and on response latency ( $B = -0.38, SE = .10, p < .001$ ). Second, participants' response latency significantly predicted likelihood ratings, regardless of ending ( $B = -0.74, SE = .15, p < .001$ ). Third, the moderating effect of outcome on behavior no longer predicted likelihood ratings when response latency was included in the regression equation ( $B = 0.20, SE = .16, p = .20$ ). Finally, the effect of response latency remained a significant predictor of likelihood ratings when the moderating effect of outcome on behavior was included in the regression equation ( $B = -0.66, SE = .161, p < .001$ ). For ease of exposition, we present the rejection and acceptance data separately in the main body of the text (i.e., we present the simple mediation at each level of the moderator).

Second, the reaction time data indicate that actions that tempt fate enhance the accessibility of negative outcomes only, not outcome-relevant knowledge in general. Third, and most important, participants' likelihood judgments were mediated by their speed to recognize that the ending in question made sense. Thus, it appears that the negative outcomes were judged to be more likely because they were more accessible.

### Study 5

We contend that the effects observed in Studies 1–4 are the product of online computations of accessibility. That is, actions that tempt fate are considered likely to yield negative outcomes because such outcomes, being particularly aversive, leap to mind (i.e., become “spontaneously accessible”), and their resultant enhanced accessibility is used as a cue for judging likelihood. Thus, the belief that negative outcomes are likely to follow actions that tempt fate need not result from any “off the shelf,” preexisting, culturally shared belief about the hazards of tempting fate. Although such culturally shared beliefs can certainly contribute to the accessibility of negative outcomes when contemplating actions that tempt fate, they are not necessary to produce the effects we have documented here. (We discuss later how the very processes under investigation give rise to such culturally shared beliefs that, once formed, can enhance these processes, yielding a cyclical pattern of mutual influence.)

Study 5 was therefore designed to isolate the causal role of spontaneous (rather than retrieved) accessibility on likelihood judgments. We manipulated accessibility with a subliminal priming procedure, thereby moving beyond a demonstration of the relationship between accessibility and likelihood. We predicted that the subliminal prime would, under specifiable conditions, increase the accessibility of the pertinent negative outcome and thereby increase its perceived likelihood of occurrence. Note that this prediction entails that participants' likelihood judgments be constructed from the sense of accessibility constructed in the moment rather than retrieved from a stored belief.

Because negative outcomes spontaneously spring to mind when considering actions that tempt fate, we predicted that the negative outcome would be accessible (and be perceived as likely) for participants who read a tempting fate story, regardless of whether or not they were primed with a negative outcome. However, we predicted that the prime would increase the accessibility of a negative outcome (and therefore likelihood judgments) when participants read a story that did not involve an action that tempted fate. This predicted asymmetry would provide clear evidence that participants had processed the tempting fate story differently than the control story.

### Method

**Participants.** One hundred eleven Cornell undergraduates participated in exchange for course credit in their psychology or human development courses.

**Materials and procedure.** Participants read four short stories on the computer and were asked to determine, for each one, whether the ending that appeared on a follow-up screen was a logical conclusion to the story or a non sequitur. As in Studies 3

and 4, participants were encouraged to read each story carefully and to take as much time as they needed to understand each one. However, once they advanced to the next screen, they were to determine as quickly and accurately as possible whether the one-sentence ending was a logical conclusion to the story. After advancing (following the completion of each story), an asterisk was presented in the center of the screen for 150 ms to capture participants' attention and prepare them for the ending. Participants pressed the “Yes” key if they believed that the ending made sense, however likely or unlikely it might seem to them, and pressed the “No” key if they believed that the ending did not make sense (i.e., was a non sequitur). If the ending made sense, participants were then asked to indicate how likely they believed it was that such an ending would actually occur on a 9-point scale anchored at 1 with *not at all likely* and at 9 with *extremely likely*. Participants read two practice stories and their corresponding endings (one had an ending that made sense and one had one that did not make sense) and were told the correct answers to the practice stories before beginning the actual task.

The first three stories were fillers presented to participants in a random order. Two fillers had endings that did not make sense and one had an ending that did make sense. The critical story involved a protagonist named Julie who heeded or ignored a forecast of rain by either bringing her umbrella when she packed her bag for the day or not (even though she had room in her bag). Thus, participants read either that Julie tempted fate by leaving herself vulnerable and ignoring the warning or that she did not tempt fate. After reading the umbrella story and being presented with the fixation point, half of participants who read each version were subliminally primed with the word “rain” and half were subliminally primed with the letter string “cois.” The prime was presented for 24 ms and was masked by the story ending, which immediately followed. All participants then evaluated the negative ending, “Later that day it starts to rain really hard, and Julie needs an umbrella.” After determining whether the ending made sense, participants rated the likelihood that such an outcome would occur.

Note that the negative outcome in this story (rain) was the forecasted outcome rather than an unforeseen or unusual outcome. (And, outside the context of the story, foul weather is not at all unusual for our participants, all of whom were residing in Ithaca, New York.) Thus, although negativity and rarity are often conflated, in this study we were able to isolate the tendency for a negative outcome to come to mind following an action that tempts fate.

After participants finished reading the stories, they were probed to determine whether they had seen the subliminal prime. Participants were first asked to recall whether they had seen anything unusual presented during the study. They were then given a list of items (cois, ####, small, yes, no, kaeb, moon, rain, wrong) and asked to circle anything they recognized as being presented during the study that was not part of one of the stories or endings. In addition, participants were given a manipulation check to ensure that they had paid attention to the stories. The manipulation check consisted of one recall question for each of the stories. For the umbrella story, participants were asked, “Did Julie bring her umbrella when she packed for school?” Participants were then thanked and debriefed.

## Results

The data from 8 participants (7.2%) were omitted because they failed to remember whether or not Julie brought her umbrella.<sup>4</sup>

**Response time.** Because participants' response latencies were skewed, we used natural log transformations in all response time analyses, but again we report the raw means for ease of interpretation. In addition, to reduce within-group variance, we calculated each participant's average response time to the filler endings for which he or she responded correctly and included it as a covariate.

A 2 (story: brought umbrella vs. didn't bring umbrella)  $\times$  2 (prime: rain vs. cois) ANOVA of participants' response latencies revealed a main effect of story,  $F(1, 85) = 9.43, p < .01$ , and a significant interaction,  $F(1, 85) = 5.89, p < .05$ .<sup>5</sup> As predicted, when participants were presented with a nonsense prime, those who read that Julie had tempted fate by not bringing her umbrella were faster to indicate that the negative ending made sense ( $M = 2,694$  ms,  $SD = 876$ ) compared with those who read that Julie had brought her umbrella ( $M = 3,957$  ms,  $SD = 2,112$ ),  $F(1, 43) = 15.45, p < .001, d = 1.19$ . However, when the negative outcome was made accessible with the presentation of the subliminal "rain" prime, the difference in response time disappeared (see Figure 3). In the rain prime condition, there was no difference between those who read the tempting fate story and those who read the story that did not tempt fate ( $M = 2,749$  ms,  $SD = 971$ , and  $M = 2,770$  ms,  $SD = 1,032$ , respectively),  $F < 1$ .

Put another way, we predicted that the rain prime would increase the accessibility (and hence decrease response latency) of the negative ending when fate had not been tempted in the story but would have little or no effect on accessibility when fate had been tempted because the negative ending would have already spontaneously come to mind. This hypothesis was tested with an ANOVA with the following contrast weights: No Tempting Fate–Control, 3; No Tempting Fate–Rain, –1; Tempting Fate–Control, –1; Tempting Fate–Rain, –1. This analysis yielded a significant contrast,  $F(1, 86) = 12.96, p < .001$ . The residual was not significant,  $F(1, 86) < 1$ .

**Likelihood.** A 2 (story: brought umbrella vs. didn't bring umbrella)  $\times$  2 (prime: rain vs. cois) ANOVA of participants' likelihood ratings yielded a marginally significant effect of prime,  $F(1, 86) = 3.62, p = .06$ , and no significant interaction. However, our specific hypothesis that the likelihood judgments would mirror the response latencies, such that the No Tempting Fate–Control condition would stand out from the other three conditions (i.e., the rain prime would only increase the likelihood judgments of those who had not read that the protagonist tempted fate) was supported (see Figure 3). An ANOVA with the following contrast weights: No Tempting Fate–Control, –3; No Tempting Fate–Rain, 1; Tempting Fate–Control, 1; Tempting Fate–Rain, 1; yielded the predicted significant effect,  $F(1, 86) = 3.94, p = .05$ . Again, the residual was not significant,  $F(1, 86) < 1$ .

In the control, nonsense prime condition, those who read that Julie had tempted fate by not bringing her umbrella thought that it was more likely to rain ( $M = 6.96, SD = 1.31$ ) than did those who read that Julie had brought her umbrella ( $M = 6.15, SD = 1.46$ ),  $t(44) = 2.00, p = .05, d = 0.58$ . However, in the rain prime condition, there was no difference between those who read that Julie had brought her umbrella ( $M = 7.11, SD = 1.56$ ) and those who read that she had failed to bring it ( $M = 7.16, SD = 1.41$ ),  $t <$

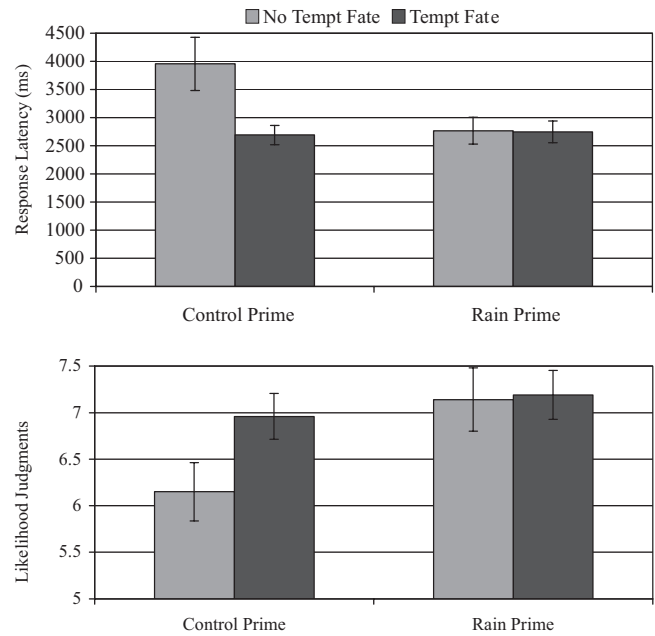


Figure 3. Response latency (top) and subjective likelihood judgments (bottom) in Study 5, following a story in which Julie tempted fate or did not, depending on whether the prime was "rain" or a nonsense letter string. Error bars represent standard errors.

1. In other words, if the negative ending did not spring to mind because of the story (that is, when Julie did not tempt fate), the rain prime increased the accessibility of the negative ending (as described above) and also made that ending seem more likely.

**Response time and likelihood.** As predicted, there was a significant negative correlation between participants' latencies to indicate that the ending made sense and their likelihood ratings ( $r = -.34, p = .001$ ), indicating that the faster a participant responded that the rain ending made sense, the more likely he or she believed the ending to be.

To determine whether participants believed that the ending was more likely because it more easily came to mind, we again used the

<sup>4</sup> No participant recalled the presentation of the word "rain" or "cois" without prompting. Although 14 participants (13.5%) claimed to recognize the presentation of the word "rain" with prompting, we did not omit these participants for several reasons. First, 8 of the 14 who claimed to have seen "rain" presented were in the "cois" condition and were not actually exposed to the subliminal prime of "rain." Second, 7 participants claimed to recognize the presentation of "stars," 5 recognized "no," 4 recognized "yes," and 1 recognized "small" (none of which were presented). Finally, when the data are analyzed with these participants excluded, the findings remain the same.

<sup>5</sup> Thirteen participants (5 from the No Tempting Fate–Control, 7 from the No Tempting Fate–Rain, and 1 from the Tempting Fate–Rain conditions) answered incorrectly and were excluded from all analyses that involved the latency to determine whether the ending made sense. These participants were also excluded from the likelihood analyses because their pattern of data differed from those who understood that the ending made sense (i.e., even after being prompted with the likelihood rating, these participants still presumably believed that the ending did not make sense, claiming that it was especially unlikely across conditions).



mediation analysis procedures outlined by Baron and Kenny (1986). The analysis was focused on our a priori contrast, that is, we examined the specific hypothesis that the rain prime would only affect responses to the story in which fate had not been tempted (because the negative ending would already be accessible for those who had read that Julie did not bring her umbrella). Thus, the condition in which Julie brought her umbrella and participants were primed with the nonsense string should stand out from the other three. To create the contrast, we dummy coded the No Tempting Fate–Control condition as  $-3$  and the other three conditions as  $1$ . In addition, all regression equations that used the a priori contrast as a predictor controlled for the other two orthogonal contrasts (i.e., the contrasts  $0, -2, 1$ , and  $1, 0, 0, -1$ , and  $1$ ).

The a priori contrast significantly predicted participants' ratings of the likelihood that it would rain ( $B = 0.23, SE = .09, p < .05$ ) and the latency to indicate that the rain ending made sense ( $B = -0.22, SE = .06, p < .001$ ). In addition, the latency to indicate that the rain ending made sense significantly predicted participants' ratings of the likelihood of it raining ( $B = -0.51, SE = .15, p = .001$ ). Finally, when both the contrast and participants' response latencies were included in the same equation predicting participants' likelihood judgments, the former dropped to nonsignificance and the latter remained significant ( $B = 0.13, SE = .09, p = .16$ , and  $B = -0.44, SE = .16, p < .01$ , respectively). The mediated relation was supported by a marginally significant Sobel (1982) test ( $z = 1.88, p = .06$ ).

### Discussion

The results of Study 5 lend further support to the role of accessibility as a determinant of people's belief that negative outcomes are especially likely following behaviors that tempt fate. In this study we directly manipulated accessibility and observed a corresponding influence on participants' assessments of likelihood—but only among those participants for whom the negative outcome was not already highly accessible. That is, when participants were primed with a negative outcome after reading a story in which the protagonist had not tempted fate, the accessibility of the negative outcome increased to the level of accessibility among those participants who had read a story in which the protagonist had tempted fate. And, more important, the likelihood judgments of the primed participants matched those of the participants (primed or unprimed) who were exposed to a protagonist who had tempted fate. These results support our contention that the heightened accessibility of negative outcomes that results from contemplating actions that tempt fate is constructed on the spot and need not be retrieved from a culturally shared belief. Although the feeling that something bad is likely to happen if one tempts fate may be aided and abetted by such culturally shared beliefs, the results of this study suggest that such feelings do not depend on them.

Note that before providing likelihood ratings in Studies 4 and 5, participants judged whether an outcome made sense by pressing "Yes" or "No" as quickly as possible. One might be concerned that participants' likelihood judgments may have been contaminated by this procedure. That is, the bodily feedback participants received as they pressed either quickly or slowly may have influenced their likelihood judgments. Participants may have thought the negative

outcomes were especially likely because their fast physical response made them realize, either implicitly or explicitly, that the outcome had jumped to mind—something they would not have realized otherwise.

To examine this possibility, we ran a follow-up study that manipulated accessibility but did not measure it. In other words, after reading that Julie either did or did not tempt fate, and after having been subliminally primed with either "rain" or a nonsense string, participants immediately rated the likelihood of the ending, "As Julie is walking to class later that afternoon, it suddenly starts to rain." The contrast, which tested whether the No Tempting Fate–Control condition differed from the other three conditions (i.e., the rain prime would only increase the likelihood judgments of those participants who had not read that the protagonist tempted fate) was significant,  $F(1, 121) = 7.65, p < .01$ . Participants primed with a neutral string thought the negative outcome was more likely if the protagonist had tempted fate ( $M = 7.71$ ) than if she had not ( $M = 6.85$ ),  $t(62) = 2.74, p < .01$ , but the effect was eliminated if the negative outcome had been made accessible by the rain prime ( $M_s = 7.53$  and  $7.35, t < 1$ ). Because participants did not have any physical feedback, it appears that it is the mental rather than physical experience of accessibility that is used as a cue for judging likelihood. Thus, even when participants did not indicate whether the ending made sense, the manipulation of accessibility had a predictable effect on likelihood judgments.

### Study 6

The psychological processes that give rise to the effects we have documented (i.e., the mind's tendency to seize on negative prospects and the link between imagination and subjective likelihood) combine to produce a gut feeling that to tempt fate is to invite remorse—indeed, to make remorse more likely. But for many people, such a gut feeling conflicts with their more rational, deliberative thoughts on the matter. Thus, people's belief that the universe will punish those who tempt fate may be best understood from a dual-process or two-systems perspective (Chaiken & Trope, 1999). The intuitive system believes and the rational system does not.

In recent years, many psychologists have put forward various dual-process accounts of everyday cognition. Each of these dual-process accounts involves the idea that there is one set of mental processes that operates quickly and effortlessly and another that operates in a deliberate and effortful manner. Although some dual-process models suggest that the two sets of mental processes work in parallel and others suggest that the deliberate processing is saved for consequential judgments, both types posit that one set of mental processes or the other can dominate at any given time, and that whichever set is dominant will have implications for an individual's response (Windschitl & Wells, 1996).

Among those who champion the idea that the two systems work in parallel, the quick and effortless set of mental processes is often referred to simply as System 1 (Stanovich & West, 2002). System 1 renders quick, holistic judgments that are typically based on associative connections. The products of System 1 are often evaluative in nature and are responsible for our quick affective reactions to stimuli. The quick, associative output of System 1 is often sufficient to guide effective action. Occasionally, however, the output of System 1 needs to be supplemented or corrected. System

2, a deliberate, rule-based system, is responsible for overriding System 1 if there is an error detected in the original, automatic assessment (Stanovich & West, 2002).

The mediated relationship documented in Study 4 and the manipulated relationship documented in Study 5 suggest that participants' likelihood judgments resulted, in large part, from their reliance on the availability heuristic, an association-based heuristic that is typical of System 1 processing. Participants used accessibility as a cue to frequency and therefore gave higher estimates of the likelihood of negative outcomes following the behaviors that tempted fate. Although it is true that common events tend to come to mind easily, this does not logically imply that events that come to mind easily are common. However, an associative system has trouble with this distinction, having simply learned—and represented—that common events “go with” events that come to mind easily.

Although participants relied on accessibility to a large extent when they made their likelihood judgments, they had the opportunity to override the accessibility-based output with deliberative, rule-based processing. It seems reasonable to assume that college students, who take pride in being intelligent and rational, tried to ignore the fact that Jon jinxed himself or that Julie didn't bring her umbrella when they judged the likelihood of Jon being rejected or Julie getting caught in the rain because they “knew logically” that the behavior would not influence the likelihood of the outcomes. Because they had as much time as necessary to rate the likelihood of the outcomes, it is probable that some participants were able to override System 1 processing to some extent.

In Study 6, the opportunity to override accessibility-based output was manipulated. Half of the participants were under cognitive load, making it more difficult for them to override System 1 output with rule-based processing. We predicted that the typical effect of a tempting fate behavior on participants' likelihood judgments would be even greater when participants were under load, resulting in an interaction between behavior and load. In other words, when participants' ability to deliberate was diminished, we hypothesized that System 1's accessibility cue would not be corrected and would therefore lead to an even greater difference in likelihood judgments compared with participants not under load.

## Method

**Participants.** One hundred twenty-two Cornell undergraduates completed a packet of unrelated questionnaires in exchange for course credit in psychology or human development courses.

**Materials and procedure.** In the one pertinent questionnaire, participants read one of the self-scenarios from Study 2, which asked them to imagine themselves in a large lecture and to imagine that the professor is planning to call on a student because no one has volunteered to answer the question. Participants either read that they have done the reading for class or that they have not done the reading for class. Half of the participants who read each scenario were under cognitive load. While reading the story and answering the likelihood question, participants under load were required to count backwards by 3s, starting with 564. Participants indicated how likely they believed it was that they would be called on by circling a number between 0 and 10, anchored at 0 with *not at all likely* and at 10 with *extremely likely*. After answering the question, participants under load were told to stop counting and to

report the number on which they ended on. They also indicated how much effort they put into the two tasks by circling a number between 0 and 6, anchored at 0 with *I put all my effort into reading* and at 6 with *I put all my effort into counting*.

## Results

Two participants who were under load (one imagined having done the reading and one imagined not having done the reading) were excluded from analysis because they ended on a number less than 3 away from their starting number (561 and 563), suggesting that they did not count backwards while they read the story. This was confirmed by the manipulation check, on which both participants reported putting all of their effort into reading the story. The remaining 120 participants were split evenly among the four conditions.

A 2 (behavior: had read vs. had not read)  $\times$  2 (load: yes vs. no) ANOVA revealed main effects for reading,  $F(1, 116) = 22.88$ ,  $p < .001$ , and for load,  $F(1, 116) = 17.34$ ,  $p < .001$ . The main effects were qualified by the predicted interaction, however,  $F(1, 116) = 4.15$ ,  $p < .05$ . In other words, when participants were not under load, those who imagined that they had not done the reading believed that it was more likely that they would be called on ( $M = 2.93$ ,  $SD = 2.16$ ) than participants who imagined that they had done the reading ( $M = 1.90$ ,  $SD = 1.42$ ),  $t(58) = 2.19$ ,  $p < .05$ ,  $d = 0.58$ . This pair-wise comparison replicated the results of Study 2. The effect of not doing the reading versus doing the reading was significantly greater when participants were under load, however (see Figure 4). When participants were under load, those who imagined that they had not done the reading believed that it was even more likely that they would be called on ( $M = 5.27$ ,  $SD = 2.36$ ) compared with participants who imagined that they had done the reading ( $M = 2.70$ ,  $SD = 2.17$ ),  $t(58) = 4.38$ ,  $p < .001$ ,  $d = 1.15$ . Described differently, participants who imagined that they had tempted fate believed they were more likely to be called on when they responded under load than not under load,  $t(58) = 3.99$ ,  $p < .001$ ,  $d = 0.98$ , whereas participants who imagined that they had not tempted fate believed they were equally likely to be called on, regardless of whether they responded under load or not under load ( $p = .10$ ). Thus, when participants were required to count backwards and were unable to deliberate, the effect of the tempting fate behavior was magnified.

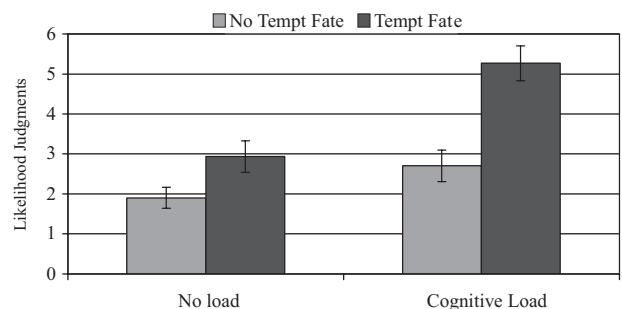


Figure 4. Subjective likelihood judgments in Study 6, following a story in which participants tempted fate or did not, depending on whether participants responded under cognitive load. Error bars represent standard errors.

## Discussion

Cognitive load increased, rather than decreased, the belief that negative outcomes are more likely following a behavior that tempts fate. This finding lends further support to the claim that the elevated perception of likelihood is due to System 1, association-based processing. After all, if cognitive load had interfered with the tendency to judge negative outcomes as more likely, then it would have suggested that the effect requires effortful processing. In contrast, these results suggest that the effect is at a maximum when effortful processing is at a minimum.

We suggest that System 1 processing is always at work. In other words, people spontaneously imagine negative outcomes and therefore feel those outcomes are more accessible and likely. The extent to which people's reported likelihood judgments match their feeling of accessibility will depend on the extent to which System 2 processing overrides the use of accessibility as a cue for likelihood. In Studies 3 and 4, participants had the capacity for effortful processing, and the relationship between accessibility and perceived likelihood was found to be moderately strong (Study 4:  $r = -.31, p < .001$ , and Study 5:  $r = -.34, p = .001$ ). If accessibility had been measured while participants were under load in Study 6, it is likely that the relationship would have been even stronger because a deliberate, rule-based analysis was not available to override the cue of accessibility. If accessibility were measured when participants were made especially accountable for their likelihood judgments, however, it is likely that the relationship would be weaker because System 2 would probably be more engaged (Tetlock, 1992). We have found in our past work, furthermore, that we can diminish the intuitive belief in tempting fate by instructing participants to respond rationally (Risen & Gilovich, 2007). We argue that this was due to participants engaging the deliberate, correction processes of System 2. Thus, cues that prompt rational thinking (e.g., explicit instructions to respond rationally; the use of percentage scales) should weaken the relationship between accessibility and likelihood judgments.

## General Discussion

Despite explicit knowledge that tempting fate does not change the likelihood of a broad range of negative outcomes, participants gave responses that reflected the intuitive belief that it does. Thus, even if they rationally recognized that there is no mechanism to make rain more likely when they leave behind an umbrella or rejection more likely when they wear one shirt rather than another, participants reported that they thought these particular negative outcomes were indeed more likely following such actions. Elsewhere we have shown that these beliefs apply to real events in the here-and-now of experience and not just to hypothetical scenarios, and that they are sufficiently powerful to influence behavior with financial consequences (Risen & Gilovich, 2007; Risen et al., 2007).

Although most traditional accounts of superstition maintain that such beliefs exist because people lack certain cognitive capacities (Frazer, 1922; Levy-Bruhl, 1926; Piaget, 1929; Tylor, 1873), the work presented here adds to accumulating evidence of magical thinking on the part of people who, according to traditional accounts, should not hold such beliefs (Gilovich & Savitsky, 2002; Nemeroff & Rozin, 1989; Pronin, Wegner, Rodriguez, & Mc-

Carthy, 2006; Rozin, Millman, & Nemeroff, 1986; Rozin & Nemeroff, 1990; Rozin & Nemeroff, 2002). Whereas previous research has highlighted the role of the representativeness and affect heuristics in such beliefs, our work indicates that they may also arise from a reliance on the availability heuristic and the tendency for negative stimuli to grab attention.

## *The Role of Negativity in the Belief in Tempting Fate*

Why are negative outcomes that follow actions that tempt fate thought to be particularly aversive? In some cases, the outcomes are materially worse, as when one is called on, unprepared, for class or one does not have an umbrella during a storm. In many other cases, the outcomes are psychologically worse, as when one fails to win a lottery after trading in the winning ticket or falls short at an important task after presumptuously boasting. In these latter cases, the outcomes are more painful because, in addition to whatever pain is experienced from the loss or failure itself, there is an additional dose of humiliation and regret. People anticipate that they will be tormented by counterfactual thoughts ("Why did I have to say that?" "Do that?" "Wear that?") and anticipate that they might have difficulty getting past the painful outcome and the action that led to it. Note that the prospect of negative outcomes such as these would tend to capture imagination even if one does not have personal experience with having tempted fate in a given domain. To anticipate how bad it would feel to be rejected from graduate school after wearing that school's shirt, one needn't have gone through a similar, previous experience. One can simply imagine doing so.

Because negative outcomes are especially accessible and seem especially likely when people consider tempting fate, it is not surprising that they live by the shared rule that fate shouldn't be tempted. The very existence of such a shared rule, in turn, makes the prospect of negative outcomes following actions that tempt fate even more aversive. To suffer a bad fate after flouting conventional wisdom and prevailing norms is especially painful because of the additional regret and embarrassment one feels for having unwisely gone out on a limb. Bee stings hurt, but an individual is likely to feel particularly badly about having been stung if he or she had taunted a hive because the pain of the sting would be accompanied by the regret of having taken such an action. Moreover, such an individual would feel even worse if taunting beehives is generally considered an action that tempts fate because everyone (including the rash individual with the stick) would know that by disobeying a shared rule, he or she somehow "deserved" the punishment. This enhanced negativity makes the prospect of getting stung even more accessible and subjectively more likely, which reinforces the convention that one shouldn't tempt fate (or bees). This mutually reinforcing dynamic helps to account for one of the most noteworthy features of superstitions—their often quite arbitrary nature. Once a given superstition gains some acceptance in a social group, no matter how arbitrary (don't walk under a ladder, don't comment on success), the thought of flaunting it makes the prospect of a negative outcome seem especially negative and, by the processes we have outlined here, especially likely.

Because the processes of negativity and accessibility serve to build on the shared, stored belief about the hazards of tempting fate, might the elevated likelihood judgments we have observed been simply taken "off the shelf" and not computed "on the fly" as

we have maintained? In other words, do negative outcomes seem especially likely following actions that tempt fate because of previously stored information (i.e., shared cultural rules)? Or does disaster seem especially likely because negative outcomes are generated the moment that one entertains the notion of tempting fate? We have suggested that cultural rules about tempting fate contribute to elevated likelihood beliefs primarily by enhancing the negativity of the imagined outcome. Previously stored information may also contribute to elevated likelihood beliefs by directly enhancing the accessibility of certain scripts. However, the current work indicates that such assessments are also generated on the fly as one contemplates the possibility of tempting fate because of the link between imagination, accessibility, and subjective likelihood.

### *The Role of Accessibility in the Belief in Tempting Fate*

The results of Studies 3 and 4 indicate that negative outcomes are indeed more accessible following behaviors that tempt fate and that accessibility mediates judgments of likelihood. Study 5 examined the impact of experimentally induced accessibility and found that likelihood judgments were influenced by the heightened online experience of accessibility. Thus, enhanced likelihood judgments are not only the product of preexisting associations that make a given outcome spring to mind, but also of online constructions that make such an outcome spring to mind in the moment.

Although past research has shown that imagining an event elevates the subjective likelihood that it will occur (Carroll, 1978; Gregory et al., 1982; Sherman et al., 1985), and it has been suggested that this occurs because imagination heightens the feeling of accessibility, to our knowledge this line of work is the first to empirically demonstrate that accessibility is used as a basis for predicting the likelihood of specific outcomes (see also Risen & Gilovich, 2007). When a specific outcome jumped to mind, participants believed it was especially likely. These results add to a growing list of judgments that are influenced by feelings of accessibility—e.g., trait inference (Schwarz et al., 1991), memory for past events (Kelly & Jacoby, 1998), category membership (Tversky & Kahneman, 1973), and the probability of general outcomes (i.e., what is more probable, dying in a car accident or in a plane crash? Tversky & Kahneman, 1973).

### *An Automatic, Intuitive Belief in Tempting Fate*

Two pieces of evidence support our contention that the belief that it is bad luck to tempt fate arises from automatic, associative processes characteristic of System 1. First, the results of Study 6 demonstrate that the processes underlying the belief do not require much in the way of cognitive resources. The belief that it is bad luck to tempt fate was exacerbated when participants were under cognitive load, suggesting that the processes responsible for the belief are automatic (Bargh, 1994; Gilbert, Pelham, & Krull, 1988). Second, we have shown elsewhere that participants who were asked to rely on their “gut feelings” reported that exchanging a lottery ticket would make a negative outcome more likely. Those who were asked to rely on their “rational thoughts,” however, were much less likely to report such a belief (Risen & Gilovich, 2007).

### *What Actions Tempt Fate?*

The behaviors examined in the current set of studies (presumptuously wearing a shirt, failing to do assigned reading, and not bringing an umbrella when rain is expected) are manifestations of needless risk and hubris. Are these essential elements of behaviors that are believed to tempt fate? As a first step in addressing that question, we had participants sort 50 randomly selected newspaper articles that used the term “tempting fate” (Risen & Gilovich, 2008). Hierarchical cluster analysis mapped the underlying structure of how participants thought the term was used and yielded an initial split in the hierarchical organization between unnecessary risk taking and hubris. Actions tend to be seen as involving unnecessary risk when they depart from one’s typical behavior, from a prevailing norm (such as a socially shared superstition), or from a state of physical safety (as when one attempts to “cheat death”). When such actions go awry, they tend to give rise to tormenting counterfactual thoughts and feelings of regret and embarrassment (Gilbert, Morewedge, Risen, & Wilson, 2004; Gilovich & Medvec, 1994, 1995; Hetts, Boninger, Armor, Gleicher, & Nathanson, 2000). Acts of hubris, which are departures from the norm in their own right, a norm of modesty and acceptance of limitations, give rise to the same tortured thoughts and the same counterfactual emotions when they go awry.

Because counterfactuals and feelings of regret are most likely to arise when the negative outcome “fits the crime,” people are much more likely to call to mind a negative outcome that matches the action that tempts fate than they are to imagine unrelated negative outcomes. For example, getting caught in a rainstorm is unlikely to spring to mind and be seen as likely to occur when Jon presumptuously wears a Stanford T-shirt. Conversely, because the sting of rejection is not intensified by failing to carry an umbrella, people are unlikely to predict Jon’s rejection from Stanford if he decides not to bring an umbrella. To be sure, once one negative outcome springs to mind, others may become more accessible and thus seem more likely. However, we suggest that the greatest effect will be for negative outcomes that match the behavior in question, which is why the universe seems interested not only in punishing certain behaviors but in punishing them a certain, ironic way.

Does it matter who commits the action that is seen as tempting fate? Can one’s fate be tempted by someone else? One might expect that an outcome is only experienced as more aversive if one comments on a streak of success oneself, exchanges one’s own lottery ticket, or expresses overconfidence about one’s own outcomes. After all, only then is one likely to kick oneself for what is experienced as an unwise action. But we have found that people believe that commenting on success is likely to jinx a run of good fortune even when someone else calls attention to the streak and that their chances to win a lottery are diminished even when it is their partner who exchanges their original tickets (Risen & Gilovich, 2007; Risen et al., 2007).

Note that the outcomes in such cases are seen as especially aversive even when someone else does the tempting. A streak that comes to an end is likely to be experienced as particularly irksome even when someone else had commented on it because there are still plenty of counterfactual thoughts that are elicited when the streak has been made salient (“Why did she have to say that?”). And, if overconfidence is expressed on someone else’s behalf (“Of course you’re going to get into Stanford. You’re going to get in



everywhere!”) rejection is likely to feel worse even if it was not one’s own confidence that was misplaced. Thus, one person’s actions can influence another person’s counterfactual thoughts and make the latter’s negative outcome more aversive. And such actions, it appears, are seen to increase the chance of a negative result.

### *Societal Influence*

The needs and goals of society surely play a role in maintaining shared beliefs that associate hubris, greed, and other instances of tempting fate with negative outcomes. Groups stand to benefit from mutual constraints against selfishness and rash action on the part of their members. These constraints can come in the form of legal sanctions, but they may be more effectively and efficiently enforced through social norms and shared beliefs. If people believe that certain behaviors (that are not in the group’s interest) will tempt fate and draw punishment from the cosmos, they are less likely to engage in them. Thus, if society’s members believe—either explicitly or implicitly—in an intentional, value-laden universe, it may encourage them to behave in a manner that promotes the shared values of society.

Although some societies and cultures stress the role of supernatural agents more than others (Atran, 2002; Boyer, 2001), we want to emphasize that the beliefs we have investigated are by no means absent in populations in which notions of fate and the intervention of supernatural agents are not well articulated. The present data, involving the responses of Western-educated college students, make that clear. People in different cultures, regardless of their explicit beliefs, do not much differ in the tendency for negative outcomes to jump to mind and in the use of accessibility as a cue for judging likelihood. Instead, cultures are more likely to differ in their access to and reliance on abstract rules that override such automatic associations and assessments (Denes-Raj & Epstein, 1994; Kahneman & Frederick, 2002; Stanovich, 1999). Thus, members of some cultures fully believe that it is bad luck to tempt fate. Members of other cultures intuitively believe it (and often behave accordingly) but simultaneously know that the belief is not rational.

Beyond differences in the explicit endorsement of supernatural influence, cultures also vary in how fate, God, and supernatural agents are assumed to operate. Dennett’s (1987) distinction between the intentional stance and design stance has been used to classify cultural views toward the supernatural. When taking an intentional stance, one treats the supernatural like a person—as though it has intentions, emotions, and goals. In the Judeo-Christian tradition, for example, the central supernatural agent is a person-like God who can be merciful or vengeful at will. When taking a design stance, in contrast, one reacts as if the supernatural is a device or system. In the Hindu tradition, for example, there are many deities, but they must follow the laws of karma and operate within a higher system (Young & Morris, 2004).

Some researchers advocate a strong cultural position whereby an intentional stance is necessary for the belief that misfortune will follow actions that tempt fate (Young & Morris, 2004). They argue that the conviction arises from people believing that their actions can offend a person-like supernatural agent who punishes reprehensible behavior. This strong position rests on the assumption that cultures can be unambiguously divided into those that view the

universe as an intentional agent and those that view it as a system. But it is not clear that they can. The pervasive human tendency to anthropomorphize suggests that even those in a culture with a design stance are likely to perceive some intentionality in the actions of the prevailing system. And there certainly are system-like regularities present in the Judeo-Christian worldview. In fact, we suggest that notions of tempting fate may exemplify the existence of design-stance thinking in cultures that primarily take an intentional stance. If participants in our subject pool were asked why they are more likely to be called on when they fail to do the reading, we predict that they would be more likely to invoke design stance language to explain their judgment (e.g., “That’s just how things work”) than intentional stance language (“God/the universe wants to punish me”).

A weaker cultural position posits that the belief in tempting fate is culturally embedded and that an intentional stance is one aspect of cultural influence that may impact the belief. This position, while hardly controversial, nonetheless raises some interesting questions. For example, because karma works across lifetimes in the Hindu, design-stance worldview, and within lifetimes in the Judeo-Christian, intentional worldview, do behaviors that tempt fate prompt different negative outcomes to spring to mind in the two cultures? That is, do Hindus tend to think of long-term negative consequences (e.g., losing status in the next life) of tempting fate rather than the immediate negative consequences that sprang to mind for our participants? And are the behaviors that are believed to invite bad luck (e.g., hubris and needless risk) universal or do they vary by culture?

### *Conclusion*

The studies presented here document a widespread belief that it is bad luck to tempt fate, even among those who would deny the existence of fate. So what happens when people believe things they know are false? They do their class reading, bring their umbrellas, hold onto their lottery tickets, and (try to) avoid boasting or presuming anything too soon. And when they don’t follow their intuition, they think about how they might be punished. All the while, they shake their heads and roll their eyes, knowing that their behavior and worries are unwarranted.

### *References*

- Atran, S. (2002). *In Gods we trust: The evolutionary landscape of religion*. Oxford, England: Oxford University Press.
- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, efficiency, intention, and control in social cognition. In R. S. Wyer, Jr., & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed., pp. 1–40). Hillsdale, NJ: Erlbaum.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.
- Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology*, *5*, 323–370.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Carroll, J. S. (1978). The effect of imagining an event on expectations for the event: An interpretation in terms of the availability heuristic. *Journal of Experimental Social Psychology*, *14*, 88–96.

- Chaiken, S., & Trope, Y. (1999). *Dual-process theories in social psychology*. New York: Guilford Press.
- Denes-Raj, V., & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their better judgment. *Journal of Personality and Social Psychology, 66*, 819–829.
- Dennett, D. (1987). *The intentional stance*. Cambridge, MA: MIT Press.
- Dijksterhuis, A., & Aarts, H. (2003). On wildebeests and humans: The preferential detection of negative stimuli. *Psychological Science, 14*, 14–18.
- Epstein, S., Lipson, A., Holstein, C., & Huh, E. (1992). Irrational reactions to negative outcomes: Evidence for two conceptual systems. *Journal of Personality and Social Psychology, 62*, 328–339.
- Evans, J. St. B. T. (2007). Hypothetical thinking: Dual processes in reasoning and judgment. New York: Psychology Press.
- Ferm, V. T. A. (1989). *Lightning never strikes twice (if you own a feather bed) and 1,904 other American superstitions from the ordinary to the eccentric*. New York: Gramercy Press.
- Frazer, J. G. (1922). *The golden bough: A study in magic and religion* (Abridged ed.). New York: Macmillan.
- Gilbert, D. T., Morewedge, C. K., Risen, J. L., & Wilson, T. D. (2004). Looking forward to looking backward: The misprediction of regret. *Psychological Science, 15*, 346–350.
- Gilbert, D. T., Pelham, B. W., & Krull, D. S. (1988). On cognitive busyness: When person perceivers meet persons perceived. *Journal of Personality and Social Psychology, 54*, 733–740.
- Gilovich, T., & Medvec, V. H. (1994). The temporal pattern to the experience of regret. *Journal of Personality and Social Psychology, 67*, 357–365.
- Gilovich, T., & Medvec, V. H. (1995). The experience of regret: What, when, and why. *Psychological Review, 102*, 379–395.
- Gilovich, T., & Savitsky, K. (2002). Like goes with like: The role of representativeness in erroneous and pseudo-scientific beliefs. In T. Gilovich, D. W. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 617–624). Cambridge, England: Cambridge University Press.
- Gregory, W. L., Cialdini, R. B., & Carpenter, K. M. (1982). Self-relevant scenarios as mediators of likelihood estimates and compliance: Does imagining make it so? *Journal of Personality and Social Psychology, 43*, 89–99.
- Hansen, C. H., & Hansen, R. D. (1988). Finding the face in a crowd: An anger superiority effect. *Journal of Personality and Social Psychology, 54*, 917–924.
- Hetts, J. J., Boninger, D. S., Armor, D. A., Gleicher, F., & Nathanson, A. (2000). The influence of anticipated counterfactual regret on behavior. *Psychology & Marketing, 17*, 345–368.
- Higgins, E. T. (1996). Knowledge application: Accessibility, applicability, and salience. In E. T. Higgins & A. R. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). New York: Guilford Press.
- Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist, 58*, 697–720.
- Kahneman, D., & Frederick, S. (2002). Representativeness revisited. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases* (pp. 49–81). Cambridge, England: Cambridge University Press.
- Kahneman, D., Knetsch, J. L., & Thaler, R. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives, 5*, 193–206.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. *Econometrica, 47*, 263–291.
- Kelly, C. M., & Jacoby, L. (1998). Subjective reports and process dissociation: Fluency, knowing, and feeling. *Acta Psychologica, 98*, 127–140.
- Levy-Bruhl, L. (1926). *How natives think*. London: Allen and Unwin.
- McKean, E. (Ed.). (2005). *The New Oxford American dictionary* (2nd ed.). New York: Oxford University Press.
- Miller, D. T., & Taylor, B. R. (1995). Counterfactual thought, regret, and superstition: How to avoid kicking yourself. In N. J. Roesse & J. M. Olson (Eds.), *What might have been: The social psychology of counterfactual thinking* (pp. 305–332). Mahwah, NJ: Erlbaum.
- Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology, 89*, 852–863.
- Neely, J. H. (1977). Semantic priming and retrieval from lexical memory: Rules of inhibitionless spreading activation and limited-capacity attention. *Journal of Experimental Psychology: General, 106*, 226–254.
- Nemeroff, C., & Rozin, P. (1989). “You are what you eat”: Applying the demand-free impressions technique to an unacknowledged belief. *Ethos, 17*, 50–69.
- Piaget, J. (1929). *The child's conception of the world*. New York: Harcourt, Brace, and Company.
- Pratto, F., & John, O. P. (1991). Automatic vigilance: The attention-grabbing power of negative social information. *Journal of Personality and Social Psychology, 61*, 380–391.
- Pronin, E., Wegner, D. M., Rodriguez, S., & McCarthy, K. (2006). Hexes, cheers, and everyday magic: When private thoughts lead to belief in magical powers. *Journal of Personality and Social Psychology, 91*, 218–231.
- Risen, J. L., & Gilovich, T. (2007). Another look at why people are reluctant to exchange lottery tickets. *Journal of Personality and Social Psychology, 93*, 12–22.
- Risen, J. L., & Gilovich, T. (2008). *Superstitions and tempting fate: Beliefs without justification*. Manuscript in preparation.
- Risen, J. L., Gilovich, T., Kruger, J., & Savitsky, K. (2007). *Why calling attention to success seems to invite failure*. Manuscript submitted for publication.
- Roesse, N. J., & Olson, J. M. (1995). *What might have been: The social psychology of counterfactual thinking*. Mahwah, NJ: Erlbaum.
- Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology, 50*, 703–712.
- Rozin, P., & Nemeroff, C. (1990). The laws of sympathetic magic: A psychological analysis of similarity and contagion. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 205–232). Cambridge, England: Cambridge University Press.
- Rozin, P., & Nemeroff, C. (2002). Sympathetic magical thinking. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and Biases* (pp. 201–216). Cambridge, England: Cambridge University Press.
- Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review, 5*, 296–321.
- Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, & Simons, A. (1991). Ease of retrieval as information: Another look at the availability heuristic. *Journal of Personality and Social Psychology, 61*, 195–202.
- Sherman, S. J., Cialdini, R. B., Schwartzman, D. F., & Reynolds, K. D. (1985). Imagining can heighten or lower the perceived likelihood of contracting a disease: The mediating effect of ease of imagery. *Personality and Social Psychology Bulletin, 11*, 118–127.
- Simpson, J. A., & Weiner, E. S. C. (Eds.). (1989). *The Oxford English dictionary* (2nd ed.). New York: Oxford University Press.
- Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin, 119*, 3–22.
- Sobel, M. E. (1982). Asymptotic intervals for indirect effects in structural equation models. In S. Leinhardt (Eds.), *Sociological methodology* (pp. 290–312). San Francisco: Jossey-Bass.
- Srull, T. K., & Wyer, R. S. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and

- implications. *Journal of Personality and Social Psychology*, 37, 1660–1672.
- Stanovich, K. E. (1999). *Who is rational? Studies of individual differences in reasoning*. Mahwah, NJ: Erlbaum.
- Stanovich, K. E., & West, R. F. (2002). Individual differences in reasoning. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and Biases* (pp. 421–440). Cambridge, England: Cambridge University Press.
- Tetlock, P. E. (1992). The impact of accountability on judgment and choice: Toward a social contingency model. In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 35, pp. 331–376). San Diego, CA: Academic Press.
- Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5, 207–232.
- Tylor, E. B. (1873). *Primitive culture*. New York: Harper & Brothers.
- Will, G. F. (2002, December 23). Let's keep dancing. *Newsweek*, p. 76.
- Windschitl, P. D., & Wells, G. L. (1996). Measuring psychological uncertainty: Verbal versus numeric methods. *Journal of Experimental Psychology: Applied*, 2, 343–364.
- Young, M. J., & Morris, M. W. (2004). Existential meanings and cultural models: The interplay of personal and supernatural agency in American and Hindu ways of responding to uncertainty. In J. Greenberg, S. L. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental existential psychology* (pp. 215–230). New York: Guilford Press.
- Zeelenberg, M., van Dijk, W. W., Manstead, A. S., & van der Pligt, J. (2000). On bad decisions and disconfirmed expectancies: They psychology of regret and disappointment. *Cognition and Emotion*, 14, 521–541.

Received September 14, 2007

Revision received March 15, 2008

Accepted March 18, 2008 ■