Consequence-Cause Matching: Looking to the Consequences of Events to Infer Their Causes

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This article documents a bias in people's causal inferences, showing that people nonnormatively consider an event's consequences when inferring its causes. Across experiments, participants' inferences about event causes were systematically affected by how similar (in both size and valence) those causes were to event consequences, even when the consequences were objectively uninformative about the causes. For example, people inferred that a product failure (computer crash) had a large cause (widespread computer virus) if it had a large consequence (job loss) but that the identical failure was more likely to have a smaller cause (cooling fan malfunction) if the consequence was small—even though the consequences gave no new information about what caused the crash. This "consequence-cause matching," which can affect product attitudes, may arise because people are motivated to see the world as predictable and because matching is an accessible schema that helps them to fulfill this motivation.

Imagine that your computer suddenly crashes: the screen turns black, the power drains away, and you cannot bring it back to life. How might you determine the cause of this event? Several reasonable strategies come to mind. You might consider antecedent factors, such as what you were doing immediately before the crash (e.g., eating a burrito that leaked onto your keyboard). You might also learn more about the event by asking coworkers if their computers were affected or by asking a technician to diagnose the damage. Other strategies, however, seem less appropriate. It seems particularly inappropriate to allow incidental consequences of the crash to alter your belief about its cause: if the crash destroyed your only copy of a grant proposal just before the submission deadline (potentially costing you thousands of dollars), you have no more objective insight into the crash's cause than if the crash had less severe consequences (e.g., the deadline was serendipitously extended, allowing you to reconstruct the proposal). We suggest, however, that far from such reasoning being the exception, people frequently and systematically allow such uninformative consequences to influence their causal inferences.

Specifically, we suggest that people not only use information about a focal *event* to infer its causes (fig. 1*A*) but also use information about the event's final *consequences* to make such inferences (fig. 1*B*), even when those consequences are arbitrarily determined and uninformative about the focal event's antecedents. We specifically propose that causal inferences may be characterized by *consequence-cause matching*, with people assuming, for example, that large causes are more likely when large (vs. small) consequences obtain and that good causes are more likely when good (vs. bad) consequences obtain.

Understanding causal inferences has important implications for consumer behavior (Folkes 1988; Mizerski, Golden, and Kernan 1979; Weiner 2000). For example, consumers may often need to decide where fault lies for a product failure, and such decisions may affect subsequent behavior and subsequent product attitudes (Folkes 1984; Folkes, Koletsky, and Graham 1987). Even when products are associated with positive outcomes, causal inferences can influence the degree to which brand attitudes are bolstered following those outcomes. In fact, it could be argued that inferences about whether products will cause desired effects

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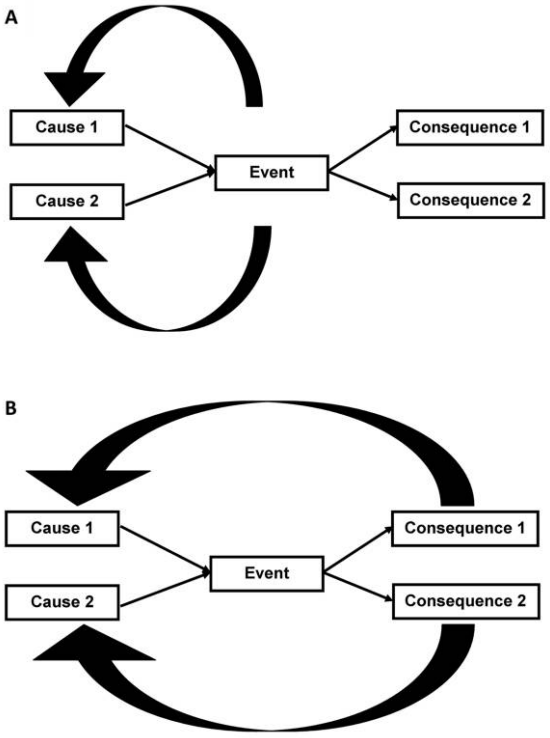
FIGURE 1

TWO MODELS OF CAUSAL REASONING



NOTE.—People may not only look to events to infer event causes (*A*) but may also look to (even uninformative) event consequences to infer a focal event's causes (*B*).

drive many—and perhaps the majority of—purchase decisions (Folkes 1988; Weiner 2000).

This article therefore explores how people use consequences to infer causes. We show that consequence-cause matching emerges across a variety of domains and dimensions. We investigate the psychological underpinnings of this matching tendency, suggesting that matching arises because people are motivated to see the world as predictable and because matching is one accessible schema that may help them to fulfill this motivation.

MATCHING CAUSES TO CONSEQUENCES

Researchers have taken a variety of approaches to the study of causal reasoning. Early research suggested that causal inferences are based on whether possible causes covary with observed effects, showing, for example, that people use cues such as an effect's consistency and distinctiveness to infer its cause (Jones and Davis 1965; Kelley 1967; McArthur 1972; see Folkes [1984, 1988] for related research in marketing). While covariation information likely plays an important role in causal reasoning (Cheng 1997), it is not sufficient to explain all causal inferences (Einhorn and Hogarth 1986; Griffiths and Tenenbaum 2009; Johnson, Boyd, and Magnani 1994; McGill 1989; White 1989, 2009a, 2009b): covariation information does not distinguish correlational from causal relationships (Johnson et al. 1994), and people can draw causal inferences even without detailed covariation information (Griffiths and Tenenbaum 2009). More recent research has thus examined, for example, how people use prior knowledge to make causal inferences (Griffiths and Tenenbaum 2009) and how people perceive causes as forces that generate effects (Johnson et al. 1994; White 1989, 2009a, 2009b; see Buehner and Cheng [2005] and Keil [2006] for recent reviews).

As researchers considered cues other than covariation that people might use to infer causation, several theorists suggested that people may be influenced by the similarity between candidate causes and observed effects. For example, Nisbett and Ross (1980) proposed the resemblance criterion, suggesting that people think that causes resemble their effects in quality or size, and others similarly proposed that people assume there to be some likeness between causes and their effects (Einhorn and Hogarth 1986; Heider 1944; Kelley 1973; White 1988). However, these "matching" proposals were mainly supported with historical examples, such as people's incredulity about small germs causing large-scale epidemics, rather than with experimental evidence (Einhorn and Hogarth 1986; Nisbett and Ross 1980).

Although these proposals have received relatively limited empirical scrutiny, the notion that people might be receptive to matching patterns has received support in other areas, such as attitude change (Petty and Wegener 1998; Shavitt 1990), risk assessment (Johnson and Tversky 1983; but see DeSteno et al. 2000), and counterfactual reasoning (Sim and Morris 1998). For example, Sim and Morris (1998) asked people how an athlete's overall time in a three-part race could have been different. Participants felt that increasing the speed in the slowest part of the race (e.g., swimming) would have most improved the athlete's time and that reducing the speed in the fastest part of the race (e.g., cycling) would have most hurt her time. However, these studies do not directly explore causal inferences: believing that swimming faster would increase one's time does not equate to endorsing slow swimming as the cause of one's finishing time. (People may very well have endorsed fast biking as the cause as it offset the slow swimming.)

The studies that have directly addressed matching in causal reasoning have primarily focused on children, examining beliefs about physical causes and effects (e.g., causes of loud vs. quiet sounds; Shultz and Ravinsky 1977); few studies have examined the role that similarity plays in adults' causal inferences about complex events. One recent exception is the finding that, for example, adults are more likely to blame extensive damage on a large tornado than on a small one and that they credit a taller (vs. smaller) basketball player as having scored the most points in a game (Spina et al. 2010). However, in each of these cases, the

effect in question is not uninformative about the candidate causes (e.g., large tornados often do cause more damage than small ones). One goal of the current investigation is therefore to examine similarity's role in adult causal reasoning even when similarity provides no legitimate basis for a causal inference.

Moreover, our research departs from prior work in that we argue not just that people think that causes and their *effects* resemble each other, but that people even allow the similarity between causes and arbitrarily determined, objectively uninformative *consequences* of effects to influence causal inferences. Again consider our opening example and figure 1: the resemblance criterion would predict that a large cause (e.g., a widespread computer virus) would be more often inferred for a large computer crash (e.g., one that causes permanent damage) than for a smaller, less severe crash (e.g., one from which recovery is possible). Although characteristics of the focal event (e.g., the computer crash) may indeed affect causal inferences (Kelley 1967), we suggest that, even with the size of the focal event held constant, incidental consequences of that event (such as whether it happens to lead to job loss) will still bias causal inferences, with people assuming that the cause is relatively similar in size or valence to the consequences.

To our knowledge, the potential existence of consequence-cause matching has never been directly addressed in the literature. Perhaps most relevant is prior research suggesting that when a person's actions arbitrarily lead to more severe or negative consequences, that person is blamed or punished more (Alicke, Davis, and Pezzo 1994; Burger 1981; Janoff-Bulman, Timko, and Carli 1985; Lerner and Simmons 1966; Scroggs 1976; Walster 1966). However, even this research sheds little light on whether the perceived cause of the event changes as consequences change: generally, researchers examined the blame assigned only to one focal actor and not the relative blame assigned to different potential causes. Thus, although prior research suggests that consequences of an event may influence perceptions of that event (see also Baron and Hershey 1988; Hoch and Loewenstein 1989; Rozin and Stellar 2009), still unknown is whether people allow incidental, arbitrarily determined consequences of an event to influence their perceptions of what caused that event and, if so, whether people are biased by similarities between causes and consequences. This article's primary aim is to show that people indeed match causes to (uninformative) consequences and that they do so across a wide variety of domains and dimensions, with implications for consumer attitudes and behavior.

Of course, many factors will shape people's beliefs about what caused a particular event, and this will lead some causes to generally seem more likely than others in a particular situation. We do not deny the influence of these factors, nor do we suggest that consequence-cause matching is the only principle that guides causal inferences. Instead, we suggest that matching may play a role in causal inferences even with other factors (such as prior experience or covariation information) held constant.

THE MOTIVATION TO LIVE IN A PREDICTABLE WORLD

We propose that people engage in consequence-cause matching; but what might underlie this tendency? Matching could be akin to a perceptual effect: just as, in vision, similarity among constituent parts fosters the perception that those parts form a coherent figure, in causal reasoning, similarity between a consequence and a candidate cause may foster perceptions that the two form a causal unit (Heider 1944). Another possibility is that matching is a shortcut or heuristic that people use to avoid an effortful search for an event's cause. After all, applying a belief that "big things cause big things" is much simpler than constructing a covariation matrix and keeping close track of when causes and effects cooccur.

We suggest, however, that consequence-cause matching not only may reflect a natural perceptual process or dispassionate overuse of a shortcut, but also may have a motivational basis. Specifically, many researchers have suggested that people are motivated to understand, structure, and predict the world (Heider 1958; Katz 1960; Kay et al. 2010; Kelley 1967; Kruglanski 1990). One means of fostering the belief that the world works in predictable ways is to believe that causes and consequences are systematically related (Kay et al. 2010; Lerner and Simmons 1966). A motivation to see the world as predictable might thus lead people to overlook the fact that some consequences are determined arbitrarily or by chance, and to instead infer regularities between an event's consequences and its causes. This inferred regularity may specifically take the form of consequence-cause *matching* because people likely naturally observe many instances in which causes and consequences resemble each other in magnitude or valence. For example, even children learn that shoving their siblings forcefully has a larger effect than does shoving them lightly (see White [2009b] for discussion). Because people so often observe causes and consequences legitimately resembling each other, matching may be an especially accessible causal pattern that people can impose to make the world seem predictable.

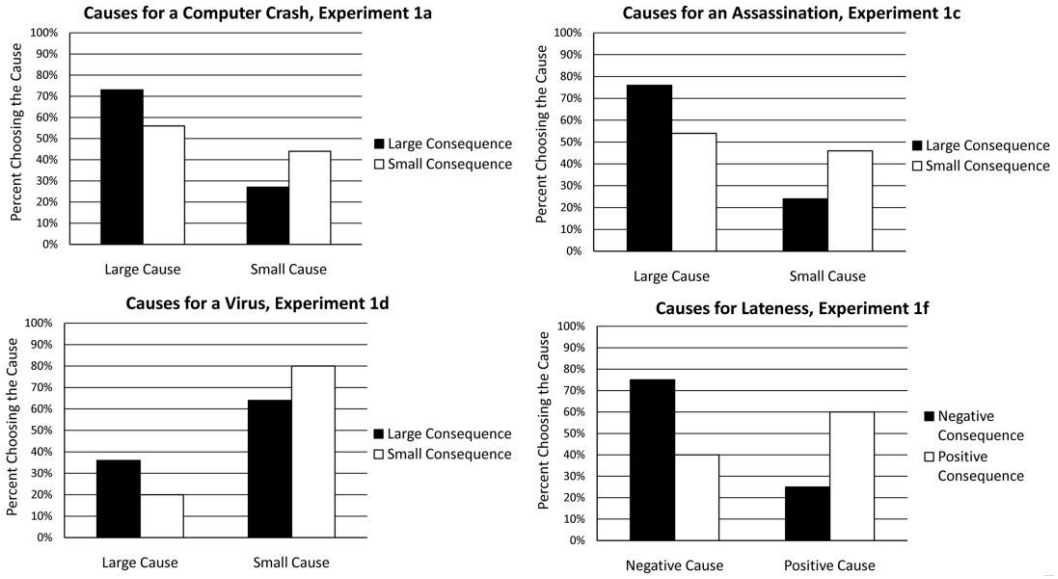
Thus, we propose that consequence-cause matching may arise (*a*) because perceiving causes and consequences as systematically related fulfills a motivation to see the world as predictable and (*b*) because matching is a particularly accessible causal schema on which people can rely to "detect" such a systematic relationship. As a result, we predict that people will no longer engage in matching when either (*a*) they are no longer motivated to see the world as predictable or (*b*) another schema becomes more accessible than matching. Before developing these ideas further, we first explore the basic notion of consequence-cause matching.

THE CURRENT RESEARCH

We first investigate whether causal inferences are affected by a tendency to match causes to consequences, even when the consequences are uninformative about the potential causes (experiments 1a–1f). We next consider whether

FIGURE 2

PREFERENCES FOR CAUSES THAT MATCH EVENT CONSEQUENCES, EXPERIMENT 1



matching helps people see causal relationships as stable and predictable (experiment 2). Finally, we investigate whether matching might arise because people are motivated to see the world as predictable and because matching is an accessible schema that allows them to do so (experiments 3 and 4).

EXPERIMENT 1: CONSEQUENCE-CAUSE MATCHING

Experiments 1a–1f investigated whether people match causes to consequences in terms of size and valence. The experiments all had a similar structure: participants read about an event and a consequence of that event. Each event had two possible consequences (large or small; positive or negative) that were manipulated between subjects and were uninformative about the event's cause. We assessed participants' beliefs about the cause of the event, either by asking them to choose between causes that differed in size or valence or by asking them to estimate the size of the possible causes. We made the following prediction.

H1: Even when an event's consequence is uninformative about its cause, people will be more likely to select larger causes for events with larger (vs. smaller) consequences and more likely to select positive causes for events with positive (vs. negative) consequences.

Each experiment is described relatively briefly below, with full materials in the appendix. All participants were randomly assigned to condition. Unless noted, participants were undergraduate students at the University of Florida. They participated for extra credit and completed the experiment via a questionnaire among other unrelated tasks in the lab.

Experiments 1a and 1b: Perceptions of Product Failure

In experiments 1a and 1b, participants read about a student, Adam, whose computer crashed, causing him to lose a term paper. In the large-consequence condition, Adam's professor did not grant him an extension. Adam failed the class, could not graduate, and lost a job offer. In the small-consequence condition, the professor granted the extension. Adam rewrote the paper, passed, graduated, and started the job as planned. Thus, in both cases, the crash's consequences were determined by the professor rather than by anything informative about the crash's causes.

In experiment 1a, participants ($N = 129$) decided whether the crash was more likely caused by a widespread virus (large cause) or by a malfunctioning cooling fan (small cause), order counterbalanced. In a pretest with a separate sample ($N = 199$), many more selected a virus as a more severe computer problem than a malfunctioning fan (72% vs. 27%; $\chi^2(1) = 40.9$, $p < .001$), suggesting that viruses indeed seem like larger causes.

Participants reading that Adam lost his job because of the crash were more likely to select the (large) virus as the crash's cause than were those reading that Adam graduated on time (73% vs. 56% chose the virus, respectively; $\chi^2(1, N = 129) = 4.14$, $p = .04$; see fig. 2). This effect arose even though the crash itself was identical in both cases and

the consequences were uninformative about the causes. (The general tendency to select the virus over the fan could be due to the general prevalence of viruses, but most important for our account is that this tendency was reduced when the consequence was smaller.) As hypothesis 1 suggested, a larger cause was chosen more frequently when the event led to a larger (instead of smaller) consequence.

Experiment 1b examined the implications of these results for consumer attitudes. Given that a virus was more often seen at fault when the consequence was large, the manufacturer of Adam's antivirus software may be blamed more and trusted less when the crash has larger (vs. smaller) consequences. Thus, after a new set of participants ($N = 64$) read the scenario described above, we did not ask them to choose between the causes but instead asked, "Assume that Adam used McAfee antivirus software. Based on what you read above, how would you rate the level of security provided by McAfee antivirus software?" Participants responded on a scale ranging from 1 (very low security) to 7 (very high security).

Participants who learned that the computer crash led to a large consequence had a worse view of McAfee's security ($M = 3.1$) than did those who learned that the very same crash was less consequential ($M = 3.8$; $t(62) = 1.97$, $p = .05$). This is consistent with the finding that a virus was blamed more when the consequence of the crash was large instead of small, and it shows the implications of consequence-cause matching for product attitudes: such attitudes can be harmed by events that unfold after, and have only an indirect relation to, a product failure. Experiments 1c–1f further explore consequence-cause matching, its implications, and its generality.

Experiment 1c: Conspiracy Theories

Next, we investigated consequence-cause matching in a very different context, examining whether people would differentially endorse a conspiracy (a "large" cause) depending on whether an event had larger or smaller consequences. Participants ($N = 74$) read about the assassination of a small country's president. They next read that a British newspaper criticized the assassinated leader, with the criticism sparking attacks against Britain. In the large-consequence condition, Britain's prime minister responded aggressively to the attacks, triggering war. In the small-consequence condition, Britain's prime minister responded peacefully, quelling the attacks. Participants chose whether the initial assassination was more likely to have been caused by a lone gunman or by a conspiracy within the assassinated leader's government (order counterbalanced). When war ensued, participants were more likely to select the (large) conspiracy as the assassination's cause than when peace prevailed (76% vs. 54%, respectively; $\chi^2(1, N = 74) = 3.80$, $p = .05$; see fig. 2). This happened even though the final outcome was determined by the British prime minister and not by anyone in the assassinated leader's country.

In a conceptual replication of experiment 1c, participants read about the assassination of John F. Kennedy. Some read that his assassination prolonged the Vietnam War, causing 40,000 extra American deaths; others read that the assassination altered neither the war nor the fact that 40,000 more Americans were killed. Participants endorsed a conspiracy as the assassination's cause more often when its consequences seemed large instead of small (75% vs. 64%, respectively; $\chi^2(1, N = 224) = 3.69$, $p = .055$). Research has suggested that assassinations are more often attributed to conspiracies than are failed assassination attempts (Jarudi and Keil 2006; McCauley and Jacques 1979), but our results suggest that even when an attempt succeeds, events following it continue to influence beliefs about its cause.

Experiment 1d: Size, Literally

Experiment 1d examined just how far-reaching consequence-cause matching might be: will people even infer that events with large consequences are more likely than events with small consequences to have physically large causes? Participants ($N = 130$) read about a zoo in which all the animals caught an unusual disease. In the large-consequence condition, most of the animals died before the disease was brought under control; but in the small-consequence condition, the caretakers controlled the disease so that only a few animals died. Thus, in all cases, the disease was widely transmitted, with the difference in survival driven by whether the caretakers controlled the disease in time. Participants chose between two newly acquired animals (order counterbalanced) as the disease's source: a fully grown bear and a small rabbit.

When many animals died, participants were more likely to choose the literally larger cause (the bear) for the disease than when most animals survived (36% vs. 20%, respectively; $\chi^2(1, N = 130) = 4.28$, $p = .04$; see fig. 2). This result arose even though, in both cases, all animals caught the disease; thus, the procedure controlled for beliefs about some animals being more contagious than others. Lay theories about the spread of disease may even have operated against the current effects; in a follow-up experiment ($N = 33$), 82% of participants selected a rabbit as more likely to transmit a fatal disease than a bear. Despite this general belief, participants selected the bear as the cause more often when the disease had more severe consequences than when the consequences were smaller. Events with larger consequences thus seem more likely to have large causes than events with smaller consequences, whether the size differences are literal (experiment 1d) or more abstract (experiment 1a).

Experiment 1e: Continuous Dependent Measures

Experiment 1e examines whether people engage in consequence-cause matching even when they are not forced to choose between two causes (or compare two causes) for an event: do people spontaneously imagine larger causes when an event has a larger consequence?

Participants ($N = 55$ undergraduates and 97 members of a paid online pool) considered a case of ground beef con-

tamination; we sampled only nonvegetarians to avoid ambiguous responses about subsequent willingness to dine at the affected restaurant. Participants read that a chain restaurant received and served contaminated beef from a supplier, sickening 3,000 people. In the small-consequence condition, the Centers for Disease Control (CDC) warned the public quickly, so everyone sought treatment and made a full recovery. In the large-consequence condition, the CDC did not warn the public in time, so most people died from a lack of treatment. Thus, in both cases, the bacteria made 3,000 people ill, but the CDC's actions determined the eventual consequences. To assess the perceived size of the contamination's causes, participants estimated the number of the supplier's plants involved (out of 23), the percentage of the supplier's employees who knew about the problem (out of 100%), and the number of restaurants (out of 6,000 in the chain) that served the contaminated beef. To assess the consumer implications of matching, participants estimated the number of days until it would be safe to visit that restaurant chain.

Participants perceived each of the three potential causes as bigger when the very same contamination led to large consequences instead of small (see table 1). Responses were log-transformed (to correct for skewness), standardized, and combined into a composite of perceived cause size (Cronbach's $\alpha = .72$). This composite was reliably greater—suggesting that the contamination seemed to have larger causes—when the contamination led to a large instead of a small consequence ($t(150) = 1.97$, $p = .05$). Participants also thought that more time should pass before it would be safe to dine at the affected restaurants when the contamination's consequences were large ($M = 57.6$ days) instead of small ($M = 22.0$ days; $t(147) = 2.74$, $p = .007$). (Degrees of freedom are lowered by responses of 0 that were rendered null by the log-transformation; similar results emerge when the raw data are analyzed; $t(150) = 2.26$, $p = .03$.) Consequence-cause matching thus seems to emerge across paradigms and situations; we next considered whether it extends beyond magnitude to another dimension: valence.

TABLE 1

PERCEPTIONS OF POSSIBLE CAUSES, EXPERIMENT 1E

	Consequences of food contamination	
Potential causes	Small	Large
Number of affected plants (of 23)	6.95	7.82
Employees involved (%)	31.44	33.24
Number of restaurants involved (of 6,000)	1,085	1,376*
Standardized composite	−.15	.12*

NOTE.—These are raw responses; hypothesis tests were conducted on log-transformed responses. Responses were transformed into logs before being standardized and averaged into a composite.
*$p < .05$.

Experiment 1f: Valence Matching

Participants ($N = 40$) read a scenario in which positive and negative causes created an event, which in turn had a positive or negative consequence. Participants read that, one morning, a man named Steve argued with his wife before leaving home. Steve then felt remorse and stopped to buy his wife flowers, arriving at work 25 minutes late. In the negative-consequence condition, Steve missed an important meeting and was fired. In the positive-consequence condition, the same important meeting had been serendipitously postponed, and Steve gave an excellent presentation that led to a promotion. Participants chose the cause most responsible for Steve being 25 minutes late: arguing with his wife or buying flowers (order counterbalanced).

When Steve was fired, 75% of participants selected the fight (the negative cause) as causing his lateness, but only 40% did so when Steve was promoted ($\chi^2(1, N = 40) = 5.01$, $p = .03$; see fig. 2). This happened even though in both cases the absolute amount of lateness was the same, with the final consequence determined by whether the meeting had been fortuitously postponed. People thus seem to match causes to consequences in terms of valence, selecting good causes when good outcomes incidentally emerge but bad causes when bad outcomes prevail. More broadly, experiments 1a–1f suggest that consequence-cause matching arises in many situations and in at least two dimensions. The following experiments investigate the psychological processes that may underlie this tendency.

EXPERIMENT 2: MATCHING ENHANCES PERCEIVED PREDICTABILITY

We suggested in the introduction that consequence-cause matching may arise because people are motivated to see the world as predictable. Experiment 2 takes a first step toward examining that suggestion by exploring whether perceiving causes and consequences as matching might help people feel that causal relationships are more stable and, thus, that the world is more predictable.

If perceiving a cause-consequence match makes the world seem more predictable, then the confidence with which people predict a cause's future effects may be affected by whether that cause has produced matching consequences in the past. That is, people who learn that a consequence has a matching cause not only should find the current causal explanation to be more plausible, but also should be more likely to predict that the same causal relationship will manifest in the future. Learning that a cause mismatched a consequence, however, might make people relatively less confident in their ability to predict that cause's future effects.

Experiment 2 examined this idea in a product failure setting. As in experiment 1a, participants read about a computer crash that had either a large or a small consequence. Instead of having to infer the cause, participants were told the likely cause, which was manipulated to be large or small (and thus to match or mismatch the described consequence). This design, combined with the above reasoning, led to hypothesis 2.

H2: People for whom the identified cause of an event matches (instead of mismatches) its consequence should be (*a*) more confident in the offered causal explanation and (*b*) more likely to predict that a similar future event will have the same cause.

Method

Participants. Participants either were members of an online survey panel who were paid for completing this and other surveys ($N = 441$) or were University of Florida undergraduates participating for extra credit ($N = 182$). Results were similar across the two samples; data were combined for analysis.

Materials and Procedure. Participants were randomly assigned to one cell of a 2 (consequence size: large or small) × 2 (cause size: large or small) between-subjects design. Participants read the computer crash scenario from experiment 1a, in which a student either failed to graduate and lost a job following the crash (large consequence) or graduated and began work as planned (small consequence). Participants next read that a technician determined either that the computer was struck by a virus (large cause) or that the cooling fan malfunctioned (small cause). Participants rated how confident they were that the stated cause was the true cause of the crash, on a scale ranging from 1 (not very confident) to 7 (very confident). Next, we asked participants to assume that the stated cause was indeed the true cause of the crash. We then asked, "Now, imagine . . . a similar computer crash in the future (in which a computer crashes and cannot boot up). How likely would you think it is that this new crash was also caused by [the identified cause]?" Participants responded on a 1 (not very likely) to 7 (very likely) scale.

Results and Discussion

When the cause matched the consequence (large consequence/large cause and small consequence/small cause), participants were more confident that the identified cause was the true cause ($M = 4.78$) than when the cause and consequence did not match (large consequence/small cause and small consequence/large cause: $M = 4.48$; $t(621) = 2.35$, $p = .02$). Participants were also more confident that a future crash would be due to the stated cause when the cause matched instead of mismatched the consequence ($M = 4.87$ vs. 4.58, respectively; $t(621) = 2.32$, $p = .02$). A composite "faith in the cause" measure, created by averaging participants' two responses, was also reliably greater when causes and consequences matched instead of mismatched ($M = 4.82$ and 4.53, respectively; $t(621) = 2.79$, $p = .005$).

As predicted by hypothesis 2, participants found explanations that feature a consequence-cause match instead of a mismatch to be more compelling and more likely to hold in the future. It is notable that what mattered was the degree of match or mismatch rather than the cause itself: faith in the cause was unaffected by which cause was identified as the culprit ($M_{fan} = 4.65$ vs. $M_{virus} = 4.68$; $t(621) = -.27$, $p = .79$), suggesting that it is not that people generally find one cause (virus or fan) more plausible than the other but are instead affected by the fit between cause and consequence. Perceiving that causes and consequences match seems to make people feel more confident and causal relationships seem more stable, suggesting that consequence-cause matching might play a role in making the world seem more predictable. Experiment 3 examines this issue further, examining whether matching might primarily arise when people feel the need to make the world seem predictable.

EXPERIMENT 3: MATCHING AND MOTIVATION

Experiment 3 used both a manipulation and an individual-difference measure to examine whether matching is related to the motivation to see the world as predictable. We reasoned that people can likely fulfill the need to see the world as predictable in many different ways. If consequence-cause matching arises from such a need, matching may be attenuated when that need has recently been fulfilled. Specifically, if the world is made to seem predictable to people just before they engage in causal reasoning, they may be less driven to infer that causes and consequences match. This experiment shares its logic with recent research on the motivations to maintain a sense of control (Kay et al. 2008, 2010) and meaning (Heine, Proulx, and Vohs 2006): that research suggests that when people feel deprived of control or meaning in one domain, they reassert a sense of control or meaning in another, even unrelated, domain (Proulx and Heine 2008; Whitson and Galinsky 2008). If such a compensatory relationship exists for the motivation to view the world as predictable, then fulfilling that motivation in one domain may temporarily reduce the tendency to impose structure and predictability in causal reasoning—reducing consequence-cause matching.

Thus, in experiment 3, some participants recalled situations in which the world seemed predictable, and we hypothesized that these participants would be temporarily less motivated to match the cause of an event to its consequence. Other participants recalled situations in which the world seemed unpredictable; we hypothesized that these participants would match causes to consequences to promote a predictable view of the world. Hypothesis 3a thus follows.

H3a: People encouraged to think of the world as predictable will be less likely (than those not encouraged to do so) to engage in consequence-cause matching because they will be temporarily less motivated to impose structure on the world.

Support for hypothesis 3a would also provide evidence that matching does not arise only because it is a belief or heuristic that is applied to simplify causal reasoning. If matching did operate as a belief or heuristic, then recalling times when the world was predictable should not decrease the prevalence of matching. If anything, it might increase

its prevalence, as reinforcing the idea that the world is predictable may increase people's likelihood of applying heuristic beliefs about how the world works. We argue that the opposite will hold because making the world seem predictable will reduce the need for matching.

To further examine the relationship between matching and the motivation to see the world as predictable, we assessed participants' general tendencies to seek order, predictability, and clarity via the need for closure scale (Webster and Kruglanski 1994). People with a high need for closure are highly motivated to feel that they understand the world and how it works (Kruglanski 1990; Webster and Kruglanski 1994). If consequence-cause matching arises from a motive to see the world as predictable, matching may primarily emerge among people who are higher in need for closure. However, the moderating role of need for closure may be diminished when people have recently been made to feel that the world is predictable (and thus the need to seek predictability has been temporarily fulfilled). This reasoning leads to hypothesis 3b.

H3b: Unless the need to see the world as predictable is fulfilled through other means, people who are higher in need for closure will be more likely to engage in consequence-cause matching than people who are lower in need for closure.

Method

Participants. University of Florida undergraduates ($N = 204$) participated for extra credit.

Materials and Procedure. Participants were randomly assigned to one cell of a 2 (worldview prime: predictable or unpredictable) × 2 (consequence size: large or small) between-subjects design. In the worldview-predictable conditions, participants first wrote about a time when their lives or the world seemed very predictable, "such as a time when what happened was exactly what you expected." They then wrote about how that situation made them feel and described one thing "that you feel like you can predict" about the future. Participants in the worldview-unpredictable conditions completed a similar task but wrote about a time when "what happened was not at all what you expected" and about something in the future "that you feel like you can't predict" (see Whitson and Galinsky [2008] for a similar manipulation).

We conducted two separate pretests of this manipulation. First, to examine whether the manipulation influenced participants' perceived ability to predict the world, a separate sample of undergraduates ($N = 203$) was randomly assigned to complete either the predictable or the unpredictable prime. They then rated, on 7-point scales, the degree to which they felt that they could predict eight different items, such as what will happen in life and what people will do. Across the eight items, participants who completed the predictable prime felt reliably more able to predict things ($M = 4.1$) than did those who completed the unpredictable prime ($M = 3.8$; $t(201) = 2.29$, $p = .02$). We also examined whether this manipulation influenced mood. We repeated the above procedure, but after a different group of undergraduates ($N = 215$) completed the prime, they completed the Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, and Tellegen 1988) and rated their overall mood on a 7-point scale. The overall mood rating did not differ by priming condition ($M_{\text{predict}} = 5.0$ vs. $M_{\text{unpredict}} = 5.0$; $t(213) = .41$, $p = .68$), and neither did scores on the PANAS (positive affect: $M_{\text{predict}} = 2.7$ vs. $M_{\text{unpredict}} = 2.9$; $t(211) = 1.23$, $p = .22$; negative affect: $M_{\text{predict}} = 1.6$ vs. $M_{\text{unpredict}} = 1.5$; $t(211) = .79$, $p = .43$; two participants did not complete the PANAS).

In the main experiment, after the priming manipulation, participants read the computer crash scenario from experiment 1a, learning that the crash's consequence was either large or small. They then indicated whether they thought that the crash was more likely caused by a virus (large cause) or a cooling fan (small cause). Finally, participants completed the need for closure scale (Webster and Kruglanski 1994). Twenty-one participants who did not fully complete the materials were excluded from all analyses. Following the procedure outlined by Kruglanski (2011), we also excluded 10 participants who scored above 15 on the "lying" subscale of the need for closure scale; this removes participants who likely did not give truthful responses.

Results and Discussion

Among participants who contemplated the unpredictable nature of the world, only 18% inferred that the (large) virus caused the computer failure when the crash's consequence was small, but more than twice as many (43%) chose the virus when the consequence was large ($\chi^2(1, N = 80) = 5.55$, $p = .02$). Thus, as before, causal inferences were biased by consequences. However, this matching tendency was no longer reliable when participants contemplated the world as predictable, with 51% selecting the virus when the consequence was large and 43% doing so when the consequence was small ($\chi^2(1, N = 93) = .61$, $p = .44$). Consistent with hypothesis 3a, when people think of the world as predictable, their tendency to match causes to uninformative consequences is attenuated.

Hypothesis 3b suggested that, when the world seems unpredictable, consequence-cause matching should be most prevalent for people who are high in need for closure. We conducted a logistic regression in the unpredictable-world condition, entering consequence (-1 = small, 1 = large), need for closure (centered), and their interaction as predictors of the chosen cause (fan = 0, virus = 1). This analysis revealed a significant consequence × need for closure interaction ($B = .03$, Wald = 5.23, $p = .02$). A spotlight analysis at 1 SD above the mean for need for closure revealed a reliable effect of consequence on cause choice ($B = 1.24$, Wald = 9.16, $p = .002$), but a similar analysis at 1 SD below the mean for need for closure revealed no effect of consequence on choice ($B = .03$, Wald = .008, $p = .93$). These results suggest that, when the world seems un-

predictable, consequences primarily affect causal inferences for people with higher need for closure levels. (Need for closure scores were not affected by either of the manipulations: $M_{\text{predict}} = 156.8$, $M_{\text{unpredict}} = 158.9$; $t(171) = -.64$, $p = .53$; $M_{\text{large cons}} = 157.9$, $M_{\text{small cons}} = 157.6$; $t(171) = .11$, $p = .91$.)

We conducted the same regression in the predictable-world condition, entering the same predictors of cause choice. Consequence and need for closure did not interact ($B < .001$, Wald $= .001$, $p = .98$), and consequence affected choice at neither high (1 SD above the mean) nor low (1 SD below the mean) need for closure (both $p > .6$). An analysis of the full set of data that included prime ($-1 =$ predictable, $1 =$ unpredictable), consequence, need for closure, all two-way interactions, and the three-way interaction to predict cause choice revealed a marginally reliable three-way interaction ($B = .01$, Wald $= 2.88$, $p = .09$). Taken together, these results support hypothesis 3b: people who are naturally more motivated to seek closure are also more likely to use consequence-cause similarity when making causal inferences, unless their need for predictability has been recently satisfied in some other way.

In sum, we suggested that people may match causes to consequences to make the world seem more predictable. Consistent with this proposition, when people thought about the world as unpredictable, they exhibited matching tendencies much like those seen in experiment 1 (especially if they had strong natural tendencies to seek predictability). However, when they were encouraged to see the world as predictable, matching was attenuated. These findings show a boundary condition of matching and suggest that people match causes to consequences when they feel a need to make the world seem more predictable. Although experiment 3 did not feature an unprimed control condition, the similarity between the results in experiment 3's unpredictable-world condition and experiment 1 suggests that perceiving the world as unpredictable is perhaps the natural or default perception.

These findings also suggest that matching is not just a simplifying heuristic but rather that it emerges in nuanced ways. If matching arose because people simply applied a rule of thumb, then one would not expect predictable-world priming to reduce matching's prevalence. (If anything, it might increase it, as people might use rules of thumb more often when the world seems predictable.) Similarly, these results suggest that matching is not only a priming effect. That is, large consequences could activate thoughts of "largeness" more generally (Oppenheimer, LeBoeuf, and Brewer 2008), making large causes more accessible or fluently processed. However, if matching arises only because the consequences prime magnitude (or something else, such as affect), one would not expect matching to be moderated either by the world's apparent predictability or by the need for closure. We do not suggest that matching can never result from priming or the use of a shortcut, but experiment 3 suggests that motivation plays a role in the tendency to seek matching causes.

EXPERIMENT 4: MATCHING AND ACCESSIBILITY

We have suggested that consequence-cause matching might occur for two primary reasons. First, people are motivated to see the world as predictable and thus to see causes and consequences following a regular pattern. Second, the "detected" pattern specifically takes the form of matching because matching is particularly accessible in individuals' minds. Experiment 3 demonstrated that matching is related to the motivation to make the world seem predictable, specifically showing that matching no longer arises when the world already seems predictable. Experiment 4 examines the role that accessibility plays in matching, specifically examining whether matching no longer arises when another schema is accessible instead.

That is, although experiments 1–3 suggest that people often believe that causes and consequences match, it is not true that people have no intuition that causes and consequences can contrast in magnitude or valence. The aphorism "no good deed goes unpunished," for example, suggests a belief that good causes can yield negative consequences, and the notion of the butterfly effect (i.e., butterfly wings can create tiny atmospheric changes that eventually alter the path of a storm) suggests a belief that small causes can, at times, lead to large consequences.

We thus suggest that people may have available multiple causal schemata that they can use to interpret the world (Kelley 1987) but that circumstances may render one schema particularly accessible, making it most likely to be applied in a particular instance (Keil 2006; Tversky and Kahneman 1980). Viewed from this perspective, matching may often be an accessible schema that is used to make the world seem predictable (as suggested by the frequency with which our participants used it), but another schema could be made accessible instead and could be applied to reach the same goal. Thus, the tendency to infer that causes and consequences match could be reduced by making another causal schema accessible.

In experiment 4, we thus primed an alternate causal schema (the butterfly effect, which suggests that small causes can have large consequences) for half of our participants. All participants then read a scenario in which an event had a large consequence. Participants were asked to select the event's cause and, as another measure of their causal inferences, to make a decision about future precautions they would recommend. (That is, if a given cause is more likely to be blamed, people should also be more eager to guard against it in the future.) Our prediction was as follows.

H4: The tendency to select a matching cause for a consequence and to take future precautions against that matching cause will be reduced when a new causal schema is primed, compared to when no countervailing schema is primed.

Method

Participants and Design. University of Florida undergraduates ($N = 176$), participating for extra credit, were randomly assigned to the default schema or the butterfly effect schema condition.

Materials and Procedure. To disguise the purpose of the experiment, the initial, schema-priming portion was labeled a "video pretest." Participants, responding in the lab via computer, read that researchers were gauging reactions to video clips that might be used in future experiments. Participants in the butterfly effect schema condition watched a 5.5-minute clip from the television program *The Simpsons*. This clip presented a humorous illustration of the butterfly effect: a character repeatedly traveled back in time and found each time that his small actions in the past had large repercussions in the future. Participants in the default schema condition watched a clip from *The Simpsons* of similar length; the clip (about advertising's prevalence) did not suggest any particular causal schema. Participants next rated how enjoyable they found the clip, how funny they found it, and whether the clip would increase their likelihood of watching *The Simpsons*, all on 1–7 scales. Participants also indicated whether they had seen the clip before and were asked to briefly summarize the clip. (These questions served primarily to maintain the cover story about evaluating videos.) Participants were then told that the video pretest was over and that a new experiment was beginning.

The "new experiment" was our measurement of causal inferences. Participants read the large-consequence version of the computer crash scenario used in experiment 1a, in which, following a computer crash, a student failed to graduate and lost his job. Participants decided whether the crash was more likely to have been caused by a virus (large cause) or a cooling fan (small cause). Cause order was counterbalanced. Participants were also asked to imagine that the university had received a $1 million grant and were asked whether that grant should be spent on better virus protection or on scholarships for incoming students.

Results and Discussion

We excluded six participants for whom the program malfunctioned, one who commented that a computer crash would not cause the type of data loss described, and 21 who did not adequately complete other tasks in the session, indicating that they were not fully attending to the instructions. All analyses reported below were based on the 148 participants remaining.

Video Clip Ratings. Participants who watched the butterfly effect video clip did not reliably differ from those who watched the control clip in terms of how much they enjoyed the clip ($t(146) = -.06$, $p = .96$), how funny they found it ($t(146) = 1.19$, $p = .24$), or whether it would affect their likelihood of watching *The Simpsons* ($t(146) = .76$, $p = .45$). The clips were equally familiar to participants, with 31% of participants having previously seen the butterfly effect clip and 37% having seen the control clip ($\chi^2(1, N = 148) = .67$, $p = .41$).

Main Analysis. Participants were less likely to select the large cause (the virus) for the large-consequence computer crash after watching the butterfly effect clip than after watching the control clip (44% vs. 59%; $\chi^2(1, N = 148) = 3.31$, $p = .07$). Similarly, when participants were asked whether funds should be allocated to virus protection or scholarships, reliably fewer chose virus protection when the butterfly effect had been primed (22%) than when no alternative schema had been primed (40%; $\chi^2(1, N = 148) = 5.78$, $p = .02$). Both results suggest that priming the butterfly effect made participants less likely to infer that the large consequence stemmed from an event with a large cause. The propensity to select the virus as the crash's cause and the propensity to decide that further virus protection is warranted were correlated ($\phi = .18$, $p = .03$), and so we combined them into a composite that assessed the overall perception that the virus was at fault. This composite was lower, indicating that the virus seemed less at fault, when the butterfly effect was primed ($M = .33$) than when no alternative schema was primed ($M = .49$; $t(146) = 2.78$, $p = .006$).

Experiment 4 suggests that making another causal schema accessible can reduce the tendency to engage in matching. Experiments 3 and 4 together suggest that matching arises because people are motivated to see the world as predictable and because matching is an accessible schema that allows them to do so. When the need to see the world as predictable is reduced or when another schema becomes accessible, people are less likely to engage in matching. Experiment 4 also suggests that the causal inferences observed in this article can affect future decisions. When people became somewhat less likely to see the virus as causing the crash, they also became less inclined to believe that additional money should be spent on virus protection going forward, even though nothing new had been learned about the crash itself.

GENERAL DISCUSSION

People are influenced by similarities between an event's consequences and its candidate causes: across a variety of domains, participants in our experiments were more likely to select large causes for events with large (vs. small) consequences and more likely to select good causes for events with good (vs. bad) consequences—even when those consequences were objectively uninformative about the causes (experiments 1a–1f). Perceiving a consequence-cause match seems to make people more confident that causal relationships are stable and predictable (experiment 2). Furthermore, the tendency to match causes to consequences is reduced when the need to see the world as predictable has recently been met (experiment 3) and when an alternative causal schema has recently been primed (experiment 4). Although experiments 3 and 4 do not present direct evidence as to why matching does arise, by showing when matching does not arise, they establish important boundaries of matching,

and taken together they suggest that matching is an accessible schema that helps people to fulfill the motivation to see the world as predictable. Experiments 1b, 1e, and 4 also showed that brand attitudes and decisions about the future are related to the causal inferences that people draw about the past, underscoring the importance of understanding consumer causal reasoning.

Of importance, there is little reason to think that consequence-cause matching arose in our experiments because the consequences provided a legitimate basis for inferring the causes. In each experiment, we constructed a lengthy chain of events to ensure that the determinants of each event's consequences were unrelated to the determinants of the target events. Furthermore, in some cases, any information leaked by the consequences would have operated against the current effects. For example, in the computer crash scenario, a professor's granting of an extension could be interpreted as a sign that he knew that there was a large virus circulating on campus. This would lead to the opposite result from the one that we obtained: our participants thought that the virus was more likely when the professor was harsher. Similar logic applies to the food contamination scenario: a swift CDC response might lead one to infer that the event was a quite serious one, with large systemic causes. However, our participants inferred that the causes were smaller when the CDC acted quickly.

In addition, if our participants were drawing inferences from information leaked by the consequences, one would not expect matching to be moderated by, for example, fulfilling a need to see the world as predictable. Similarly, if matching were the result only of a heuristic, one would not expect the incidence of matching to be reduced when the world is made to seem more, instead of less, predictable. Of course, we do not suggest that similarity is the only basis for people's causal inferences: as prior research demonstrates, these inferences are influenced by covariation information as well as many other factors. What we suggest is that, when people experience some uncertainty about an event's cause even after taking this relevant information into account, they may be swayed in their final assessment by the magnitude or valence of the event's consequences.

Consumer, Managerial, and Policy Implications

The tendency to match causes to consequences has implications for a variety of consumer decisions. Our findings directly extend research on attributions for product failures (Folkes 1984, 1988; Weiner 2000) by demonstrating that such attributions are determined not only by factors such as how widespread the failure is but also by outcomes that somewhat arbitrarily follow from the failure itself. People may seek large causes for an event that incidentally leads to a larger consequence rather than a smaller one, not noticing that consequence severity was determined by something uninformative about the event's cause. We have further shown that product attitudes can be affected by these causal inferences, with attitudes fluctuating depending on whether the identical product failure had a greater or lesser impact on a consumer's life. This work has similar applications for attributions for positive product outcomes: to the extent that one experiences large, positive outcomes (e.g., one scores a 175 on the Law School Admission Test and is admitted into Harvard Law School), one may be inclined to attribute those outcomes to large interventions (e.g., thousands of dollars in test preparation services), even if the attribution is logically unwarranted. More broadly, our results suggest that managers should keep in mind the fact that attitudes toward a firm can be altered by events that unfold after, and have little relation to, actual product usage.

Another important consideration is that linkages between events and consequences may be malleable. Managers may wish to explore strategies for breaking event-consequence links or, conversely, for fostering links to desirable consequences. The factors determining which consequences are seen as following from events and which are not may itself be a fruitful topic for future research. The current results also suggest that consumers will find consequence-cause mismatches to be surprising; managers may be able to use this fact to attract attention. For example, advertisements that feature small products having large effects (e.g., small speakers that are so powerful that bridges collapse; Goldenberg, Mazursky, and Solomon 1999) may attract attention precisely because they violate the matching schema.

Consequence-cause matching may also lead people to misunderstand the causes of problems and consequently to misjudge the necessary size of interventions (cf. Einhorn and Hogarth 1986). When an issue, such as teenage pregnancy, has large societal consequences, people may presume that it must have a similarly large cause—and therefore require a large, costly solution. Such reasoning may lead policy makers to overlook less costly, potentially more effective, interventions: for example, some research suggests that the small act of subsidizing school uniforms can be more effective at reducing teenage pregnancy (by reducing dropout rates) than larger, more expensive—and more intuitive—interventions (Duflo et al. 2006). Trivial actions can have disproportionate effects, a fact that may be underappreciated by policy makers and marketing managers alike. Believing that causes and consequences generally match could lead people to overlook simple solutions for big problems.

Because matching can have so many disparate, and at times undesirable, implications, it seems important to keep in mind how matching might be overridden or undone. Experiments 3 and 4 suggest that the use of consequence-cause matching is not inevitable and that highlighting another causal schema or making the world seem predictable might foster a different, and potentially more open-minded, view of an event's causes.

Concluding Remarks

When making causal inferences, people seem to search for event causes that match even unrelated, arbitrarily determined consequences of the events. We have shown that consequence-cause matching arises along the dimensions of

size and valence; it likely also arises along other dimensions, such as time (ephemeral causes may be chosen for ephemeral consequences), importance (important causes may be chosen for important consequences), novelty (unusual causes may be chosen for unusual consequences), and other salient dimensions. Perceiving regularity in causal relationships likely prevents people from perceiving themselves to be at the mercy of capricious and arbitrary forces. Life in general, and decision making in particular, are often fraught with uncertainty; matching causes to consequences may be just one small way in which people manage the largely uncertain world that they navigate.

APPENDIX

EXPERIMENT 1A AND 1B STIMULI

Adam, a graduating senior, has recently purchased a computer from Dell, and he uses it to write a major paper for his art history class. Adam has most of the paper written the day before it is due, but as he is applying the finishing touches, his computer crashes. Adam can't get the computer to boot up again. He contacts a few technical experts, but there is nothing they can do to help him recover the file. . . .

Small consequence: . . . Adam approaches his art history professor and explains the situation, and the professor agrees to give Adam an extension. Adam re-creates the paper as soon as possible and passes the class. He is still able to graduate on time and start work at a new job as planned.

Large consequence: . . . Adam approaches his art history professor and explains the situation, but the professor is unsympathetic. He refuses to give Adam an "incomplete" in the course, and instead assigns him a zero for the paper. Because the paper was a large component of the course's grade, Adam ends up failing the course. Since he now lacks enough credits to graduate, he must delay his graduation for a semester; this also causes him to lose the job he had been offered, as his new employer refuses to hire him unless he has a college degree.

Potential causes:

- Dell incorrectly installed the computer's cooling fan, causing it to overheat.
- Adam's computer was struck by a virus developed by a hacker whose admitted goal was to completely re-format users' hard drives, so that people everywhere would lose access to important documents. [In experiment 1b, this was shortened to "a virus developed by a hacker who was trying to destroy users' machines."]

EXPERIMENT 1C STIMULI

Imagine that the president of a small, peaceful country is assassinated by one of his own countrymen. The citizens of the country are shocked and saddened, and plans are immediately made for a large, dignified funeral. Leaders from all over the world fly in for the funeral. Around the time of the funeral, a British newspaper runs an editorial that is highly critical of the assassinated president. This editorial sparks protests around the globe, and soon, Britain finds itself the target of boycotts and terrorist attacks from all over the world. . . .

Small consequence: . . . Britain's prime minister adopts a very peaceful, diplomatic posture, and the attacks subside. Because of the prime minister's actions, world order is restored, and there are no further casualties.

Large consequence: . . . Britain's prime minister adopts a very aggressive, anti-diplomatic posture, and the attacks escalate out of control. Because of the prime minister's actions, the world order is destabilized, and an all-out war ensues, leading to mass casualties.

Potential causes:

- The president was assassinated by a gunman acting alone.
- The president was assassinated by a gunman who received assistance from various people involved in that country's government. There was a conspiracy to assassinate the president.

EXPERIMENT 1D STIMULI

The Willamette Zoo houses 200 different species of animals. One day, the caretakers begin to notice that something is wrong with the animals; before they know it, all of the mammals and birds have caught a never-before-seen disease. . . .

Small consequence: . . . The caretakers rush to save the animals, and they quickly get the situation under control so that only a few of the mammals die.

Large consequence: . . . The caretakers rush to save the animals, but almost all of the mammals die before they can get the disease under control.

Potential causes:

- The zoo recently acquired a new fully-grown bear; it was a member of a newly discovered, rare species. The bear may have had the disease, and from the bear, the disease may have spread to the other mammals.
- The zoo recently acquired a small new rabbit; it was also a member of a newly discovered, rare species. The rabbit may have had the disease, and from the rabbit, the disease may have spread to the other mammals.

EXPERIMENT 1E STIMULI

CFW Farms, which supplies beef to Wendy's, has 15,000 employees and operates 23 plants. Each plant sends beef to Wendy's restaurants nationwide. One day, thanks to an anonymous tip from employees, the CEO of CFW learns that the sanitation conditions at some plants have rapidly deteriorated, and that the beef being shipped to Wendy's is likely contaminated by bacteria. The CEO notifies Wendy's, and Wendy's pulls the beef from its restaurants, but unfortunately, the contaminated beef has already been served to

customers for over a week. All in all, 3,000 people become sick from consuming the contaminated beef. . . .

Small consequence: . . . Fortunately, the Centers for Disease Control manage the situation very effectively, and the public is notified in time. The sick customers seek timely medical treatment. Although the bacteria could have caused serious illness and death in most people, everyone is treated in time and fully recovers.

Large consequence: . . . Unfortunately, the Centers for Disease Control manage the situation very ineffectively, and the public is not notified in time. The sick customers do not learn that they should seek timely medical treatment. Although everyone could have fully recovered from eating the infected food, most people are not treated in time. The bacteria causes many serious illnesses, and 1,797 people die.

EXPERIMENT 1F STIMULI

Steve, a 30-year-old businessman, is married with two young children. On the morning of an important meeting with a client, Steve finds himself running late for work. As Steve is about to leave the house, his wife asks if he would be able to pick up the children at school that afternoon. Steve, impatient because he is running late, snaps at his wife and says, "I don't have time to run your errands." Steve and his wife get into a heated argument, which ends when Steve storms out of the house, slamming the door. As soon as Steve leaves the house, he begins to feel remorse for what he said and did. He wants to apologize to his wife, so, even though he needs to get to work, he stops at a flower market to buy his wife a bouquet of flowers to surprise her with that night. The service at the flower market is slow, but Steve finally leaves with the bouquet. When all is said and done, Steve arrives at work 25 minutes late. . . .

Positive consequence: . . . Fortunately, his meeting has been postponed. Steve has time to prepare for the meeting, and he gives such an excellent presentation that his boss promises him a raise and a promotion.

Negative consequence: . . . His boss is furious with him for missing the meeting, and he fires Steve on the spot for being so irresponsible.

Potential causes:

- Steve's argument with his wife.
- The fact that Steve stopped to buy his wife flowers.

REFERENCES

Alicke, Mark D., Teresa L. Davis, and Mark V. Pezzo (1994), "A Posteriori Adjustment of A Priori Decision Criteria," *Social Cognition*, 12 (4), 281–308.

Baron, Jonathan, and John C. Hershey (1988), "Outcome Bias in Decision Evaluation," *Journal of Personality and Social Psychology*, 54 (4), 569–79.

Buehner, Marc J., and Patricia W. Cheng (2005), "Causal Learning," in *The Cambridge Handbook of Thinking and Reasoning*, ed. Keith J. Holyoak and Robert G. Morrison, New York: Cambridge University Press, 143–68.

Burger, Jerry M. (1981), "Motivational Biases in the Attribution of Responsibility for an Accident: A Meta-analysis of the Defensive-Attribution Hypothesis," *Psychological Bulletin*, 90 (3), 496–512.

Cheng, Patricia W. (1997), "From Covariation to Causation: A Causal Power Theory," *Psychological Review*, 104 (2), 367–405.

DeSteno, David, Richard E. Petty, Duane T. Wegener, and Derek D. Rucker (2000), "Beyond Valence in the Perception of Likelihood: The Role of Emotion Specificity," *Journal of Personality and Social Psychology*, 78 (3), 397–416.

Duflo, Esther, Pascaline Dupas, Michael Kremer, and Samuel Sinei (2006), "Education and HIV/AIDS Prevention: Evidence from a Randomized Evaluation in Western Kenya," Policy Research Working Paper 4024 (October), World Bank, Washington, DC 20433.

Einhorn, Hillel J., and Robin M. Hogarth (1986), "Judging Probable Cause," *Psychological Bulletin*, 99 (1), 3–19.

Folkes, Valerie S. (1984), "Consumer Reactions to Product Failure: An Attributional Approach," *Journal of Consumer Research*, 10 (4), 398–409.

——— (1988), "Recent Attribution Research in Consumer Behavior: A Review and New Directions," *Journal of Consumer Research*, 14 (4), 548–65.

Folkes, Valerie S., Susan Koletsky, and John Graham (1987), "A Field Study of Causal Inferences and Consumer Reaction: The View from the Airport," *Journal of Consumer Research*, 13 (4), 534–39.

Goldenberg, Jacob, David Mazursky, and Sorin Solomon (1999), "The Fundamental Templates of Quality Ads," *Marketing Science*, 18 (3), 333–51.

Griffiths, Thomas L., and Joshua B. Tenenbaum (2009), "Theory-Based Causal Induction," *Psychological Review*, 116 (4), 661–716.

Heider, Fritz (1944), "Social Perception and Phenomenal Causality," *Psychological Review*, 51 (6), 358–74.

——— (1958), *The Psychology of Interpersonal Relations*, New York: Wiley.

Heine, Steven J., Travis Proulx, and Kathleen D. Vohs (2006), "The Meaning Maintenance Model: On the Coherence of Social Motivations," *Personality and Social Psychology Review*, 10 (2), 88–110.

Hoch, Stephen J., and George Loewenstein (1989), "Outcome Feedback: Hindsight and Information," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15 (4), 605–19.

Janoff-Bulman, Ronnie, Christine Timko, and Linda L. Carli (1985), "Cognitive Biases in Blaming the Victim," *Journal of Experimental Social Psychology*, 21 (2), 161–77.

Jarudi, Izzat, and Frank Keil (2006), "A Cognitive Theory of Conspiracy Theories," poster presented at the annual meeting of the Psychonomic Society, Houston.

Johnson, Eric J., and Amos Tversky (1983), "Affect, Generalization, and the Perception of Risk," *Journal of Personality and Social Psychology*, 45 (1), 20–31.

Johnson, Joel T., Kenneth R. Boyd, and Phyllis S. Magnani (1994), "Causal Reasoning in the Attribution of Rare and Common Events," *Journal of Personality and Social Psychology*, 66 (2), 229–42.

Jones, Edward E., and Keith E. Davis (1965), "From Acts to Dispositions: The Attribution Process in Person Perception," in *Advances in Experimental Social Psychology*, Vol. 2, ed. Leonard Berkowitz, New York: Academic Press, 219–66.

Katz, Daniel (1960), "The Functional Approach to the Study of Attitudes," *Public Opinion Quarterly*, 24 (2), 163–204.

Kay, Aaron C., Danielle Gaucher, Ian McGregor, and Kyle Nash (2010), "Religious Belief as Compensatory Control," *Personality and Social Psychology Review*, 14 (1), 37–48.

Kay, Aaron C., Danielle Gaucher, Jamie L. Napier, Mitchell J. Callan, and Kristin Laurin (2008), "God and the Government: Testing a Compensatory Control Mechanism for the Support of External Systems," *Journal of Personality and Social Psychology*, 95 (1), 18–35.

Keil, Frank C. (2006), "Explanation and Understanding," *Annual Review of Psychology*, 57, 227–54.

Kelley, Harold H. (1967), "Attribution Theory in Social Psychology," in *Nebraska Symposium on Motivation*, ed. David Levine, Lincoln: University of Nebraska Press, 192–238.

——— (1973), "The Processes of Causal Attribution," *American Psychologist*, 28 (2), 107–28.

——— (1987), "Causal Schemata and the Attribution Process," in *Attribution: Perceiving the Causes of Behavior*, ed. Edward E. Jones, David E. Kanouse, Harold H. Kelley, Richard E. Nisbett, Stuart Valins, and Bernard Weiner, Hillsdale, NJ: Erlbaum, 151–74.

Kruglanski, Arie W. (1990), "Motivations for Judging and Knowing: Implications for Causal Attribution," in *Handbook of Motivation and Cognition: Foundations of Social Behavior*, Vol. 2, ed. E. Tory Higgins and Richard M. Sorrentino, New York: Guilford, 333–68.

——— (2011), "Scoring the Need for Closure Scale," http://terpconnect.umd.edu/~hannahk/NFC_Scale.html.

Lerner, Melvin J., and Carolyn H. Simmons (1966), "Observer's Reaction to the 'Innocent Victim': Compassion or Rejection?" *Journal of Personality and Social Psychology*, 4 (2), 203–10.

McArthur, Leslie Ann (1972), "The How and What of Why: Some Determinants and Consequences of Causal Attribution," *Journal of Personality and Social Psychology*, 22 (2), 171–93.

McCauley, Clark, and Susan Jacques (1979), "The Popularity of Conspiracy Theories of Presidential Assassination: A Bayesian Analysis," *Journal of Personality and Social Psychology*, 37 (5), 637–44.

McGill, Ann L. (1989), "Context Effects in Judgments of Causation," *Journal of Personality and Social Psychology*, 57 (2), 189–200.

Mizerski, Richard W., Linda L. Golden, and Jerome B. Kernan (1979), "The Attribution Process in Consumer Decision Making," *Journal of Consumer Research*, 6 (September), 123–40.

Nisbett, Richard E., and Lee Ross (1980), *Human Inference: Strategies and Shortcomings of Intuitive Judgment*, Englewood Cliffs, NJ: Prentice-Hall.

Oppenheimer, Daniel M., Robyn A. LeBoeuf, and Noel T. Brewer (2008), "Anchors Aweigh: A Demonstration of Cross-Modality Anchoring and Magnitude Priming," *Cognition*, 106 (1), 13–26.

Petty, Richard E., and Duane T. Wegener (1998), "Matching versus Mismatching Attitude Functions: Implications for Scrutiny of Persuasive Messages," *Personality and Social Psychology Bulletin*, 24 (3), 227–40.

Proulx, Travis, and Steven J. Heine (2008), "The Case of the Transmogrifying Experimenter: Affirmation of a Moral Schema Following Implicit Change Detection," *Psychological Science*, 19 (12), 1294–1300.

Rozin, Paul, and Jennifer Stellar (2009), "Posthumous Events Affect Rated Quality and Happiness of Lives," *Judgment and Decision Making*, 4 (4), 273–79.

Scroggs, James R. (1976), "Penalties for Rape as a Function of Victim Provocativeness, Damage, and Resistance," *Journal of Applied Social Psychology*, 6 (4), 360–68.

Shavitt, Sharon (1990), "The Role of Attitude Objects in Attitude Functions," *Journal of Experimental Social Psychology*, 26 (2), 124–48.

Shultz, Thomas R., and Frances B. Ravinsky (1977), "Similarity as a Principle of Causal Inference," *Child Development*, 48 (4), 1552–58.

Sim, Damien L. H., and Michael W. Morris (1998), "Representativeness and Counterfactual Thinking: The Principle That Antecedent and Outcome Correspond in Magnitude," *Personality and Social Psychology Bulletin*, 24 (6), 595–609.

Spina, Roy R., Li-Jun Ji, Tieyuan Guo, Zhiyong Zhang, Ye Li, and Leandre Fabrigar (2010), "Cultural Differences in the Representativeness Heuristic: Expecting a Correspondence in Magnitude between Cause and Effect," *Personality and Social Psychology Bulletin*, 36 (5), 583–97.

Tversky, Amos, and Daniel Kahneman (1980), "Causal Schemas in Judgments under Uncertainty," in *Progress in Social Psychology*, ed. Martin Fishbein, Hillsdale, NJ: Erlbaum, 49–72.

Walster, Elaine (1966), "Assignment of Responsibility for an Accident," *Journal of Personality and Social Psychology*, 3 (1), 73–79.

Watson, David, Lee Anna Clark, and Auke Tellegen (1988), "Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scale," *Journal of Personality and Social Psychology*, 54 (6), 1063–70.

Webster, Donna M., and Arie W. Kruglanski (1994), "Individual Differences in Need for Cognitive Closure," *Journal of Personality and Social Psychology*, 67 (6), 1049–62.

Weiner, Bernard (2000), "Attributional Thoughts about Consumer Behavior," *Journal of Consumer Research*, 27 (3), 382–87.

White, Peter A. (1988), "Causal Processing: Origins and Development," *Psychological Bulletin*, 104 (1), 36–52.

——— (1989), "A Theory of Causal Processing," *British Journal of Psychology*, 80 (4), 431–54.

——— (2009a), "Not by Contingency: Some Arguments about the Fundamentals of Human Causal Learning," *Thinking and Reasoning*, 15 (2), 129–66.

——— (2009b), "Property Transmission: An Explanatory Account of the Role of Similarity Information in Causal Inference," *Psychological Bulletin*, 135 (5), 774–93.

Whitson, Jennifer A., and Adam D. Galinsky (2008), "Lacking Control Increases Pattern Perception," *Science*, 322 (5898), 115–17.