Consequence-Cause Matching:

How and Why People Look to the Consequences of Events to Infer the Causes of Events

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Abstract

We show that consumers non-normatively infer event causes from event consequences. For example, consumers inferred that a product failure (computer crash) had a large cause (malicious virus) if it had a large consequence (job loss), but that the identical failure had a smaller cause if the consequence was small, even though the consequences were objectively uninformative about the causes. Across experiments, participants regularly inferred that causes "matched" consequences (in size or valence). Experiments further suggested that consequence-cause matching arises from a need to see the world as predictable and that matching can be reduced by priming a different causal schema.

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 may have leaked onto your keyboard). You might also learn more about the event itself by asking co-workers if their computers were similarly affected or by asking a technician to diagnose the underlying damage. Other strategies, however, seem less appropriate. It seems particularly inappropriate to allow incidental consequences of the crash to alter your belief about the crash's underlying 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 very same crash led to 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, consumers frequently and systematically allow such uninformative consequences to influence causal inferences.

Specifically, we suggest that consumers not only use information about an *event* to infer its causes (figure 1, top panel), but also use information about the event's final consequences to make such inferences (figure 1, bottom panel), even when those consequences are arbitrarily determined (and uninformative about the event's antecedents). We specifically propose that causal inferences may often be characterized by systematic *consequence-cause matching*, with consumers assuming, for example, that events leading to large consequences have large causes, and that events leading to good consequences have good causes.

Understanding how consumers make causal inferences has important implications (Folkes 1988; Mizerski, Golden, and Kernan 1979; Weiner 2000). To take just one example,

consumers may often need to decide where fault lies for a product failure, and such decisions often affect subsequent behavior (Folkes 1984; Folkes, Koletsky, and Graham 1987; Weiner 2000). In the computer crash described above, a consumer's decision about whether the anti-virus software malfunctioned (versus, for instance, whether the computer manufacturer installed a faulty component) has implications for the type of redress the consumer will seek and for the consumer's subsequent attitudes towards the firms involved. Even when products are associated with positive outcomes, causal inferences can influence the degree to which brand attitudes are bolstered following those outcomes (e.g., admission to college after taking a test preparation course could be credited to many factors; the degree to which the course itself is credited has natural implications for attitudes towards the course and its sponsor). In fact, one might argue that inferences about whether products will cause desired effects drive many—and perhaps the majority of—purchase decisions (Folkes 1988; Weiner 2000).

This paper therefore examines consumer causal reasoning, with three main aims. First, we show that consumers match causes to consequences across a variety of domains and dimensions. Second, we investigate the psychological underpinnings of this matching tendency: We specifically show that matching arises out of a motivation to see the world as predictable and orderly. Third, we consider situations and manipulations that may attenuate matching and thereby foster greater flexibility in causal inference.

MATCHING CAUSES TO CONSEQUENCES

Several theorists have suggested that people may have a lay belief that a cause and its effects will be similar in quality or size. For example, Nisbett and Ross (1980) proposed the

"resemblance criterion," suggesting that people think that causes resemble their effects, and others have proposed that people may assume there to be some likeness between causes and their effects (Einhorn and Hogarth 1986; Heider 1944; Kelley 1973). Despite the intuitive appeal of these proposals, they have received relatively limited empirical scrutiny. Those studies that have directly addressed cause-effect similarity have mainly focused on children, examining beliefs about simple, physical causes and effects (such as perceptions of whether a loud sound was produced by a heavy vs. light lever; Shultz and Ravinsky 1977). Thus, although many have speculated that similarity likely plays an important role in causal reasoning (see White 1988 for a review), relatively little empirical work has addressed the role that it actually plays in adults' causal inferences about complex events.

Moreover, our research differs from these prior suggestions about similarity 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 "big" cause (e.g., a widespread computer virus) would be more often inferred for a "big" computer crash (e.g., one that permanently damages the machine) than for a "small," less severe crash (e.g., one from which recovery is possible). However, we suggest that, even with the size of the event (the computer crash) held constant, incidental consequences of the event (such as whether it affects one's ability to meet a deadline and thus leads to job loss) will still bias causal inferences, with people assuming that the cause is similar (in size or valence) to the consequences. That is, we suggest that people may not separate information about the event (which may have legitimate bearing on causal inferences) from information about the event's associated but arbitrarily determined

consequences (which does not), in that they may inappropriately use the latter type of information when making causal inferences. Given that the ultimate consequences of events can perhaps be strategically framed to seem to follow more (versus less) directly from the events themselves, an empirical examination of the interplay between causes, events, and event consequences is essential to understanding causal inference more generally.

Insert figure 1 about here

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 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; Scroggs 1976; Walster 1966). However, those investigations shed little light on whether the perceived cause of the event *changes* as consequences change (and thus, on whether consequence-cause matching arises): Generally, researchers examined the blame assigned only to one focal actor and not the relative blame assigned to different potential causes. (Note also that these papers focused on blame and punishment for an event, but decisions about blame and punishment, such as the amount of jail time deserved, are fundamentally different from inferences about what *caused* that event*;* see Fincham and Jaspars 1980 for further discussion.)

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), still unknown is whether people allow incidental, arbitrarily determined consequences of an event to influence their perceptions of what caused the event, and, if so, whether they generally infer that causes and consequences match. One goal of this paper is therefore to show that consumers

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.

THE MOTIVATION TO LIVE IN A PREDICTABLE WORLD

If consumers engage in consequence-cause matching, a natural question would be *why* they do this. A further goal of this paper is to explore precisely this question. 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 potential cause may foster perceptions that the two form a "causal unit" (Heider 1944). Another possibility is that matching is an overgeneralization of an occasionally valid observation. Perhaps people notice, for example, that large actions often produce large results; they may come to assume that all large actions have large results, and that any large consequence indicates the operation of some large cause. People may thus judge the likelihood that an event was caused by a particular factor by assessing the degree to which its consequences resemble that factor, much like, when using the representativeness heuristic (Kahneman and Tversky 1972, 1973), people use the degree to which an item resembles a class to judge the probability that the item belongs to the class.

We suggest, however, that consequence-cause matching may not only reflect a natural perceptual process or dispassionate overuse of a shortcut, but may also have a motivational basis. Specifically, many researchers have suggested that people are motivated to understand, structure, and predict their worlds (Heider 1958; Katz 1960; Kelley 1967; Kruglanski 1990). Feeling that the world is structured and predictable may have many benefits: For example, it may foster a

sense of control and provide apparent foreknowledge about actions' likely effects, thereby enhancing perceived self-efficacy and promoting adaptive interactions (Heider 1958; Kelley 1987; Kruglanski 1990; Lerner and Miller 1978). Could consequence-cause matching be an outgrowth of this motivation to make the world seem orderly and predictable? This seems possible, as the world may seem less chaotic when one assumes that consequences have appropriate, matching causes (cf. Lerner and Simmons 1966). A motivation to see the world as orderly and predictable might lead people to overlook the fact that some consequences are determined arbitrarily or by chance, and to instead infer regularities between the consequences produced by an event and the factors that caused it. Supporting these ideas, recent research suggests that people who feel a *lack* of control are more likely to perceive patterns in a variety of contexts (Whitson and Galinsky 2008), suggesting that perceiving patterns or regularities can be used to restore feelings of control. It thus seems possible that perceiving regularities in causation (i.e., that consequences and causes match) could similarly be used to enhance a person's sense of being able to understand and predict the world (and could be driven by the motivation to do so).

THE CURRENT RESEARCH

In what follows, we first investigate whether consumers infer that event causes match event consequences, even when the consequences are uninformative about the potential causes (experiments 1a-1d). We then investigate whether such matching might be driven by the motivation to perceive the world as orderly and predictable (experiments 2 and 3). We conclude by exploring an intervention designed to reduce the tendency to match causes to consequences (experiment 4).

EXPERIMENT 1: CONSEQUENCE-CAUSE MATCHING

Experiments 1a through 1d investigated whether consumers tend to match causes to consequences across a variety of situations and across two dimensions: 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 (e.g., large or small; positive or negative); these were manipulated between subjects and were designed to be uninformative about the event's cause. After reading about the event and its consequence, participants indicated which of two possible causes (e.g., large or small; positive or negative) seemed most likely to have caused the event itself. We predicted:

> **H1:** Even when an event's consequence is uninformative about its cause, consumers will engage in consequence-cause matching, inferring that the event's cause matches (in terms of magnitude or valence) its consequence.

Because of the similarities among experiments 1a through 1d, each is described relatively briefly below. In each case, participants were undergraduate students participating for extra credit and were randomly assigned to condition; they completed the experiment via a questionnaire among other unrelated tasks in the lab. Full materials for these experiments appear in the appendix.

Experiment 1a: Perceptions of Product Failure

In experiment 1a, we examined inferences about the perceived cause of a computer failure as an initial test of consequence-cause matching in a consumer setting.

Participants (N = 129) read about a student, Adam, whose computer crashed the day before a major paper was due, causing him to lose the paper. Those in the large-consequence

condition read that Adam's professor did not grant him an extension; as a result, Adam failed the class, could not graduate, and lost a job offer. Those in the small-consequence condition read that the professor granted the extension and that Adam re-wrote the paper, passed the class, graduated, and started the job as planned. Thus, in both cases, the crash's eventual consequences were determined by the professor, rather by than anything informative about the crash's causes.

All participants then decided whether the crash was more likely caused by a malicious virus affecting computer users worldwide (large cause) or by an incorrectly installed, malfunctioning cooling fan (small cause), order counterbalanced. (A pretest asked 199 students to select the more severe computer problem: an incorrectly installed fan or a virus. Many more students chose the virus than the fan, 72% vs. 27%, $X^2(1) = 40.9$, $p < .001$, suggesting that the virus indeed seemed like a "bigger" cause.)

As shown in figure 2, those reading that the student lost his job because of the crash were more likely to select the "large" virus (instead of the "small" fan) as the crash's cause than those reading that the student graduated on time (73% vs. 56% selected the virus, respectively), ($X^2(1$, $N = 129) = 4.14$, $p = .04$). This happened even though the consequences were uninformative about the causes and the crash itself was the same in both cases.

Insert figure 2 about here

This finding offers support to hypothesis 1: Causes were matched to consequences, with a larger cause selected more frequently when the event led to a larger consequence. This finding highlights potential implications for consumer attitudes, suggesting that, for example, the manufacturer of Adam's antivirus software would be blamed more (and liked less) when the ensuing consequences were large (versus small), even though the crash's consequences were

outside of that firm's control. Thus, consequence-cause matching does seem to arise; experiments 1b through 1d further explore this matching tendency and its generality.

Experiment 1b: Conspiracy Theories

Next, we investigated not just whether consequence-cause matching might emerge in a different context, but whether it might also partially explain the appeal of conspiracy theories. We examined whether people would differentially endorse a conspiracy (a "large" cause) as a function of whether an event (here, an assassination) led to larger or smaller consequences. Specifically, participants (N = 74) read about the assassination of the president of a "small, peaceful country." They read that, soon after the assassination, a British newspaper criticized the assassinated leader; the criticism sparked protests and terrorist attacks against Britain. Those in the large-consequence condition read that Britain's prime minister responded aggressively to these attacks, triggering world-wide war, whereas those in the small-consequence condition read that Britain's prime minster responded peacefully, quelling the attacks. Participants then decided whether the initial assassination was more likely to have been caused by a lone gunman or by a conspiracy involving 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), ($X^2(1, N = 74) = 3.80$, $p = .05$, see figure 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. Research has shown that assassinations are more often attributed to conspiracies than are assassination attempts that fail (possibly because conspiracies seem more effective, Jarudi and Keil 2006;

McCauley and Jacques 1979), but the current results suggest that even when an assassination attempt "succeeds," events following it may nevertheless influence beliefs about its cause.

We conducted a conceptual replication of experiment 1b, using instead an actual assassination (the assassination of John F. Kennedy). Some participants 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. Those who read that the assassination had a large impact on the war were more likely to endorse a conspiracy theory for the assassination than those who read that the assassination had no impact on the war (75% vs. 64%, respectively), ($X^2(1, N = 224) = 3.69$, $p = .055$).

Thus, people seem to infer causes from consequences that are uninformative about (and only tangentially related to) target events, matching causes to consequences on the dimension of magnitude. Experiment 1c examined just how far-reaching this matching tendency might be.

Experiment 1c: Size, Literally

In experiment 1c, we examined whether people would even infer that large consequences have *physically* large causes. Participants ($N = 130$) read about a zoo in which all of the animals caught an unusual disease. Those in the large-outcome condition learned that most of the animals died before the disease was brought under control, but those in the small-outcome condition learned that 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 were asked to choose between two newly acquired animals (order counterbalanced) as the disease's source, choosing between a fully-grown bear and a small rabbit.

Participants learning that many animals died were more likely to choose the literally larger cause (the bear) for the disease than those learning that most animals survived (36% vs. 20%, respectively), ($X^2(1, N = 130) = 4.28$, $p = .04$, see figure 2). This result arose even though, in both cases, all animals caught the disease; thus, the procedure controlled for any beliefs about some animals being more "contagious" than others. Despite this, people were nevertheless more likely to select the (larger) bear as the cause when the disease had more severe consequences. People apparently infer that events with large consequences have (even literally, physically) large causes.

The findings thus far provide strong support for hypothesis 1: Across a variety of events, causes, and consequences, there is a pervasive tendency to match causes to (unrelated) consequences in terms of magnitude, with implications for consumer behavior. Before exploring why this happens, we considered whether this matching tendency extends beyond magnitude to another dimension: valence.

Experiment 1d: Valence Matching

In experiment 1d, participants ($N = 40$) read a scenario in which positive and negative causes together created an event, which in turn had a positive or negative consequence. Participants read that, on the morning of an important meeting, a man named Steve argued with his wife and stormed out of the house; Steve then felt remorse and stopped to buy his wife flowers. Steve arrived at work 25 minutes late. In the negative-consequence condition, Steve missed the meeting and was fired. In the positive-consequence condition, the meeting had been serendipitously postponed; Steve went on to give an excellent presentation during the meeting, leading his boss to promise him a raise and promotion. Participants chose the cause most

responsible for Steve being 25 minutes late for work: Steve arguing with his wife or Steve 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 ($X^2(1, N = 40) = 5.01$, $p = .03$, see figure 2). This differential view of the fight's causal role arose 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.

Thus, people seem to match causes to consequences on the dimension of valence, seizing upon good causes when good outcomes serendipitously obtain, but upon bad causes when bad outcomes prevail. More generally, experiments 1a through 1d suggest that consequence-cause matching arises in many situations and in multiple dimensions. The following experiments investigate the psychological processes that may underlie this tendency.

EXPERIMENT 2: MATCHING ENHANCES PERCEIVED PREDICTABILITY

Experiment 1 revealed that consumers have a robust tendency to infer that causes and consequences match. Experiments 2 and 3 examine the possibility that this tendency stems from a motivation to see the world as predictable and orderly. That is, if consumers are motivated to structure their worlds to reduce uncertainty (Heider 1958; Katz 1960; Kelley 1967; Kruglanski 1990), they may be inclined to overlook the fact that arbitrary factors determine some outcomes, and they may seek a regular relationship between causes and consequences. "Detecting" that large consequences stem from large causes, and good consequences stem from good causes, may thus enhance consumers' views of the world as structured and predictable.

If perceiving a cause-consequence "match" indeed makes the world seem more predictable, then the confidence with which consumers predict a cause's *future* effects may be affected by the degree to which that cause has produced matching consequences in the past. That is, consumers who learn that a consequence has a matching (instead of mismatching) cause should not only find the current causal explanation to be more plausible, but should also be more likely to predict that the identified cause will produce a similar effect in the future. Learning that a cause mismatched a consequence, on the other hand, might make participants 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 either had a large or small consequence. Instead of being asked 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:** Consumers for whom the identified cause of a product failure matches its consequence (in terms of size) should be (a) more confident in the offered causal explanation and (b) more likely to predict that a future product failure would have the same cause, compared to those for whom the cause mismatches the consequence.

Method

Participants. Participants were either members of a survey panel from an online survey administration site who were paid for completing this survey in a longer set of surveys (N = 441) or were undergraduates participating for extra credit (N = 99). 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) x 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 because of the crash (large consequence), or graduated and began work as planned (small consequence). Participants further read either that a technician determined that the computer was struck by a malicious virus (large cause) or that a technician determined that the cooling fan malfunctioned (small cause).

We then asked participants to rate how confident they were that the stated cause was the true cause of the crash; participants responded on a scale ranging from 1 (not very confident) to 7 (very confident). Next, we asked participants to assume that the cause stated in the scenario 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

Hypothesis 2 predicted that learning that a consequence had a matching (instead of mismatching) cause should make respondents more confident in the offered causal explanation and more likely to predict that a similar, future incident would have a similar cause. This hypothesis was supported. When the identified cause matched the obtained consequence (i.e., large consequence/large cause and small consequence/small cause), participants were more confident that the identified cause was the "true" cause ($M = 4.67$) than when the cause and consequence did not match (i.e., large consequence/small cause and small consequence/large

cause, $M = 4.41$), ($t(538) = 1.85$, $p = .06$). Participants were also more confident that the stated cause would produce a similar future crash when the cause matched the consequence ($M = 4.82$) than when the two did not match ($M = 4.54$), ($t(538) = 2.09$, $p = .04$). 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 (Ms = 4.75 and 4.47, respectively), ($t(538) = 2.34$, $p = .02$).

Thus, explanations that feature a consequence-cause match seem to have a somewhat privileged status: consumers find those explanations to be more compelling and more likely to hold in the future, compared to explanations that feature a mismatch. It is notable that what mattered to consumers was the degree of match or mismatch, rather than the cause itself: The composite "faith in the cause" measure was unaffected by *which* cause was identified as the culprit ($M_{fan} = 4.61$ vs. $M_{virus} = 4.59$), ($t(538) = .18$, $p = .86$), 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.

More broadly, experiment 2 suggests that perceiving that causes and consequences match makes consumers feel more confident and makes causal relationships seem more stable (i.e., more likely to recur). Thus, consequence-cause matching may indeed play a role in making the world seem more predictable and orderly and may help to fulfill the motivation to see the world as such: Consumers seem to be more comfortable and assured in a world in which consequential product failures have large causes and unimportant failures have smaller causes. Experiment 3 examines more directly whether consequence-cause matching stems from a motivation to see the world as structured and predictable.

EXPERIMENT 3: MATCHING IS MOTIVATIONALLY DRIVEN

In experiment 3, we used both a manipulation and an individual difference measure to examine whether a motivation to see the world as orderly and predictable underlies the tendency to match causes to (uninformative) event consequences. 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 should be attenuated to the degree that the need has recently been fulfilled. Specifically, if the world is made to seem predictable to consumers just before they engage in causal reasoning, they should have less of a need to impose structure and to infer that causes and consequences match. Thus, in experiment 3 we encouraged some participants to recall situations in which the world seemed predictable; we predicted that these participants would temporarily be less motivated to match the cause of a product failure to its consequence. We encouraged other participants to recall situations in which the world seemed unpredictable; we predicted that these participants would match causes to consequences to promote a view of the world as stable and orderly. This design leads to hypothesis 3a:

> **H3a:** Consumers encouraged to think of the world as predictable will be less likely (than those not encouraged to do so) to infer that an event's cause matches its consequences, because they will be temporarily less motivated to impose structure on the world.

We also assessed participants' general tendencies to seek order and predictability and their desires to reduce ambiguity, via the need for closure scale (Webster and Kruglanski 1994). The need for closure is a general epistemic motivation to understand and make sense of situations (Kruglanski 1990): Reaching "closure" is thought to create the sense that the world is predictable, and people with a high need for closure are highly motivated to feel that they

understand the world (Kruglanski 1990; Webster and Kruglanski 1994). If consequence-cause matching is driven by a desire to see the world as predictable and orderly, high need-for-closure consumers may thus be more likely than low need-for-closure consumers to engage in matching. However, the moderating effect of need for closure should be diminished when consumers are encouraged to see the world as predictable (and thus, the need to reduce ambiguity and reach closure has been temporarily fulfilled). Hypothesis 3b thus follows:

> **H3b:** Unless the need to see the world as predictable is fulfilled through other means, consumers who are high in need for closure, compared to those low in need for closure, should be more likely to infer that an event's cause matches its consequences.

Method

Participants. Undergraduates (N = 139) participated for extra credit.

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

Participants then read the computer-crash scenario used in experiment 1a, learning either that the crash had a large or small consequence and deciding whether 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), which was labeled an "attitude, belief, and experience survey." Eight participants who did not fully complete the materials were excluded from all analyses.

Results and Discussion

Participants who contemplated the unpredictable nature of the world displayed consequence-cause matching, with only 20% of participants inferring that the (large) virus caused the computer failure when the crash had a small consequence, but more than twice as many (44%) selecting the virus as the cause when the crash's consequence was large ($X^2(1, N = 62) = 4.00$, $p = .05$). However, as predicted by hypothesis 3a, this matching tendency was eliminated among those who contemplated instances of the world being predictable, with 43% selecting the virus as the cause when the consequence was large and 41% selecting the virus when the consequence was small ($X^2(1, N = 69) = 0.05$, $p = .83$). Thus, when consumers are encouraged to think of the world as a predictable place, they no longer match causes to uninformative consequences, suggesting that the matching tendency stems from a need to see the world as predictable (and that it will not arise if that need is fulfilled in other ways).

We further suggested that consequence-cause matching should be most prevalent for those consumers who are naturally motivated to impose order and structure on the world: consumers who are high in need for closure. Using a median split, we divided participants into "high" and "low" need for closure groups. (Following the procedure outlined by Kruglanski,

2009, we excluded 18 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.) In the unpredictable-world conditions, participants high in need for closure exhibited a strong matching tendency, with 11% selecting the virus as the cause when the consequence was small and 64% selecting it when the consequence was large ($X^2(1, N = 29) = 8.80, p = .003$). However, participants low in need for closure exhibited no reliable matching tendencies, with 20% of participants selecting the virus when the consequence was small and 28% when it was large ($X^2(1, N = 23) = .12, p = .73$). In the predictable-world conditions, neither high nor low need-for-closure participants showed any tendency towards matching (X^2_{low} $(1, N = 35) = .02, p = .89$, X^2_{high} $(1, N = 26) = .02, p = .90$). These results support hypothesis 3b: People who are naturally more motivated to seek order and predictability are also more likely to match causes to consequences, unless their need for predictability has been recently satisfied in some other way.

In sum, we suggested that people match causes to consequences to make the (unpredictable) world seem more orderly. Consistent with this proposition, when consumers 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 order and predictability). However, when participants were encouraged to feel that the world was predictable, matching was eliminated. These findings are strongly suggestive of a motivational basis for matching: Consumers match causes to consequences to the extent that they feel a need to make the world seem more predictable and orderly.

Note also that these findings offer evidence that matching is not merely a simplifying heuristic, but rather that it emerges in nuanced ways, primarily when motivations are strong: If people matched causes to consequences by blindly applying a rule of thumb that suggests that

consequences and causes match, then one would not expect predictable-world priming to moderate matching's prevalence. Similarly, these findings suggest that matching is not merely a response-priming or magnitude-priming effect: That is, large consequences might activate thoughts about "largeness" more generally (Oppenheimer, LeBoeuf, and Brewer 2008), and these activated cognitions may make large causes more accessible or fluently processed. However, were that the case, one would not expect matching to be moderated by the world's apparent predictability or by the need to attain closure. We do not suggest that matching can never result from priming or the use of a shortcut, but experiments 2 and 3 suggest that motivation plays an important role in the tendency to seek matching causes.

EXPERIMENT 4: SUPPLANTING CONSEQUENCE-CAUSE MATCHING

Thus far, we have shown that consumers often match causes to consequences, in part because matching helps to make the world seem more orderly and predictable. However, although people seem to prefer for causes to match consequences, it is certainly not the case that people have *no* intuition that causes and consequences can be mismatching 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 familiar notion of the butterfly effect (i.e., a butterfly can flap its wings and create atmospheric changes that eventually alter the path of a storm) suggests a belief that small causes *can* lead to large consequences. Experiments 1 through 3 suggest that consequence-cause matching often guides causal inferences, but, to better understand matching and its boundaries, experiment 4 considers whether and when matching might be supplanted by a competing view of causation.

Specifically, we suggest (following Kelley 1987) that consumers may have available multiple causal schemata that they could use to interpret a given situation, but that circumstances may render one schema particularly accessible, making that schema the most likely to be applied in a particular instance (Keil 2006 and Tversky and Kahneman 1980 offer similar perspectives on causal schemata). Viewed from this perspective, matching is likely often a very accessible schema (as suggested by the frequency with which participants in our experiments used it), but another causal schema could be made accessible and could govern causal inferences. Thus, we suggest that a consumer's propensity to infer that consequences have matching causes can be reduced by making another causal schema, such as the butterfly effect, accessible instead.

Furthermore, we suggest that, although consumers who are high in need for closure should generally be the consumers who are most likely to match causes to consequences (as shown in experiment 3), those consumers should also be the most likely to abandon matching if another schema becomes accessible. Recall that high need-for-closure respondents are motivated to reduce the ambiguity that they perceive in the world (Kruglanski 1990; Webster and Kruglanski 1994). One way in which they seem to do this is by making quick judgments using information recently made accessible (Webster and Kruglanski 1994), as relying on accessible information may simplify judgments and reduce felt uncertainty. Thus, although high need-for-closure consumers should generally be especially likely to match causes to consequences (because matching may often be a salient schema that makes the world seem orderly), they may also—and ironically—be especially likely to seize upon a newly accessible causal schema, since *any* accessible schema can serve to make the world seem more orderly.

In experiment 4, we thus primed an alternate causal schema (the butterfly effect, which suggests that large effects often have small causes) for half of our participants. All participants

then read a scenario in which an event had a large consequence, and we asked them to select the event's cause. Our predictions were as follows:

> **H4:** The tendency to select a matching cause for a consequence will be reduced when a new causal schema (different from matching) is primed, compared to when no countervailing schema is primed. This effect will be more pronounced among those who are higher (vs. lower) in need for closure.

Finally, this experiment included a measure to examine more directly whether the causal inferences studied here have implications for subsequent consumer behavior. Specifically, experiment 4 examined whether decisions about future spending correspond to causal inferences.

Method

Participants and design. 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 of the experiment was labeled a "video pre-test." Participants, responding in the lab via computer, read that researchers were gauging reactions to video clips that might be used in subsequent 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: In the clip, a character repeatedly travels back in time and finds each time that his small actions in the past have 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 the clip, 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 pre-test was over and that a new study was beginning.

The "new study" 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 large crash was more likely to have been caused by a virus (large cause) or a cooling fan (small cause). Cause order was counterbalanced.

Next, participants were asked to imagine that the university had received a $1,000,000 grant, and were asked to decide whether that grant should be spent on better virus protection or on scholarships for incoming students. We predicted that decisions about spending on better virus protection would be related to decisions about the crash's cause (and thus, would be affected by our manipulation of the salient causal schema).

Finally, participants completed the need for closure scale (Webster and Kruglanski 1994), again labeled an "attitude, belief, and experience survey."

Results

We excluded six participants for whom the program malfunctioned, and one who commented that a computer crash would not cause the type of data loss described in the causal-reasoning scenario. We further excluded 21 participants who scored above 15 on the "lying"

subscale of the need for closure scale, as recommended by Kruglanski (2009). 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 video clip ($t(146) = -.06$, $p = .96$), how funny they found the clip ($t(146) = 1.19$, $p = .24$), or whether the clip would affect their likelihood of watching "The Simpsons" ($t(146) = .76$, $p = .45$). Furthermore, the two clips were equally familiar to participants, with 31% of participants having previously seen the butterfly-effect clip, and 37% of participants having previously seen the control clip ($X^2(1, N = 148) = .67$, $p = .41$).

Overall 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%), ($X^2(1, N = 148) = 3.31$, $p = .07$), suggesting that priming the butterfly effect made participants somewhat less likely to infer that the large consequence had a large cause. This finding, albeit marginally significant, suggests that highlighting an alternate causal schema may reduce consumers' tendencies to infer that outcomes have matching causes.

More strikingly, when participants were asked whether funds should be allocated to virus protection or scholarships, the proportion choosing virus protection was reliably lower when the butterfly effect had been primed (22%) compared to when no alternative schema had been primed (40%), ($X^2(1, N = 148) = 5.78$, $p = .02$), consistent with the virus seeming a less likely cause of the crash when the butterfly effect was made salient. The preference for spending money on virus protection was reliably related to having chosen the virus as the cause of the crash (*phi* = .18, $p = .03$), suggesting that the causal inferences observed in our experiments may predict future behavior.

Need for closure. We also posited that priming an alternative causal schema would be most effective for consumers with a high need for closure, as those participants should be especially motivated to seize upon the salient causal schema, whether that schema was consequence-cause matching (which our earlier studies suggest is salient by default) or the butterfly effect (which was manipulated to be salient). Figure 3 presents the percentage of participants choosing the large (matching) cause separately for participants above and below the median in need for closure.

Insert figure 3 about here

As predicted, high need-for-closure respondents were especially sensitive to causal-schema priming, selecting the large (matching) cause 65% of the time when no schema was primed, but only 41% of the time when the butterfly effect was primed ($X^2(1, N = 73) = 4.12$, $p = .04$). Low need-for-closure respondents were not reliably affected by schema priming ($M_{\text{control clip}} = 54\%$, $M_{\text{butterfly effect}} = 47\%$), ($X^2(1, N = 75) = .33$, $p = .57$), choosing the matching cause somewhat less often than their high need-for-closure counterparts when no schema was primed, but somewhat more often than their counterparts when the butterfly effect was primed.

Finally, we can examine whether similar patterns emerged in consumers' funding allocations. Indeed, those high in need for closure preferred to allocate money to virus protection (instead of scholarships) 39% of the time when no schema was primed but a reliably lower 17% of the time when the butterfly effect was primed ($X^2(1, N = 73) = 4.50$, $p = .03$), paralleling the finding that these participants were less likely to select the virus as the cause when the butterfly effect was primed. Further paralleling the causal-reasoning findings, priming had a weaker, and

non-significant, effect on the allocation decisions of those low in need for closure ($M_{\text{control clip}}$ = 41%, $M_{\text{butterfly effect}}$ = 28%), ($X^2(1, N = 75) = 1.45, p = .23$).

Discussion

Although experiments 1 through 3 demonstrated that consequence-cause matching is quite prevalent, experiment 4 suggests that matching can be supplanted if an alternative causal schema is made accessible. Experiment 4 also suggests (along with experiment 3) that consumers who are naturally motivated to structure the world are most sensitive to the accessible causal schema, whether it is matching (which seems to be naturally accessible) or another schema (such as the butterfly effect) that has been recently primed. Seizing upon an accessible schema may help such consumers to fulfill their need to see the world as orderly and predictable, as the world likely seems more orderly if one can fit it into an accessible, predefined pattern.

Of perhaps even greater interest, experiment 4 suggests that that the causal inferences observed in this paper can affect future decisions. Evoking an alternate causal schema not only changed people's causal inferences, but also their resource-allocation decisions: When consumers became somewhat less likely to see the virus as the cause for the computer 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

We began by showing, in experiments 1a through 1d, that consumers infer that an event's causes are similar to the event's consequences: For large consequences, consumers select large

(vs. small) causes, and for good consequences, consumers select good (vs. bad) causes, even when those consequences are objectively uninformative about the nature of the causes. Experiment 2 showed that perceiving a consequence-cause match makes consumers more confident in predicting a cause's future effects, and experiment 3 showed that the tendency to match causes to consequences is eliminated when the need to see the world as predictable has recently been met. Experiment 3 also showed that consequence-cause matching is more pronounced among high need-for-closure consumers. Experiments 2 and 3 thus suggest that consequence-cause matching stems from, and helps to fulfill, a motivation to see the world as orderly and predictable. Finally, experiment 4 showed that consumers (especially high need-for-closure consumers) are less likely to select a matching cause for a consequence when an alternative causal schema has recently been made accessible. Experiment 4 also showed that consumers' decisions about the future are related to the causal inferences that they draw about the past, underscoring the importance of understanding consumer causal reasoning.

We stress that there is little reason to think that the consumers in these experiments engaged in consequence-cause matching because the consequences provided a legitimate basis for inferring the causes. In each of experiments 1a through 1d, we took pains to ensure that the determinants of each event's consequences were unrelated to the determinants of the target events. Furthermore, were consumers drawing inferences from information "leaked" by the consequences, one would not expect consequence-cause matching to be moderated by, for example, fulfilling a need to see the world as predictable. Although it is true that, at times, large consequences legitimately implicate large causes, consumers' causal reasoning seems to be governed not just by legitimate inferences about common causal relationships, but also by the motivation to reduce the amount of randomness that is apparent in the world.

This research extends what is known about attributions and causal reasoning, both in the consumer domain in particular (e.g., Folkes 1988) and in psychology more generally (e.g., Alicke 1992; Cheng 1997; Keil 2006; Kelley 1973; McGill 1989). This research suggests that consumers do not make attributions only by considering information that is legitimately informative (such as consensus or consistency information, Kelley 1973), but rather, that attributions can be biased by irrelevant, non-diagnostic information. The current findings seem to fit particularly well with certain existing frameworks: For example, Keil (2006) suggests that people find certain causal patterns more natural than others; our findings suggest that one such "natural" pattern is a relationship in which causes and consequences are similar. This paper also strongly supports the suggestion that people assume that causes and effects resemble each other (Einhorn and Hogarth 1986; Heider 1944; Kelley 1973; Nisbett and Ross 1980). In addition to empirically establishing the validity of this suggestion, this paper further shows that such "resemblance" assumptions have a motivational basis and that the assumptions hold not only for causes and effects, but also for the consequences that follow from those effects (see figure 1).

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; Folkes 1988; Weiner 2000), by suggesting that such attributions are not only determined by factors such as how widespread the failure is across consumers and how often the product performs as intended, but also by outcomes that somewhat arbitrarily follow from the failure itself. For example, people may seek large causes for an event (e.g., *e. coli* contamination of produce) that incidentally leads to a large consequence (many die because the Centers for

Disease Control is slow to act) rather than a small one (few are affected because the CDC acts quickly), not noticing that consequence severity was determined by something uninformative about the event's cause. Naturally, attributions about what caused a product to fail are important in determining whether consumers feel anger towards a firm, whether they will patronize a firm again, whether they engage in negative word of mouth, and whether they litigate, among other things (Folkes 1984, 1988). To confirm that the effects explored in this paper have such implications, we conducted a replication of study 1a (Adam's computer crash). In this new study, after participants made causal inferences, we asked them to assume that Adam had used McAfee antivirus software, and to rate, on a 1-7 scale "the level of security" provided by McAfee. Recall that, in study 1a, participants who learned that the computer crash had a large impact on Adam's life were more likely to see the ("large") virus as the likely cause of the crash. In this new study, such participants also had a worse view of McAfee's security (M = 3.1) than did those who learned that the crash was less consequential (M = 4.0), ($t(47) = 2.10$, $p = .04$), even though, in both cases, the computer crash itself was identical. Thus, attitudes towards a firm can be harmed by events that unfold after, and have little relation to, a product failure.

This work has similar applications for attributions for product "success:" To the extent that one experiences large, positive outcomes (e.g., one scores a 175 on the LSAT and is admitted into Harvard Law School), one may be inclined to attribute those outcomes to large interventions (e.g., one invested thousands of dollars in test-preparation services), even if the attribution is logically unwarranted. Managers may also want to consider that memory for an event tends to be distorted positively when the event has a positive cause, but negatively when the same event has a negative cause (Pizarro et al. 2006). Thus, if consequence-cause matching

distorts causal reasoning (as shown here), it might thereby distort memory for the event itself, perhaps making the product success or failure in question seem that much better (or worse).

Another important consideration is that the degree to which an event is linked to a particular consequence may be malleable. Managers may wish to explore strategies for breaking event-consequence linkages, so that firms do not receive undue blame for negative consequences not under their control. There may also be occasions when firms wish to foster linkages to desirable consequences. The factors determining which consequences are automatically linked to 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 consumer attention. For example, advertisements that feature small products having large effects (e.g., stereo speakers that cause a bridge to collapse because of their intensity, Goldenberg, Mazursky, and Solomon 1999) may be especially attention-getting precisely because they violate the matching schema.

Finally, consequence-cause matching may also lead consumers, managers, and policymakers to misunderstand the causes of problems and to consequently misjudge the necessary size of various interventions (cf. Einhorn and Hogarth 1986). For example, when an issue, such as teenage pregnancy, seems to have 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 policymakers to overlook less costly, potentially more effective, interventions. For example, policymakers and voters may not realize that the small act of subsidizing school uniforms can be more effective at reducing teenage pregnancy (by reducing school dropout rates) than larger, more expensive—and more intuitive—interventions (Duflo et al. 2006). Trivial actions often have disproportionate effects, a fact which may be

underappreciated by policymakers and marketing managers alike: A recent study found that simply featuring a woman's photograph (instead of a man's) on a loan-offer letter increased men's loan take-up as sharply as reducing the advertised interest rate by a substantial 4.5 percentage points (Bertrand et al. 2005). As these examples suggest, 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 dimensions that are salient to consumers. Matching appears to arise because people are motivated to feel that the world is predictable: Perceiving that there is regularity in why and how various consequences emerge likely prevents consumers from perceiving themselves to be at the mercy of capricious and arbitrary forces. Life in general, and decision making in particular, is 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 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.

Experiment 1b 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 1c 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 1d 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

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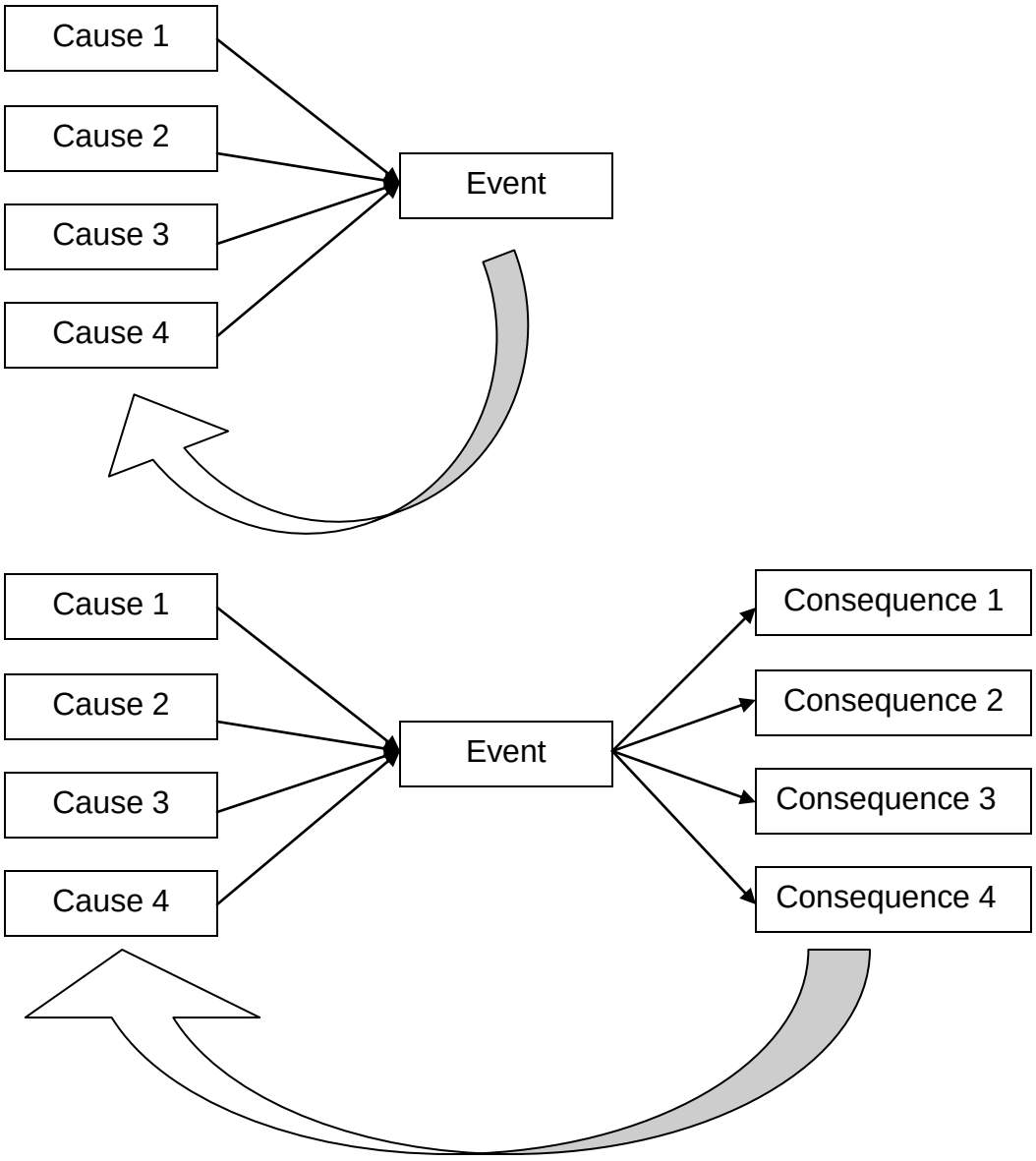
FIGURE 1

TWO MODELS OF CAUSAL REASONING



We suggest that people not only look to *events* to infer event causes (top panel), but that they also look to (even uninformative) event consequences to infer the focal event's causes (bottom panel).

FIGURE 2

PREFERENCES FOR CAUSES THAT "MATCH" EVENT CONSEQUENCES, EXPERIMENT 1

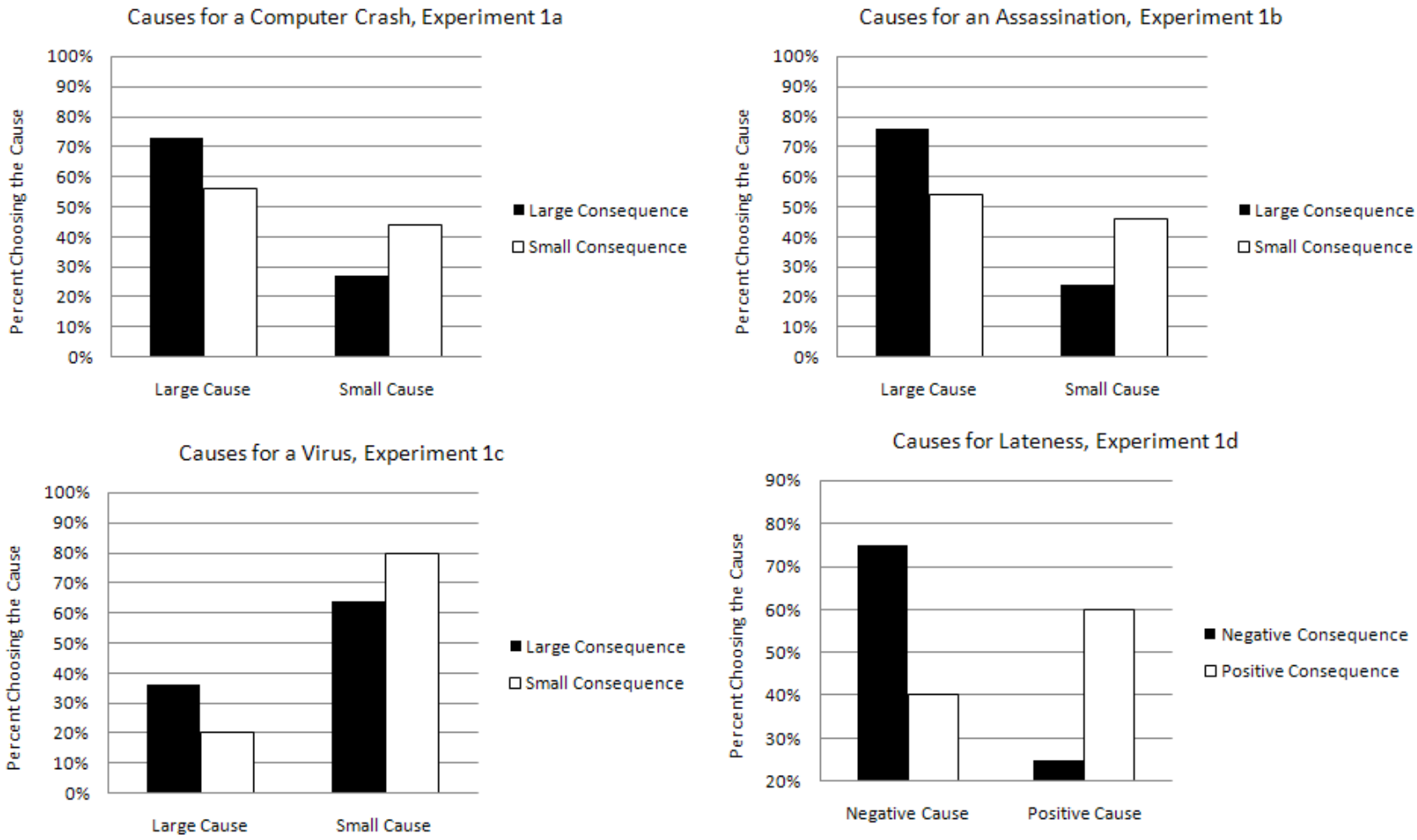


FIGURE 3

PERCENTAGE INFERRING THAT AN EVENT WITH A LARGE CONSEQUENCE HAD A LARGE CAUSE, AS A FUNCTION OF NEED FOR CLOSURE AND THE PRIMING OF AN ALTERNATIVE CAUSAL SCHEMA (EXPERIMENT 4)