RUNNING HEAD: COUNTERFACTUAL SEEKING

Counterfactual-seeking: The scenic overlook of the road not taken

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Abstract

Decision-makers faced with an opportunity to learn the outcome of a foregone alternative must balance anticipated regret, should that information be unfavorable, with the potential benefits of this information in reducing experienced regret. Counterfactual-seeking, the choice to learn more about foregone alternatives, may be a functional, regret-regulating strategy for individuals already experiencing regret. Counterfactual-seeking increases in response to dissatisfying outcomes (Studies 1 & 2). Counterfactual-seeking is generally able to reduce dissatisfaction (Study 2), regardless of whether individuals personally chose to view this information or were randomly assigned to do so (Study 3). Moreover, both imaginative (versus factual) thoughts about the foregone option and upward (versus downward) counterfactual thoughts play a role in this improvement in satisfaction (Study 4). Regret thus has a complex influence in how individuals engage with counterfactual information.

Keywords: counterfactual, regret, decision-making, affect, information seeking

Counterfactual seeking: The scenic overlook of the road not taken

Life is uncertain, and the decisions we make are often among the largest sources of uncertainty. What career will make me happiest? Which car will provide the best value for my money? Moreover, after making a decision, we may still be left uncertain whether the outcome of that decision was in fact the best that we could have done. Would I have been happier as a lawyer than as an academic? Might the other car have needed fewer repairs? The current research examines how individuals respond to the opportunity to obtain information about foregone options, a phenomenon I term *counterfactual-seeking*[1]. Under what circumstances will individuals choose to learn about foregone alternatives, and what are the consequences of seeking this information?

The decision to counterfactual-seek hinges on the balance of two motivations. Regret regulation theory (Zeelenberg & Pieters, 2007) highlights a need for decision-makers to manage their emotional state by avoiding and reducing regret, whereas the functional theory of counterfactual thinking (Epstude & Roese, 2008) suggests that this emotion, and the counterfactual thoughts that underlie it, have benefits to the decision-maker. Decision makers thus have to balance experienced regret with the anticipated potential for further regret from counterfactual-seeking, on the one hand, and the possibility of this information instead alleviating their regret, on the other. As shown in Figure 1, I predict that counterfactual seeking is more likely following dissatisfying outcomes (Studies 1-2), and will reduce regret (Studies 2-3) due in part to changes in counterfactual thoughts (Study 4) within counterfactual-seekers.

Regret regulation

Regret regulation theory (Zeelenberg & Pieters, 2007) suggests that regret can exist in an anticipatory form, particularly when information about foregone alternatives will be available, and that decision-makers are motivated to minimize this anticipated regret. In an initial demonstration of regret aversion, Zeelenberg, Beattie, van der Plight, and de Vries (1996) gave participants a choice of two gambles (A and B). Participants were told they would learn the outcome of a particular gamble (gamble A), regardless of whether they chose that gamble (A) or an alternative gamble (B). Participants tended to choose gamble A, thereby insulating themselves from knowing the outcome of a foregone gamble (i.e., choosing gamble B and also learning the outcome of gamble A), providing evidence for a pattern of aversion towards anticipated regret and a resulting avoidance of counterfactual information. Likewise, outside the regret literature, Sweeny, Melnyk, Miller, and Shepperd (2010) argue that individuals will avoid information if doing so will help them avoid negative emotional states. This might suggest that individuals will generally avoid information about foregone alternatives.

In addition to the desire to avoid anticipated regret, however, regret regulation theory also suggests that individuals will attempt to reduce experienced regret. The post-decisional dissonance literature has demonstrated that individuals will reduce initial dissatisfaction with a chosen option by devaluing the foregone alternative (Brehm, 1956; Festinger & Walster, 1964). In decision contexts in which individuals have limited negative information about foregone options (for instance, when one has only seen the glossy brochure and shiny showroom model of a foregone car), it may be difficult to devalue the foregone option without additional information about its negative qualities.

If these decision-makers are dissatisfied, the most likely way to improve satisfaction by improving the relative standing of a chosen option compared to a foregone option would be to seek out information about the foregone alternative that has the potential to cast the chosen option in a relatively more favorable light—that is, to counterfactual-seek. In the gambles used by Zeelenberg and colleagues to demonstrate regret aversion, individuals could anticipate potentially experiencing regret, but since the decision had not yet been made, post-decisional regret necessarily could not exist at the time that counterfactual information was sought or avoided. Anticipated regret therefore dominates the decision process, resulting in a pattern of regret-aversion. In contrast, in daily life, the decision usually has been made and the outcome is known prior to an individual's decision to seek versus avoid counterfactual information. For instance, one can ask a friend about her satisfaction with her Ford even after one has bought a Toyota, in contrast to the constraints in Zeelenberg et al.'s (1996) task.

In fact, recent research has found that individuals reading hypothetical scenarios that imply greater regret with a decision's outcome express more interest in learning about foregone possibilities. Shani, Tykocinski, and Zeelenberg (2008) found that participants who read a vignette in which it was highly probable (vs. unlikely) that they had missed out on a prize reported more interest in the counterfactual outcome (i.e., whether or not their unsubmitted form had the winning numbers). This effect was mediated by greater dissatisfaction among participants who thought the prize was more (vs. less) likely, which in turn predicted the level of curiosity about their entry form. Likewise, participants who read a vignette in which they were responsible for a bad investment were less satisfied with this outcome than participants who read a vignette in

which another person was responsible for the investment, and were subsequently more likely to express interest in learning about a foregone investment (Shani & Zeelenberg, 2007). Thus, in scenarios implying greater regret (whether driven by a more easily imagined alternative or greater personal responsibility), individuals express more interest in the foregone outcome.

The current research therefore expands on the tenet of regret regulation theory (Zeelenberg & Pieters, 2007) that regret exists in both anticipatory and experienced forms to examine how these two forms of regret simultaneously influence the decision to counterfactual seek. Given that experienced emotions have strong motivational effects (Frijda, 1986), I predict that experienced regret will lead to counterfactual seeking, even in the face of anticipated regret about that information (Figure 1, Step 1).

The benefits of counterfactuals

If counterfactual-seeking is motivated by an attempt to reduce experienced regret, it should have direct or indirect affective benefits to seekers. Research indeed suggests counterfactual-seeking by dissatisfied individuals would be quite functional. Both counterfactual thinking (thoughts about "what might have been") and regret, the negative emotion driven by counterfactual thoughts about one's own behavior (Kahneman & Miller, 1986; Roese, 1997), can be highly beneficial, as highlighted by the functional theory of counterfactual thinking (Epstude & Roese, 2008). Counterfactual thoughts play a role in causal reasoning (Wells & Gavanski, 1989), and more importantly, help people feel better about outcomes and improve future outcomes (Roese, 1994). This ability to improve outcomes occurs even on a relatively automatic level; counterfactuals facilitate formation of behavioral intentions (e.g., to wear sunscreen to avoid future sunburns;

Smallman & Roese, 2009). Likewise, regret highlights decision strategies and behaviors that had poor outcomes, creating an impetus to alter behavior to improve outcomes (Landman, 1993; Zeelenberg, Inman, & Pieters, 2001). For instance, regret following an unpleasant experience with a service provider predicts switching providers (Zeelenberg & Pieters, 1999). For this reason, individuals do not view regret as being uniformly aversive. Instead, they endorse regret more highly than twelve other negative emotions (e.g., sadness, anger, disappointment) on a range of beneficial functions (Saffrey, Summerville, & Roese, 2008). Counterfactual-seekers could thus expect a range of benefits for future outcomes as a result of learning about foregone options.

In addition to these longer-term benefits, counterfactual seeking may be able to improve satisfaction in the short run. Satisfaction with a decision is based not only on the absolute quality of the chosen option but on its relative standing compared to real or imagined foregone alternatives (Aronson, 1969). Counterfactual-seeking may shift the nature of this comparative evaluation (Figure 1, Step 2). First, counterfactual seeking may reveal information that makes the chosen option clearly superior to the other (my hotel was dingy, but the one I almost stayed in instead had bedbugs), and change this comparison from one that is *upward* (focused on how the alternative would have been better) to one that is *downward* (focused on how the alternative would have been worse). Second, in addition to describing *what **would** have been* (i.e., a factual contrast between the actual attributes of the chosen and foregone options), counterfactuals can also be characterized by supposition and imagination—the comparison to *what **might** have been.* Car buyers might imagine, for instance, finding the Platonic ideal of cars—if only they had kept looking, they might have found a car in their price range, with better mileage,

more features, more room, and a better warranty. Since it is unlikely for any car to meet this ideal, having information about a foregone alternative—even if this alternative is still superior to the obtained outcome—may reduce regret by highlighting that the difference between the obtained outcome and the *available* alternative outcome (i.e., what *would* have been) is substantially smaller than the difference between the obtained outcome and the *imagined* (and idealized) alternative outcome (what *might* have been). Thus, the degree of dissatisfaction experienced would be reduced in comparisons to *available* alternatives versus to *imagined* alternatives, even if it is not eliminated. For instance, car buyers may shift from imagining that they would have found a more spacious car with a better warranty and more features for less money to realizing that the other cars in their price range all offer about the same amount of space and features; in turn, this should reduce the extent to which their thoughts involve upward comparisons and increase the extent to which they involve downward comparisons.

In short, I predict that counterfactual seeking will change the imaginative vs. factual nature of the thoughts that individuals have about the foregone options (Figure 1, Step 2). Moreover, these changes will be accompanied by changes in counterfactual thoughts, such that comparisons become less upward and more downward (Step 3). I predict that these cognitive effects will produce changes in satisfaction, as in Step 4 of Figure 1. Given the myriad regret regulation strategies identified by Zeelenberg and Pieters (2007), and the range of benefits from counterfactuals (Epstude & Roese, 2008), it is unlikely that cognitive changes are the only means by which counterfactual-seeking has an influence on satisfaction; rather, many other mechanisms may simultaneously contribute to this effect of counterfactual-seeking on improved satisfaction.

The current research

The existing scenario studies (Shani & Zeelenberg, 2007; Shani, Tykocinski, and Zeelenberg, 2008) support the prediction that the experience of regret following a decision may lead individuals to counterfactual-seek. However, these past findings are somewhat limited by the fact that they present decisions in the scenarios as a *fait accompli* and ask participants to imagine how they might respond. This leaves open the possibility that participants believe that the action they have purportedly taken in the scenario is not a decision they would have actually made, and yet have to predict what they would then do. Moreover, requiring participants to predict their future actions, and particularly their future emotions, is often unreliable (e.g., Gilbert et al., 1998; Wilson & Gilbert, 2003). Therefore, the present research introduces a new paradigm in which participants make a decision between hypothetical options and then choose to see or avoid information about foregone alternatives, rather than simply expressing interest on a Likert scale. Research on romantic relationships has demonstrated that hypothetical decisions about an interaction with a romantic partner are related to attachment style and to real relationship outcomes, supporting the value of these simulated decisions in understanding real behavior (Vicary & Fraley, 2007).

Across four studies, the current research investigates the causes and consequences of counterfactual-seeking, suggesting that it is a regulatory response to dissatisfaction that reduces regret by producing changes in counterfactual thoughts. I predict that both objectively poor outcomes and subjective dissatisfaction following a choice (post-decisional regret) will drive increased counterfactual-seeking (Step 1, Figure 1). Moreover, I predict that this will be functional in reducing post-decisional regret after a

bad choice (Step 4, Figure 1) because it will shift cognitions away from the nearly impossibly good alternatives that can be imagined (a car that looks like a Ferrari, with the engineering of a BMW, at the cost of a used Camry) to the more realistic trade-offs that are normally encountered in the real world (a used Camry that looks and runs like a Camry) and produce a reduction in upward counterfactuals and increase in downward counterfactuals (Steps 2 and 3, Figure 1).

In Studies 1 and 2, I investigate whether worse outcomes and greater dissatisfaction directly influence the likelihood of actually choosing to view information about foregone alternatives. In Study 1, I predict that participants in a computerized card game will be more likely to look at the foregone "hand" if their actual hand is relatively weak. In Study 2, I predict that participants who selected a hypothetical course that was revealed to have had low student evaluations, and who were highly dissatisfied, will be more likely to seek information about the foregone courses. In Study 2, I also investigate whether individuals do in fact show improved satisfaction after learning about foregone options, and whether this effect is moderated by the discrepancy in objective quality between the actual and foregone options. In Study 3, I use an experimental approach to examine whether this improvement in satisfaction is due to self-selection by counterfactual seekers, or whether counterfactual information improves satisfaction regardless of whether an individual has requested to see it. Finally, Study 4 examines the role of counterfactual thoughts in this change in satisfaction. I predict that although participants' thoughts about the foregone option will be relatively more imaginative than factual initially (i.e., more focused on what *might* have been than what *would* have been), this ratio will shift to show relatively more factual thoughts following counterfactual-

seeking. Furthermore, I anticipate that counterfactual seeking will produce a reduction in upward counterfactuals and an increase in downward counterfactuals, which will in turn predict increased satisfaction. Together, these four studies illustrate that counterfactual-seeking is an adaptive response to dissatisfaction that results from balancing the influence of anticipated and experienced regret.

Study 1

Study 1 was designed to provide preliminary evidence that worse outcomes after a decision will increase counterfactual-seeking. Of particular interest was whether participants whose choice led to a relatively poor outcome (i.e., a bad score) would be more likely to choose to view foregone alternatives, relative to participants whose choice led to a good outcome (i.e., a higher score).

Method

Sixty-five introductory psychology students participated in lab sessions for course credit.

Participants played 100 rounds of a computerized card game (broken into 5 "games" of 20 rounds per game in order to alleviate fatigue). Participants were first informed of the rules of the game: red cards (diamond or heart) LOST the number of points on the card (1 to 10), and black cards (spade or club) GAINED the number of points on the card. In each round, they drew a single card from one of two shuffled decks, each with face cards removed. For each trial, the obtained score was thus a non-zero integer from -10 to +10. After seeing this card, participants were asked if they wished to view the card they would have drawn from the other deck. Whether or not they elected to view this foregone card represented the dichotomous dependent measure of

counterfactual-seeking. For participants who did elect to view the foregone card, the counterfactual outcome represented by this card (i.e., the points they *would have* gained/lost had they selected the other deck) could likewise be any non-zero integer from -10 to +10; both cards were randomly generated by the computer. Participants then proceeded to the next round. The computer displayed information about which round of which game the participant was on, the current net score for the game, and (for games 2-5) the highest score of the previous games. Participants were told that the card(s) were replaced and the decks reshuffled between rounds.

Results and Discussion

Study 1 tested the hypothesis that decision outcome would affect counterfactual-seeking, with worse outcomes increasing the likelihood of seeking counterfactual information. If this is the case, a significant negative relationship should be observed between the score on a given round and the likelihood of counterfactual-seeking. Because of the repeated-measures design, the obtained data are dependent in nature. To account for this interdependence and model a dichotomous outcome, I used a hierarchical logistic regression strategy (HLM software, Raudenbush, Bryk, & Congdon, 2007), nesting trials within participants while predicting the logit of the counterfactual-seeking outcome variable. As predicted, worse outcome quality (i.e., greater losses and smaller gains) significantly increased the likelihood of counterfactual-seeking, $\pi = -0.04$, $F(1, 6252) = 24.93$, $p < .001$, odds ratio = 0.96.

The results of Study 1 supported the hypothesis that counterfactual-seeking would be increased by poorer decision outcomes. In this case, the worse the outcome of participants' choices, the more they sought out knowledge about the forgone outcome.

Study 2 expands upon this result by assessing experienced dissatisfaction, as well as investigating the ability of counterfactual information to improve satisfaction.

Study 2

Although Study 1 found that objectively poor outcomes increase counterfactual-seeking, it does not speak to the psychological mechanisms that underlie counterfactual-seeking. Study 2 examines this directly. Additionally, Study 2 examined whether counterfactual-seeking is a functional strategy to improve satisfaction. While the content-specific effects of counterfactuals suggest that long term benefits could exist even if satisfaction is not improved (e.g., having conclusive evidence that another brand is better will result in a better decision on the next shopping trip; Epstude & Roese, 2008), I predict that counterfactual information will also be able to improve satisfaction in the short term.

Method

Three-hundred and ninety-eight introductory social psychology students participated in a web-based study for course credit.

Participants were asked to imagine that the psychology department would hire one of three (fictional) candidates as a visiting professor to teach an elective course next semester, for which the course title and catalogue description were displayed, along with the professor's name and a photo. After selecting the course they personally would most like to take, and confirming this choice, participants read comments and numeric ratings made by past students in that course. Participants were randomly assigned to read one of five reviews corresponding to five levels of instructor quality (i.e., means of approximately 1, 2, 3, 4, or 5 on 5-point rating scales). These reviews consisted of

numeric rating of items such as “gained a lot from this class” and “would recommend to others” and verbal comments such as “Lectures were really boring, and slides always had typos and grammatical errors and sometimes didn't really make sense at all” (instructor rated 1 on scale of 5); “Sometimes comes off as unprepared in class. Good during office hours though” (instructor rated 3 on scale of 5); and “Interesting and funny lecturer, not only teaches the concepts but outlines the studies that led to the knowledge” (instructor rated 5 on scale of 5).

After seeing this review, participants then rated their regret and satisfaction (reversed) on 7-point scales; these variables were highly correlated (r = .68) and thus averaged into a single dissatisfaction variable. Additionally, they indicated their curiosity about foregone alternatives (“I am curious about the courses/professors I did not select”) and the aversiveness of this information (“It would upset me to think about the courses/professors I did not select”). Next, participants could read a review for one of the foregone courses. Whether or not they elected to view this information represented the dichotomous dependent measure of counterfactual-seeking. Participants viewing this information were again randomly assigned to the quality of the foregone alternative (1, 3, or 5 out of 5 on the same rating scale), to examine the boundary conditions for an improvement in satisfaction. These participants were then asked to re-rate their satisfaction, “now that you’ve had the opportunity to learn about another course.” Finally, participants completed the five-item Schwartz et al. (2002) regret-proneness scale (items include such statements as “Whenever I make a choice, I'm curious about what would have happened if I had chosen differently”) and three items assessing the belief that

regret has a beneficial function (e.g., "Feeling regret helps me learn from my mistakes.") Reliabilities for the two scales were acceptable (αs = .74 and .69, respectively).

Results

Study 2 tested the prediction that subjective dissatisfaction, and not merely negative outcomes *per se*, leads to counterfactual-seeking. The 5 different reviews of the chosen professor were coded as an *objective outcome quality* variable ranging from 0 to 4. The effect of objective outcome quality on counterfactual-seeking in Study 1 was replicated, with better outcomes associated with lower likelihood of seeking $\beta = -0.14$, Wald = 3.67, $p = .05$, odds ratio = 0.87. Objective outcome quality was strongly, but not perfectly, correlated with dissatisfaction, $r = -.74$, suggesting that although the manipulation was effective, individuals had idiosyncratic reactions to the reviews. As predicted, therefore, greater dissatisfaction, and not merely objective outcome quality, was associated with higher rates of counterfactual-seeking, $\beta = 0.12$, Wald = 4.56, $p = .03$, odds ratio = 1.13.

Examining the rated aversiveness of counterfactual information suggested that counterfactual-seeking does not result from a simple absence of regret-aversion; instead, experienced and anticipated regret may co-exist, as predicted by regret regulation theory. The more dissatisfied participants were with their choice, the more they reported that they would be upset if they thought about the course/professors not selected ($r = .53$, $p < .001$), indicating that they felt anticipatory regret about counterfactual seeking as well as experienced regret about their decision. Dissatisfied participants were nonetheless more curious about counterfactual information ($r = .54$, $p < .001$), indicating that as predicted, experienced regret outweighed anticipated regret. In fact, the degree to which

participants expected to find counterfactual information upsetting was positively associated with their curiosity about these outcomes (r = .48, p < .001) and their tendency to view this information (point-biserial r = .22, p < .001); this effect was weakened (though still significant, due to the large sample size) when controlling for satisfaction (point-biserial r = .18, p < .001).

If individuals with a greater dispositional tendency to experience regret were more likely to use the regret regulation strategy of counterfactual-seeking, this would further support the key role of experienced regret in this phenomenon. Correspondingly, trait level regret-proneness was associated with counterfactual-seeking, such that an increased tendency to feel regret predicted increased counterfactual-seeking, β = 0.44, Wald = 19.5, p < .001, odds ratio = 1.55. Likewise, individuals who see regret as generally beneficial (i.e., who are generally low in anticipatory regret) should be more likely to seek counterfactual information. Further supporting a regulatory function for counterfactual-seeking, positive beliefs about regret were marginally associated with an increased tendency to counterfactual-seek, β = 0.15, Wald = 3.53, p = .06, odds ratio = 1.16. The anticipated unpleasantness of counterfactual information may be reframed by these individuals and thus increase its value, just as one might reframe a negative experience of missing the bus into the thought "well, at least I'll get some exercise."

The role of experienced dissatisfaction in prompting counterfactual-seeking would be particularly functional if counterfactual-seeking improves satisfaction. As predicted, among those who sought counterfactual information, dissatisfaction decreased significantly after viewing this information (Ms = 3.63 vs. 3.27), t (142) = 3.61, p < .001, d = 0.19. Unsurprisingly, this effect was qualified by the discrepancy in objective

outcome quality of the chosen and foregone options. An objective discrepancy score was computed by subtracting the objective outcome quality of the chosen option (0, 1, 2, 3, 4) from the objective outcome quality of the foregone option (0, 2, 4); this discrepancy score could thus range from -4 to +4, indicating that the chosen option was objectively much worse to much better than the foregone option. The objective discrepancy score was a significant predictor of post-seeking dissatisfaction, controlling for initial dissatisfaction, $\beta = -0.43$, $t\,(89) = 6.13$, $p < .001$. Unpacking this effect by examining the difference in dissatisfaction before and after seeking counterfactual information within each level of outcome discrepancy revealed that the only significant differences were decreases in dissatisfaction when the two outcomes were equivalent or the chosen option was between 1 and 3 points better on the 5-point scale. (Those participants who had a + 4-point gap—which would only occur if they had gotten the most favorable review of the chosen professor, and the most unfavorable review of the foregone professor—appeared to show a floor effect for dissatisfaction, with *M*s = 1.29 vs. 1.25 initially and post-seeking, respectively, $p = .59$, $d = 0.07$). Notably, those participants who discovered the foregone alternative was objectively superior to the chosen option did *not* show significant increases in dissatisfaction (for objective discrepancies of - 2 points or more, all $p > .30$). In fact, descriptively, those participants with a -1-point objective discrepancy score (i.e., the foregone alternative was objectively 1 point better than the chosen option on a 5-point scale) still showed a decrease in dissatisfaction (*M*s = 4.29 vs. 3.91), though this effect was non-significant, $t(16) = 1.28$, $p = .22$, $d = 0.22$. Thus, counterfactual-seeking appears to carry a possible benefit of improving satisfaction without a corresponding risk of increasing dissatisfaction.

Discussion

Study 2 extends the effects of objective outcome in Study 1 to find an effect of subjective satisfaction on counterfactual seeking. Moreover, this experienced emotion outweighed anticipated regret in the decision to counterfactual-seek, as seekers actually expected to be more upset by counterfactual information (but, clearly, sought it out nonetheless). One interpretation of this result is that individuals were fully aware of the potentially aversive nature of counterfactual information, yet were still willing to engage in counterfactual-seeking, consistent with Shani and colleagues' framing of this behavior as a "search for unpleasant truths" (Shani, Tykocinski, & Zeelenberg, 2008; Shani & Zeelenberg, 2007). This suggests that experienced dissatisfaction with the selected alternative may be more powerful than anticipated dissatisfaction in the decision to counterfactual-seek, consistent with the fact that experienced emotions are strong motivators (Frijda, 1986). Additionally, Sweeny et al. (2010) cite unpublished evidence that suggests that it is the relative levels of anticipated regret about learning information *and* about *not* learning this information that drives information avoidance, rather than either absolute level. The current results suggest that experienced emotion may also be directly weighted in this calculus, or that individuals use experienced emotion as a proxy to predict their anticipated regret of continuing to not know the foregone outcome. Alternatively, this correlation could result from participants "bracing" for this information and exaggerating the potential negative consequences of their desire to seek this information. However, participants were not aware when rating their interest and aversion to this information that they would actually have the opportunity to decide to

seek this information, raising potential doubts about whether they could have used an anticipatory strategy.

Finally, Study 2 illustrated that, as predicted, counterfactual-seeking significantly improved satisfaction for most participants who saw an equivalent or inferior foregone option, and that even those who learned that the foregone option was better than the chosen option were not significantly less satisfied with their choice, supporting the hypothesis that counterfactual seeking is a functional, regret-regulating strategy.

Study 3

Study 2 showed an improvement in satisfaction among most counterfactual-seekers. However, counterfactual-seekers were a self-selected population, and not randomly assigned. It is therefore possible that the benefits of counterfactual seeking are limited to those who are deliberately seeking this information, and that those who choose to avoid this information are self-diagnosing based on knowledge that they will not share these benefits. Moreover, because a second satisfaction rating was not obtained among non-seekers, the changes in satisfaction in Study 2 could be due to an effect of time, rather than counterfactual information. Study 3 therefore experimentally manipulated whether participants self-selected to seek or not seek (as in Studies 1 and 2) or were assigned by the experimenter to view or not view this information. Additionally, Study 3 examined the changes in satisfaction among all participants, not just those who viewed counterfactual information.

Method

One hundred seventy seven participants were recruited from Amazon's Mechanical Turk website and paid 25 cents for their participation (see Buhrmester, Kwang, & Gosling, 2011, for more information about Mechanichal Turk).

Participants were told to imagine that they were planning a trip to a beach with a group of friends. After seeing an attractive photograph with a brief description of each resort's amenities, they were asked to choose which hotel they would most want to visit. They were then given feedback about the chosen hotel in the form of a summary of a customer review that was somewhat unfavorable in tone. They then rated their satisfaction with the hotel.

Participants were then randomly assigned to the *free choice* or *experimenter-assigned* condition. Participants in the *free choice* condition, as in Study 2, were given the choice of whether to read a review of a foregone option. Those who elected to *read* this information (i.e., counterfactual-seekers) were shown a customer review of one of the two foregone hotels that was also largely unfavorable. The content of the two reviews (i.e., which review text was associated with the chosen vs. foregone hotel) was counterbalanced across participants. Participants who *did not read* this information (i.e., non-seekers) continued to the next phase of the experiment.

Participants in the *experimenter-assigned* condition were further randomly assigned to either *read* a review of the foregone alternative, or *did not read* this information and continued on to the next phase. Other than being randomly assigned, rather than self-selected, the *experimenter-assigned* conditions were identical to the *free choice* conditions.

Finally, participants in all four conditions were asked to re-rate their satisfaction with their initially chosen hotel.

Results

The key question in this study was whether readers in both the free choice and experimenter-assigned conditions experienced a change in satisfaction, or whether this change was qualified by an interaction of the two conditions (free choice vs. experimenter-assigned X read vs. did not read). Such an interaction could indicate that counterfactual-seekers might be self-selecting based on whether or not they anticipated benefiting from the information, or that the act of choosing to view information contributed to this effect.

A 2 (Time 1 vs. Time 2) x 2 (read vs. did not read) X 2 (experimenter-assigned vs. free choice) repeated-measures ANOVA revealed a main effect of time, with satisfaction improving from Time 1 to Time 2, as expected, $F(1, 173) = 6.12$, $p = .01$, $\eta_p^2 = .03$. This was qualified by the predicted interaction with reading condition, $F(1, 173) = 4.54$, $p = .03$, $\eta_p^2 = .03$. As can be seen in Figure 2, satisfaction improved for readers ($t(96) = 2.57$, $p = .01$, $d = 0.24$) but not for non-readers ($t(104) = 1.01$, $p = .32$, $d = 0.03$). Most importantly, this two-way interaction was not qualified by an interaction with assignment, $F(1, 173) = 0.54$, $p = .36$, $\eta_p^2 = .005$, indicating that the benefits of counterfactual information were not limited to those who self-selected to seek this information.

Discussion

Obtaining counterfactual information increased post-decisional satisfaction, regardless of whether the counterfactual information was voluntarily sought or not. This

indicates that the benefits of counterfactual information are not isolated to the subset of participants who voluntarily seek out the information. More importantly, this also indicates that it is not the act of counterfactual-seeking, but rather counterfactual information, that provides the benefit to satisfaction observed in Study 2.

Study 4

Study 2 demonstrated that counterfactual-seeking can improve satisfaction, and Study 3 illustrated that this effect was due to the counterfactual information itself rather than the decision to seek it out. Study 4 builds upon these previous findings by examining whether changes in the nature of participants' thoughts are partially responsible for this increase in satisfaction caused by counterfactual-seeking.

As previously noted, even an upward counterfactual comparison (in which the foregone alternative is superior to the obtained outcome) can improve satisfaction if the comparison target shifts from the imagined ideal alternative (the brand new BMW that costs less than a used Camry) to having a more realistic comparison target of the actually available alternatives (the features, mileage, and safety records of mid-size sedans in a given price range are all fairly similar). To the extent that counterfactual-seeking is able to reduce dissatisfaction, it should produce changes in the thoughts that individuals have about their initial decision. I therefore expect that factual thoughts about foregone options will increase following counterfactual-seeking, and imaginative thoughts about foregone options will decrease following counterfactual-seeking. More importantly, I predict that upward counterfactuals, focused on how the foregone alternative could have been better, will decrease, and that downward counterfactuals, focused on how an alternative could

have been worse, will increase, and that these changes will be associated with changes in satisfaction.

Method

One hundred forty-seven participants were recruited from Amazon's Mechanical Turk website and paid 25 cents for their participation. Potential participants were excluded from participation if they had participated in the research described in Study 3.

Participants were told to imagine that they were selecting one of three mobile phones that would be free with their contract, and saw pictures of three smartphones with brief descriptions of their capabilities (e.g., plays MP3s). After selecting their preferred phone, participants read a review and numeric ratings of the phone that were somewhat unfavorable in tone (a mix of numeric ratings near 1 and 3 on a 5 point scale of call quality, ease of use, etc., with corresponding comments).

After reading this review, participants were asked to briefly describe their thoughts, and then were asked to self-code these thoughts on several dimensions by rating their agreement with the extent to which each dimension described their thoughts. (All ratings were made on 7-point Likert scales.) The focal ratings were imaginative thoughts about one or more foregone phones ("Right now, I am using my imagination to envision what the other phones I could have selected might have been like") and factual thoughts about one or more foregone phones ("…focused on the facts that I know about the phone I did not select.") Participants were also asked to rate their satisfaction with their selected phone. Additionally, participants rated the extent to which they were focused on upward counterfactual thoughts ("I am thinking how things might have been

better if I had made another choice") and downward counterfactuals ("…how things might have been worse…").

Following this, participants were asked if they wished to see a review of one of the phones they had not selected, which was the dichotomous measure of counterfactual-seeking. Those participants who elected to see this information read another review that was likewise somewhat unfavorable in nature and had numeric ratings that were again a mix of values near 1 and 3. The content of these two reviews (i.e. which review text and table was associated with the chosen vs. foregone phone) was counterbalanced across participants. All participants, whether or not they viewed this information, were asked to again describe their thoughts and provide the same self-codings and satisfaction ratings.

Results

Effects on thought content. I predicted that following counterfactual-seeking, thoughts about the foregone option would become relatively more factual and less imaginative in nature, and that these changes would be attenuated or not occur among those who did not seek. I therefore conducted a 2 (seek vs. did not seek) x 2 (thought type: imaginative vs. factual) x 2 (Time 1 vs. Time 2) repeated-measures ANOVA, which revealed the predicted three-way interaction, $F(1, 131) = 11.48$, $p = .001$, $\eta_p^2 = .08$; see Figure 3. For non-seekers, imaginative thoughts were more prevalent than factual thoughts both initially (*M*s = 4.41 vs. 3.24, $t(93) = 6.43$, $p < .001$, $d = 0.62$) and at time 2 (*M*s = 3.75 vs. 3.01, $t(87) = 4.31$, $p < .001$, $d = 0.38$). In contrast, although seekers showed the same preponderance of imaginative versus factual thoughts initially (*M*s = 4.76 vs. 3.14, $t(50) = 7.00$, $p < .001$, $d = 0.96$), their thoughts after seeking showed no such difference (*M*s = 4.24 vs. 4.09, $t(45) = 0.71$, $p = .48$, $d = 0.08$). Further analysis

revealed that, as predicted, seekers showed an increase in factual thoughts ($t(44) = 3.47$, $p = .001$, $d = 0.55$); the decrease in imaginative thoughts failed to attain significance ($t(44) = 1.47$, $p = .15$, $d = 0.23$).

Effects on counterfactuals. I also predicted that counterfactual seekers would show a decrease in upward counterfactuals and an increase in downward counterfactuals more than those who did not seek. A 2 (seek vs. did not seek) x 2 (time 1 vs. time 2) repeated-measures ANOVA revealed the predicted interaction for upward counterfactuals, $F(1,134) = 5.29$, $p = .02$, $\eta_p^2 = .04$; see Figure 4. Upward counterfactuals decreased more for counterfactual-seekers (*M*s = 5.27 vs. 3.71, $d = 1.42$) than for non-seekers (*M*s = 4.62 vs. 3.78, $d = 1.19$). Likewise, this interaction emerged for downward counterfactuals, $F(1,133) = 4.81$, $p = .03$, $\eta_p^2 = .04$. Downward counterfactuals increased for counterfactual-seekers (*M*s = 3.36 vs. 4.18, $t(44) = 2.50$, $p = .02$, $d = 0.75$) but did not significantly change for non-seekers (*M*s = 2.79 vs. 2.88, $t(89) = 0.52$, $p = .60$, $d = 0.11$).

Effects on satisfaction. Study 4 also examined the effects of counterfactual-seeking on satisfaction. A 2 (seek vs. did not seek) x 2 (time 1 vs. time 2) repeated-measures ANOVA revealed the predicted interaction for satisfaction, $F(1, 135) = 5.42$, $p = .02$, $\eta_p^2 = .04$. Counterfactual seekers showed a greater increase in satisfaction (*M*s = 2.89 vs. 3.84, $t(44) = 3.10$, $p = .003$, $d = 0.93$) than those who did not seek this information (*M*s = 3.46 vs. 3.76, $t(91) = 2.43$, $p = .02$, $d = 0.51$).

I further predicted that these changes in satisfaction would be associated with a shift toward less imaginative and more factual views of the alternative. In a regression predicting time 2 satisfaction while controlling for satisfaction and thoughts at time 1,

fewer time 2 imaginative thoughts were associated with improved satisfaction, β = -.23, $t(131) = 2.18$, $p = .03$. However, time 2 factual thoughts were not associated with improved satisfaction, β = -.05, $t(131) = .44$, $p = .66$. Thus, the shift in imaginative thoughts was central to the changes in satisfaction.

Mediation by counterfactual thoughts. I predicted that the effects of imaginative thoughts on satisfaction would be mediated by changes in counterfactual thoughts. In a regression controlling for upward counterfactuals and imaginative thoughts at time 1, time 2 imaginative thoughts were significant predictors of time 2 upward counterfactuals, β = .51, $t(133) = 6.31$, $p < .001$. Supporting a meditational argument, the effect of imaginative thoughts on satisfaction became non-significant (β = .003, $t(132) = 0.04$, $p = .97$) when upward counterfactuals were added as a predictor (β = -.50, $t(132) = 6.05$, $p < .001$). A Sobel (1982) test confirmed significant mediation, $z = 4.39$, $p < .001$.

I also predicted that upward counterfactuals would partially mediate the effects of counterfactual-seeking on satisfaction. Counterfactual-seeking was not significantly rated to time 2 satisfaction (β = .09, $t(134) = 1.45$, $p = .13$) when upward counterfactuals were added as a predictor (β = -.47, $t(134) = 6.58$, $p < .001$). A Sobel (1982) test was marginally significant, $z = 1.66$, $p = .09$, indicating that upward counterfactuals partially mediated the effect of counterfactual-seeking on satisfaction, in line with Step 3 for Figure 1.

However, downward counterfactuals were not associated with either factual or imaginative thoughts in regressions of these time 2 variables controlling for time 1 (for factual thoughts, β = .10, $t(131) = 0.94$, $p = .35$; for imaginative thoughts, β = .03, $t(132)$

= 0.28, p = .78), indicating that contrary to predictions downward counterfactuals were not a mediator of the effect of thought content on satisfaction.

I also examined whether downward counterfactuals would mediate the effects of counterfactual-seeking on satisfaction. Although counterfactual-seeking was not significantly related to satisfaction when downward counterfactuals were added to a regression (β = .10, $t(133)$ = 1.51, p = .13), the effect of downward counterfactuals in this regression was only marginally significant (β = .14, $t(133)$ = 1.80, p = .07), as was the Sobel test, z = 1.64, p = .10. Downward counterfactuals do not appear to be central to the effects of counterfactual-seeking in regulating regret.

Discussion

Study 4 examined counterfactual thoughts as a mechanism for improving satisfaction. I predicted that, along with changes in satisfaction, changes in counterfactual thoughts would occur following counterfactual-seeking. In particular, I predicted that thoughts about the alternative would be more factual (what *would* have been) than imaginative (what *might* have been) in nature following counterfactual-seeking. Following seeking, factual thoughts about the foregone option increased, supporting this prediction. Moreover, changes in imaginative thoughts about the foregone options were associated with changes in satisfaction, as predicted, with reduced imaginative thoughts associated with improved satisfaction (though factual thoughts were not significantly related to this change). Likewise, participants reported more upward counterfactuals and fewer downward counterfactuals after seeking; these changes were both associated with improved satisfaction, and upward counterfactuals partially mediated the effects of changes in thought content. In addition to replicating the finding that counterfactual-

seeking reduces dissatisfaction, Study 4 finds counterfactual-seeking changes cognition as well, and that these cognitive effects, particularly reductions in imaginative thoughts and upward counterfactuals, are related to the changes in satisfaction.

General Discussion

The present research used a new paradigm to investigate the phenomenon of counterfactual-seeking, the deliberate decision to seek information about foregone alternatives. Consistent with the role of regret in past research (Shani, Tykocinski, & Zeelenberg, 2008; Shani & Zeelenberg, 2007), negative outcomes (Study 1) and subjective dissatisfaction (Study 2) were associated with greater counterfactual seeking. This research also investigated the affective (Study 2-4) and cognitive (Study 4) consequences of counterfactual-seeking. In Study 2, counterfactual seeking improved satisfaction when the chosen alternative was equivalent or somewhat superior to the foregone alternative; there was no parallel decrease in satisfaction when the foregone alternative was superior. Study 3 revealed that this benefit was not specific to those who chose to view information, but extended to those who were randomly assigned to read this information as well. Finally, Study 4 illustrated the role of counterfactual thoughts in this improvement of satisfaction, in particular the shift of thoughts from being highly imaginative to become relatively more factual after viewing counterfactual information.

The present results indicate that individuals are not uniformly regret averse. Instead, when they are currently experiencing regret, they become more willing to seek out information about foregone alternatives. This is made all the more notable by the fact that in Study 2, participants reported that they expected to be upset by this counterfactual information. Although apparently contradictory, this pattern may explain why the present

results differ from those of Zeelenberg (1999; Zeelenberg et al., 1996). In that research, the decision to view counterfactual information was part of the initial decision process; in that case, participants could expect to be upset without having any current emotion to balance that expectation against, which would lead them to avoid information about foregone alternatives. In this paradigm, as in most real life decisions, the decision to seek counterfactual information came after the initial decision and its outcome, when participants had an experienced emotion to weigh against the expectation of being upset, which here led them to choose to seek out this information in spite of the potential pain it could bring. Given the strong effects of experienced emotions (Frijda, 1986), experienced regret may simply outweigh anticipated regret. Alternatively, if individuals construe their initial dissatisfaction as "disappointment" (the outcome is worse than expectations) rather than "regret" (the outcome is worse than what they might have obtained from another decision) they may see potential regret as an improvement on experienced disappointment, given past findings that individuals find regret more beneficial than disappointment (Saffrey, Summerville, & Roese, 2008).

Despite participants' anticipated regret about counterfactual-seeking, counterfactual-seeking was generally able to improve satisfaction, regardless of whether individuals had chosen or been assigned to learn about the foregone alternative. This result is consistent with the prediction from cognitive dissonance theory (Festinger, 1957), that individuals will respond to dissatisfaction by increasing their favorable beliefs about the chosen option and increasing negative beliefs about the foregone option (Brehm, 1956). In this case, individuals moved away from having relatively imaginary thoughts about the foregone options to having more factual thoughts, suggesting that

there is a dissatisfaction-reducing shift from *what **might** have been* to *what **would** have been.* In addition to the long-term, behavioral benefits of counterfactual information (e.g., Landman, 1993; Smallman & Roese, 2009; Zeelenberg, Inman, & Pieters, 2001), it therefore appears to have a short-term affective value in highlighting possible rather than idealized alternatives.

Although the present research used a new paradigm that allows participants to make their choice to seek information about foregone alternatives *after* experiencing post-decisional regret, improving external validity over previous approaches, it will be important to extend this research into decisions with real personal or economic consequences. Likewise, the only cost of seeking information here was the time spent reading; in daily life, obtaining information can incur additional costs. It will be important to examine how individuals balance those costs against the influence of experienced dissatisfaction demonstrated here. Nevertheless, the present research both improves psychological realism relative to previous paradigms for examining interest in counterfactual information and, for the first time, examines the short-term consequences of viewing this information.

Rather than uniformly shielding themselves from regret, on the one hand, or denying the potential pain counterfactual information might bring, on the other, decision-makers in the present research instead willingly risked the pain of regret in service of other motives. These findings suggest that decision makers' considerations of counterfactual information are subject to a nuanced calculus of both experienced and anticipated regret.

References

Aronson, E. (1969). The theory of cognitive dissonance: A current perspective. In Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology: Vol. 4.* (pp. 2-35). New York: Academic Press.

Brehm, J.W. (1956). Postdecision changes in the desirability of alternatives. *Journal of Abnormal and Social Psychology, 52,* 384–389.

Buhrmester, M. D., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality data? *Perspectives on Psychological Science, 6,* 3-5.

Epstude, K., & Roese, N. J. (2008). The functional theory of counterfactual thinking. *Personality and Social Psychology Review, 12,* 168-192.

Festinger, L. (1957). *A theory of cognitive dissonance.* Stanford, CA: Stanford University Press.

Festinger, L., & Walster, E. (1964). Post-decision regret and decision reversal. In L. Festinger (Ed.), *Conflict, decision, and dissonance* (pp. 112-127). Stanford, CA: Stanford University Press.

Frijda, N. H. (1986). *The emotions*. Cambridge: Cambridge University Press.

Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatley, T. P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology, 75,* 617-638.

Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review, 93,* 136-153.

Landman, J. (1993). *Regret: The persistence of the possible.* New York: Oxford University Press.

Northcraft, G. B., & Ashford, S. J. (1990). The preservation of self in everyday life: The effects of performance expectations and feedback context on feedback inquiry. *Organizational Behavior and Human Decision Making, 47,* 42-64.

Raudenbush, S., Bryk, A., & Congdon, R. (2007). HLM [Computer Software]. Lincolnwood, IL: Scientific Software International, Inc.

Roese, N. J. (1994). The functional basis of counterfactual thinking. *Journal of Personality and Social Psychology, 66,* 805-818.

Roese, N. J. (1997). Counterfactual thinking. *Psychological Bulletin, 121*, 133 148.

Saffrey, C., Summerville, A., & Roese, N. J. (2008). Praise for regret: People value regret above other negative emotions. *Motivation and Emotion, 32,* 46-54.

Schwartz, B., Ward, A., Monterosso, J., Lyubormirsky, S., White, K., Lehman, D. R. (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of Personality and Social Psychology, 83,* 1178-1197.

Shani, Y., Tykocinski, O. E., & Zeelenberg, M. (2008). When ignorance is not bliss: How feelings of discomfort promote the search for negative information. *Journal of Economic Psychology, 29,* 643-653.

Shani, Y., & Zeelenberg, M. (2007). When and why do we want to know? How experienced regret promotes post-decision information search. *Journal of Behavioral Decision Making, 20,* 207-222.

Smallman, R., & Roese, N. J. (2009). Counterfactual thinking facilitates behavioral intentions. *Journal of Experimental Social Psychology, 45,* 845-852.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equations models. In S. Leinhart (Ed.), *Sociological methodology 1982* (pp. 290-312). San Fransisco: Jossey-Bass.

Sweeny, K., Melnyk, D., Miller, W., & Shepperd, J. A. (2010). Information avoidance: Who, what, when, and why. *Review of General Psychology, 14,* 340-353.

Vicary, A. M. & Fraley, R. C. (2007). Choose your own adventure: Attachment dynamics in a simulated relationship. *Personality and Social Psychology Bulletin, 33,* 1279-1291.

Wells, G. L. & Gavanski, I. (1989). Mental simulation of causality. *Journal of Personality and Social Psychology, 56,* 161-169.

Wilson, T. D., & Gilbert, D. T. (2003). Affective forecasting. *Advances in Experimental Social Psychology, 35,* 345-411.

Zeelenberg, M. (1999). Anticipated regret, expected feedback, and behavioral decision making. *Journal of Behavioral Decision Making, 12,* 93-106.

Zeelenberg, M., Beattie, J., van der Pligt, J., & de Vries, N. K. (1996). Consequences of regret aversion: Effects of expected feedback on risky decision making. *Organizational Behavior and Human Decision Processes, 65,* 148-158.

Zeelenberg, M., Inman, J. J., & Pieters, R. G. M. (2001). What we do when decisions go awry: Behavioral consequences of experienced regret. In E. U. Weber, J. Baron, & G. Loomes (Eds.), *Conflict and tradeoffs in decision making. Cambridge series on judgment and decision making* (pp. 136-155). New York: Cambridge University Press.

Zeelenberg, M., & Pieters, R. (1999). Comparing service delivery to what might have been. *Journal of Service Research, 2,* 86-97.

Zeelenberg, M., & Pieters, R. (2007). A theory of regret regulation 1.0. *Journal of Consumer Psychology, 17,* 3-18.

Notes:

[1] Although some other research has termed this phenomenon *information-seeking*, *counterfactual-seeking* better disambiguates seeking information about what might have been from other kinds of information-seeking, e.g., seeking absolute feedback or social-comparison information about performance (Northcraft & Ashford, 1990), information about one's health status (Sweeny, Melnyk, Miller, & Shepperd, 2010), or seeking information about decision objects prior to (vs. following) the decision.

Figure 1

Proposed model of counterfactual-seeking

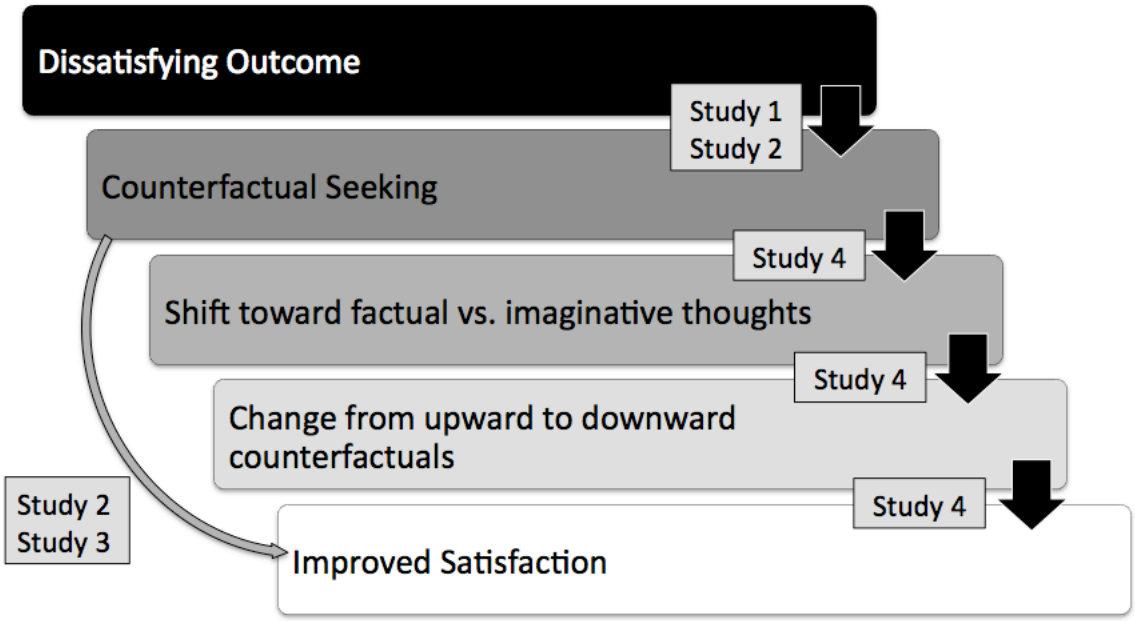

Figure 2

Study 3 results. Mean ratings of satisfaction (with standard errors) at Time 1 and Time 2 for participants given free choice to read or not read counterfactual information (i.e., seekers and non-seekers) and participants randomly assigned by the experimenter to read or not read this information.

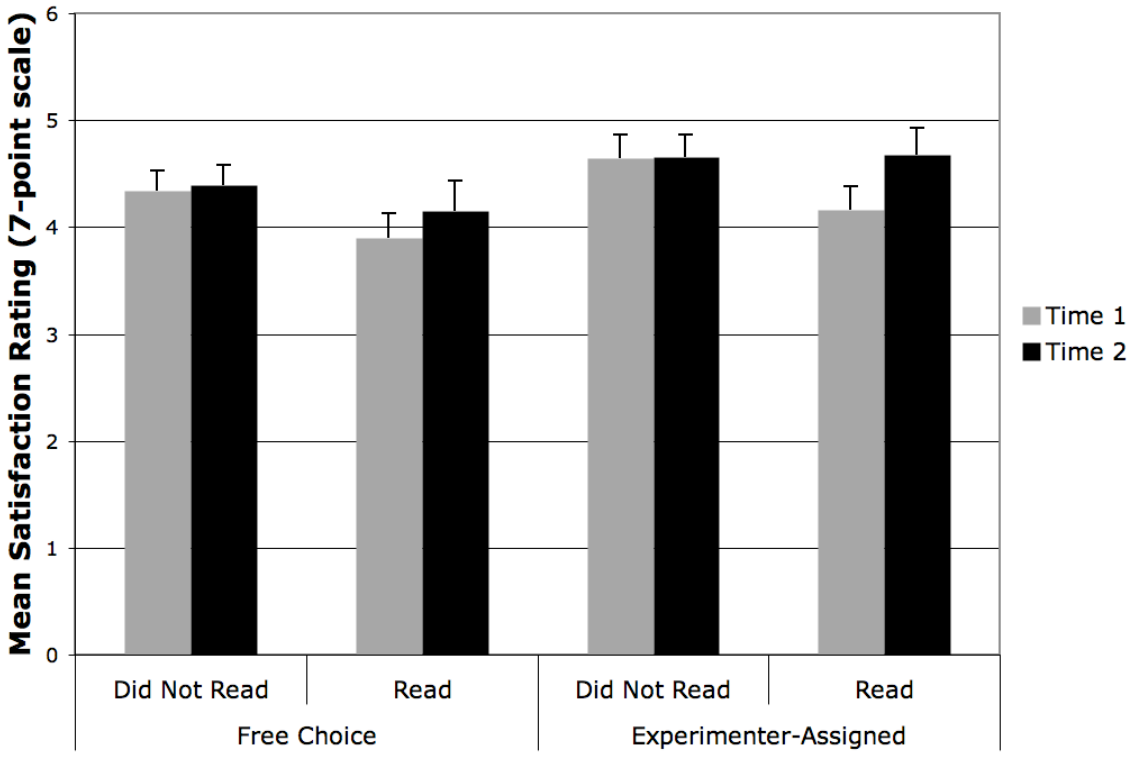

Figure 3

Study 4 results. Mean ratings (with standard errors) of the extent to which thoughts of counterfactual-seekers and non-seekers were factual or imaginative at Time 1 and Time 2.

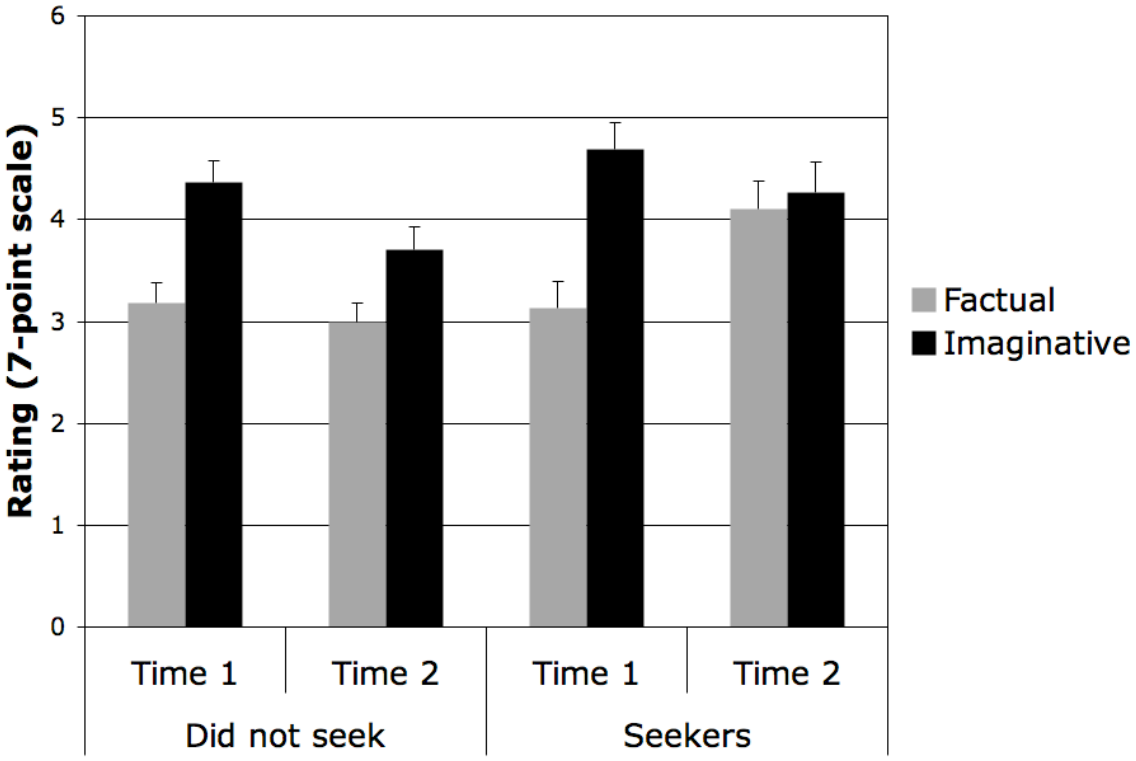

Figure 4

Study 4 results. Mean ratings (with standard errors) of upward and downward counterfactual thoughts by counterfactual-seekers and non-seekers at Time 1 and Time 2.