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The Mental Simulation of Better and Worse Possible Worlds

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Counterfactual thinking involves the imagination of non-factual alternatives to reality. We investigated the spontaneous generation of both *upward counterfactuals*, which improve on reality, and *downward counterfactuals*, which worsen reality. All subjects gained $5 playing a computer-simulated blackjack game. However, this outcome was framed to be perceived as either a win, a neutral event, or a loss. "Loss" frames produced more upward and fewer downward counterfactuals than did either "win" or "neutral" frames, but the overall prevalence of counterfactual thinking did not vary with outcome valence. In addition, subjects who expected to play the game again made more upward counterfactuals and were less satisfied with the outcome than were subjects who did not expect to play again. However, once subjects saw the cards from which they could have selected had they "hit" again (two winning cards and two losing cards), all subjects generated primarily upward counterfactuals and showed a corresponding decrease in satisfaction. These results implicate both cognitive and motivational factors in the generation of counterfactuals and tell us something about the functional value of counterfactual thinking: downward counterfactuals provide comfort; upward counterfactuals prepare one for the future.

We live in neither the best nor the worst of possible worlds. Few people would maintain that their governments, jobs, marriages, health, or wealth are as good as they possibly could be. But for the most part, they would also deny that these life conditions are as bad as they could be. Thus,

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most people can imagine both better and worse alternatives to their present reality.

The imagination of alternatives to reality is called *counterfactual thinking* (Kahneman & Miller, 1986; Kahneman & Tversky, 1982). In the current research we investigated the generation of counterfactuals that either improve on or worsen reality. Our goals were to determine the conditions under which people compare their reality to better or worse possible alternatives and to examine some cognitive and emotional consequences of these different counterfactual comparisons.

Research conducted over the past few years has examined the cognitive rules that govern counterfactual thinking. This research has shown, for example, that people are generally more likely to imagine what might have been different about exceptional (i.e., surprising or unexpected) events than about normal events (Kahneman & Miller, 1986; Kahneman & Tversky, 1982). In addition, counterfactual thinking has been found to influence both social judgments and feelings, including regret, perceived happiness, victim compensation, suspicion, and event causality (e.g., Johnson, 1986; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Landman, 1987; Miller & Gunasegaram, 1990; Wells & Gavanski, 1989).

Although understanding the cognitive rules that govern the availability of various counterfactuals is important, we believe that a full understanding of counterfactual thinking processes also requires consideration of how they might serve people's motives and goal states. What are the costs and benefits of imagining what could have been (but can no longer be)? Here we consider several possible benefits.

STANDARDS OF COMPARISON

For learning about ourselves, for judging our opinions and abilities, and for understanding, predicting, and coming to grips with the outcomes of the situations in which we find ourselves, we often compare ourselves and our situations to certain standards of comparison. Often these standards are other individuals who can serve as reference points or as sources of information. Thus, for students assessing their test scores, for athletes evaluating their performance levels, or for people suffering from a disease who are trying to judge their coping effectiveness or their prognosis, social comparison is an important process. In most situations multiple people are available as potential standards and targets for social comparison. Some of these others are better off than we are, and some are worse off. Of these many potential standards of comparison, who is most likely to be chosen for social comparison? Social comparison theory has examined factors that govern people's selection of different standards of comparison (see, e.g., Festinger, 1954; Wills, 1981; Wood, 1989). Festinger (1954) believed that the primary purpose of social comparison is accurate self-evaluation—people compare themselves to others in order to evaluate

their opinions and abilities. Accordingly, people generally prefer to compare themselves to similar others. In addition, people strive to improve themselves, so they may compare themselves to slightly better-off others (Wheeler, 1966; but see Hakmiller, 1966). Interestingly, Festinger also pointed out that such "upward" social comparisons may lead to feelings of failure and inadequacy.

Wills (1981), on the other hand, has argued for the predominance of "downward" social comparison, which involves comparison with a worse-off other (e.g., "I may have gotten a C− on the exam, but I did better than Bob"). Wills maintains that downward social comparison is initially evoked by negative affect, and that people engage in this process in order to protect and enhance their subjective well-being.

Despite the importance of specific other individuals who serve as standards of comparison, specific others are not the only possible reference standards. We propose that counterfactual comparisons involving the self may serve the same functions as social comparisons. Thus, for social comparison one might compare a grade of C− on an exam to the F that one's roommate received. Alternatively, one might compare the grade to an imagined alternative to reality (e.g., "I may have gotten a C− on the exam, but if I hadn't done that one hour of studying, I might have gotten an F"). In both cases the standard is an exam with an even worse performance. We argue that the generation of counterfactuals may be determined by the same motives as determine the selection of standards for social comparison.

Just as we can generally find comparison people who are better or worse off than us, most outcomes also allow the imagination of both better and worse possible alternatives. We use the term *upward counterfactual* to describe alternatives that improve on reality and the term *downward counterfactual* to describe alternatives that worsen reality. Upward counterfactuals often take the form of "if only . . ." statements. Consider, for example, the disgruntled owner of a "lemon" who thinks, "If only I had bought a Honda, I wouldn't be at the service station every other week."[1] Such counterfactuals may devalue the actual outcome and make us feel worse. However, by simulating routes to imagined better realities, we may learn to improve on our outcomes in the future (Taylor & Schneider, 1989; Wells, Taylor, & Turtle, 1987). Just as upward social comparison can help us improve our tennis game or our coping with a disease by focusing on someone who is doing better, so can the generation of upward counterfactuals help us learn and prepare for the future by pointing out how a given outcome might have been better. The car owner who thinks, "If only I had bought a Honda. . ." may benefit from this counterfactual

[1] Of course, it is not only bad outcomes that allow upward counterfactuals. Even when something good happens, we might wonder "how might this have been even better?"

in that he or she learns to buy a Honda (or car of similar quality) the next time. Unfortunately, both upward social comparison and upward counterfactual generation are likely to make us unhappy with the current state of affairs, which could have been better.

The generation of worse alternatives to reality, or downward counterfactuals, has received less attention. Downward counterfactuals often take the form of "at least . . ." statements as in the example of a student who receives a C− on an exam and thinks "at least I didn't fail." Such a downward counterfactual may make one feel better—in comparison to the F one could have gotten, a C− seems pretty good. Taylor, Wood, and Lichtman (1983) speculated that many accident victims enhance their present reality by comparing it to a hypothetical worse reality. Johnson and Sherman (1990) suggest that downward counterfactual generation can help in coping with stressful events. However, although downward counterfactuals may provide comfort, they leave one ill-prepared for the future.[2] The student who simulates how a C− might have been even worse may be comforted but will not identify alternative strategies to improve the grade on future occasions. Thus, both downward social comparison and downward counterfactual generation can serve the function of enhancing coping and feelings of relative well-being by highlighting how the situation or outcome could easily have been worse.

In sum, both upward and downward counterfactuals hold trade-offs for the individual: the upward counterfactual prepares one for the future at the expense of immediate feelings of dissatisfaction, whereas the downward counterfactual enhances satisfaction, often at the expense of leaving one unprepared for the future.

REPEATABILITY AND COUNTERFACTUALS

If people generate upward counterfactuals primarily to prepare for the future and downward counterfactuals primarily to comfort themselves, this suggests some conditions under which each kind of counterfactual might be preferred. In particular, people who experience a particular outcome (e.g., a C− on an exam; the purchase of a "lemon" car) and who foresee the possibility of being in a similar situation in the near future (e.g., taking another exam in the course, buying another car) might be expected to generate primarily upward counterfactuals, with the goal of improving on that outcome.[3] On the other hand, for a one-time event

[2] One could argue that imagination of how things could have been worse helps to avoid future negative outcomes, but we would argue that avoidance of such worse outcomes is more economically attained by pursuing the same actions that resulted in the better factual outcome on this occasion.

[3] We restrict this generalization to the *near* future because of the large body of research showing that people sharply discount delayed rewards and punishments (see, e.g., Rachlin, Logue, Gibbon, & Frankel, 1986).

(e.g., one's only visit to Las Vegas; one's only time in graduate school) preparation for a better "next time" is largely irrelevant. The best one can do is to feel better about one's current outcomes and situation—by downward comparison ("It could have been worse; I could have lost more money.") Accordingly, we would expect the potential repeatability of an outcome to influence people's tendency to imagine better or worse possible counterfactual outcomes (or to use upward vs downward social comparisons).

In addition, people's desire either to improve upon an outcome or to obtain comfort and maximize the value of the obtained outcome may depend on their initial impressions of how good or bad the outcome is. In the following section, we consider possible influences of outcome valence on counterfactual thinking.

OUTCOME VALENCE AND COUNTERFACTUALS

Several theorists have suggested that people are generally more likely to engage in counterfactual thinking and to imagine what might have been different about bad than about good outcomes (e.g., Gavanski & Wells, 1989; Gleicher, Kost, Baker, Strathman, Richman, & Sherman, 1990; Kahneman & Miller, 1986; Landman, 1987). Kahneman and Miller (1986) posit that it is harder to imagine how a favorable reality might have been worse (downward counterfactual) than to imagine how an unfavorable reality might have been better (upward counterfactual).

However, previous research has not provided strong tests of the effects of outcome valence on counterfactual thinking. In much of this work, subjects have been instructed or otherwise directed to produce a specific change to a factual outcome (i.e., to make a bad outcome better or to make a good outcome worse). Such procedures have several deficiencies from our standpoint: (a) they do not tell us how outcome valence influences the *spontaneous* generation of counterfactuals; (b) they overlook the possibility that outcome valence may have different effects on the generation of upward and downward counterfactuals.

In addition, in most previous research, outcome valence has been at least partially confounded with the ease of generating different kinds of counterfactuals. For example, several studies have examined counterfactual thinking about scenarios that culminate in the death of the protagonist (e.g., Kahneman & Tversky, 1982; Wells & Gavanski, 1989). It is easy to imagine how such outcomes could have been better (upward counterfactual) but rather difficult to imagine how they could have been worse (downward counterfactual). In other research, only two possible outcomes have been explicitly described—either a favorable factual outcome paired with an unfavorable counterfactual outcome or an unfavorable factual outcome paired with a favorable counterfactual outcome (e.g., Gavanski & Wells, 1989; Gleicher et al., 1990). In each of these cases, bad outcomes

are paired with a better counterfactual *default event* (cf., Wells & Gavanski, 1989), whereas good outcomes are paired with a worse counterfactual default. But most outcomes that we experience in our daily lives allow imagination of both better *and* worse possible alternatives (although the availability of these two kinds of counterfactuals is probably somewhat correlated with the valence of the factual outcome). Under such conditions we predict that outcomes that are experienced as dissatisfying will activate a desire for something better and thus will stimulate upward counterfactuals; outcomes experienced as satisfying will lead to the desire to enjoy the outcome and will stimulate downward counterfactuals.

OVERVIEW OF THE RESEARCH

Our goals were to determine, first, whether the motives to improve upon one's outcome in the future or to gain maximum satisfaction from the obtained outcome influence the nature of the counterfactuals that people generate and, second, whether the relative strengths of these motives depends on the repeatability of the event and on people's initial perceptions of how good or bad the outcome was.

The scenario paradigms that have been used in previous work, in which uninvolved observer subjects read hypothetical stories and make inferences about the protagonists, are not well suited to studying the questions we address. Such paradigms are unlikely to activate either self-improvement or self-protection motives and, at best, they evoke only weak affect in subjects. Accordingly, we developed a paradigm that allowed us to examine the *spontaneous* generation of counterfactuals by people in an actual situation involving the self. Subjects played a computer-simulated blackjack game. The objective outcome was the same in all conditions: subjects tied the dealer and ended up with $5. This allowed all subjects the opportunity to make either upward (I could have won more money) or downward (I could have lost) counterfactuals.

To examine the effects of the motives to improve future outcomes or to enhance obtained outcomes on counterfactual thinking, we manipulated subjects' perceptions of the *repeatability* of the outcome. Some subjects (*repeaters*) were led to believe that they would be playing three more hands of blackjack after the first hand. Other subjects (*no-repeaters*) believed that they would be going on to an unrelated task after playing one hand of blackjack. Repeaters should be motivated primarily by a desire to improve their outcomes in the future, whereas no-repeaters should be motivated by a desire to make the best of their obtained outcome. Hence, the former group should tend to simulate how the outcome could have been better (upward counterfactual), whereas the latter group should simulate how the outcome could have been worse (downward counterfactual). Moreover, these differences in counterfactual generation should have a predictable effect on satisfaction: repeaters should be *less*

satisfied than no-repeaters with the outcome they obtained. This is because repeaters will be focused on how their outcome could have been better, whereas no-repeaters will focus on how things might have been worse.

In addition, we varied subjects' perceptions of outcome valence through a framing manipulation (see Kahneman & Tversky, 1979). This manipulation enabled us to study spontaneous counterfactual generation in reaction to three differently perceived valences of an identical outcome: positive, neutral, and negative. If negative outcomes are more likely to evoke counterfactual thinking, then subjects in "lose" frames should be most likely to imagine how the outcome might have been different whereas subjects in "win" frames should be least likely to do so. If, on the other hand, outcome valence influences only the generation of particular kinds of counterfactuals, then subjects in all conditions should be equally likely to simulate alternative outcomes, with the differences arising in the relative proportions of upward and downward counterfactuals. Subjects in "win" frames should generate relatively more downward counterfactuals, whereas subjects in "lose" frames should generate relatively more upward counterfactuals. If repeatable outcomes activate motives for improvement only to the extent that subjects are initially dissatisfied with the outcome, then this will show up as an interaction between outcome repeatability and outcome framing, with repeatable outcomes leading to relatively more upward counterfactuals than non-repeatable outcomes only in the case of negative framing.

Finally, we were interested in whether there was a difference between the counterfactuals that people generate when they simply speculate on what outcomes might have resulted had particular actions occurred (e.g., "What would have happened if I had selected the first card?") versus when they actually know what outcomes would have resulted from the actions (e.g., "If I had selected the first card, I would have won [lost]"). Accordingly, near the end of the procedure, we allowed subjects to see the values of the cards from which they could have selected had they chosen to hit again. Some of these cards would have resulted in subjects winning the game (i.e., beating the dealer) and others would have resulted in subjects going over 21 and losing the game. Thus, we obtained data concerning subjects' counterfactuals and levels of satisfaction during two discrete time intervals of the experiment: after subjects discovered their outcomes, but *before* they saw the values of the cards from which they could have selected, and *after* subjects saw the values of these cards.

METHOD

Subjects and design. Eighty-eight introductory psychology students participated in partial fulfillment of a course requirement. Subjects were randomly assigned to conditions of a 3 (Frame: win, neutral, lose) × 2 (Repeat vs No-repeat) factorial design. Seeing the cards from which they could have selected (before–after) was a within-subjects factor. Data from

TABLE 1
STARTING POINTS AND POTENTIAL PAYOFFS ($) FOR SUBJECTS IN THE THREE FRAMING CONDITIONS

	Frame		
	Win	Neutral	Lose
Subjects start with	0	5	20
"Possible" Outcomes			
Beat dealer	+20	+15	0
Tie dealer	+ 5	0	−15
Lose to dealer	0	− 5	−20
Net gain with tie	+ 5	+ 5	+ 5

Note. All subjects tied the dealer and ended up with $5.

two additional subjects, assigned to the win, no-repeat cell, were discarded due to a procedural error. As well, data from three subjects who "busted" during the experiment were discarded.

Procedure. Subjects were told that the study concerned "what people think about as they gamble." Subjects were informed that they would be asked to "think aloud" as they played blackjack. They were given a practice thinking-aloud task to allow them to become comfortable speaking into a tape recorder and were given detailed instructions on how to play the game, regardless of whether or not they were familiar with blackjack.[4] Subjects then saw a visual demonstration on a Macintosh SE computer of how the game was going to operate. When the demonstration was completed, subjects were informed of their potential payoffs. These payoffs are shown in Table 1.[5]

The game was programmed so that all subjects would tie the dealer and end up with $5. However, we used a framing manipulation to create in subjects a perception of *gaining* $5 in the win condition, *neither gaining nor losing* in the neutral condition, and *losing* $15 in the lose condition. In *win* conditions, subjects started off with no money. They were told that if they won (beat the dealer's hand) they would receive $20. If they tied (matched the dealer's hand), they would receive $5. If they lost (went over 21 or failed to beat or tie the dealer), they would receive nothing. In *neutral* conditions, subjects were given $5 to start with. They were told that if they won, they would receive an additional $15. If they tied, they would keep their $5. If they lost, they would lose the $5 that they were initially given. In *lose* conditions, subjects were given $20 to start with. They were told that if they won, they would keep the $20. If they tied, they would lose $15 of the $20. If they lost,

[4] One small change was made to the usual rules of blackjack: the dealer had to *stay* on 16 or more (the usual rule is that the dealer must *hit* on 16 or less). This rule change was made so that it would be possible for the dealer and subject to achieve a tie at 16.

[5] As shown in Table 1, the difference in the payoffs between winning and tying ($15) is greater than the difference between tying and losing ($5). This asymmetry was decided upon because Kahneman and Tversky (1979) have shown that the slope of the value function (i.e., the increment or decrement in the perceived value of an outcome) is steeper for perceived losses than for perceived gains. In other words, a gain of $5 has less impact on value and satisfaction than an equal loss of $5. The specific magnitudes of the payoffs for win, neutral, and lose conditions were decided upon based on pilot testing with a separate group of subjects.

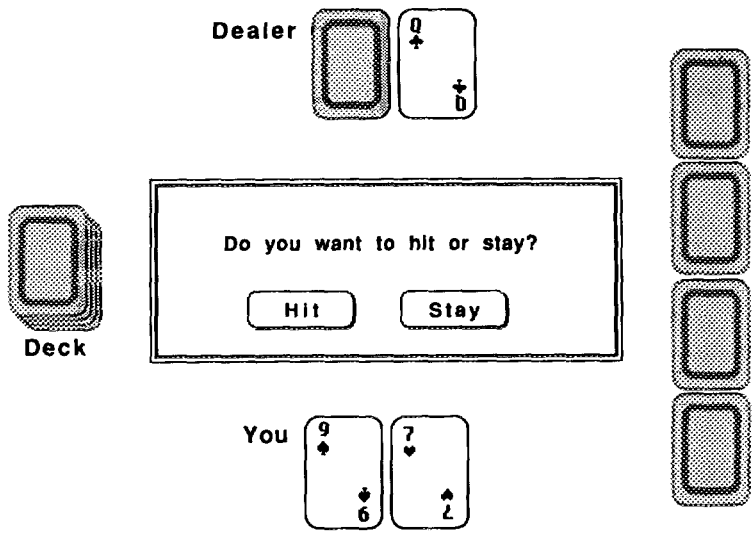

FIG. 1. Computer screen display at outset of game.

they would lose all $20. As can be seen, the potential and actual outcomes (i.e., the net gains) were objectively the same across the win, neutral, and lose conditions.

After being informed of the potential payoffs, subjects in *repeat* conditions were told that this would be the first in a series of four similar blackjack games that they would play. Subjects in *no-repeat* conditions were told that after playing this one hand of blackjack they would go on to an unrelated task that did not involve gambling. Subjects talked into the tape recorder as they played the game.

Subjects first saw the cards being "shuffled" on the computer screen. The subjects' and the dealer's cards were then dealt from the shuffled deck. In addition, four face down cards were dealt on the right side of the screen. The game was "fixed" in the following way: subjects were always dealt 16 to start off. (The number 16 was chosen because of the uncertainty it provides the players as to whether to stay or take another card.) The dealer was dealt a queen face up and one down card. Figure 1 shows the screen display that was visible to subjects at this point.

If subjects decided to hit (take another card), they were instructed to choose one of the four face-down cards. This card would become an ace (for a total of 17), regardless of which was chosen. The deck of cards was again shuffled on the computer screen and four new face-down cards were dealt to the side of the screen. If subjects hit again, the same sequence of events transpired, that is, subjects received another ace (18). If subjects hit yet again, they "busted" and the data were discarded (this occurred only three times). At whatever point subjects stayed, the dealer's face down card was revealed to show that the dealer had matched the subjects' hand (16, 17, or 18).

After subjects finished recording their thoughts to this point, the nature of the possible counterfactual alternatives was revealed. The four face-down cards on the side of the screen (from which subjects might have selected had they decided to hit again) were turned over to reveal a *two, ten, three,* and *king.* Note that the two and three would have won the game whereas the ten or king would have lost. The positions of the winning and the losing cards on the screen was counterbalanced. Subjects were instructed to continue recording their thoughts.

Subjects' spontaneous verbalizations during the thought-listing procedure served as our primary dependent measures. However, we also collected questionnaire data at the end of the experiment. Subjects indicated, on scales of −2 (extremely dissatisfied) to +2 (extremely satisfied), how satisfied they were with the outcome. In addition, they wrote down what might have occurred differently so that the outcome of the game would have been different. Finally, subjects completed a questionnaire that assessed suspiciousness and familiarity with the game of blackjack. Subjects were then debriefed and asked to keep the nature of the study confidential until all the data had been collected.

Coding. From the transcribed protocols, two judges who were blind to the experimental hypotheses and conditions independently coded the number and direction of the spontaneous *counterfactuals* generated by subjects (+1 = upward counterfactual; 0 = no counterfactual; −1 = downward counterfactual). Examples of responses coded as upward counterfactuals are: "maybe I should have taken another card";"I was hoping the dealer had a 6 or a 7 'cause he has to stay with 16 or 17"; "if I had gotten the 2, I would have beaten the dealer"; "Ooh . . . 3 would have been nice!"; "Wow, if I had picked the last one or second one I could've won." Examples of responses coded as downward counterfactuals are: "I get to keep the $5 instead of losing"; "it's better than losing it all, I guess"; "at least I didn't lose"; ". . . five dollars is better than nothing"; "Oh, a ten and a king . . . I'm happy I stayed."; "If I had gotten the king, I would have lost to the dealer."

The judges agreed 93% of the time as to whether or not subjects had generated at least one counterfactual during each interval of the game (i.e., both before and after subjects had seen the cards from which they could have selected had they hit again). Agreement concerning the presence of additional counterfactuals was somewhat lower, but acceptable (78% overall). Interjudge agreement on the *direction* of these counterfactuals was only moderate (r = .69 for the first counterfactual coded after subjects discovered the outcome of the game; r = .67 for the first counterfactual after subjects saw the cards from which they could have selected). The disagreements in direction appear to have arisen, at least in part, from cases where the judges had coded different statements as the first counterfactual. Accordingly, in cases where one judge had coded an upward counterfactual whereas the other had coded a downward counterfactual, the disagreement was resolved by a third judge. When both judges had agreed, either a +1 (upward) or −1 (downward) was assigned; when one judge had coded a counterfactual whereas the other had not, either a +.5 or −.5 was assigned. When neither judge had coded a counterfactual, a 0 was assigned. Because reliability was generally highest for the first counterfactuals that the judges coded both before and after subjects saw the cards from which they could have selected, our primary analyses concentrated on these counterfactuals.

The judges also coded any explicit expressions of *outcome satisfaction* on a scale ranging from −2 (extremely dissatisfied) to +2 (extremely satisfied). Subjects who gave no indication of satisfaction or dissatisfaction received a score of 0. Interjudge reliability was high for the satisfaction ratings (r = .84 for the interval after subjects discovered their outcomes; r = .94 for the interval after subjects saw the cards from which they could have selected). Analyses were performed on the mean satisfaction ratings.

RESULTS

In a preliminary analysis, we examined the number of "hits" that subjects took while playing the game. Of the 88 subjects, 24 stayed at 16, 48 took one additional card, and 16 took two cards (mean number of hits = .86). An analysis of variance (ANOVA) showed that the number of "hits" was not influenced by either Outcome Repeatability, $F(1, 82) = 1.66$, $p = .20$, or Outcome Frame, $F(2, 82) = 1.91$, $p = .15$; interaction, $F < 1$.

We initially analyzed the counterfactuals that subjects had generated immediately after discovering the outcome of the game (*before* they had seen the values of the cards that they could have selected from had they hit again). After discovering the outcome of the game, 82 of the 88 subjects spontaneously generated at least one codable counterfactual. Of these subjects, 28 generated two counterfactuals and 22 generated three counterfactuals. The average number of counterfactuals was 1.5. The overall number of counterfactuals was not significantly influenced by either Outcome Repeatability, $F(1, 82) = 1.55$, $p = .22$, or Outcome Frame, $F(2, 82) < 1$; the interaction between these factors also did not attain significance, $F(2, 82) < 1$.

Direction of Counterfactuals

We then examined the *direction* of the counterfactuals that subjects generated immediately upon discovering the outcome of the game, with upward counterfactuals coded as + 1 and downward counterfactuals coded as −1. In accordance with previous research (e.g., Kahneman & Tversky, 1982; Wells & Gavanski, 1989), we analyzed the first counterfactual that each subject generated. Six subjects, relatively evenly distributed among conditions, generated no codable counterfactuals and were omitted from the analysis. Figure 2 shows the mean direction-of-counterfactual score for subjects in all conditions. As shown in this figure, subjects tended to make downward counterfactuals, in that the mean direction-of-counterfactual score was negative in all but the lose-repeat condition. However, the relative incidence of upward and downward counterfactuals varied substantially by condition. An ANOVA showed significant effects of both Outcome Repeatability, $F(1, 76) = 5.32$, $p < .05$, and Outcome Frame, $F(2, 76) = 7.27$, $p < .01$. The Repeatability X Frame interaction was not significant, $F < 1$.[6]

As seen in Fig. 2, the proportion of upward to downward counterfactuals was greater for subjects who anticipated playing the game again (repeaters) than for subjects who did not anticipate playing the game again (no-repeaters). In addition, subjects in lose frames generated a higher proportion of upward to downward counterfactuals than did subjects in either neutral or win frames. Individual comparisons showed that the mean direction-of-counterfactuals for lose conditions significantly differed from that in both neutral and win conditions, $ps < .05$, and that the latter two conditions did not significantly differ.

[6] The same pattern of effects is obtained when this analysis is done including subjects who did not generate counterfactuals (these subjects received a score of 0: Frame, $F(2, 82) = 7.51$, $p < .01$; Repeatability, $F(1, 82) = 5.34$, $p < .05$; interaction, $F(1, 82) < 1$.

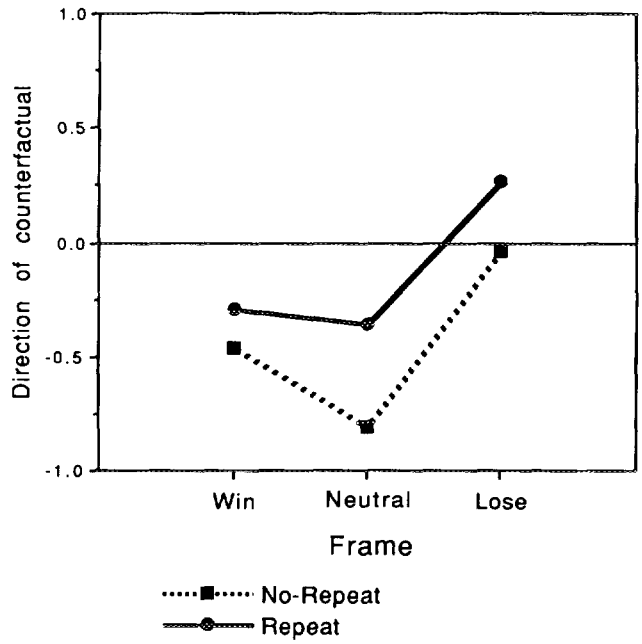

FIG. 2. Mean direction-of-counterfactuals (pre-card). Positive numbers indicate relatively more upward than downward counterfactuals; negative numbers indicate relatively more downward than upward counterfactuals.

Satisfaction With Outcome

We next examined subjects' spontaneous expressions of satisfaction with the outcome of the game (coded on a scale ranging from +2 = very satisfied to −2 = very dissatisfied). Satisfaction varied predictably with the pattern of counterfactuals. A 2 (Repeatability) × 3 (Frame) ANOVA on the satisfaction measure showed significant effects of both Outcome Repeatability, $F(1, 82) = 7.88$, $p < .01$, and of Outcome Frame, $F(2, 82) = 17.51$, $p < .001$. Figure 3 shows the mean satisfaction scores for subjects in all conditions. As shown in this figure, repeaters expressed less satisfaction with the outcome than did no-repeaters. In addition, subjects in lose frames were significantly less satisfied than were subjects in either neutral or win frames, $ps < .05$; the latter two groups did not differ in satisfaction. The Repeat X Frame interaction approached significance on this measure, $F(2, 82) = 2.77$, $p = .07$. As seen in Fig. 3, repeatability had relatively strong effects on subjects' satisfaction in the lose and neutral conditions but not in the win condition. Note that this pattern is paralleled by a nonsignificant tendency for the effects of repeatability on the direction of counterfactuals to be weaker in win conditions than in either neutral or lose conditions.

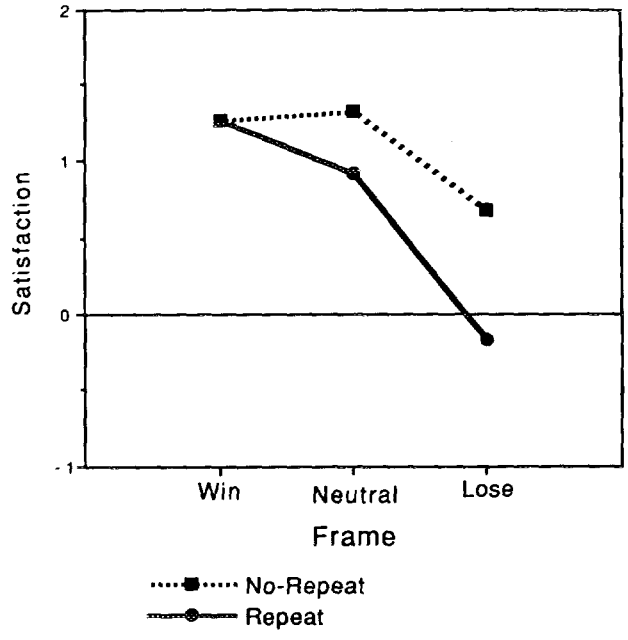

FIG. 3. Mean satisfaction ratings (pre-card).

These results suggest a close relation between direction of counterfactual comparison and outcome satisfaction—subjects in conditions that evoked the highest proportion of upward to downward counterfactuals were least satisfied with the obtained outcome. To further examine this relation, we calculated the correlation between direction-of-counterfactuals and outcome satisfaction, partialling out the contributions of the independent variables (i.e., Repeatability and Frame) to this relation. This analysis allows us to determine whether direction of counterfactuals and satisfaction are related independently of the effects of framing and repeatability on both of them. The correlation was significant, $r(72) = -.62$, $p < .01$, indicating that satisfaction decreased as the proportion of upward to downward counterfactuals increased.

After the cards were revealed

We next examined what happened to subjects' counterfactuals and expressions of satisfaction after they had seen the cards from which they could have selected had they "hit" again. Again, the majority of subjects (82 of 88) generated at least one counterfactual after seeing the cards. Of these, 16 generated two counterfactuals and 56 generated three.

To examine the effects of seeing the cards on the direction of subjects' counterfactuals, we performed a mixed ANOVA, with Before/After as

a within-subjects factor. Recall that two of the four cards would have resulted in the subject beating the dealer and two would have resulted in the subject "busting" and losing the game. Hence, subjects again had the opportunity to make either upward or downward counterfactuals. However, subjects overwhelmingly generated upward counterfactuals after seeing the cards. As shown in Fig. 4, the direction-of-counterfactuals score was positive in all conditions. The change in the direction of counterfactuals from before to after seeing the cards was significant, $F(1, 76) = 30.90$, $p < .001$.

With the "after-card" data included, neither Framing nor Repeatability produced significant main effects on the direction-of-counterfactuals measure, Framing $F(2, 76) = 2.65$, $p = .08$; Repeatability $F(1, 76) = 1.15$, $p = .29$. However, the effect of seeing the cards showed marginally significant interactions with both Framing, $F(2, 76) = 2.92$, $p = .06$, and Repeatability, $F(1, 76) = 2.99$, $p = .09$. These interactions reflect that seeing the cards eradicated the effects of Framing and Repeatability on the direction of the counterfactuals that subjects generated. ANOVA revealed no significant effects of these manipulations on subjects' "post-card" counterfactuals, Fs < 1.

One possible interpretation for the prevalence of upward counterfactuals after the cards were revealed is that subjects were surprised to discover that they would have had a 50% chance of winning with an additional card. Hence, they generated counterfactuals about this unexpected (exceptional) possible outcome. If so, then one might expect that subjects who had taken more hits, for whom the outcome should have been more surprising, would have generated relatively more upward counterfactuals. (The actual probabilities of not busting with another hit from a fair deck were .41 when the subject had 16 showing, .31 when the subject had 17 showing, and .21 when the subject had 18 showing.) In order to test this possibility, we included number-of-hits as a pseudo-factor in the design. This analysis showed no significant main or interaction effects of number of hits, all ps $> .20$. The degree to which the winning cards were improbable does not seem to have mediated the tendency toward upward counterfactuals.

Subjects also expressed significantly lower satisfaction after seeing the cards than before seeing the cards, $F(1, 82) = 12.18$, $p < .01$. However, on this measure, the main effects of Outcome Frame and Outcome Repeatability were still significant, Frame $F(2, 82) = 11.77$, $p < .001$; Repeat $F(1, 82) = 5.47$, $p < .05$. No interaction effects attained significance. When we performed an ANOVA on the post-card satisfaction alone, the effect of Frame remained significant, albeit substantially weaker, $F(2, 82) = 4.50$, $p < .05$. The effect of Repeatability was no longer significant, $F(1, 82) = 2.38$, $p = .13$. The interaction was not significant, $F(2, 82)$

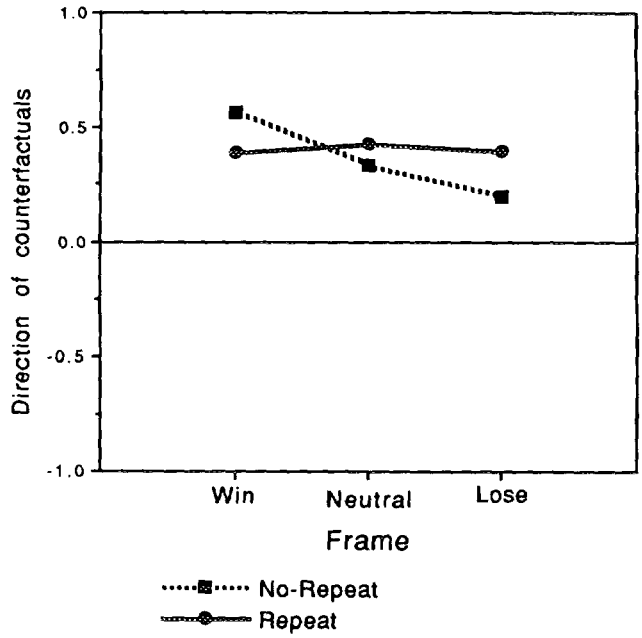

FIG. 4. Mean post-card direction-of-counterfactuals. Positive numbers indicate relatively more upward than downward counterfactuals; negative numbers indicate relatively more downward than upward counterfactuals.

= 1.18, p = .31. Figure 5 shows subjects' mean post-card satisfaction scores.

At this point, there is a difficulty in interpreting the reduction in satisfaction brought about by seeing the cards. The way that satisfaction was coded, 0s might reflect either ambivalence (i.e., some statements of satisfaction and some of dissatisfaction) *or* a lack of explicit statements about satisfaction. Hence, the drop in satisfaction after seeing the cards might simply reflect that subjects, having already expressed their levels of satisfaction earlier, made few statements concerning satisfaction after seeing the cards. Arguing against this possibility, only a small minority of subjects had actually received scores of 0 on either the pre- or post-card satisfaction measures. Of the 88 subjects, 5 received satisfaction scores of 0 before seeing the cards whereas 8 received satisfaction scores of 0 after seeing the cards (2 subjects received 0s on both the pre- and post-card measures). When we repeated the analysis omitting the 11 subjects who had received 0s on *either* the pre- or post-card satisfaction measure, the reduction in satisfaction brought about by seeing the cards remained significant, $F(1, 74) = 5.89$, $p = .02$.

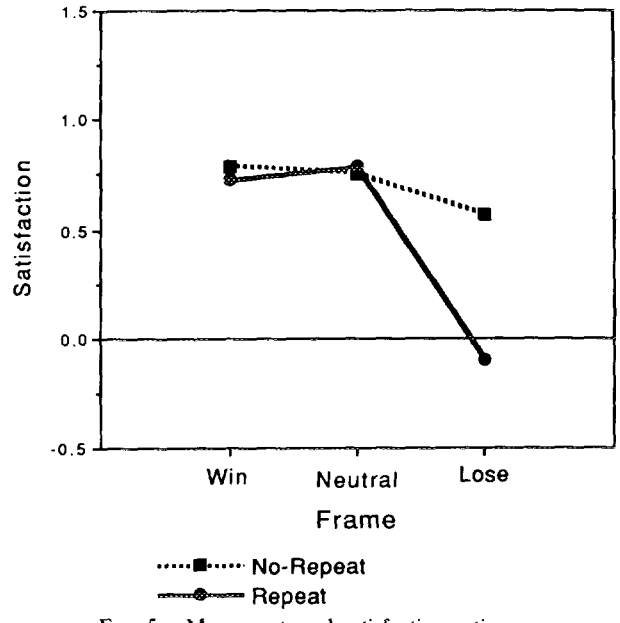

FIG. 5. Mean post-card satisfaction ratings.

Questionnaire Data

Subjects' questionnaire data, obtained at the end of the study, followed a similar pattern to the verbal protocol data from the time interval *after* subjects had seen the cards from which they could have selected. That is, there was a significant effect of Outcome Frame on satisfaction, $F(2, 82) = 31.35$, $p < .001$, such that subjects reported greater satisfaction in the win and neutral frames than in the lose frame. In addition, there was a marginally significant effect of Outcome Repeatability, $F(1, 82) = 3.06$, $p = .08$, such that subjects were more satisfied in no-repeat conditions than in repeat conditions. As with the post-card verbal protocols, the counterfactuals that subjects wrote on the questionnaires failed to show consistent effects of the manipulations. There were no significant effects involving Outcome Frame, $ps > .50$. The first counterfactual listed did show a marginally significant effect of Repeatability, such that subjects generated relatively more *upward* than downward counterfactuals in the no-repeat conditions, $F(1, 82) = 3.65$, $p = .06$. However, this pattern was reversed with the second counterfactual, with subjects generating relatively more downward counterfactuals in the no-repeat conditions, $F(1, 82) = 7.10$ $p < .01$.

DISCUSSION

Previous work in the area of counterfactual generation has focused primarily on the cognitive rules that govern the availability of different counterfactuals. This work has informed us of important factors that determine which counterfactual is most likely to be generated under various situations. For example, we know that the timing of events is very much related to counterfactual generation. People are likely to mentally undo the initial event in a causal chain (Wells et al., 1987) and to undo the final event in a temporal chain (Miller & Gunasegaram, 1990). In addition, counterfactuals are more likely to develop around exceptional or surprising events as opposed to normal events (Kahneman & Miller, 1986) and around actions rather than inactions (Landman, 1987).

Although findings such as these have helped us to understand important antecedents and consequences of counterfactual thinking, the current study suggests that a fuller understanding of counterfactual generation will require more than the cognitive rules that govern the availability of various counterfactual scenarios. We must, in addition, consider how counterfactual thinking serves people's motives and goal states. Counterfactual generation has functional value, and people tend to generate those counterfactuals that hold the greatest psychological value for them in a given situation.

We have identified two important values of counterfactual thinking: improvement of one's outcomes in the future and the provision of comfort and the ability to deal with stressful or negative situations. The motivations for these two goals will be differentially activated in different kinds of situations and will determine the direction of counterfactual generation. We have investigated two factors that affect one or the other of these motivations. The repeatability of an event induces the goal of improving upon one's outcomes in the future. This leads one to think about how things might have been better "if only—." Such thinking will ensure that one tries to bring about the "if only" situation in the future so that better outcomes might be achieved. For one-time events, preparation for a better future is irrelevant. The predominant goal is thus to make the best of whatever outcome occurred. This goal is best met by generating counterfactuals that allow one to see that things could have been worse and that at least those very negative outcomes did not occur. Interestingly, the attainment of each goal comes with its cost. Preparing for the future leaves one focused on the inadequacy of current outcomes and leads to feelings of dissatisfaction. The comfort obtained by thinking about how things could have been worse comes at the expense of being unprepared in the future should the same or a similar situation happen to arise.

In addition to repeatability, outcome valence also affects the goal or motive that is activated. Outcomes experienced as negative focus one on

the inadequacy of the current situation and thus on the possibility of better outcomes that might have been or could be. Positively experienced outcomes focus one on the goodness of these outcomes compared to other things that could have been. These findings suggest that optimists and pessimists, who may view the very same outcome in positive or negative terms respectively, may well generate different counterfactuals as a consequence of their psychological framing. The optimist may be satisfied and happy, and yet may be ill-prepared to improve upon circumstances in the future. The pessimist, on the other hand, may be well set up for improvement in the future, but may never enjoy the fruits of improvement due to the predominance of upward counterfactual generation.

In identifying two of the important functions of counterfactual generation, the current findings have illuminated the importance of the direction of counterfactual thought. Upward counterfactuals are activated by the goal of future improvement. This focus on better possible worlds allows one to avoid mistakes in the future. Downward counterfactuals are activated by the goal of coping with the present. Worse alternative worlds allow one to feel relatively satisfied and fortunate, despite the absolute level of the negativity of an outcome.

Given the close link between counterfactual thinking and causal attribution (Gavanski & Wells, 1989; Kahneman & Tversky, 1982; Lipe, 1991), it is interesting to consider how the different counterfactuals evoked by repeatable versus non-repeatable outcomes may influence the nature of people's causal attributions. Repeatable outcomes evoke upward counterfactuals. Upward counterfactuals about one's own behavior and performance at a task (i.e., what could I have done differently to improve the outcome?) may lead to lower estimates of one's ability; upward counterfactuals about the task (i.e., what could have been different about the task that would have improved the outcome?) may lead one to view the task as more difficult than would otherwise be the case. Hence, one might expect that repeatable outcomes would lead to lower ability attributions *and* higher task-difficulty attributions than non-repeatable outcomes. Interestingly, one causal attribution study (Wortman, Costanzo, & Witt, 1973) did manipulate the potential repeatability of an outcome and found exactly this pattern. Although Wortman et al. did not interpret their results in terms of counterfactual thinking processes, our research suggests that different directions of counterfactuals may well have mediated the effects of outcome repeatability on the subjects' causal attributions.

In focusing on upward and downward counterfactuals, the present work has helped us to see some important links between principles of counterfactual generation and social comparison principles. The literature on social comparison has pointed out that people can choose for social comparison purposes either those who are better off than themselves (upward social comparison) or those who are worse off (downward social com-

parison). Upward social comparison is typically associated with the motive of self-improvement (Festinger, 1954; Wheeler, 1966), although focusing on those who are better off might well make one feel inadequate. Downward social comparison is typically associated with self-protection, although a focus on people who are worse off may prevent one from improving or learning to be better. Thus, whether the comparisons are with other specific individuals (in the case of social comparison) or with alternative possible worlds (in the case of counterfactual generation), the goals that drive the motivational processes and the outcomes of these processes seem very similar indeed.

These parallels between social comparison principles and counterfactual generation imply that work in each area, although separately developed historically, may well have benefits for the other. For example, one principle of social comparison is that people generally tend to compare themselves to similar others. This implies that counterfactuals that involve subjectively small changes (similar realities) will be more likely than counterfactuals that require large changes. In fact, counterfactuals involving relatively small changes do appear to be more likely (Kahneman & Tversky, 1982). Many other findings in the social comparison literature identify when different types of others will and will not be chosen for comparison purposes (for overviews, see Wills, 1981; Wood, 1989). The factors identified in these studies may suggest when certain counterfactual worlds as opposed to other possible worlds will be generated, for both cognitive and motivational reasons.

Similarly, consideration of the literature on counterfactual generation may lead to important suggestions about when and why certain social comparisons as opposed to others are likely to occur. Literature on counterfactual generation and the exceptionality of events suggests that the unexpectedness or surprisingness of people's outcomes may make them especially likely targets for social comparison. Or perhaps people who do things rather than those who maintain the status quo are likely to be chosen for social comparison. In any case, it seems likely that these two areas of work have much to offer each other both in the way of specific predictions and in the way of conceptual clarification.

Aside from the general principles of counterfactual generation that the present study has suggested, several of the more specific findings are worthy of comment. With regard to the effects of positive vs. negative framing of outcomes, we found that the former led to relatively more downward counterfactuals. However, we did not find a greater number of counterfactuals in response to negative outcomes as previous literature might have suggested (Gavanski & Wells, 1989; Gleicher et al., 1990; Landman, 1987). There are several possibilities for this seeming discrepancy. In the first place, past research has employed scenarios where the possible alternatives were limited in terms of number and direction, and

perhaps these limitations were more severe for the positive outcome scenarios. Our situation clearly allowed for counterfactuals in both directions, and the objective outcome was identical. Other studies had employed quite different positive and negative scenarios rather than simply manipulating the framing of a constant outcome. A second possibility is that positive outcomes do generally lead to fewer counterfactuals because they are more expected and less surprising. People don't usually expect to fail or to have negative events occur. In the current study, however, whether the outcome was framed as positive, negative, or neutral, it was a quite unusual and surprising event—an exact tie with the dealer (cf. Kahneman & Varey, 1990). It may have been the novelty of this outcome that allowed for the large and equal number of counterfactuals in all the framing conditions.

Another finding of note concerns the effects of subjects seeing the cards that they would have received had they taken another hit. Recall that after subjects had chosen not to take a further hit, they were shown the cards from which they could have chosen. Two of these cards would have led to a win, and two would have led to a loss. Upon seeing these cards, subjects in *all* conditions focused on the potentially winning cards and they overwhelmingly generated upward counterfactuals (and showed a corresponding decrease in satisfaction with the outcome).[7] Seeing the actual values of the cards also erased the effects of framing and repeatability on the counterfactuals that subjects generated (note, however, that the initial effects of these manipulations on subjects' satisfaction with the outcome persisted to some extent). There are two possible interpretations of these effects. First, subjects may have been surprised that as many as two of the four cards would have led to a win and hence generated counterfactuals about this surprising outcome. The fact that the tendency toward upward counterfactuals was not influenced by the objective probabilities of a winning card (i.e., whether the subject had 16, 17, or 18 showing) argues against this possibility. However, because we did not assess *subjective* probabilities of winning with another card, it cannot be ruled out.

An alternative and interesting possibility is that counterfactual thinking processes differ when people simply speculate on what outcomes might have resulted had particular actions occurred (e.g., "What would have happened if I had selected the first card?") and when they actually know what outcomes would have resulted from the actions (e.g., "If I had

[7] Interestingly, some subjects actually expressed reluctance to see the cards from which they could have selected. Presumably they did so in anticipation of the possibility that seeing the cards might reduce their satisfaction with the outcome. Research currently underway is exploring conditions under which people are likely to either seek out or avoid information about counterfactual alternatives.

selected the top card, I *would* have won"). In the former case, subjects' counterfactuals seem to be determined by the motives that are activated by situational circumstances—better possible worlds with repeatability and negative outcomes, worse possible worlds with no repeatability and with positive outcomes. In the latter case, once subjects know for sure that a better world *was* possible if a particular choice had been made, these positive possibilities dominate attention and lead to upward counterfactual generation and the consequences of such generation. This distinction between situations where the consequences of counterfactuals are imagined (e.g., what would have happened had Lincoln not been shot?) and situations where the consequences are known (e.g., if I had bought stock X as opposed to stock Y, I would now be $50,000 better off) is one that is certainly worth pursuing.

In addition to specifying the conditions under which upward or downward counterfactuals are likely, the present study also demonstrated the close correspondence between the type of counterfactual generated and the type of affect experienced. Upward counterfactuals were associated with dissatisfaction, whereas downward counterfactuals were associated with feelings of satisfaction. Although we suspect that the relation between counterfactuals and affect is reciprocal (i.e., initial satisfaction influences type of counterfactuals *and* type of counterfactuals influences subsequent satisfaction), our results provide evidence for the causal influence of counterfactuals on affect. It is difficult to imagine (simulate) how the potential repeatability of an outcome would directly produce the patterns of satisfaction that were obtained, independently of counterfactual thinking processes. In fact, repeatability in our experiment meant a chance to win *more* money in the future, so if anything one would expect subjects in repeat conditions to be happier. In addition, the finding that seeing the "counterfactual inducing" cards produced sharp reductions in satisfaction is hard to explain without positing that the counterfactuals that subjects generated actually caused them to become less satisfied.

Finally, we wish to point out other ways in which the current study has gone beyond previous work on counterfactual thinking. Much of the previous research (e.g., Johnson, 1986; Kahneman & Tversky, 1982; Landman, 1987; Wells & Gavanski, 1989) has examined situations involving extreme and dramatic outcomes (e.g., death, serious injury, winning a lottery). One unfortunate consequence of this focus on dramatic-outcome situations might be to encourage the impression that counterfactual thinking guides cognitive and emotional responses only in a highly circumscribed set of circumstances. We have here demonstrated the importance of counterfactual thinking in response to relatively mundane outcomes of the kind that are common in people's day-to-day living.

In addition, most previous work on counterfactual generation has involved hypothetical scenarios in which the self was not directly included.

The amount of personal involvement in such scenarios is likely to be minimal. By including the self directly in outcomes that have self-relevance and meaning, we were able to examine counterfactual generation as it occurs more naturally. Moreover, past work has generally directed subjects to generate counterfactuals that might undo a given outcome. Such direction leaves open the possibility that spontaneous counterfactual generation may not be very likely and may operate by a quite different set of principles. We were able to observe spontaneous counterfactual generation and thus to identify factors that lead people not simply to respond to imperatives to undo an outcome but that lead them to generate such alternative worlds on their own.

In short, we believe that this research brings us closer to understanding the interplay of cognition and affect in the kinds of counterfactual thinking processes that are an integral part of our day-to-day existence; they provide insight into both *when* people will imagine certain alternatives to reality, as opposed to others, and *why* people bother to imagine these counterfactual alternatives in the first place.

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