Journal of Personality and Social Psychology
2006, Vol. 91, No. 1, 33–48

0022-3514/06/$12.00 DOI: 10.1037/0022-3514.91.1.33

Thinking Within the Box: The Relational Processing Style Elicited by Counterfactual Mind-Sets

Laura J. Kray
University of California, Berkeley

Adam D. Galinsky
Northwestern University

Elaine M. Wong
University of California, Berkeley

By comparing reality to what might have been, counterfactuals promote a *relational processing style* characterized by a tendency to consider relationships and associations among a set of stimuli. As such, counterfactual mind-sets were expected to improve performance on tasks involving the consideration of relationships and associations but to impair performance on tasks requiring novel ideas that are uninfluenced by salient associations. The authors conducted several experiments to test this hypothesis. In Experiments 1a and 1b, the authors determined that counterfactual mind-sets increase mental states and preferences for thinking styles consistent with relational thought. Experiment 2 demonstrated a facilitative effect of counterfactual mind-sets on an analytic task involving logical relationships; Experiments 3 and 4 demonstrated that counterfactual mind-sets structure thought and imagination around salient associations and therefore impaired performance on creative generation tasks. In Experiment 5, the authors demonstrated that the detrimental effect of counterfactual mind-sets is limited to creative tasks involving novel idea generation; in a creative association task involving the consideration of relationships between task stimuli, counterfactual mind-sets improved performance.

Keywords: counterfactuals, mind-sets, relational processing, analytical, creativity

Whenever individuals consider how the past might have turned out differently, they are engaging in counterfactual thinking. For example, people who ponder, "What would life be like if I had married that other person?" or "Would I be better off if I had selected that other job?" are implicitly comparing reality with what might have been. Thoughts of "if only" and "what if" are signposts for counterfactual musings, and their presence in mental life is both pervasive and predictable. A growing body of literature suggests that counterfactuals are not merely fodder for daydreamers stuck in the past but rather serve important functions for directing future behavior (Roese & Olson, 1995).

Laura J. Kray and Elaine M. Wong, Haas School of Business, University of California, Berkeley; Adam D. Galinsky, Kellogg Graduate School of Management, Northwestern University.

Elaine M. Wong is now at the School of Communication, Northwestern University.

This research was supported in part by National Science Foundation Grants SES-0233294 and SES-0136931. We gratefully acknowledge insightful comments provided by Phil Tetlock on an earlier version of this article and the valuable feedback provided by participants in colloquia at the Haas School of Business, Carnegie Mellon University, and the University of Chicago. We are indebted to the many research assistants who helped out in every stage of the research process. In particular, we are grateful to Joyce Chen, Joe Gacula, Linda Pham, and Alissa Roberts.

Correspondence concerning this article should be addressed to Laura J. Kray, Haas School of Business, 545 Student Services Building, #1900, Berkeley, CA 94720. E-mail: kray@haas.berkeley.edu

In the present article, we examined the impact of counterfactual thinking on subsequent thinking styles and problem solving. Broadly speaking, we explored how reflecting back on events in which an outcome almost turned out differently impacts future problem solving. More precisely, we explored the nature of the mind-set that results from constructing counterfactual thoughts. Because counterfactuals involve a consideration of both reality and what might have been, they are inherently relational in nature. Our central thesis is that constructing counterfactual thoughts in one context produces a counterfactual mind-set characterized by a tendency to process information relationally in subsequent contexts. Thus, the mental structure of logical relationships created through counterfactual thinking increases the ability to understand and perceive relationships in subsequent contexts, structuring thought around salient associations and the pursuit of connections. Because the counterfactual mind-set occurs regardless of the content or valence of the counterfactual thoughts (Galinsky & Kray, 2004; Galinsky & Moskowitz, 2000; Kray & Galinsky, 2003), what lingers is the form and structure of the counterfactual (i.e., the tendency to consider relationships and connections between a set of stimuli).

Although previous research has explored the consequences of the counterfactual mind-set on subsequent performance across a variety of tasks, the present research is the first to identify the mental states and thinking styles that counterfactuals activate and the mechanisms by which counterfactual mind-sets have their effects. We characterize the counterfactual mind-set as a structured form of thought involving a consideration of relationships and

associations between a set of stimuli. We expect this processing style to have three consequences. First, it should create phenomenological experiences and preferences for structured thought (Sternberg, 1988). Second, it should promote lay conceptions of *analytic thought*, defined as "an examination of a complex, its elements and their relations" (Merriam-Webster, 2005). Third, it should promote structured imagination, or the tendency to build on existing knowledge structures (Ward, 1994). We have chosen the term *relational processing style* to capture the essence of the counterfactual mind-set because it both describes the nature of counterfactual thoughts and because it is broad enough to encompass the full range of effects produced by the activation of a counterfactual mind-set.

The Conceptual Link Between Counterfactuals and Relational Processing

Although the ability to undo events and construct possible worlds is theoretically unlimited, in reality, when and how counterfactuals are constructed is fairly predictable. The commencement of counterfactual thinking is often initiated when an event nearly occurred (Kahneman & Miller, 1986; Roese & Olson, 1997). For example, missing a plane by 5 min tends to evoke more counterfactuals than missing a plane by 1 hr, presumably because the former case more readily conjures up elements of the day leading up to the flight that could have been undone. In addition to near misses, "abnormal" events tend to produce counterfactual thoughts. For example, it is easier to undo missing one's flight when a new, atypical route to the airport was taken than it is after taking one's usual route. It is often the mere presence of an obvious mutable component to an event that leads to the spontaneous generation of counterfactuals.

Just like the rules that govern when counterfactuals are generated, how counterfactual thoughts are constructed is predictable. Counterfactuals involve a comparison of the relationship between reality and what might have been. Constructing a counterfactual thought implicitly involves laying out a causal chain of events in an action sequence and mutating one step in the process to construct an alternate reality. As such, running a counterfactual simulation in one's head is the mental equivalent of conducting an experiment. Like the experimental process, counterfactual thinking involves a logical consideration of relationships and causal associations between events (Einhorn & Hogarth, 1986; Mandel, 2003; Mandel & Lehman, 1996; Wells & Gavanski, 1989). For example, Wells and Gavanski showed that an initial event was judged to be causally connected to a subsequent event to the extent that a mutation to the initial event would have undone the occurrence of the subsequent event.

As described above, a logical structure underlies when and how counterfactuals are created. Counterfactuals are most likely when potential mutations to a sequence of events are salient or when potential alternative worlds are close in time and space. Implicit comparisons assessing similarities and differences between the alternate world and reality are then made that facilitate the identification of causal connections (Markman & McMullen, 2003). Broadly speaking, relational processing is used in counterfactual thinking in that it involves the consideration of relationships and connections between events. We expect that once the counterfactual mind-set is activated, it persists because the relational processing style that accompanies it is a well-learned and useful strategy for assessing causality, a critical tool for comprehending the world (cf. Kelley, 1973).

Past research has demonstrated that situations with an obvious mutable component tend to elicit counterfactual thoughts, which then orient cognition in subsequent contexts. This cognitive orientation has been called a "counterfactual mind-set" (Galinsky & Kray, 2004; Kray & Galinsky, 2003). The idea that the activation of a counterfactual mind-set impacts subsequent cognition and performance has received strong support across a variety of individual and group tasks. More specifically, counterfactual mind-sets appear to be an asset when the consideration of alternatives facilitates performance (Galinsky & Kray, 2004; Galinsky & Moskowitz, 2000; Kray & Galinsky, 2003). Counterfactual mind-sets also appear to encourage skepticism about the dominant hypothesis. For example, having just considered an alternate reality can reduce the confirmation bias or the tendency to seek information that is consistent with an existing hypothesis to the relative detriment of information that could potentially disconfirm it (Galinsky & Moskowitz, 2000; Kray & Galinsky, 2003). In fact, the number of counterfactual thoughts generated in response to a mutable scenario has been shown to be an important predictor of subsequent disconfirmatory information search (Kray & Galinsky, 2003). Counterfactual mind-sets also improve decision accuracy by increasing the discussion of unique information critical for group decision making and promoting synergistic coordination, or the tendency of group members to build on and develop relationships between each other's ideas (Galinsky & Kray, 2004; Liljenquist, Galinsky, & Kray, 2004). Finally, counterfactual thinking has been shown to increase the scrutiny of persuasive message content (Krishnamurthy & Sivaraman, 2002), enabling decision makers to distinguish between strong and weak arguments. Despite the diversity of tasks explored in this growing body of literature, a common facilitative effect has emerged after the activation of a counterfactual mind-set. Overall, it appears that by considering alternative realities in one context, greater clarity regarding task associations is gained in later contexts. Although the counterfactual mind-set has been described generally as promoting "a consideration of alternatives" (Galinsky & Moskowitz, 2000), in the present investigation, we seek to better understand the content of and processing style associated with this counterfactual mind-set and the mechanisms by which it impacts performance.

Research Overview

Despite numerous demonstrations that counterfactual mind-sets affect subsequent problem solving, to date, our understanding of the exact nature of a counterfactual mind-set has been limited because little effort has been made to explore the underlying process by which counterfactual mind-sets influence performance. Although previous research has examined the content and structure of counterfactual thoughts (Roese, 1994; Roese & Olson, 1995), no research to date has explored the phenomenological experience produced by counterfactual thinking. We argue that the mind-set promotes a relational processing style, characterized by a tendency to ponder associations and make connections between a set of stimuli. As such, we suggest that counterfactual mind-sets will

improve performance on analytic tasks, which typically require that one identify and understand the relationships among a set of stimuli.

In seeking to understand the unique characteristics of the counterfactual mind-set, we also explored its impact on two types of creative tasks. Our hypothesis that counterfactual mind-sets promote a relational processing style suggests that they might lead to imaginative processes that build from existing knowledge structures. Ward (1994) termed the tendency to rely on existing knowledge in the creative process as "structured imagination." Although Ward demonstrated that structured imagination is fairly characteristic of how creative tasks are approached in general, we argue that this tendency is intensified by the activation of a counterfactual mind-set. Just as the generation of counterfactual thoughts are structured and conform to certain rules and logic, we contend that imagination following the activation of a counterfactual mind-set is structured around salient knowledge structures. Therefore, counterfactual mind-sets should have a positive effect on creative tasks that require the identification of associations within and between a set of stimuli. However, if a counterfactual mind-set consists of a relational processing style that structures imagination, then it might hinder the generation of novel ideas. This increased attention to associations among task stimuli may actually decrease one's ability to "think outside the box."

Each of the findings described above is consistent with the basic hypothesis that counterfactual mind-sets foster not just a consideration of alternatives, as previous research has suggested, but more precisely a consideration of relationships and connections between or among a set of stimuli, structuring thought and imagination around these associations. The present set of experiments was conducted to test this hypothesis. In Experiment 1a and 1b, we examined whether counterfactual mind-sets promote a phenomenological experience consistent with a relational processing style. In Experiment 2, we examined whether counterfactual mind-sets improve performance on an analytic task requiring the consideration of relationships and associations. Specifically, we examined performance on a standardized test designed to assess the analytic reasoning skills of potential graduate school applicants. In Experiments 3 and 4, we explored the impact of counterfactual mind-sets on structured imagination. In Experiment 5, we examined the relative impact of counterfactual mind-sets on creative generation versus creative association tasks, which generally differ in the optimal degree of conceptual attention devoted to relationships and associations between task stimuli. Overall, the studies presented here clarify the nature and phenomenology of the counterfactual mind-set by demonstrating that activating a counterfactual mind-set promotes a relational processing style and therefore has predictable effects, both beneficial and detrimental, on a range of problem-solving tasks.

Experiment 1a: Counterfactual Mind-Sets and Mental States

The purpose of Experiment 1a was twofold. First, we sought to better understand how a counterfactual mind-set is experienced at a phenomenological level. As described above, we expected that the mental structure of logical relationships created through counterfactual thought would promote a relational processing style. In considering how this processing style might translate into a mental state, we reasoned that an individual who is primed to consider logical relationships should feel poised for analytic and critical thinking.

A second goal was to rule out the possibility that a third variable is responsible for the effect of counterfactual mind-sets on performance. Because analytic thinking is affected by mood (Schwarz & Bless, 1991), it is possible that counterfactual mind-sets simply depress moods. Previous research has addressed this possibility by manipulating whether participants generate downward versus upward counterfactuals (Roese, 1994). Downward counterfactuals, or thoughts about how events could have been worse, tend to evoke positive feelings such as joy, relief, and surprise. Upward counterfactuals, or thoughts about how events could have been better, tend to evoke negative feelings such as regret, remorse, and disappointment. Because upward and downward counterfactuals tend to evoke different emotional experiences, the fact that the valence of the counterfactual thoughts has not moderated any of the findings to date on counterfactual mind-sets and problem solving (Galinsky & Moskowitz, 2000; Kray & Galinsky, 2003) suggests that affect and counterfactual mind-sets have independent effects on problem solving. In the present experiment, in addition to manipulating the valence of the scenario, we also measured mood to determine whether it operates as a mediator. Recognizing that common psychological measures of affect rely on self-assessments (cf. Watson, Clark, & Tellegen, 1988), we compared self-reported cognitive and affective states after engaging in counterfactual thinking.

Method

Design. The experiment had a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) between-subjects factorial design.

Participants. Participants were 65 students on a large western university campus. Participants were approached in several cafes on campus and asked to complete a short questionnaire. In return for their compliance, they were given a pencil bearing the university's logo.

Procedure. Participants read a scenario that described the actions of Jane, a woman who was attending a rock concert (see Galinsky & Moskowitz, 2000). In each scenario, an individual at the rock concert wins a valuable prize, a trip to Hawaii. In half of the scenarios, Jane is the winner of the prize (positive valence); in the other half of the scenarios, Jane is not the winner of the prize (negative valence). In addition, half of the scenarios describe a sequence of events designed to elicit counterfactual thoughts, and half of the scenarios describe a sequence of events that is not expected to elicit counterfactual thoughts. In the downward counterfactual scenario, Jane wins the trip to Hawaii when the new seat she had just switched to (in order to get a better view of the stage) was chosen. In the upward counterfactual scenario, Jane loses the trip to Hawaii when the seat that she had just switched from wins the trip. In the noncounterfactual conditions, Jane does not switch seats. After reading one of the four scenarios, participants were asked to consider some thoughts likely to be running through Jane's mind.

After considering the scenario, participants were asked to "Please indicate the extent to which your current mental state is characterized by the following attributes." This measure allowed us to evaluate the degree to which participants' current cognitive state was consistent with a sense of being analytic. Specifically, participants' cognitive states were assessed

along the following dimensions ($\alpha = .85$): analytic, critical, focused, and smart.[1]

We also sought to distinguish the impact of counterfactual thinking on cognitive states from its impact on affective states. As affective experience can be distinguished along valence-based and arousal-based dimensions (Feldman, 1995; Russell, 1980), we measured both of these affective responses separately. To measure valence-based affect, we included a two-item mood measure ($\alpha = .80$): mood and happy. To measure arousal-based affect, we simply asked participants to assess their perceived arousal. Mood was measured on a 9-point scale ranging from 1 (*very negative*) to 9 (*very positive*). All other assessments were done on 9-point scales ranging from 1 (*not at all characteristic*) to 9 (*very characteristic*).

Results and Discussion

To test our hypotheses regarding the cognitive and affective states elicited by a counterfactual mind-set, we conducted 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) between-subjects analyses of variance (ANOVAs). Table 1 provides a correlation matrix of all experimental variables.

Cognitive state. We hypothesized that the process of thinking counterfactually would elicit a sense of being analytic. Consistent with our hypothesis, participants in a counterfactual mind-set ($M = 5.8$, $SD = 1.6$) rated their cognitive state as being more consistent with a sense of being analytic than did participants exposed to a noncounterfactual scenario ($M = 4.3$, $SD = 1.9$), $F(1, 61) = 14.12$, $p < .001$.[2] No other effects emerged as statistically significant.

Valence-based affective experience. Although we did not expect our counterfactual manipulation to affect participants' affective experience, we explored whether the protagonist winning or losing the valuable prize would affect participants' emotional reaction. Participants exposed to a positive outcome scenario indeed reported a more positive emotional experience ($M = 6.9$, $SD = 1.5$) than did participants exposed to a negative outcome scenario ($M = 5.39$, $SD = 2.1$), $F(1, 61) = 8.43$, $p = .005$. Neither the effect for type of prime, $F(1, 61) = 1.2$, $p = .28$, nor the interaction between type and valence of prime, $F(1, 61) = 0.08$, $p = .78$, were statistically significant.

Arousal-based affective experience. Like affect, we expected that only the valence of the outcome in the rock concert scenario would impact participants' perceived level of arousal. Consistent with this hypothesis, a main effect for valence of prime emerged as statistically significant, $F(1, 61) = 5.57$, $p = .02$. Participants who read the scenario in which a positive outcome occurred ($M = 5.37$, $SD = 2.97$) reported feeling more aroused than participants who read a scenario in which a negative outcome occurred ($M = 3.63$, $SD = 2.7$). An unanticipated two-way interaction between valence of prime and type of prime also emerged, $F(1, 61) = 4.17$, $p = .05$. In the noncounterfactual condition, participants reported more arousal after the positive outcome ($M = 6.22$, $SD = 2.86$) relative to the negative outcome ($M = 2.96$, $SD = 2.54$), $t(31) = 3.17$, $p = .01$; however, in the counterfactual condition, the difference between the two outcomes ($M = 4.6$, $SD = 2.99$ vs. $M = 4.4$, $SD = 2.72$) was not statistically significant, $t(30) = 0.22$, *ns*. No other effects emerged as statistically significant.

The main purpose of this study was to provide support for our assertion that counterfactual mind-sets create a phenomenological experience consistent with a relational processing style. Consistent with this hypothesis, participants in the counterfactual condition reported feeling more poised for critical thinking than did baseline participants. After having engaged in relational processing through the construction of counterfactual thoughts, participants in the resulting mind-set reported more affinity for analytic thinking.

Another goal of this study was to bolster support for the assertion that the impact of counterfactual mind-sets on cognitive processes operates independently of emotional experiences. The fact that the counterfactual manipulation had no effect on participants' reported affective state casts serious doubt on the possibility that mood accounts for the relationship between counterfactual mind-sets and relational processing. Whereas the counterfactual mind-set had no effect on the mood of participants, it had a clear effect on their cognitions. Given the reasonable assumption that participants are similarly adept at assessing their cognitive and affective experiences, this finding suggests that the effects of counterfactual thinking on cognitive processing occur independently of moods.

Table 1
Experiment 1a: Correlations Between Variables

Variable	1	2	3	4	5
1. Type of prime	—				
2. Valence of prime	.04	—			
3. Cognitive state	**−.41**	.08	—		
4. Valence-based affective state	.14	**−.34**	−.20	—	
5. Arousal-based affective state	−.10	**−.28**	−.20	.12	—

Note. Significant correlations ($p < .05$) are in boldface.

Experiment 1b: Counterfactual Mind-Sets and Thinking Styles

In Experiment 1a, we observed that counterfactual mind-sets led to self-assessed mental states consistent with a relational processing style. Because the measures we used to assess internal states had not been independently validated, we thought it important to replicate the effect with established measures of cognitive processing styles. To this end, we examined the impact of our counterfactual manipulation on Sternberg's (1988) thinking style preferences.

Sternberg proposes that abilities may be used for three distinct functions in mental self-government, including legislative, executive, and judicial thinking styles (O'Hara & Sternberg, 2001). Individuals with executive styles prefer tasks that have clearly defined structure and guidelines from which to solve problems and build. Individuals with legislative thinking styles prefer tasks that

[1] We included several other exploratory, distractor variables that were not theoretically relevant. As no statistically significant effects emerged for these additional variables, they will not be discussed further.

[2] In a separate sample of 51 participants, we replicated this effect. That is, participants exposed to a counterfactual prime rated themselves higher on terms characteristic of an analytic style of thinking ($M = 6.74$, $SD = 1.06$) than those exposed to the noncounterfactual prime ($M = 5.88$, $SD = 1.06$), $F(1, 47) = 7.26$, $p < .01$.

have little assigned structure and that allow them to invent new ideas and tend to enjoy creating original works. Individuals with judicial styles like to evaluate and critique others' ideas and enjoy giving feedback and advice.

We hypothesized that the executive thinking style preference would be stronger for individuals in a counterfactual mind-set. We expected that the mental structure of logical relationships created through counterfactual thinking would increase preferences for the structured, rule-based, logical nature of the executive thinking style.

Another goal of the present experiment was to explore the connection between the construction of counterfactual thoughts and the strength of the resulting mind-set. Past research has demonstrated that the counterfactual mind-set's impact occurs regardless of the content or valence of the counterfactual thoughts (Galinsky & Kray, 2004; Kray & Galinsky, 2003), which suggests that what lingers is the implicit mental structure of the counterfactual. An established methodology for assessing the strength of the counterfactual mind-set involves counting the number of counterfactual thoughts generated in the pretask scenario. Because no counterfactual is explicitly stated in the scenario, the tendency to infer counterfactual thoughts following the mutable versus nonmutable scenario can be assessed through this process. Kray and Galinsky (2003) observed that the strength of counterfactual activation mediated the relationship between the experimental manipulation and disconfirmatory information search. In the present experiment, we examined whether counterfactual activation (the number of counterfactual thoughts) mediated the relationship between type of prime and thinking styles. Finally, because we were interested in determining whether writing out the counterfactual thoughts (vs. simply pondering them) intensifies the impact of the prime on thinking styles, we included this as a factor in our design.

Method

Design. The experiment had a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence: positive vs. negative) × 2 (thought listing: yes vs. no) between-subjects factorial design. We also included an additional no-valence control condition to establish that our valence-based control conditions serve as appropriate baseline comparisons.

Participants. Participants were 139 students from a large midwestern university campus. Participants were paid $10 an hour for their participation.

Procedure. Participants were greeted in the laboratory by an experimenter who explained that they would complete several questionnaires related to decision making. The experimental manipulations and the dependent variables were embedded in a single packet of questionnaires. Participants read the same rock concert scenario used in Experiment 1a, considered thoughts going through the main character's mind (for approximately half the participants), and then completed both thinking style and mood measures.

Experimental manipulation. The counterfactual prime manipulations were identical to those used in Experiment 1a. We also include an additional control condition, with no counterfactual prime and no valence. In this scenario, participants read the following: "Three weeks ago, Jane bought a general admission ticket to a rock concert of her favorite band. Jane is now at the concert, which is about to begin." Approximately half the participants were asked simply to read the scenario as in Experiment 1a. The other participants were asked to "List some thoughts going through Jane's mind." The sheet on which they listed their thoughts was numbered from 1 to 10, but participants were told to list only as many thoughts as came to their mind. Because none of the scenarios contain actual counterfactual statements, but rather only possess the potential to generate counterfactual thoughts, the number of counterfactual thoughts that participants subsequently listed was our measure of the strength of the counterfactual mind-set.

Thinking style. Participants' preferred thinking style was assessed using a 24-item subset of Sternberg and Wagner's (1991) Thinking Styles Inventory. The Thinking Styles Inventory comprises three subscales, including Executive Style, Legislative Style, and Judicial Style. Participants were asked to indicate how well each statement characterized their current preferred approach to solving problems and making decisions using a 7-point Likert scale ranging from 1 (*extremely uncharacteristic*) to 7 (*extremely characteristic*). The subscales had a high degree of reliability ranging from .72 to .76.

Mood. Mood was assessed using a one-item 9-point scale ranging from 1 (*very negative*) to 9 (*very positive*).

Results and Discussion

Table 2 provides a correlation matrix for all experimental variables.

Counterfactual activation. Two independent coders identified the number of counterfactual thoughts listed by participants. The reliability for counterfactual thoughts was high ($\alpha = .95$), and, therefore, the ratings of the two coders were averaged. We submitted the number of counterfactual thoughts to a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence: positive vs. negative) between-subjects factorial design. As expected, counterfactual prime participants ($M = 1.78$, $SD = 1.1$) listed significantly more counterfactual thoughts than noncounterfactual prime participants ($M = 0.19$, $SD = 0.42$), $F(1, 67) = 69.48$, $p < .001$.

Table 2
Experiment 1b: Correlations Between Variables

Variable	1	2	3	4	5	6	7
1. Type of prime	—						
2. Valence of prime	.03	—					
3. Number of counterfactual thoughts	**.69**	**−.24**	—				
4. Executive style	.21	.10	**.28**	—			
5. Judicial style	−.01	.04	.03	.10	—		
6. Legislative style	−.03	**−.23**	.00	−.29	**.34**	—	
7. Mood	.08	−.09	.08	.10	**.24**	**.25**	—

Note. Significant correlations ($p < .05$) are in boldface.

Consistent with previous research (Galinsky & Moskowitz, 2000; Roese & Hur, 1997), participants exposed to a negatively valenced event ($M = 1.25$, $SD = 1.2$) generated more counterfactual thoughts than participants exposed to a positively valenced event ($M = 0.70$, $SD = 1.0$), $F(1, 67) = 7.85$, $p = .007$. More important for establishing the independence of counterfactual thinking and mood, however, the two-way interaction was not significant, $F(1, 67) = 1.79$, *ns*.

Thinking styles. To test our hypotheses, we conducted separate 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) × 2 (thought listing: yes vs. no) between-subjects ANOVAs for each thinking style. We hypothesized that exposure to a counterfactual prime would elicit an executive thinking style. In support of our hypothesis, participants in a counterfactual mind-set ($M = 5.28$, $SD = 0.68$) rated themselves higher on executive thinking style than participants exposed to a noncounterfactual scenario ($M = 4.97$, $SD = 0.82$), $F(1, 114) = 4.85$, $p = .03$. The only other effect to emerge was a tendency for participants exposed to a scenario in which the protagonist did not win the trip to Hawaii to indicate a greater preference for the legislative thinking style ($M = 5.38$, $SD = 0.81$) than participants exposed to the positive emotional experience ($M = 5.04$, $SD = 0.66$), $F(1, 114) = 5.74$, $p = .02$. No other effects emerged as statistically significant.

Relationship between counterfactual activation and executive thinking style. To better understand the relationship between counterfactual mind-sets and the executive thinking style, we examined whether the amount of counterfactual activation mediated the relationship between the counterfactual primes and an increased executive thinking style. When we regressed executive thinking style on both type of counterfactual prime and number of counterfactual thoughts listed, the effect of number of counterfactual thoughts on the outcome approached significance ($\beta = .15$), $t(68) = 1.77$, $p = .08$, but the partial effect of the type of prime on the outcome was significantly reduced in magnitude once the number of thoughts was controlled ($\beta = -.00$), $t(68) = -0.01$, *ns*. A Sobel test determined the reduction in the significance level was statistically significant ($Z = 2.35$, $p < .05$). This finding suggests that the generation of counterfactual thoughts accounted for the relationship between the mutable scenario and thinking style preferences.

Supplementary control condition analyses. We also conducted analyses that included the additional no-valence control condition ($M = 5.00$, $SD = 0.83$) to build confidence that our counterfactual manipulation was responsible for the increased preference for an executive thinking style. To do so, we conducted planned contrasts comparing the two counterfactual conditions with the three control conditions (no-valence, negative outcome, positive outcome noncounterfactuals), which revealed that participants in the counterfactual conditions scored higher on executive thinking style than those in the control conditions, $t(134) = 2.24$, $p < .05$. Additionally, we tested whether the additional control differed from the two original control conditions and found no significant differences for their effects on executive thinking style, $t(134) = 0.16$, *ns*.

Supplementary mood analyses. To determine whether mood was affected by our experimental manipulation, we first conducted an ANOVA, with mood as the dependent variable and type of prime, valence of prime, and thought listing as the independent variables. No effects were statistically significant. We also conducted an ANOVA, with executive thinking style as the dependent variable, including our independent variables and the covariate mood. The main effect of type of counterfactual prime remained reliable, $F(1, 113) = 4.47$, $p = .04$. These findings suggest that mood did not mediate the effect of counterfactual prime on executive thinking style.

Three noteworthy findings emerged from this set of experiments. First, the heightened sense that one was poised for analytic thinking (see Experiment 1a) and the greater preference for an executive thinking style (see Experiment 1b) following the activation of a counterfactual mind-set is consistent with the idea that the mind-set promotes a relational processing style. Second, the number of counterfactual thoughts was implicated as the mediating mechanism through which our experimental manipulation elicited a preference for an executive style of thinking (see Experiment 1b). And finally, across both experiments, we failed to observe any indication that mood is a driving force behind counterfactual mind-sets. This conclusion is backed by a lack of a significant effect of the counterfactual manipulation on mood and by the fact that mood did not reduce the effect of counterfactual primes on executive thinking style. In addition, the observation that the no-valence control was identical to the valence-control conditions gives us confidence that the remaining experiments in which valence-based controls were used establish valid baseline conditions.

Experiment 2: Counterfactual Mind-Sets and Analytical Reasoning

The demonstration that counterfactual mind-sets affect mental states in a manner consistent with a relational processing style was our first step in understanding the process through which counterfactual mind-sets have their impact. The second step is to explore how counterfactual mind-sets impact analytical reasoning abilities. Because the analytical process involves the examination and identification of logical relationships between task variables, we expected the relational processing style activated by counterfactual thoughts to facilitate analytical reasoning abilities.

To test this hypothesis, we had participants complete a version of the Law School Admission Test (LSAT) analytical reasoning section. The LSAT analytical reasoning section assesses one's ability to understand and apply rules, determine relationships between concepts, analyze situations and draw conclusions, and apply logic to ambiguous or complex situations (Princeton Review, 2005). Specifically, this LSAT section consists of problems designed to "simulate the kinds of detailed analyses of relationships that a law student must perform in solving legal problems" (Law School Admission Council, 2005, p. 10). For example, one might be told to arrange guests at a dinner party and be given rules, including who may sit next to whom. These rules are followed by several questions that examine one's understanding of the relationships between dinner guests. If counterfactual mind-sets promote a relational processing style, then invoking a counterfactual mind-set should be positively associated with LSAT analytical reasoning performance.

Method

Design. The experiment had a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence: positive vs. negative) between-subjects factorial design. We also included an additional control condition in which participants simply took the LSAT exam without first reading a scenario.

Participants. Participants were 135 students from a large midwestern university campus. Participants were paid $10 an hour for their participation.

Procedure. Participants were greeted in the laboratory by an experimenter who explained that they would complete several questionnaires related to decision making. The experimental manipulations and the dependent variables were embedded in one large packet of questionnaires.

Participants were randomly assigned to one of the five experimental conditions described in Experiment 1b. After reading one of the scenarios, all participants were asked to consider some thoughts likely to be running through Jane's mind and then to indicate their current mood on a 9-point scale ranging from 1 (*very negative*) to 9 (*very positive*). Finally, participants completed one section of the LSAT analytical reasoning test.

LSAT analytical reasoning problems. Each analytical reasoning section of the LSAT has four games with 24 questions that must be accurately diagrammed in order to be answered correctly. Our main dependent variable was task performance. We followed LSAT scoring guidelines within which the overall score consists of the number of questions answered correctly adjusted for the number of guesses. We also measured task effort, as gauged by the number of attempted answers.

Results and Discussion

Counterfactual activation. Two independent coders identified the number of counterfactual thoughts in relation to the rock concert scenario. The reliability for counterfactual thoughts was high ($\alpha = .95$), and, therefore, the ratings of the two coders were averaged. We submitted the number of counterfactual thoughts to a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence: positive vs. negative) between-subjects factorial design. As expected, counterfactual prime participants ($M = 1.32$, $SD = 0.66$) listed significantly more counterfactual thoughts than noncounterfactual prime participants ($M = 0.29$, $SD = 0.54$), $F(1, 108) = 88.08$, $p < .001$. We also observed a main effect for valence of prime, with the negative outcome ($M = 0.99$, $SD = 0.79$) generating more counterfactuals than the positive outcome ($M = 0.62$, $SD = 0.75$), $F(1, 108) = 10.61$, $p = .002$. The interaction between type and valence of prime was not significant, $F(1, 108) = 0.71$, $p = .40$.

Task performance. To measure analytical performance, we assessed the LSAT score using an ANOVA, which included the type of prime and valence as factors. We hypothesized that counterfactual mind-sets would improve analytical reasoning performance. Consistent with this hypothesis, counterfactual mind-set participants ($M = 7.92$, $SD = 2.74$) outperformed noncounterfactual mind-set participants ($M = 6.09$, $SD = 3.45$), $F(1, 108) = 9.51$, $p = .003$.[3] No other effects emerged as statistically significant for this analysis.

Task effort. To determine whether our manipulations affected task effort, we conducted an ANOVA in which the dependent variable was the number of LSAT items attempted, and the independent variables were the type of prime and valence. Results indicated an effect for the valence of the prime such that participants exposed to the positive emotional experience attempted more LSAT questions ($M = 15.35$, $SD = 4.50$) than those exposed to the negative emotional experience ($M = 13.30$, $SD = 4.65$), $F(1, 108) = 5.53$, $p = .02$. No other results emerged as statistically significant.

Relationship between counterfactual activation and LSAT performance. We next examined whether the amount of counterfactual activation mediated the relationship between the mutable primes and LSAT performance. When we regressed LSAT score on both type of counterfactual prime and number of counterfactual thoughts listed, number of counterfactual thoughts was statistically significant ($\beta = .33$), $t(109) = 2.82$, $p = .006$, but not type of prime ($\beta = .07$), $t(109) = 0.58$, *ns*. A Sobel test determined that the reduction in the significance level was statistically significant ($Z = 3.85$, $p < .001$). This finding suggests that the generation of counterfactual thoughts accounted for the relationship between the mutable scenario and performance.

Supplementary control condition analyses. We also conducted analyses that included the additional no-valence control condition ($M = 5.95$, $SD = 3.84$) to build confidence that our counterfactual manipulation was responsible for the better LSAT performance. To do so, we conducted planned contrasts comparing the two counterfactual conditions with the three control conditions, which revealed that participants in the counterfactual conditions performed better than those in the control conditions, $t(130) = 3.28$, $p = .001$. Additionally, we tested whether the additional control differed from the two original control conditions and found no significant differences for their effects on LSAT performance, $t(130) = -0.18$, *ns*.

Supplementary mood analyses. We sought to determine whether mood played a role in the relationship between counterfactual mind-sets and LSAT task effort and performance. To do so, we first conducted an ANOVA, with mood as the dependent variable and type of prime and valence of prime as between-subjects factors. No effects were statistically significant. We also conducted analyses of covariance using LSAT task effort (LSAT attempted) and task performance (overall LSAT score) as the dependent variables, type of prime and valence as our independent variables, and mood as a covariate. For the LSAT number attempted, the main effect for valence remained reliable, $F(1, 107) = 5.49$ $p < .05$. For the overall LSAT score, the main effect of type of prime remained reliable, $F(1, 107) = 7.16$, $p = .009$. These findings suggest that mood did not mediate the effect of counterfactual prime or valence on LSAT task effort or task performance.

One goal of the present study was to provide support for the assertion that counterfactual mind-sets promote a relational processing style, thereby facilitating the recognition and better understanding of ambiguous and complex relationships. In support of this hypothesis, we found that participants in a counterfactual mind-set outperformed participants who were not in a counterfactual mind-set on the LSAT analytic reasoning test. In combination with the results of Experiment 1, which demonstrated that the

[3] We also tested our hypothesis by examining only the number of correct LSAT items (unadjusted for guesses). We found the same pattern of results, with participants in a counterfactual mind-set ($M = 9.21$, $SD = 2.61$) outperforming noncounterfactual mind-set participants ($M = 7.71$, $SD = 3.20$), $F(1, 108) = 7.42$, $p = .008$.

activation of a counterfactual mind-set was predictive of phenomenologies and preferences consistent with a relational processing style, Experiment 2 demonstrated that performance on a task measuring one's ability to understand logical relationships and make connections between task stimuli is improved by counterfactual mind-sets.

Experiment 3: Counterfactual Mind-Sets and Structured Imagination

Thus far, we have provided evidence consistent with the idea that counterfactual mind-sets promote a relational processing style in terms of both mental states and analytical reasoning performance. Because we expect the effects of a relational processing style to be quite broad, in Experiment 3, we explore whether and how counterfactual mind-sets influence the tendency to build on existing knowledge structures during the creative generation process, or structured imagination.

Intuitively it might seem that thoughts of "if only" associated with counterfactual thinking would facilitate creative generation. The construction of alternative possible worlds would seem to be the epitome of creative generation, and it is easy to speculate that counterfactual thinking would encourage imagination to roam unfettered and unencumbered by mental constraints. To the contrary, we contend that the counterfactual mind-sets may not be the springboard to freewheeling generation. A key insight underlying this counterintuitive hypothesis concerns the fact that logical rules and clear structure govern when and how counterfactuals are constructed. As we have repeatedly demonstrated, counterfactual mind-sets have their impact regardless of the content or direction of the preceding counterfactual thoughts. This observation suggests that what lingers following the construction of counterfactual thoughts is their underlying logical form. We argue that the mental structure of logical relationships created through counterfactual thought increases the tendency to structure thought around salient associations and the pursuit of connections.

In addition to the conceptualization described above, the counterfactual mind-sets increase a preference for structured thinking, as was empirically demonstrated in Experiment 1b. Structured thinking differs from the mental states that encourage creative generation, which generally requires an expansion of conceptual attention that goes beyond the bounds of what is presently known or salient (Guilford, 1950). Some have even characterized the mind-set that encourages creative generation as a "risky" processing style (Friedman & Forster, 2001; quotations in original). Noting the connections and relationships between stimuli and making structured associations, as counterfactual participants did with relative ease in Experiment 2, may inhibit the tendency to go beyond what is already known or salient, and thereby impair creative generation.

Creative generation tasks typically elicit responses that are loosely defined, which creates the potential for an infinite number of unique responses (Guilford, 1950). However, performance on creative generation tasks tends to be impaired because participants borrow from and rely too heavily on existing knowledge structures. For example, participants instructed to create creatures "beyond their wildest imagination" tended to produce results that conformed to the attributes of realistic earth creatures, including bilateral symmetry, and ordinary sensory receptors and appendages (Ward, 1994). On the basis of Ward's concept of structured imagination, we expected participants in a counterfactual mind-set to adopt a more structured approach to generating creative output than under baseline conditions. Given the relational processing style characteristic of counterfactual thinking, the resulting mind-set should increase the tendency to structure one's imagination around existing knowledge structures. That is, in contrast to the "thinking outside the box" characteristic of creative generation processes, we expected counterfactual mind-sets to promote "thinking within the box."

Method

Design. The experiment had a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence: positive vs. negative) × 2 (type of scenario: rock concert vs. spelling bee) between-subjects factorial design.

Participants. Participants were 93 students from a large western university campus enrolled in an introductory organizational behavior course. By participating in the experiment, participants received partial credit toward a class requirement.

Procedure. Participants were greeted in the laboratory by an experimenter who told them that they would complete several tasks predictive of future job performance. Participants first read one version of the two prime scenarios. As in previous experiments, approximately half the participants read a version of the rock concert scenario. To ensure that our results generalize to different instantiations of the counterfactual mind-set, the other half of participants read a version of a spelling bee scenario, in which a young boy named Paul competes to advance in the National Junior Spelling Bee. In each scenario, an individual at the spelling bee advances to the next round. To manipulate valence, in half of the spelling bee scenarios, Paul correctly spells the assigned word and advances to the next round, whereas in the other half, he misspells the word and is eliminated from the competition. Additionally, half of the scenarios describe a sequence of events designed to elicit counterfactual thoughts, whereas the other half of the scenarios describe a sequence of events not expected to elicit counterfactual thoughts. In the downward counterfactual scenario, Paul advances to the next round of the competition after his place in line is altered (because he had to use the restroom), and he is asked to spell a word he knows (but had he stayed in his original place in line, he would have been given a word he did not know how to spell). In the upward counterfactual scenario, Paul is eliminated from the competition after his place in line is altered, and he is asked to spell a word he does not know (but had he stayed in his original place in line, he would have been given a word he knew how to spell). In the noncounterfactual conditions, he either spells or misspells a word but does not alter his place in line. After reading the scenario and listing thoughts in the protagonists' mind, participants began the creative task.

Creative task. Following Ward (1994), we asked participants to "imagine going to another galaxy in the universe and visiting a planet very different from earth" and to spend 7 min drawing a picture of an animal that is local to this planet. Immediately upon completion of the drawing task, participants completed a questionnaire in which they provided a short written description of how they went about approaching this creative task and then evaluated their approach along several domains. Participants' evaluations of their approach to the task were used to determine the extent to which they engaged in structured imagination. Specifically, they indicated the extent to which they considered the following five items of knowledge: known science fiction creatures, general attributes of science fiction creatures, known earth animals, general attributes of earth animals, and consideration for the local environment. Each item was rated on a 7-point scale ranging from 1 (*not at all*) to 7 (*completely*).

Creative coding. Because Ward's (1994) study suggests potential ceiling effects for some characteristics of the imagined creatures (e.g., bilateral symmetry) and demonstrated greater variability for atypical sensory organs, our dependent variable for the drawings was the atypicality of the sensory organs.[4] Three trained coders who were blind to the study hypotheses coded the drawings and descriptions for atypical sensory organs. Following Ward's coding, sensory organs were considered atypical if they (a) lacked a major sensory organ (i.e., eyes, ears, nose), (b) had atypical numbers of a sensory organ (e.g., three eyes), (c) demonstrated an unusual configuration of the senses (e.g., eyes located below the nose), (d) had an exaggerated or unusual ability (e.g., eyes that had laser beams), or (e) served an atypical function (e.g., ears for protection). The total number of atypicalities were tallied for each participant. The codings for the drawing were highly reliable ($\alpha = .93$), as were the codings for the descriptions ($\alpha = .89$), and discrepancies were resolved through discussion. The coders' data were averaged to create one measure for sensory atypicality in the drawing and one measure for sensory atypicality in the description.

Results and Discussion

Counterfactual activation. Three independent coders identified the number of counterfactual thoughts after the rock concert and spelling bee scenarios. The reliability for both was high (αs = .88 and .87, respectively), so the ratings were averaged. We submitted the number of counterfactual thoughts to a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence: positive vs. negative) × 2 (type of scenario: rock concert vs. spelling bee) between-subjects ANOVA. As expected, counterfactual prime participants ($M = 1.32$, $SD = 0.96$) listed significantly more counterfactual thoughts than noncounterfactual prime participants ($M = 0.94$, $SD = 0.71$), $F(1, 85) = 4.00$, $p < .05$. Participants exposed to a negatively valenced event ($M = 1.33$, $SD = 0.77$) generated more counterfactual thoughts than participants exposed to a positively valenced event ($M = 0.93$, $SD = 0.90$), $F(1, 85) = 6.30$, $p = .01$. No other effects were statistically significant.

Self-reported structured imagination. We expected participants in the counterfactual mind-set condition to have a more structured imagination than noncounterfactual mind-set participants. To test our hypothesis, we conducted a multivariate ANOVA, including each of the five statements described above, as well as type of prime, valence of prime, and type of scenario as between-subjects factors. Consistent with our hypothesis, the only statistically significant effect to emerge was a tendency for counterfactual mind-set participants ($M = 4.49$, $SD = 0.77$) to report more structured imagination than noncounterfactual mind-set participants ($M = 4.04$, $SD = 0.85$), $F(5, 80) = 3.18$, $p = .01$. An examination of the univariate effects revealed that counterfactual mind-sets promoted a reliance on specific science fiction creatures, $F(1, 84) = 4.34$, $p < .04$; general attributes of science fiction creatures, $F(1, 84) = 4.28$, $p < .05$; and local environment considerations, $F(1, 88) = 8.18$, $p < .01$. No other effects were statistically significant.

Creative coding. Although the self-report results support our hypothesis, we further tested it by examining the actual drawings and drawing descriptions. To do so, we used a mixed-model ANOVA, with type of prime, valence of prime, and type of scenario as between-subjects factors and type of coding (drawings vs. descriptions) as a repeated measure. In support of our hypothesis, counterfactual mind-set participants ($M = 1.11$, $SD = 1.00$) were rated as incorporating fewer sensory atypicalities into their drawings and descriptions than noncounterfactual mind-set participants ($M = 1.69$, $SD = 1.61$), $F(1, 85) = 4.92$, $p < .03$. No other effects were statistically significant.[5]

The primary goal of this study was to demonstrate that the relational processing style associated with counterfactual mind-sets can lead to "thinking within the box." The results of this experiment are consistent with our hypothesis. Participants in a counterfactual mind-set reported structuring their imaginative process around existing knowledge structures to a larger degree than control participants. In addition, they showed evidence of considering the local environment in constructing their drawings. Finally, participants in a counterfactual mind-set incorporated fewer atypicalities into their drawings and descriptions than participants in the noncounterfactual mind-set. Together, these findings reinforce the notion that counterfactual mind-sets promote a form of structured imagination.

A secondary goal of the present study was to demonstrate that the results found in the previous studies were not driven by the nature of the rock concert scenario. To do so, we included a different scenario that involved a mutable event at a spelling bee. Regardless of which mutable scenario participants read, counterfactual mind-sets promoted a form of structured imagination. This observation gives us confidence that our results thus far generalize to different instantiations of the counterfactual mind-set.

Experiment 4: Counterfactual Mind-Sets and Creative Generation

In Experiment 4, we further explore whether counterfactual mind-sets impact the creative generation process. Because the drawings created in the previous experiment were highly variable, and it was difficult to determine what aspects of science fiction creatures counterfactual mind-sets might have been borrowing from, in the present experiment, we used a creative generation task that can be more easily coded for structured imagination.

In the previous experiments, participants reported relying on existing knowledge and examples in constructing their alien creatures. The presence of salient examples in a creative generation task leads to less novel solutions than when examples are not provided a priori (Smith, Ward, & Schumacher, 1993). If counterfactual mind-sets facilitate a relational processing style that seeks connections with readily available cognitive representations, then participants in this mind-set should be more attentive to and influenced by a set of provided examples. As a result, the output of participants in a counterfactual mind-set should be less novel than baseline conditions. To test this hypothesis, we examined performance on a creative generation task involving the creation of novel product labels. Prior to starting the task, participants were provided with a set of examples. In the present experiment, we measured the degree to which individuals were able to ignore these examples in

[4] Our data replicate this ceiling effect. For instance, 92% of the drawings demonstrated bilateral symmetry, 1% did not, and the remaining 7% were excluded from the data analysis because the drawings were profiles, and bilateral symmetry could not be determined.

[5] We also examined whether participants differed in terms of appendage atypicalities in their drawings and descriptions, but no effects emerged as statistically significant.

their creation of labels for the new products. That is, we measured the extent to which participants' own product labels resembled the examples we provided them.

In addition to coding for resemblance to examples, we also coded the product labels on two dimensions: overall creativity and descriptiveness of the labels in representing the product category. In the previous experiment, participants in a counterfactual mind-set reported that they were more likely to consider the local environment in drawing their space aliens. This suggests that counterfactual mind-sets gear participants toward structuring imagination to reveal something about the essence of the object. If this is true, then counterfactual mind-sets should produce product labels that are representative of the product. We predicted the counterfactual mind-set participants would both draw on the given examples and be more likely to produce labels that were more descriptive of the product. However, to the extent that the labels were not judged to be particularly novel, they should suffer in terms of their perceived creativity.

Method

Overview and design. The experiment had a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) between-subjects factorial design.

Participants. Participants were 29 undergraduate business students from a large western university campus enrolled in an introductory organizational behavior course. The experiment was conducted outside of the classroom setting. By participating in the experiment, partial fulfillment of a course requirement was granted.

Procedure. Participants were greeted in the laboratory by an experimenter who explained that they would complete several questionnaires related to decision making. The experimental manipulations and our dependent variables were embedded in the packet of materials that participants received. Participants were given up to 30 min to complete the packet of materials.

Experimental manipulations. The manipulations were identical to those used in Experiment 1a. Because Experiment 1b revealed that the strength of the counterfactual mind-set is not dependent on whether thoughts are listed, we chose not to have participants list their thoughts for this experiment. Instead, participants were simply asked to ponder thoughts running through the protagonist's mind.

Creative generation task. We used a modified version of the creative generation task, described in Rubin, Stoltzfus, and Wall (1991). Participants were asked to imagine that they were interviewing with a top marketing firm, and part of the interview involved testing their aptitude for business. To do so, participants were tasked with creating new labels for new products. Specifically, they were instructed to create at least one (and up to three) new label for each of three categories of products (pasta, nuclear element, pain reliever). Six examples were provided for each category, as described in Appendix A. To encourage creative output, participants were advised not to use or copy aspects of the examples provided.

For each of the categories, the examples provided had two *common endings*, which are defined as a letter or cluster of letters that ended at least one multisyllabic word. For example, all of the examples provided of nuclear elements ended in _on or _ium (e.g., *radon*, *plutonium*, *argon*, *carbon*, *radium*, *uranium*). Creative output was operationalized in terms of the number of product names created for each category that did not share the word endings of the examples. We also examined the sheer number of product names created for each category to determine whether motivational differences were evident.

Creative generation coding. Three independent coders evaluated each idea generated by participants on 9-point scales ranging from 1 (*not at all*) to 9 (*extremely*) for creativeness and descriptiveness. Specifically, coders were asked to consider "How creative is this response?" and "How descriptive is this response in revealing the type of product?"

Results and Discussion

Creative generation. To examine the novelty of name generation, we submitted the total number of names with endings deviating from the supplied examples to a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) × 3 (product category: pasta vs. nuclear element vs. pain reliever) mixed model ANOVA, with repeated measures on the third factor. The only significant effect to emerge from this analysis was a main effect for counterfactual prime, $F(1, 25) = 4.92$, $p < .05$. Across the three categories, counterfactual mind-set participants ($M = 1.26$, $SD = 1.44$) generated significantly fewer novel names than noncounterfactual mind-set participants ($M = 2.70$, $SD = 2.20$). We also conducted a similar analysis examining the raw number of ideas generated and observed no statistically significant effects, suggesting our experimental manipulation did not impact effort.

Creative versus descriptive ratings. Three independent coders who were blind to condition and our hypotheses evaluated each idea generated by participants for creativeness and descriptiveness. Reliabilities were good ($\alpha = .72$ and .73, respectively), so we combined the ratings of each coder. We submitted the ratings to a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) × 2 (rating: creativity vs. descriptiveness) mixed model ANOVA, with repeated measures on the third factor. A main effect for type of coding emerged, indicating that labels were judged to be more descriptive ($M = 5.75$, $SD = 0.69$) than they were creative ($M = 5.09$, $SD = 0.76$), $F(1, 25) = 8.61$, $p < .01$. More important for testing our hypothesis was the statistically significant two-way interaction between type of prime and type of coding, $F(1, 25) = 4.66$, $p < .05$. Counterfactual prime labels ($M = 4.86$, $SD = 0.54$) were judged to be less creative than noncounterfactual prime labels ($M = 5.34$, $SD = 0.90$), $t(27) = 1.76$, $p = .09$; yet, counterfactual prime labels ($M = 5.97$, $SD = 0.59$) were judged to be more descriptive than noncounterfactual prime labels ($M = 5.51$, $SD = 0.73$), $t(27) = 1.86$, $p = .07$. Counterfactual mind-sets led to more descriptive labels that were nonetheless lacking in creativity. No other effects emerged as statistically significant for this analysis.

The results of this experiment support our hypothesis that counterfactual mind-sets can impair creative generation. Individuals who had previously pondered counterfactual thoughts generated new product labels that were less novel than individuals who had not previously pondered counterfactual thoughts. This pattern emerged regardless of whether novelty was judged in terms of the similarity to the provided examples or a global evaluation of creativity by independent coders. The fact that counterfactual thinking did not impact the number of names generated suggests sheer effort was not responsible for this effect.

Although participants were instructed to be as creative as possible and to refrain from borrowing from the examples provided, counterfactual mind-set participants were less effective at breaking out of the mold set by the examples. In essence, the relational

processing style characteristic of the counterfactual mind-set promoted structured imagination, or thinking within the box. However, within that box, counterfactual mind-sets led to more descriptive and potentially useful labels. Like participants in the previous experiment who reported considering the local environment when drawing space aliens, counterfactual mind-sets led participants to consider the essence of what the product was about. The finding that labels generated by counterfactual mind-set participants were actually judged to be more descriptive of the product category than labels generated by control participants is consistent with the hypothesis that counterfactual mind-sets promote a relational processing style. That is, a heightened attention to the attributes generally associated with the categories for which labels were created (i.e., pasta) led to the generation of labels that were deemed to be representative of the category by lay judges.

Experiment 5: Creative Generation Versus Creative Association

We demonstrated in the previous experiment that creative generation is impaired following the invocation of a counterfactual mind-set. Measuring creativity in terms of idea generation is but one approach, as creativity is generally regarded to be a multidimensional construct (Amabile, 1983). The purpose of Experiment 5 was to determine whether counterfactual mind-sets might improve performance on creative association tasks that involve the consideration of relationships and making connections between disparate knowledge structures.

If counterfactual mind-sets promote a relational processing style involving the consideration of relationships between task stimuli, then the mind-set should improve performance on creative tasks involving the identification of unusual associations between stimuli, associations that are adaptive and responsive to the present context. Galinsky and Moskowitz (2000) provided some evidence consistent with this hypothesis with respect to the Duncker candle problem. This task gauges the ability of individuals to overcome functional fixedness, characterized by a failure to recognize a use for a particular object in a given context as a result of a fixation on its typical use (Duncker, 1945). An individual is given a candle, a box of tacks, and a book of matches and challenged with affixing the candle to the wall so that it can be lit without dripping wax onto the floor or wall. Because the box initially functions as a container for tacks, the problem solver often fails to recognize its potential as a solution to the problem: The tacks are dumped out of the box, which is affixed to the wall with a couple of tacks, and the candle is placed on top of or in the box and lit. The solution to the task requires the problem solver to see potential relationships other than the obvious ones—the box is not just a repository for tacks but can also be used as stand (Glucksberg & Weisberg, 1966). In addition, the solution involves recognizing a relationship between the candle and the box. Galinsky and Moskowitz (2000) showed that, by invoking a counterfactual mind-set prior to engaging in the task, problem solvers were more likely to recognize the potential use of the box of tacks as a platform for the candle relative to control participants.

We argue that performance on the Duncker candle problem was facilitated by the counterfactual mind-set because it promoted a tendency to explore the possible relationships between the critical objects. In the present experiment, we sought further evidence in favor of this interpretation by examining performance on another creative association task, the remote associates task (RAT; M. T. Mednick, Mednick, & Mednick, 1964). The RAT requires an individual to form "mutually distant associative elements into new combinations which are useful and meet specified as well as unforeseen requirements" (S. A. Mednick, 1962). Specifically, the test requires identifying a unique association among three distinct words. For example, the common link for the words *sore—shoulder—sweat* is *cold*. Similar to the Duncker candle problem, by considering the relationships between task stimuli, performance on the RAT improves.

In the present experiment, we used a within-subject design so that we could explore the relative effect of counterfactual mind-sets on a creative generation task versus a creative association task. We aimed to replicate the facilitative effect of the counterfactual mind-set observed previously with the Duncker candle for the RAT and also demonstrate a replication of the impairing effect for the creative generation task used in Experiment 4. By showing both facilitation and debilitation across tasks but within individuals, we aimed to provide strong evidence that the counterfactual mind-set promotes a relational processing style, which has wide-ranging effects.

Method

Overview and design. The experiment had a 2 (type of prime: counterfactual vs. noncounterfactual) × 2 (valence of prime: positive vs. negative) × 2 (type of creative task: association vs. generation) mixed design, with repeated measures on the third factor.

Participants. Participants were 50 undergraduate students at a midwestern university who were recruited through e-mail solicitations; they participated in the experiment, along with several other unrelated tasks. They were compensated $15 for their time.

Procedure. Participants were greeted in the laboratory by an experimenter who explained that they would complete several tasks assessing ability in business contexts. Participants were given a packet of materials that contained the experimental manipulations, a modified version of the RAT (M. T. Mednick et al., 1964), and the identical creative generation task used in Experiment 4. All participants read the prime scenarios and then completed the RAT first before completing the creative generative task.[6] Participants were instructed to complete each task before proceeding to the next one. Participants were allowed to work on each task until they had finished or could not answer any more questions. Finally, participants were debriefed and then proceeded to work on several unrelated tasks.

Experimental primes. The primes were the four rock concert scenarios used in the previous experiments. As in Experiment 4, participants simply pondered thoughts running through the protagonist's mind without listing any thoughts.

The RAT (M. T. Mednick et al., 1964). The RAT is designed to measure the creative ingenuity of individuals and requires identifying a unique common denominator among three distinct words. We shortened the original task designed by Mednick et al. to include only 10 items (see Appendix B for the items). Consistent with our analysis of the generative

[6] Although we did not counterbalance the order of tasks in the present experiment, the findings of Experiment 3 established that performance on the creative generation task was negatively impacted when the task immediately followed the counterfactual manipulation.

cognitive task, the dependent variables for the RAT included the number of attempted items and the number of correct items.

Results

First, because the effect of our experimental manipulations did not vary depending on product type in the generative cognitive task (replicating the results of Experiment 4), we collapsed across product type in the present set of analyses. To facilitate a comparison of performance across the two creative tasks, we first computed z scores separately for each task and then submitted each z score to a 2 (type of prime: counterfactual vs. noncounterfactual) $\times$ 2 (valence of prime: positive vs. negative) $\times$ 2 (type of task: creative association vs. creative generation task) mixed model ANOVA, with repeated measures on the third factor.

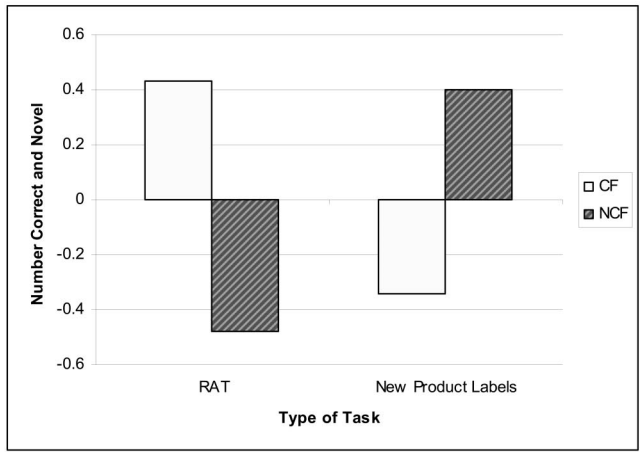
Number of correct items and novel names. To measure creative performance on the two tasks, we assessed the number of correct associations on the RAT and the number of novel names generated on the new products task. Consistent with our hypothesis, the only effect to emerge as statistically significant was the expected two-way interaction between type of task and counterfactual prime, $F(1, 45) = 22.37$, $p < .001$ (see Figure 1). Counterfactual mind-set participants ($M = 0.43$, $SD = 0.78$) outperformed noncounterfactual mind-set participants ($M = -0.48$, $SD = 1.02$) on the RAT, $F(1, 49) = 12.51$, $p < .01$, yet counterfactual mind-set participants ($M = -0.34$, $SD = 0.68$) performed worse than noncounterfactual mind-set participants ($M = 0.40$, $SD = 1.18$) on the creative generative task, $F(1, 50) = 7.97$, $p < .01$.[7] Counterfactual mind-sets improved performance on a task requiring the identification of a common association for a set of words but impaired performance on a task requiring the generation of novel ideas. No other effects emerged as statistically significant for this analysis.

Number of items attempted and labels generated. We also looked at task effort in terms of items attempted on the RAT and labels generated on the new products task. The only effect to emerge was a two-way interaction between task and counterfactual prime that approached significance, $F(1, 45) = 3.72$, $p = .06$ (see Figure 1). Whereas the number of items attempted on the RAT was greater in the counterfactual condition ($M = 0.36$) than in the noncounterfactual condition ($M = -0.40$), $F(1, 49) = 8.16$, $p < .01$, the difference between the two counterfactual conditions was not statistically significant in the creative generation task (Ms $= -0.05$ and 0.02, $F < 1$, *ns*). No other effects emerged as statistically significant for this analysis.

Discussion

The results of this study provide strong support for the assertion that counterfactual mind-sets promote a relational processing style, which has differential effects on creative tasks measuring the generation of novel ideas versus the identification of associations. Rather than uniformly impairing creative performance, the effect of counterfactual mind-sets appears to depend on the underlying creative process being assessed. Specifically, counterfactual mind-sets improved the ability of participants to identify unusual and useful associations between sets of words in the RAT, yet caused participants to borrow too heavily from the provided examples in the new products labels task. The fact that both tasks measure aspects of creativity suggests that the debilitating effect of counterfactual mind-sets is limited to thinking "outside the box."

A



B

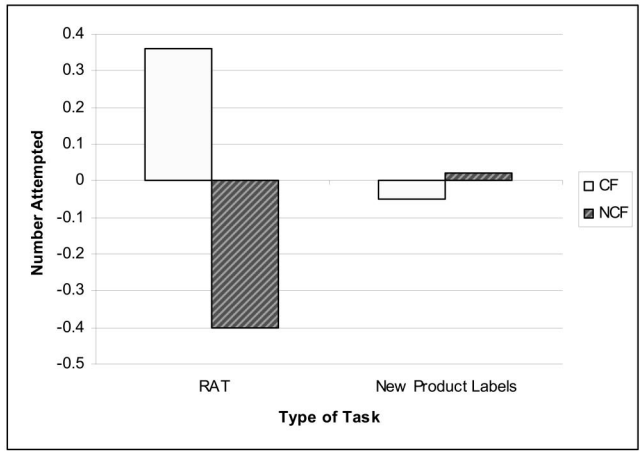


Figure 1. Mean performance as a function of type of task and type of prime in Experiment 5. CF = counterfactual condition; NCF = noncounterfactual condition; RAT = remote associates task.

General Discussion

The question of whether thoughts about alternate worlds borne out of mutated pasts impact the future has important theoretical and applied implications. Although the adage "What's done is done" may suggest that pondering the past is an unproductive use of time, the present research provides strong evidence to suggest that imagining alternatives to past realities by considering a dif-

[7] The relationship between performance on the creative generation task and the creative association task was not statistically significant, $r(49) = -.12$, *ns*; this relationship did not depend on experimental condition.

ferent path, choice, or action has a powerful impact on how future analytic and creative problems are solved. In particular, generating counterfactuals in one context appears to alter thought processes to be more relational in subsequent contexts, despite the new context's irrelevance to the imagined world. Independent of the content or valence of the imagined world, the act of generating counterfactuals produces a lingering tendency to consider relationships and associations and to problem solve from within existing frameworks.

The present article provides a range of evidence to support the hypothesis that counterfactual mind-sets promote a relational processing style. We demonstrated in Experiment 1 that counterfactual mind-sets increase a sense of being poised for analytic and critical thinking and preferences for a structured style of thinking. Evidence that the counterfactual mind-set improves performance on an analytic task involving the assessment of relationships between task variables was provided in Experiment 2. We demonstrated in Experiments 3 and 4 that counterfactual mind-sets increase the tendency to structure imagination around existing knowledge structures, leading to more descriptiveness but less novelty. Finally, using a within-subject design, we demonstrated in Experiment 5 that the heightened tendency to build on existing knowledge structures following the activation of the counterfactual mind-set leads to better performance on a creative association task involving the consideration of associations between task stimuli but to worse performance on a creative generation task.

The counterfactual thought-listing methodology used in Experiments 1b and 2 also shed light on the process through which counterfactual mind-sets promote a relational processing style. In Experiment 1b, we demonstrated that the effect of counterfactual mind-sets on executive thinking style preferences was mediated by counterfactual activation. In Experiment 2, we demonstrated that the listing of counterfactual thoughts mediated the relationship between the mutable prime and LSAT performance. In combination with previous research in which a similar methodology was used (Galinsky & Kray, 2004; Kray & Galinsky, 2003), the amount of counterfactual activation has proved to be a robust mediating mechanism in the relationship between mutable primes and performance. The greater the number of counterfactual thoughts generated following exposure to a scenario in which an event almost turned out differently, the more ingrained the mental structure of logical relationships becomes, thus increasing preferences for structure and performance on analytical tasks.

Counterfactual primes influence not just what we think but how we think. The present experiments consistently demonstrated that what we think, as determined by the direction of the counterfactual elicited (upward or downward), did not moderate any of the effects of how we think, as determined by the mutable nature of the prime. Across two experiments (1a and 2), we also demonstrated that the valence-based conditions produced results identical to both a baseline condition without a pretask scenario and a pretask scenario in which no valence-based event occurs. This finding suggests that the valence of the outcome did not impact the results. Finally, the fact that measurements of mood did not differ across our counterfactual prime manipulation across multiple experiments gives us more confidence that it is the process of thinking counterfactually, and not the content of the counterfactuals, that is responsible for the observed effects. In total, counterfactual mind-sets and the differential emotional experiences associated with upward versus downward counterfactuals appear to operate independently on subsequent thinking styles and cognitive processing.

The present article is important because it is the first to our knowledge that delves directly into the phenomenological experience of a counterfactual mind-set. The findings of Experiment 1a and 1b suggest that counterfactuals exert a powerful impact on how individuals perceive their own cognitive state but do not appear to affect perceptions of affective states. Previously, researchers have argued that counterfactual mind-sets involve a state of heightened awareness of multiple possible worlds, thereby promoting mental simulations. But mental simulations brought about by a salient counterfactual tend not to be free-form. Instead, they follow systematic laws of mutability that involve tweaking particular aspects of the counterfactual context to undo a known outcome, thereby promoting a consideration of cause–effect relationships. The present research suggests that counterfactual thinking primes a relational processing style in subsequent contexts that facilitate the examination of the relationship between clues, cues, examples, and props embedded within a problem-solving task.

The observation that the counterfactual mind-set promotes a relational processing style sheds light on one detrimental, yet seemingly anomalous, effect resulting from its activation. Specifically, counterfactual mind-sets have been shown to impair performance on the Wason (1966) card selection task involving four cards, each bearing a symbol: "E, K, 4, 7" (Byrne & Tasso, 1994; Galinsky & Moskowitz, 2000). The challenge is to determine what cards must be turned over to determine whether the following conditional statement is true: "If a card has a vowel on one side, then it has an even number on the other side." Both sets of researchers independently found that counterfactual thinking impaired performance by leading participants to incorrectly select the "4" card. Because the conditional statement to be tested is not bidirectional, the selection of this card is an error of commission. The conditional statement central to the task can be misinterpreted to imply a bidirectional hypothesis (Byrne & Tasso, 1994). We contend that it is the consideration of the relationship and connections between the antecedent and consequent characteristic of a relational processing style that promoted this misguided tendency to entertain two hypotheses at once. The fact that counterfactual mind-set participants did not incorrectly solve the problem because of a failure to select the potentially falsifying "E" and "7" cards or incorrectly selecting the irrelevant "K" card further supports this explanation.

We have claimed that counterfactual thinking elicits a particular cognitive style characterized by a consideration of relationships and associations. The idea that cognitive styles can differentially affect performance on tasks that require focus from those that require flexibility is supported by the theorizing and data of Peterson and Nemeth (1996). These researchers found that minority influence encourages flexible thinking and improves performance on tasks in which flexibility is an asset but that majority influence can aid performance on tasks that require focusing on one dimension of a two-dimension task (e.g., the Stroop task). We are not claiming that counterfactual thinking is akin to majority influence but rather suggesting that the work by Peterson and Nemeth is a useful demonstration that cognitive processing styles can have a differential influence, depending on whether a task

requires flexibility, focus, or consideration of task-embedded alternatives.

Limitations and Future Directions

The research presented here shows a uniformly negative impact of counterfactual mind-sets on creative generation tasks. However, one limitation of the studies presented here is that they only explore one aspect of the creative generation process. Creative generation can be broken down into fluency, or the number of ideas generated, flexibility, or the number of different categories of ideas represented, and novelty, or the uniqueness of the idea generated (Amabile, 1983). Perhaps counterfactual mind-sets differentially affect these components of creativity. The experiments presented here provide some evidence that counterfactual mind-sets decrease novelty, as name generation was more constrained by the suffixes of the examples after counterfactual primes. Although no differences were observed in fluency, or the quantity of names generated overall in Experiments 4 and 5, this null finding may be a reflection of the fact that the number of names generated had a limited range (from 1 to 3). The new product labels task also did not allow for a clear gauge of flexibility, or the number of definable categories of names generated. Given that counterfactual mind-sets promote a relational processing style that involves the consideration of relationships and associations, fluency and flexibility may actually be facilitated following the mind-set's activation.

The observation that new product names generated by counterfactual mind-set individuals were judged to be more descriptive of the product category than the names generated by noncounterfactual mind-set individuals suggests a practical approach to idea generation when in a counterfactual mind-set. By broadening the examination to consider the impact of counterfactual thinking on innovation, which involves both the generation of novel ideas and their successful implementation (Amabile, Conti, Coon, Lazenby, & Herron, 1996), researchers may find that the counterfactual mind-set facilitates the pragmatic process of turning a novel idea into reality by modeling the execution process after previously successful ventures.

Future research that explores different instantiations of counterfactual mind-sets is needed. In all of the experiments in this article, our manipulation involved the presentation of a scenario that resulted in the spontaneous generation of counterfactual thoughts resulting from the presence of a salient mutable component. Individuals constructed counterfactual thoughts without any direction or guidance from the experimenter. Whereas the results of this set of experiments show consistent effects, it is important to consider their boundaries. For example, other research has explored the effect of counterfactual thinking after encouraging individuals to imagine the implications of various "what-if" scenarios of how the past could have played out differently (cf. Tetlock & Lebow, 2001) or prefactual considerations of what may be (Gleicher, Boninger, Strathman, Armor, Hetts, & Ahn, 1995). Mind-sets resulting from these approaches, which more directly focus thought in an exploratory, imaginative direction, may have a beneficial effect on the subsequent generation of novel ideas. Instead of promoting thinking within the box, they may actually facilitate out-of-the-box thinking. Whether the counterfactual is spontaneously generated or brought about by "what-if" scenarios may moderate the relationship between counterfactual mind-sets and a relational processing style.

Another possible direction for future research is to explore whether different types of counterfactual thoughts have differential effects on relational processing. A particularly important distinction may be the additive versus subtractive nature of the counterfactual. Additive counterfactuals refer to an action that may have been taken to create an alternate world, whereas subtractive counterfactuals refer to an action that may not have been taken to create an alternate world (Roese, Hur, & Pennington, 1999). Although counterfactuals generally aid in making causal judgments, Roese et al. demonstrated that additive counterfactuals more often express causal sufficiency, whereas subtractive counterfactuals more often express causal necessity (McGill, 1998; McGill & Klein, 1993). In the present research, the most common reaction to the rock concert scenario was "If only she had not switched seats. . .," which expresses a subtractive counterfactual. If the causal necessity associated with subtractive counterfactuals creates a closer association between the antecedent and consequent events than the causal sufficiency associated with additive counterfactuals, then the resulting relational processing style may be more strongly activated for the former type of counterfactual than the latter. One consequence of this possibility is that additive counterfactuals may be more beneficial for creative generation than subtractive counterfactuals have proved to be.

Given the powerful effect counterfactual thinking has been shown to have on a wide variety of problem-solving tasks, it is important to consider the implications of these findings. For example, an important practical consideration is how the use of a counterfactual mind-set as a debiasing technique stacks up against other procedures for promoting analytic thinking. Procedures that encourage decision makers to "consider the opposite" (Lord, Lepper, & Preston, 1984; Mussweiler, Strack, & Pfeiffer, 2000) or assign group members the role of a "devil's advocate" (Cosier, 1978; Janis & Mann, 1977) work by explicitly directing decision makers to become more critical. However, no explicit training or assignment of roles is required when a counterfactual mind-set is subtly activated. Perhaps the activation of a counterfactual mind-set to promote analytic thinking may be advantageous in delicate situations in which it is particularly important to avoid the appearance of a heavy hand guiding the decision-making process. Likewise, because blatant attempts to restrict an individual's freedom often provoke reactance (Brehm, 1966), the counterfactual mind-set approach to guiding decision-making processes may be more readily embraced by decision makers than the more directive approaches described above.

Conclusion

The present set of experiments provides evidence across multiple domains that counterfactual mind-sets promote a relational processing style, which is characterized by a tendency to consider relationships and associations among a class of stimuli and to structure thought and imagination around those associations. As a result, performance on analytic and creative tasks requiring the identification of logical relationships and associations is aided, but performance on creative tasks requiring the generation of novel

ideas matters is hindered. On a general level, the present research suggests that reflecting back on events in which an outcome almost turned out differently and mentally constructing an alternate world can impact how future problems are approached. More specifically, thinking about what may have been can prevent one from creating novel ideas but can lead that same person to notice hidden connections. Simply put, counterfactual mind-sets promote thinking within the box.

References

Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology, 45,* 357–376.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal, 39,* 1154–1184.

Brehm, J. W. (1966). *A theory of psychological reactance*. New York: Academic Press.

Byrne, R. M. J., & Tasso, A. (1994, August). Counterfactual reasoning: Inferences from hypothetical conditional. In A. Ram & K. Eiselt (Eds.), *Proceedings of the 16th Annual Conference of the Cognitive Science Society*. Hillsdale, NJ: Erlbaum.

Cosier, R. A. (1978). The effects of three potential aids for making strategic decisions on prediction accuracy. *Organizational Behavior and Human Decision Processes, 22,* 295–306.

Duncker, K. (1945). On problem solving. *Psychological Monographs, 58,* 270.

Einhorn, H. J., & Hogarth, R. M. (1986). Judging probable cause. *Psychological Bulletin, 99,* 3–19.

Feldman, L. A. (1995). Valence focus and arousal focus: Individual differences in the structure of affective experience. *Journal of Personality and Social Psychology, 69,* 153–166.

Friedman, R. S., & Forster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology, 81,* 1001–1013.

Galinsky, A. D., & Kray, L. J. (2004). From thinking about what might have been to sharing what we know: The effects of counterfactual mind-sets on information sharing in groups. *Journal of Experimental Social Psychology, 40,* 606–618.

Galinsky, A. D., & Moskowitz, G. B. (2000). Counterfactuals as behavioral primes: Priming the simulation heuristic and consideration of alternatives. *Journal of Experimental Social Psychology, 36,* 257–383.

Gleicher, F., Boninger, D. S., Strathman, A., Armor, D., Hetts, J., & Ahn, M. (1995). With an eye toward the future: The impact of counterfactual thinking on affect, attitudes, and behavior. In N. J. Roese & J. M. Olson (Eds.), *What might have been: The social psychology of counterfactual thinking* (pp. 283–304). Hillsdale, NJ: Erlbaum.

Glucksberg, S., & Weisberg, W. R. (1966). Verbal behavior and problem solving: Effects of labeling in a functional fixedness problem. *The Journal of Experimental Psychology, 71,* 659–664.

Guilford, J. P. (1950). Creativity. *American Psychologist, 5,* 444–454.

Janis, I. L., & Mann, L. (1977). Emergency decision making: A theoretical analysis of responses to disaster warnings. *Journal of Human Stress, 3,* 35–48.

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

Kelley, H. H. (1973). The processes of causal attribution. *American Psychologist, 28,* 107–128.

Kray, L. J., & Galinsky, A. D. (2003). The debiasing effect of counterfactual mind-sets: Increasing the search for disconfirmatory information in group decisions. *Organizational Behavior and Human Decision Processes, 91,* 69–81.

Krishnamurthy, P., & Sivaraman, A. (2002). Counterfactual thinking and advertising responses. *Journal of Consumer Research, 28,* 650–658.

Law School Admission Council. (2005).*Preparing for the LSAT*. Retrieved April 11, 2006, from http://www.lsac.org/pdfs/2006–2007/TestPrep06.pdf

Liljenquist, K. A., Galinsky, A. D., & Kray, L. J. (2004). Exploring the rabbit hole or possibilities by myself or with my group: The benefits and liabilities of activating counterfactual mind-sets for information sharing and group coordination. *Journal of Behavioral Decision Making, 17,* 263–279.

Lord, C. G., Lepper, M. R., & Preston, E. (1984). Considering the opposite: A corrective strategy for social judgment. *Journal of Personality and Social Psychology, 47,* 1231–1243.

Mandel, D. R. (2003). Judgment dissociation theory: An analysis of differences in causal, counterfactual, and covariational reasoning. *Journal of Experimental Psychology: General, 132,* 419–434.

Mandel, D. R., & Lehman, D. R. (1996). Counterfactual thinking and ascriptions of cause and preventability. *Journal of Personality and Social Psychology, 71,* 450–463.

Markman, K. D., & McMullen, M. N. (2003). A reflection and evaluation model of comparative thinking. *Personality and Social Psychology Review, 7,* 244–267.

McGill, A. L. (1998). Relative use of necessity and sufficiency information in causal judgments about natural categories. *Journal of Personality and Social Psychology, 75,* 70–81.

McGill, A. L., & Klein, J. G. (1993). Contrastive and counterfactual reasoning in causal judgment. *Journal of Personality and Social Psychology, 64,* 897–905.

Mednick, M. T., Mednick, S. A., & Mednick, E. V. (1964). Incubation of creative performance and specific associative priming. *Journal of Abnormal and Social Psychology, 69,* 84–88.

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review, 69,* 220–232.

Merriam-Webster. (2006). *Merriam-Webster online dictionary*. Retrieved April 11, 2006, from http://www.m-w.com/dictionary/analysis.

Mussweiler, T., Strack, F., & Pfeiffer, T. (2000). Overcoming the inevitable anchoring effect: Considering the opposite compensates for selective accessibility. *Personality and Social Psychology Bulletin, 26,* 1142–1150.

O'Hara, L. A., & Sternberg, R. J. (2001). It doesn't hurt to ask: Effects of instructions to be creative, practical, or analytical on essay-writing performance and their interaction with students' thinking styles. *Creativity Research Journal, 13,* 197–210.

Peterson, R. S., & Nemeth, C. J. (1996). Focus versus flexibility: Majority and minority influence can both improve performance. *Personality and Social Psychology Bulletin, 22,* 14–23.

Princeton Review. (2005). *The LSAT in detail.* Retrieved May 3, 2006, from http://www.princetonreview.com/law/testprep/testprep.asp?TPRPAGE=87&TYPE=LSAT-SECTIONS

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

Roese, N. J., & Hur, T. (1997). Affective determinants of counterfactual thinking. *Social Cognition, 15,* 274–290.

Roese, N. J., Hur, T., & Pennington, G. L. (1999). Counterfactual thinking and regulatory focus: Implications for action versus inaction and sufficiency versus necessity. *Journal of Personality and Social Psychology, 77,* 1109–1120.

Roese, N. J., & Olson, J. M. (1995). Functions of counterfactual thinking. In N. J. Roese & J. M. Olson (Eds.), *The social psychology of counterfactual thinking* (pp. 169–197). Hillsdale, NJ: Erlbaum.

Roese, N. J., & Olson, J. M. (1997). Counterfactual thinking: The intersection of affect and function. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 1–59). New York: Academic Press.

Rubin, D. C., Stoltzfus, E. R., & Wall, K. L. (1991). The abstraction of form in semantic categories. *Memory & Cognition, 19,* 1–7.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39,* 1161–1178.

Schwarz, N., & Bless, H. (1991). Happy and mindless, but sad and smart? The impact of affective states on analytic reasoning. In J. P. Forgas (Ed.), *Emotion and social judgments: International series in experimental social psychology* (pp. 55–71). Elmsford, NY: Pergamon Press.

Smith, S. M., Ward, T. B., & Schumacher, J. S. (1993). Constraining effects of examples in a creative generation task. *Memory & Cognition, 21,* 837–845.

Sternberg, R. J. (1988). Mental self-government: A theory of intellectual styles and their development. *Human Development, 31,* 197–224.

Sternberg, R. J., & Wagner, R. K. (1991). *MSG thinking styles inventory manual*. Unpublished manuscript.

Tetlock, P. E., & Lebow, R. N. (2001). Poking counterfactual holes in covering laws: Cognitive styles and historical reasoning. *American Political Science Review, 95,* 829–843.

Ward, T. B. (1994). Structured imagination: The role of category structure in exemplar generation. *Cognitive Psychology, 27,* 1–40.

Wason, P. C. (1966). Reasoning. In B. Foss (Ed.), *New horizons in psychology* (pp. 135–151). Middlesex, England: Penguin.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063–1070.

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

Appendix A

Examples Provided in Creative Generation Task Used in Experiments 4 and 5

(*1*) *Please generate a name for*: a new pasta

Examples: spaghetti, lasagna, fettuccini, rotini, pastina, rigatoni

(*2*) *Please generate a name for*: a nuclear element

Examples: radon, plutonium, argon, carbon, radium, uranium

(*3*) *Please generate a new name for:* an analgesic (pain reliever)

Examples: Tylenol, Anacin, aspirin, bufferin, panadol, Midol

Appendix B

Modified Version of the Remote Associates Task

Please identify a common word that links each set of 3 words together. You should answer as many questions as you can.

Example: sore—shoulder—sweat *Answer:* cold

(*1*) blank—white—lines (*page*)

(*2*) magic—plush—floor (*carpet*)

(*3*) thread—pine—pain (*needle*)

(*4*) stop—petty—sneak (*thief*)

(*5*) envy—golf—beans (*green*)

(*6*) chocolate—fortune—tin (*cookie*)

(*7*) barrel—root—belly (*beer*)

(*8*) broken—clear—eye (*glass*)

(*9*) pure—blue—fall (*water*)

(*10*) widow—bite—monkey (*spider*)

(Note: Answers appear in parentheses.)

Received June 17, 2005
Revision received September 28, 2005
Accepted September 29, 2005 ■