Counterfactual Thinking and Risk-Taking:
An Individual Difference Perspective
An Honors Thesis (HONRS 499)
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Counterfactual Thinking and Sensation Seeking

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Running Head: COUNTERFACTUAL THINKING AND RISK-TAKING
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Abstract

Social psychological research on counterfactual thinking has largely focused on its relationship to social issues. However, no research has focused on how individual differences affect counterfactual thinking. This study examined whether high and low sensation seekers differed in their tendencies to engage in counterfactual thinking. Results showed that the positive or negative outcome of a risky event can impact the thoughts of high and low sensation seekers. The only effect due to sensation seeking was that low sensation seekers who imagined a positive outcome were more likely than low sensation seekers who imagined a negative outcome to report they would do the event again. Because few effects were due to sensation seeking, the exact relationship between counterfactual thinking and sensation seeking remains inconclusive. The difficulties in predicting behavior from traits is discussed.
Acknowledgments

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Mr. Crane and Mr. Tees were scheduled to leave the airport on different flights at the same time. They traveled from town in the same limousine, were caught in a traffic jam, and arrived at the airport 30 minutes after the scheduled departure of their flights. Mr. Crane is told that his flight was delayed and just left five minutes ago. Mr. Tees is told that his flight left on time. Who is more upset?

The fate of these two men is identical, yet most people would say that Mr. Crane would be more upset (Kahneman & Tversky, 1982a). One process that may account for this decision is labelled counterfactual thinking. This type of thinking is a reaction to some event that has already occurred and is a thought that centers on what might have been. It is, for example, easier to imagine Mr. Crane thinking, "If only I had arrived five minutes earlier" than to imagine Mr. Tees thinking, "If only I had arrived 30 minutes earlier." (Miller, Turnbull, & McFarland, 1990).

The mechanisms that produce counterfactual thinking can be understood by examining norm theory
also tend to change items about which they have little knowledge (Kahneman & Miller, 1986). In addition, effects are seen as more mutable than causes, but if an effect follows a cause, then the cause is seen as more mutable (Wells et al., 1987). People will also change events dealing with the main character rather than sub-characters (Kahneman & Tversky, 1982a). Finally, affective reactions can result from counterfactual thinking (Kahneman & Tversky, 1982b; Landman, 1987), and social issues such as victim compensation, attributional effects, blame, and suspicion are all affected by counterfactual thinking (Miller & McFarland, 1986; Johnson, 1986; Wells & Gavanski, 1989; Miller & Gunasegaram, 1990; Miller et al., 1989). Research supporting each of these conditions is described below.

Change Involving Exceptions and Normality

People often mentally change the exceptions in a circumstance in order to undo the event. Consider, for example, a situation wherein a man is killed in an auto accident while taking a different route than usual. When asked to describe an event that would alter the outcome, most people chose to change the different
route (the exception) to the usual route (the normal) in order to avoid the accident rather than, for example, having the man go through the intersection two seconds earlier and therefore miss the car that would have hit him (Kahneman & Tversky, 1982a). Similarly, when the scenario involved three different events that could be either exceptions or norms, people chose to change the exception even when there were normal events that would have served to undo the event (Wells et al., 1987).

In contrast, however, other research has revealed that mutable events are not always exceptions and that changes are not always made toward normality. Wells and Gavanski (1989) developed a scenario about a employer who ordered a dish with wine sauce for an employee during a business meal. Unbeknownst to the employer, the employee was allergic to wine and died from eating the meal. In the first condition, the employer’s choice was between two dishes made with wine. In the second condition, the choice was between one meal with wine sauce and one without it. When asked to list changes in the story that could have prevented the employee’s death, more people in the
second condition chose to alter the meal choice as a way to undo the outcome than did those in the first condition. This occurred even though the normality of events was not changed. Another study also showed that people do not always change towards normality when presented with either exceptional or normal outcomes. Rather, when undoing the events, people changed the exceptional outcomes towards normality and the normal events toward exceptionality (Gavanski & Wells, 1989).

**Replicating Events**

Much of the research in this area deals with undoing events, but counterfactual thinking can also play a part in replicating events. This means that people will try to determine the normality of an event by the number of similar instances the event evokes. For example, in one experiment people read a scenario in which a child chose a chocolate chip cookie out of a jar. In one condition, there was one chocolate chip cookie and 20 oatmeal cookies in the jar. In the second condition, the jar contained 10 chocolate chip cookies and 200 oatmeal cookies. People reported how suspicious they were that the child peaked while choosing a cookie. Results showed that people in the
one chocolate chip cookie and 20 oatmeal cookies condition were more suspicious of the child than those in the 10 chocolate chip cookies and 200 oatmeal cookies condition. The probability of the child choosing the chocolate chip cookie is the same in both conditions. Differences in suspicion then likely occurred because the participants had to mentally replicate the event to determine how normal it would be that the child chose the chocolate chip cookie. Ten chocolate chip cookies in the jar evoked more similar instances of picking a chocolate chip cookie than the number of similar instances evoked by having only one chocolate chip cookie in the jar. Accordingly, the ten chocolate chip cookie condition was seen as more normal and as less suspicious. Counterfactual thinking resulted without having to undo the event, but instead normality was determined through how many times the event could be replicated (Miller et al., 1989).

**Improvement and Reliability**

Counterfactual thinking research suggests that events are more likely to be altered by an improvement than a deterioration (Kahneman & Miller, 1986). For example, if a runner loses a race, people’s thoughts
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about changing the outcome center more on the runner's own improvement in order to win the race than on the opponent's performance declining. Also, predictions from a reliable item to a less reliable item are made with more confidence than vice versa. Kahneman and Miller (1986) hypothesized that people would predict the score of a short IQ test more confidently from a long IQ test than they would predict a score on a long IQ test from a short IQ test. This happened even though probability of prediction from one test to another is the same. Moreover, if there is a discrepancy between test scores, more people change the short IQ test score.

Effects versus Causes

Kahneman and Miller (1986) have asserted that effects are more mutable than causes. In their experiment, people read a list of body weights and the amount of weight lifted by 10 weight lifters. The information given about the 10th weight lifter was unusual compared to the other nine, and people were asked to make changes according to what they expected. The majority of people changed the amount the 10th weight lifter lifted (the effect) instead of his body
weight (the cause). In contrast to this finding, however, when people in another study read scenarios wherein there was a specific set of events that led to a negative circumstance, they did change one of the prior events in order to change the outcome (Wells et al., 1987). It appears, then, that when an effect follows a cause, the cause is more mutable than the effect.

Main Characters versus Sub-characters

People tend to alter events surrounding the main character in the story rather than the actions of sub-characters. In a previously mentioned scenario, for example, a man reportedly took an unusual way home from work, was hit by a truck, and was killed. The majority of people's responses centered around changing the actions of the man who was killed (Kahneman & Tversky, 1982a). The focus of attention was put on the main character even though the truck driver's actions also led up to this tragedy.

Positive and Negative Affect

Counterfactual thinking can have affective results as well. That is, greater regret is experienced after an action outcome than after an inaction outcome in a
negative circumstance. For example, if a person receives a D in a class that he/she switched into from another class, he/she is thought to experience more regret than a person who received a D in the class and was in the class from the beginning (Kahneman & Tversky, 1982b). This has also been found to be true for positive outcomes. There is more joy over an action outcome than an inaction outcome, but the emotional response to negative events is stronger than emotional responses to positive events. The only time that joy responses equal responses of regret is when it is known that a negative event was avoided and, therefore, a successful decision was made (Landman, 1987). Counterfactual thinking, then, not only plays a part in negative circumstances and regret but also in positive events and joy.

Social Issues

Counterfactual thinking also speaks to how people react to social issues. One area in which this occurs is victim compensation. Miller and McFarland (1986) discovered that victims of abnormal actions received more sympathy than victims of normal actions. For example, the person who was shot in a convenience store
that is infrequently visited by him received more compensation than the person who was shot in a convenience store where he was a usual customer. Similarly, distance can affect victim compensation. The family of a plane crash victim who died 1/4 of a mile from a town received more sympathy than the family of a plane crash victim who died 75 miles from a town. Hence, both normality and distance can affect victim compensation.

Another area impacted by counterfactual thinking concerns affective and attributional effects of circumstances almost happening (Johnson, 1986). For example, people who just barely missed a positive outcome (e.g., winning the lottery) were rated more negatively than those who just missed a negative outcome (e.g., being diagnosed with cancer). They were also seen as being less likely to succeed and being less positive about their lives. In all of Johnson’s scenarios, the negative near outcome was rated more positively except when the scenario dealt with a trauma in which others were hurt. Specifically, in one scenario the person escaped being killed from a balcony collapsing but saw many people injured. In this case,
the person in the negative near outcome was not rated more positively than the person in the positive near outcome. This finding suggests that a person's circumstance, and the amount of control that he or she has over it, can affect how others view that person.

Counterfactual thinking can also lead to placing blame on others for innocent actions. Consider, for example, the previously mentioned scenario in which a boss orders a meal that contains wine for his employee (Wells & Gavanski, 1989). Unknown to the employer this particular employee is allergic to wine and dies from eating this meal. When the employer had the choice between a meal with wine and one without wine, people rated his decision to order the meal as having a high causal role for the employee's death. Judgment was placed on the employer even though the consequences were unforeseen. In another example, people were asked to play the role of a teacher and to select questions about an article in order to test students' knowledge about the article. If the students completed their studying of the article before the teacher chose the test questions, the teacher chose easier questions than if the students had not studied yet. This resulted
because the teachers attributed more blame to themselves if the students did poorly; student preparation was fixed and could not be changed (Miller & Gunasegaram, 1990). Counterfactual thinking, then, can play a role in how we judge others for possible innocent actions and for how we blame ourselves for neutral actions.

Finally, counterfactual thinking can lead to suspicion. In an earlier example (Miller et al., 1989), people imagined a child choosing a chocolate chip cookie out of a jar in which there was either 1 chocolate chip cookie and 20 oatmeal cookies or 10 chocolate chip cookies and 200 oatmeal cookies. People were more suspicious of the child when there was only one chocolate chip cookie in the jar even though the probability of choosing the chocolate chip cookie was the same in both conditions. When events seem more normal, there are more likely ways to imagine the event as occurring by chance, and therefore the outcome is less suspicious. These counterfactual beliefs lead to irrational thoughts and unfair suspicion and judgment.

Previous research on counterfactual thinking has dealt with how and when counterfactual thinking occurs.
One area that needs to be explored, however, is whether personality variables have an effect on people's use of counterfactual thinking. This experiment examines whether sensation seeking affects one's tendency to engage in counterfactual thinking. To test this, people will be categorized, on the basis of pretest scores, as either high or low sensation seekers (Zuckerman, 1979). Next, subjects will read risk scenarios in which they are to imagine themselves and their reactions. They will respond with their thoughts about participating in these events. It is expected that high and low sensation seekers will view the situations differently. Next, subjects will imagine completing the event successfully or unsuccessfully. They will then describe their thinking about the outcome and what they would change. These descriptions of their thoughts will be analyzed for evidence of counterfactual thinking with the expectation that high and low sensation seekers will differ in their use of counterfactual thinking. Finally, they will rate certain feelings and actions to test for differences in reactions to the positive and negative outcomes.
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Pretest

Selection of categories. A pretest was performed to identify differences in thoughts about the risk scenarios between the high and low sensation seeking groups. Independent coders placed each thought statement into one of 27 categories such as feelings positive, internal trait negative, and behavior neutral (see Appendix A). The categories were developed by reading the subjects' responses to what they were thinking about the scenario and then dividing those responses into as many descriptive categories as possible. The definitions of the categories are presented in Appendix B. The inter-rater reliability for the pretest was 74%.

Analysis of pretest report results. Chi-square tests were conducted only on those categories that were used by at least ten subjects. Significant effects for sensation seeking groups emerged for only the behavior negative category, $\chi^2(1, N = 72) = 9.48, p < .01$, with low sensation seekers (5.6%) reporting more negative behavior statements than high sensation seekers (12.0%). Next, the 27 categories were combined into three larger categories of positive, negative, and
neutral thoughts. An analysis of variance compared each of these three categories by sensation seeking groups (e.g., high versus low) and risk scenario type (e.g., car, raft and parachute scenarios). These tests revealed that, in the positive category, much of the variance was due to differences between the car scenario ($M = .93$), raft scenario ($M = .19$) and parachute scenario ($M = .60$), $F(2,210) = 20.67$, $p < .001$. Also, significant results were found for the effect of sensation seeking group, $F(1,210) = 6.49$, $p < .05$; the high sensation seeking group ($M = .68$) showed more positive reactions than the low sensation seeking group ($M = .44$). In addition, analyses of the negative category revealed a marginally significant difference between the car scenario ($M = .76$), raft scenario ($M = .92$), and parachute scenario ($M = .64$), $F(2,210) = 2.48$, $p < .09$. Finally, differences in the neutral category were found between the car scenario ($M = .29$), the raft scenario ($M = .75$), and the parachute scenario ($M = .71$), $F(2,210) = 9.61$, $p < .001$. Because of these scenario effects, Chi-square tests were performed within each risk scenario type for each of the 27 categories. Most significant results occurred for the
raft scenario; the only other significant result emerged for the parachute scenario (see Table 1).

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Insert Table 1 about here
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Because the variance caused by risk scenario type was undesirable, only the raft scenario was included for analysis in the final study.

Method

Subjects

One hundred twelve male subjects from a Midwestern university participated in this experiment to fulfill an introductory course requirement. The mean age of subjects was 19.68 (SD = 3.36). Self-reports of ethnicity revealed 92.0% were Caucasian, 3.6% were African-American, 2.7% were Asian and 1.8% did not respond.

Procedure

During a pretest session, subjects first completed an informed consent and received instructions about the experiment. Next, subjects rated themselves on a variety of filler scales and on the Sensation Seeking Scale (Zuckerman, 1979). After the debriefing, the
subjects had the opportunity to participate in another experiment. Those subjects who chose to participate signed an informed consent and received instructions about this experiment. Subjects in the pretest then read each of the three scenarios in which they were to imagine themselves parachuting, driving a car at 100 miles per hour, and river rafting. Order of scenarios was counterbalanced. After each scenario, subjects responded with their thoughts about participating in this event. Then, subjects reread the raft scenario and imagined either that they completed the event successfully or that they had failed with a result in injury. Subjects responded to this failure or success with their thoughts about the outcome and about what they would change about the event. They also completed four rating scales assessing their responsibility for the outcome, how lucky they felt, how likely or unlikely they would be to do the event again, and how likely the outcome would be the same. For each scale, scores ranged from 1 not at all to 7 very. Finally, subjects were debriefed.

Results

The subjects were classified as high and low
sensation seekers based upon the scoring system and norms reported by Zuckerman (1979) for the Sensation Seeking Scale. Subjects with a sensation seeking score equal to or above 21 were placed in the high sensation seeking group, and subjects with a sensation seeking score equal to or below 20 were placed in the low sensation seeking group. The sensation seeking scores had a mean of 20.25 (SD = 5.55) and scores ranged from six to 32. These results were similar to those obtained by Zuckerman (1979).

**Analysis of categories.** Chi-square tests compared the percentage of high and low sensation seekers who used each category statements within the raft scenario. One effect, $\chi^2(1, N = 64) = 4.03, p < .05$, revealed that high sensation seekers (9.7%) were more likely to use internal negative trait statements than low sensation seekers (1.4%). The other significant effect, $\chi^2(1, N = 64) = 6.18, p < .01$, showed that low sensation seekers (13.9%) more often stated negative behavior statements than high sensation seekers (4.2%).

**Analysis of responses to rating scale statements.** An analysis of variance on the responses to the rating scale items revealed that subjects in the positive
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outcome ($M = 5.58$) felt more lucky than those in the negative outcome ($M = 4.03$), $F(1,58) = 13.10, p < .001$. Results also revealed that subjects in the positive outcome ($M = 4.26$) were more likely to report willingness to try the event again than those in the negative outcome ($M = 3.10$), $F(1,58) = 4.57, p < .05$. The Outcome Group X Sensation Seeking Group interaction was also significant, $F(1,58) = 5.69, p < .02$. These means are shown in Table 2. Simple effects tests compared outcome means within each sensation seeking group. Significant effects revealed that low sensation seekers in the positive outcome group ($M = 5.17$) were more likely to report they would do the event again than were low sensation seekers in the negative outcome group ($M = 2.14$), $F(1,17) = 10.33, p < .005$. In addition, subjects in the positive outcome group ($M = 4.03$) more often believed that the outcome would be the same if they tried the event again than those in the negative outcome ($M = 2.74$), $F(1,58) = 7.47, p < .01$. 

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Insert Table 2 about here

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Categorization of outcome responses. For the last section of the study, subjects were given the same raft scenario with either a positive or negative outcome and were asked to respond to this with their thoughts about the outcome and what they would change. Two independent coders placed the statements dealing with subjects' thoughts about the outcome into the same 27 categories as used for the pretest. Statements about what subjects would change were placed into eight new categories such as internal behavior and nothing (see Appendix B). The inter-rater reliability for the coding was 89%.

Analysis of outcome responses. Only categories used by ten or more subjects were included in the analysis. A Chi-square analysis revealed significant effects in four categories. These results are displayed in Table 3. Subjects in the positive outcome group reported more positive feeling statements, external immaterial positive statements, and behavior positive statements than did those in the negative
outcome group. Reasoning statements were reported more often by those in the negative outcome group than those in the positive outcome group.

Discussion

Counterfactual thinking can potentially have a great impact on our behavior, and the social impact of this type of thinking emerges in many situations (Miller & Turnbull, 1990). Victims of more abnormal circumstances are awarded more money than those of normal circumstances, even when both victims' fates are the same (Miller & McFarland, 1986). People also attribute different traits to target persons depending on whether they happened to nearly miss a positive or negative circumstance (Johnson, 1986). Counterfactual thinking also explains how and why people place blame on others for innocent actions (Wells & Gavanski, 1989). Suspicion is another detrimental attitude that can result from counterfactual thinking (Miller et al., 1989). All of these studies have looked at how counterfactual thinking effects our views of other people. Yet, little is known about how the characteristics or traits of the perceiver affect this processing.
This study focused on the relationship between counterfactual thinking and sensation seeking by examining the ways in which high and low sensation seekers' thoughts differ. Results showed that these individuals differ in their use of internal negative trait and negative behavior statements. Specifically, high sensation seekers are more likely than low sensation seekers to state a negative attribute about themselves for participating in a potentially dangerous act. Also, low sensation seekers are more likely than high sensation seekers to think about terminating these actions immediately or never doing them again.

In addition to these differences in thoughts, high and low sensation seekers' tendency to use counterfactual thinking was assessed. One of these assessments consisted of the participants rating their feelings and actions on a rating scale derived from Johnson (1986). In that study, people rated targets who just missed a negative or positive outcome. In my study, men imagined that they were in either a positive or negative outcome and rated their own behavior. Significant effects were found for the outcome variable, but not for sensation seeking. However, one
significant interaction revealed that low sensation seekers in the positive outcome scenarios reported a greater likelihood of repeating the event again than those in the negative outcome scenarios.

The second assessment of counterfactual thinking in this study was based by reporting changes in normal versus exceptional events. A normal event might be taking the usual route home from work while an exception might be taking a different route than usual home from work. Typically, when people are asked to undo an event, they change the exceptions (Kahneman & Tversky, 1982a). In our study, after participants learned the outcome of their actions, they were asked what they would change. These thoughts were assessed for whether they contained external statements (exceptional events) or internal statements (non-exceptional events). An external thought might be the road not being closed or his raft not hitting the rock, both of which center on an exception; that is, they imply that had this factor not occurred then the negative result would not have happened. Internal statements focus more on changing one's own behavior rather than an exceptional object in the scenario.
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This would occur if the participant driving a car stated that he should have slowed down in order to avoid the accident. In this case, the actor viewed his own behavior as causal.

The results of this assessment for counterfactual thinking revealed differences in the use of positive feeling, external immaterial positive, behavior positive, and reasoning statements. Specifically, participants in the positive outcome were more likely than those in the negative outcome to feel good, to feel lucky, and to do the event again. Those in the negative outcome were more likely than those in the positive outcome to state the logic for their actions. These results again showed significant effects only for outcome. Specifically, participants in either the negative or positive outcome group differed in their reported statements, but participants' traits of high or low sensation seeking showed no effect on these responses. These results are similar to Johnson's (1986) finding that nearly missing a positive or negative outcome greatly affected people's attributions of others. Moreover, people's emotions, as affected by action versus inaction, can be manipulated by positive
or negative outcome effects (Landman, 1987). For example, a student who switches into a class and receives a 'D' for his course grade will be more upset than the student who was in the class from the beginning and receives a 'D' for his grade. In these studies, outcome successfully interacted with the variable of attributions and emotions. In our study, outcome had a large effect, but it failed to interact with sensation seeking.

There are several plausible reasons why outcome effects were more likely to emerge than were effects due to sensation seeking. In general, social and personality psychologists have had a very difficult time predicting behavior from attitudes or traits. This is especially true when trying to predict a specific behavior from general traits (Mischel, 1977). In this study, there are many traits that could have affected people's reaction to a specific scenario. The combination of these traits could have easily outweighed reactions due to one's level of sensation seeking; therefore, the effect of sensation seeking might have been masked.

Another factor that might have played a role is
the scenario or the context itself. Context can clearly affect behaviors, thereby masking the target's attitudes or traits (Mischel, 1977; Monson, Hesley & Chernick, 1982). This is especially true for specific situations where there are clear norms to follow (Abelson, 1982); when people act according to norms, it stifles individual differences. In my study, the participants could have easily responded to the scenarios according to how they believed they should have reacted instead of reporting their actual intentions. For example, they may have regarded fear as being a weakness and, therefore, felt reluctant to report being fearful in a risky situation. Similarly, men may have not reported ceasing a risky behavior even if they desired to do so. That is, their desire to conform to a social norm might have stifled their actual responses. Finally, because each scenario described a different event, each could have elicited its own set of norms. This may explain why so much variance in the pretest was due to scenario type. For example, participants tended to respond more positively to the car scenario compared to the raft scenario perhaps because driving a car at high speeds was seen
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as a popular behavior symbolizing high power. To the extent to which this held, the participants' reactions to the scenario norms would override their individual traits of sensation seeking.

Another problem in this study is that the participants might have been self-focused. Because they were asked to report their own thoughts, people might have been seeking to present themselves in the best way possible. Two issues are relevant to this possibility. First, according to script theory, people often behave without really thinking about what they are doing (Abelson, 1982). They are simply following routine tasks. But, in a highly individual situation, such as personally responding to a scenario, people might be cautious about what they reveal and might want their statements about themselves to conform to their idealized self. If so, these guarded thoughts might cover their natural reactions and the effects of traits such as sensation seeking. A second related point concerns strategic self-presentation (Jones & Pittman, 1982; Tedeschi, 1981). People seek to form good impressions in order to achieve approval. Accordingly, when they are self-focused, people often seek to
present only good traits about themselves. These "good" traits can easily cover such natural tendencies that would differ by sensation seeking, such as anxiety about a risky action.

Another problem is that this experiment lacked mundane realism. We might expect, then, that a response to an actual high risk situation in the real world would be very different from a response to a scenario in a laboratory setting. The physical and emotional effects of a real risk situation might sharply contrast to those of a read scenario, and this, in turn, might have affected cognitions. That is, imagining having a broken leg, as the participants in the negative outcome group did, is much different from experiencing an actual broken leg. With an imagined broken leg, the consequences are not as impending. Both of these issues might have overridden effects due to sensation seeking. However, in a real situation, low sensation seekers may well experience more fear, and high sensation seekers may well feel more excitement. These reactions might then lead to increasingly larger differences in responses between the two groups.
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Many factors could play a role in my relative lack of sensation seeking effects. The many reactions to the scenarios, the context, social norms, self-presentation, mundane realism, and strategic self-presentation all may have impacted the results. Despite these complications, more research needs to be done to understand the impact of individual differences on counterfactual thinking. This could uncover connections between aspects of social cognition, counterfactual thinking, and the individual. Sensation seeking is just one trait of many that might be important. But, no matter what trait is examined, future research must seek to reduce the factors that disguise the role of individual differences.
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References


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### Table 1

**Percentage of High and Low Sensation Seekers Using Category Statements**

<table>
<thead>
<tr>
<th>Category</th>
<th>High (χ²(1))</th>
<th>Low Sensation Seekers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raft Scenario</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Trait Negative</td>
<td>4.03'</td>
<td>9.7</td>
</tr>
<tr>
<td>Behavior Negative</td>
<td>6.18'</td>
<td>4.2</td>
</tr>
<tr>
<td>Parachute Scenario</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior Negative</td>
<td>3.70'</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Note. *p* < .05*
Table 2

Subjects’ Rating of Doing the Event Again by Sensation Seeking Group and Outcome Group

<table>
<thead>
<tr>
<th>Outcome Group</th>
<th>Sensation Seeking Group</th>
<th>High</th>
<th>Low</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td></td>
<td>3.38</td>
<td>2.14</td>
<td>2.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(24)</td>
<td>(7)</td>
<td>(31)</td>
</tr>
<tr>
<td>Positive</td>
<td></td>
<td>3.68</td>
<td>5.17</td>
<td>4.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(19)</td>
<td>(12)</td>
<td>(31)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3.53</td>
<td>3.66</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(43)</td>
<td>(19)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Higher numbers indicate greater likelihood of doing the event again. Numbers in parentheses indicate n per cell.
Table 3

Percentage of Subjects in Negative and Positive Outcome Groups Using Category Statements

<table>
<thead>
<tr>
<th>Category</th>
<th>$\chi^2(1)$</th>
<th>Negative Outcome</th>
<th>Positive Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings Positive</td>
<td>20.07&quot;&quot;</td>
<td>3.1</td>
<td>29.7</td>
</tr>
<tr>
<td>External Immaterial</td>
<td>15.44&quot;&quot;</td>
<td>1.6</td>
<td>23.4</td>
</tr>
<tr>
<td>Positive Reasoning</td>
<td>15.37&quot;&quot;</td>
<td>29.7</td>
<td>13.6</td>
</tr>
<tr>
<td>Behavior Positive</td>
<td>10.43'</td>
<td>0.0</td>
<td>14.0</td>
</tr>
</tbody>
</table>

Note. *p<.001. **p<.0001.
Counterfactual Thinking and Sensation Seeking

Appendix A: Coding Categories for Scenario Responses

FEELINGS
Positive
Negative
Neutral

INTERNAL
Trait +
Trait -
Trait neu

Action +
Action -
Action neu

EXTERNAL

INTERNAL
Behavior +
Behavior -
Behavior neu

Feelings +
Feelings -
Feelings neu

NOTHING

EXTERNAL
Object +
Object -
Object neu

Immaterial +
Immaterial -
Immaterial neu

PAST THOUGHTS
Positive
Negative
Neutral

FUTURE THOUGHTS
Positive
Negative
Neutral

REASONING THOUGHTS

QUESTIONING THOUGHTS

BEHAVIOR (do it)
Positive
Negative
Neutral

CAUTION/ DAMAGE CONTAINMENT
Appendix B: Coding Manual

WHAT ARE YOU THINKING

Feelings: Any statement containing a feeling.
Positive: I feel great. This is fun.
Negative: I feel scared. This is terrible.
Neutral: This is so-so.

Internal Trait: A statement about a characteristic that the subject possesses.
Positive: I am smart.
Negative: I am incompetent.
Neutral: I am human.

Internal Action: A statement about the subject’s personal skills.
Positive: I can cook very well.
Negative: I am terrible at swimming.
Neutral: I can ride a bike.

External Object: When a subject comments on a tangible object outside of himself.
Positive: This car cruises fast.
Negative: My friends are stupid.
Neutral: This is a boat.

External Immaterial: When a subject comments on an intangible object outside of himself.
Positive: I did well because of God.
Negative: It was bad luck.
Neutral: I can’t help myself.

Past Thoughts: A statement about a past event.
Positive: I had a blast when I went skiing.
Negative: I remember a car crash that I was in.
Neutral: I’ve been water rafting before.

Future Thoughts: A statement about a future event.
Positive: I am going to have many awards.
Negative: I hope I don’t get a ticket.
Neutral: I plan to go to Indianapolis.

Reasoning Thoughts: A statement of logic for an action.
...because it is illegal.
Questioning Thoughts: A statement in question form.
Why did this happen?

Behavior: A statement about doing the event in the scenario.
Positive: I am going to go faster.
Negative: I will never do this again.
Neutral: I am parachuting.

Caution/ Damage Containment: A statement showing a need to be careful or not to damage a person or an object.
I need to be careful.
I don’t want to get hurt.

WHAT WOULD YOU CHANGE
External: Changing something outside themselves to undo an event. Changing an exception.
I would have brought people with me.
The raft was defective.
I would have taken a different road.

Internal Behavior: Changing their action to undo the event.
Positive: I should have gone faster.
Negative: I should have slowed down.
Neutral: I should listen more.

Internal Feelings: A statement about change dealing with feelings.
Positive: I should have been more excited.
Negative: I should have been more scared.
Neutral: I should have been more calm.

Nothing: The subject changes nothing.