THE ROLE OF RELEVANT INFORMATION IN FUNCTIONAL COUNTERFACTUAL
THINKING

BY

RACHEL ELIZABETH SMALLMAN

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Doctoral Committee:

     Professor Neal J. Roese, Chair
     Professor Brian H. Ross
     Professor Dolores Albarracin
     Assistant Professor Jesse Preston
     Assistant Professor Kai Epstude, University of Groningen

ABSTRACT

Although counterfactual thinking is typically activated by a negative outcome, it can have positive effects by helping to regulate and improve future behavior. Known as the content-specific pathway, these counterfactual ruminations use relevant information (i.e., information that is directly related to the problem at hand) to elicit insights about the problem, create a connection between the counterfactual and the desired behavior, and strengthen relevant behavioral intentions. The current research examines how changing the type of relevant information provided (i.e., so that it is either concrete and detailed or general and abstract) influences the relationship between counterfactual thinking and behavioral intentions. Experiments 1 and 2 found that counterfactual thinking facilitated relevant intentions when these statements involved detailed information (Experiment 1) or specific behaviors (Experiment 2) compared to general information (Experiment 1), categories of behavior, or traits (Experiment 2). Experiment 3 found that counterfactuals containing a category of behavior facilitated specific behavioral intentions, relative to counterfactuals focusing on a trait. However, counterfactuals only facilitated intentions that included specific behaviors, but not when intentions focused on categories of behaviors or traits (Experiment 4). Finally, this effect generalized to other relevant specific behaviors; a counterfactual based on one relevant specific behavior facilitated an intention based on another relevant specific behavior (Experiment 5). Together, these studies further clarify our understanding of the content-specific pathway and provide a more comprehensive understanding of functional counterfactual thinking.

ACKNOWLEDGMENTS

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CHAPTER 1: INTRODUCTION

Imagining how events might have turned out differently is a common feature of the mental landscape; we are irresistibly drawn to thoughts of "if only" and "what might have been". When we focus on these mental representations of alternatives to past occurrences, features, and states we are engaging in a process known as counterfactual thinking (Byrne, 2005; Roese, 1997). Counterfactual thinking is frequently activated by a problem or negative emotional experience (e.g., doing poorly on an exam), and takes the form of an if-then conditional proposition in which the "if" specifies a particular action (If only I had studied harder) and the "then" component specifies an imagined outcome (I would have gotten a better grade). Counterfactual thoughts can be classified by their direction as upward or downward ('If only I had received an A' versus 'I could have received an F'; Markman, Gavanski, Sherman, & McMullen, 1993) and by their structure as additive or subtractive ('I could have read the textbook' versus 'If only I hadn't gone out the night before the exam'; Roese & Olson, 1993). As a result, counterfactuals are evaluative and can impact how individuals understand and find meaning in a variety of situations (McGill & Tenbrunsel, 2000; Roese, 1997; Spellman & Mandel, 1999).

Counterfactual thinking is something of a double-edged sword. It can evoke painful emotional states, decrease satisfaction, and bias social judgments (e.g., Sherman & McConnell, 1995). However, it also has the ability to improve performance, strengthen behavioral intentions, and help a person replace dysfunctional behavior with more functional ones (e.g., Roese, 1994). In this manner, counterfactual thinking can have a preparative or behavior regulating function. Known as functional counterfactual thinking (for a review, see Epstude & Roese, 2008), counterfactuals may enhance performance by either a content-neutral pathway (via mindsets or motivation) or a content-specific pathway (via relevant behavioral intentions).

In the content-specific pathway, counterfactual thinking helps to regulate behavior by using relevant information (i.e., information that is directly related to the problem at hand) to identify how an individual could have gotten a better result had he or she acted in a different manner. Through this process, these counterfactual ruminations elicit insights about the problem (Markman & McMullen, 2003; Roese, 1997; Sanna, 2000; Tykocinski & Steinberg, 2005), create a connection between the counterfactual and the desired behavior (Spellman, Kincannon, & Stose, 2005; Spellman & Mandel, 1999), and strengthen relevant behavioral intentions (Krishnamurthy & Sirivan, 2002; Nasco & Marsh, 1999; Roese, 1994; Smallman & Roese, 2009). However, in order for a counterfactual to regulate behavior successfully, the insights and relevant information involved in the counterfactual must be both accurate and functional. Accordingly, changing the type of relevant information provided (i.e., so that it is either concrete and detailed or general and abstract) should directly impact the effectiveness of the counterfactual. The current research presents five experiments that systematically manipulate the type of relevant information provided and measure whether it influences the relationship between counterfactual thinking and relevant behavioral intentions.

1.1 CONSEQUENCES OF COUNTERFACTUAL THINKING: INTENSIFYING EMOTIONS AND BIASING JUDGMENTS

Sometimes counterfactual thinking can be dysfunctional; it can influence affective reactions to events and be a hindrance to sound judgment. That is, by comparing a better imagined alternative with the lesser actual outcome, it leads to a contrast effect which exacerbates negative emotional states (Sherif & Hovland, 1961). Dwelling on these upward counterfactuals can intensify negative affect (Roese, 1994), heighten outcome dissatisfaction

(Markman et al., 1993), and increase distress and depression symptoms (Davis, Lehman, Wortman, Silver, & Thompson, 1995).

Beyond eliciting negative affect, counterfactual thinking is also a source of bias in judgment and decision-making. This view point traces back to norm theory (Kahneman & Miller, 1986), and has been supported by research about how counterfactual thinking impacts a variety of social judgments such as blame judgments and victim compensation (Markman, Karadogan, Lindberg, & Zell, 2009; Sherman & McConnell, 1996). When an accident or other negative event activates upward counterfactuals (most typically by either including an exceptional circumstance, or having the victim almost avoid harm), participants make stronger blame judgments (Branscombe & Weir, 1992; Wells & Gavanski, 1989), assume the perpetrator was more negligent (Macrae & Milne, 1992; Williams, Lees-Haley, & Price, 1996), and award greater monetary compensation to the victim (Macrae, 1992). The explanation for this effect is that activating upward counterfactuals intensifies negative affect about the situation. To compensate for this heightened negative emotional state, jurors increase their judgments of blame and financial restitution (Miller & McFarland, 1986). From this research, it is clear that counterfactual thinking has the potential to impact both affective states and decision-making processes.

1.2 PREPARATIVE FUNCTIONALITY: NEGATIVE OUTCOMES AND COUNTERFACTUAL THINKING

Although counterfactual thinking may be harmful, it may also serve as a preparative or behavior regulating process that can lead to behavior change and performance improvement (Epstude & Roese, 2008; Markman & McMullen, 2003; Roese, 1994). Ironically, it may be the

negative emotional experience itself that triggers this improvement. Accordingly, emotions are part of a feedback system that provides information about the external environment and the success (or failure) of an individual's progress towards their goals. In this case, the negative emotion signals that there is a problem that needs to be corrected, and stimulates cognitive processing that can help rectify the situation (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Baumeister, Vohs, DeWall, & Zhang, 2007). Counterfactual thinking is one such process, helping an individual identify how they could have gotten a better result had they engaged in a different behavior. Although it may be too late to fix the current problem (e.g., a student has already failed the exam), these counterfactual ruminations can provide a roadmap detailing how to bypass the negative outcomes in the future (Markman & McMullen, 2003; Roese, 1997; Sanna, 2000; Tykocinski & Steinberg, 2005). In this manner, counterfactual thinking promotes learning lessons and elicits insight that can serve as valuable input for future behaviors.

More generally, negative outcomes can motivate more effortful and systematic processing to help an individual deal with the specific threat or problem at hand (e.g., the feelings-as-information approach; Fiedler, 1988; Schwarz, 1990; Schwarz & Bless, 1991; Taylor, 1991). According to this perspective, an individual must selectively process relevant information to the exclusion of everything else, thus narrowing attention and scrutinizing details that would be useful for determining the cause of the problem. This can influence an individual's level of processing. Whereas positive emotions and feedback about success can lead to a higher-level or more abstract focus of processing, negative emotions and failure feedback can elicit a lower-level or more concrete focus (Clore, Gasper, & Garvin, 2001; Förster & Higgins, 2005). This has been shown in a variety of studies (Gasper, 2004; Gasper & Clore, 2002; Tyler & Tucker, 1982) and has been incorporated into various theoretical processing models (e.g., Action Identification

Theory; Vallacher & Wegner, 1987; Cognitive Tuning Model, Schwarz & Bless, 1991; GLOMO[sys], Förster & Dannenberg, in press). Most relevant to counterfactual thinking and goal-directed behavior, Action Identification Theory describes actions as having a cognitive hierarchy (known as an identity structure), in which actions can be identified at a variety of different levels. Low-level identities describe the details and specifics of the action, focusing on *how* the action is done, whereas high-level identities include a more abstract and comprehensive understanding of the action, focusing on *why* the action is done. Research has shown that problems or failures can lead people to characterize their behavior in terms of specific behavioral details and how the action is performed compared to more comprehensive behavioral information and why the behavior is enacted (Beukeboom & Semin, 2005; Vallacher & Wegner, 1987; Wegner & Vallacher, 1986). If negative outcomes elicit counterfactual ruminations while the individual has a heightened sensitivity to specific relevant information and low-level behavioral identities, it may influence the manner in which they understand their past behavior choices, the insights and lessons they learn from a particular problem, and the likelihood of behavior change in future situations.

1.3 FUNCTIONAL COUNTERFACTUAL THINKING: THE CONTENT-NEUTRAL PATHWAY

Counterfactual thinking can impact behavior and improve performance in a variety of ways; it can increase effort, motivation and goal striving as well as provide information about new behaviors and strengthen intentions to replace the dysfunctional behaviors with more functional ones. The current counterfactual literature makes a distinction between two different pathways to performance enhancement: a content-neutral pathway and a content-specific

pathway. This approach draws from the social comparison literature, which has found that upward social comparisons evoke negative affect, but also have positive motivational (i.e., content-neutral) and informational (i.e., content-specific) effects (Taylor, Buunk, & Aspinwall, 1990). The content-neutral pathway relies on the activation of a more general style of information processing or motivation to exert greater effort that results in behavior change in both related and unrelated situations. In contrast, the content-specific pathway focuses on the particular information contained in the counterfactual (i.e., the lesson learned or the insight about the causal effectiveness of a particular action) to strengthen relevant behavioral intentions and change relevant behaviors. Although it was originally introduced to clarify the influence of goals on action (Gollwitzer & Moskowitz, 1996), this distinction may clarify the role of counterfactual thinking in goal-related behavior (Epstude & Roese, 2008).

In the content-neutral pathway, the counterfactual improves performance in domains that are distinct from the original counterfactual (e.g., the counterfactual might focus on studying behavior, but exerts effects on intentions to engage in physical exercise; Kray & Galinsky, 2003; Markman & McMullen, 2003). Within this pathway, one way to influence behavior is via a counterfactual mindset. Similar to other types of mindset priming (Bargh & Chartrand, 2000; Chen, Schechter, & Chaiken, 1996; Sedikides & Skowronski, 1991), a counterfactual mindset activates a particular style of processing information which gets carried over to another context, such as an unrelated person perception task or problem solving task (Galinsky, Moskowitz, & Skurnik, 2000; Liljenquist, Galinsky, & Kray, 2004). Specifically, engaging in counterfactual thinking forces an individual to consider a variety of alternatives for a particular situation. Thinking about these alternatives makes it more likely that an individual will look for alternatives in a subsequent, unrelated situation (Kray, Galinsky, & Wong, 2006). For example,

participants in a counterfactual mindset were more likely to successfully solve the Duncker candle problem (Glucksberg & Weisberg, 1966), due to the fact that the solution is facilitated by the consideration of alternatives.

Within the content-neutral pathway, a second way to change behavior is by influencing motivation. According to the Reflection and Evaluation Model (Markman, McMullen, & Elizaga, 2008), the negative affect that is initially evoked by failure and intensified by a counterfactual elicits greater effort, persistence, and striving towards an achievement goal for another task (McMullen & Markman, 2000; Reb, 2008; Roese, Hur, & Pennington, 1999). For example, participants who generated upward counterfactual thoughts after completing an initial anagram task showed increased negative affect, which in turn motivated them to try harder and perform better on a second problem-solving task (Markman et al., 2008). This idea is similar to cybernetic models of motivation in which insufficient goal progress increases goal striving, in situations where the individual believes the goal is attainable (Carver, 2003; Carver & Scheier, 1999; Lawrence, Carver, & Scheier, 2002).

1.4 FUNCTIONAL COUNTERFACTUAL THINKING: THE CONTENT-SPECIFIC PATHWAY

In contrast, the content-specific pathway focuses on improving performance and strengthening behavioral intentions that are directly relevant to the initial negative outcome. Accordingly, the counterfactual (e.g., "I should have read the textbook") evokes a semantically related behavioral intention (e.g., "In the future I will read the textbook"), which in turn guides relevant behavior (e.g., reading the textbook before the subsequent exam) that can improve the original outcome (e.g., earning a higher grade on the subsequent exam). These connections result

from the causal relationship between the counterfactual and the imagined desirable outcome (Spellman et al., 2005; Spellman & Mandel, 1999; Wells & Gavanski, 1989). It is thought that these specific causal insights can facilitate future success (Johnson & Sherman, 1990; Roese, 1997; Seelau, Seelau, Wells, & Windschitl, 1995; Wells & Gavanski, 1989). For example, a student who has just failed an exam might think, "If only I had read the textbook, then I would have passed the exam" and conclude that reading the textbook thoroughly would have allowed the student to pass the exam. As a result, the student has stronger intentions to read the textbook before the next exam, and is actually more likely to read the textbook thoroughly before the next exam. Nasco and Marsh (1999) tested this possibility, finding that the relationship between counterfactual thoughts regarding a student's exam grade and their improvement on the subsequent exam was mediated by the student's belief that the action involved in the counterfactual (reading the textbook thoroughly) was causally linked to the desired outcome (success on the next exam).

Similar to Control Theory (Carver & Scheier, 1982, 1998), the content-specific pathway corresponds to a regulatory loop mechanism that governs ongoing social behavior (e.g., Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trotschel, 2001; Miller, Galanter, & Pribram, 1960). As illustrated in Figure 1, this process consists of three steps: 1) a negative outcome or problem activates counterfactual thinking, 2) counterfactual thinking activates a relevant behavioral intention, and 3) the behavioral intention evokes the corresponding behavior. This process preserves homeostasis by increasing activity level during a problem until there is successful resolution of the problem, at which point activity level is reduced.

As noted by Epstude and Roese (2008), currently available evidence for the content-specific pathway centers mostly on the power of problems or negative outcomes to activate

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counterfactual thinking (e.g., Gilovich, 1983; Sanna, Meier, & Wegner, 2001; Sanna & Turley, 1996). In both field and lab studies, failure at a variety of tasks (e.g., gambling, anagrams, blackjack) increased the frequency of upward counterfactual thoughts in both open-ended thought listings (Roese & Hur, 1997; Roese & Olson, 1997) and spontaneous verbalizations (Markman et al., 1993). Similarly, a significant amount of research has focused on the effect of behavioral intentions on behavior (e.g., Ajzen, 1991; Bandura, 1989; Heckhausen & Gollwitzer, 1987). In work on attitude-behavior relations, intentions are a key predictor of behavior and play a significant role in a variety of attitude-behavior theories (e.g., Theory of Reasoned Action, Fishbein & Ajzen, 1975; Model of Interpersonal Behavior, Triandis, 1980; and Protection Motivation Theory, Rogers, 1983). Both correlational and experimental studies have shown that behavioral intentions are reliably associated with behavior. A recent meta-analysis of correlational studies suggested that behavioral intentions have a large effect on behavior (d = 1.47; Sheeran, 2002), while a separate meta-analysis of experimental studies noted a more modest, moderate mean effect size (d = .36; Webb & Sheeran, 2006). Thus, current research provides a fairly detailed understanding of the first and third links in the content-specific pathway.

In contrast, early research offers a somewhat unclear picture of the link between counterfactual thinking and the formation of behavioral intentions. These experiments relied on between-subjects designs in which counterfactual thought-listing tasks were coupled with Likert behavioral intention ratings. Relative to both downward counterfactual and control conditions, eliciting upward counterfactuals heightened relevant behavioral intentions regarding academic performance (Nasco & Marsh, 1999; Roese, 1994), purchasing behavior (Krishnamurthy & Sirivan, 2002), smoking cessation (Page & Colby, 2003), and aviation pilot safety (Morris &

Moore, 2000). Although these results might be evidence of the content-specific pathway, they might also reflect the content-neutral pathway. That is, because only related behavioral intentions were assessed, the behavioral intentions could have been strengthened because of the information and insight inferred from the counterfactual (i.e., a content-specific mechanism), but may also be the result of a more general motivational boost that heightened intentions to perform *any* behavior (i.e., a content-neutral mechanism).

To resolve this ambiguity, recent research focused directly on the link between counterfactual thinking and the formation of behavioral intentions (Smallman & Roese, 2009). A sequential priming paradigm was developed that could be adapted to counterfactual research and was capable of assessing whether counterfactual judgments make corresponding behavioral intentions more accessible. In a sequential priming paradigm, there are two judgments of interest, a prime task and a subsequent target task. The idea behind this is that if the prime and target are linked together, then you should be faster to respond to the target task after completing the prime task (Neely, 1977). For example, seeing the word "doctor" makes you faster to respond to the word "nurse" because there are associations between these two concepts (Higgins, 1996; Meyer & Schvaneveldt, 1976). Applied to counterfactual thinking, if a counterfactual activates or strengthens a relevant behavioral intention, then responses for a subsequent intention judgment should be faster after a relevant counterfactual, compared to a control condition. In switching from Likert ratings to reaction time, it allows for a more non-conscious measure of the activation of the behavioral intention. Additionally, since these responses are relatively spontaneous, they are less susceptible to demand characteristics.

In this paradigm, participants read a description of an everyday negative event, followed by a prime (counterfactual or control) judgment and a target (intention) judgment. This set of

judgments was repeated for a number of different negative events (see Figure 2). After imagining the negative event happening to them, the prime judgment appeared and consisted of a judgment cue and an action statement. In the counterfactual trials, the cue prompted participants to decide if this action was something that could have changed the outcome of the event. In the control trials, the cue prompted participants to either decide whether or not they thought this action was common (frequency control judgment, Experiment 1) or whether they had performed this action in the past week (recency control judgment, Experiments 2 and 3). In all trials, participants indicated their answer using keys labeled yes and no. It was crucial that the prime judgment manipulated the counterfactual cleanly, such that the information contained in the prime was held constant, while varying only the presence of the counterfactual component. That is, the only difference between the counterfactual and control trials was the judgment cue that preceded the action. After responding to the prime judgment, the target judgment appeared, consisting of a target cue and an action statement. The target judgment was a behavioral intention judgment in which participants decided whether they would be likely to perform the action in the future. The target judgment was identical for both counterfactual and control trials. If a counterfactual activates a relevant behavioral intention, then participants should be faster to respond to the target intention judgment after viewing a counterfactual compared to a control prime. Therefore, comparing response times to the target intention judgment following either a counterfactual or a control prime provides a measure of the activation of the behavioral intention.

This series of studies addressed several interlocking hypotheses. First, it was necessary to determine whether counterfactual thinking facilitates the formation of behavioral intentions. Experiment 1 provided evidence that counterfactual judgments facilitated intention judgments relative to a no-judgment baseline and to a control judgment involving frequency estimation.

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Second, it was important to understand whether this facilitation effect is due to the information and insight provided by a relevant counterfactual (i.e., content-specific pathway), or whether the effect is also influenced by either a counterfactual mindset or a general motivation directed towards any behavioral intention (i.e., content-neutral pathway). Experiment 2 found that this facilitation effect occurred only for relevant behavioral intentions, thus ruling out the interpretation that a content-neutral mechanism explained the effect. Third, it was critical to test whether counterfactual thinking facilitates any semantically related judgment, or whether there is something special and unique about the relationship between counterfactuals and relevant behavioral intentions. This particular concern underscores the importance of distinguishing whether the facilitation is driven simply by the fact that the two statements are semantically similar (i.e., both focus on the same action), or whether this facilitation went above and beyond conceptual overlap and is the result of the particular causal insight that a relevant counterfactual can provide. Experiment 3 showed that this facilitation effect could not be explained in terms of conceptual overlap between the counterfactual and behavioral intention. Rather, the effect was apparent only for behavioral intention judgments, but not for a different target judgment task that focused on the same action and had the same level of conceptual overlap with the counterfactual but was not related to a behavioral intention. Thus, this research was intended to bridge a gap in the literature by providing direct evidence that counterfactuals influence relevant behavioral intentions via the content-specific pathway.

1.5 STEPS IN THE CONTENT-SPECIFIC PATHWAY: THE IMPORTANCE OF RELEVANT INFORMATION

However, for the content-specific pathway to operate successfully, the information extracted from the counterfactual must be both accurate (i.e., include actions that are feasible and have real-world implications; Spellman et al., 2005; Spellman & Mandel, 1999) and functional (i.e., focus on identifying and evaluating the problem, as well as evoke insights into more appropriate behavior that may facilitate success in the future; Roese, 1997; Epstude & Roese, 2008). Even if multiple counterfactuals are activated, the content-specific pathway should focus on only the most plausible and realistic ones to guide future behavior. Additionally, since the negative outcome will simultaneously narrow attentional focus and activate a localized level of processing, the information involved in the content-specific pathway is likely to be more detailed and concrete as well. That is, to be most efficient, the relevant information involved in the content-specific pathway should be compatible with the individual's narrowed attention and local focus of processing. The current research tests this idea: If the relevant information (i.e., information that is directly related to the problem at hand) is crucial to changing relevant behavior via the content-specific pathway, then it will be sensitive to manipulations in the type of relevant information provided, such that the pathway is most effective when the information is very specific and concrete compared to when the information is more general and abstract.

Although it has never been studied directly, existing research allows us to infer the influence that the type of relevant information has on the effectiveness of the content-specific pathway. For example, the information included in a description of a negative event can influence the frequency of counterfactual thoughts. When a negative event is depicted using concrete and detailed information, it evokes more upward counterfactuals compared to when the

same negative event is described using more general and abstract language (Petrocelli & Sherman, 2010; Sherman, Beike, & Ryalls, 1999). These particular descriptions concerned failure situations that were determined primarily by luck or involved difficult tasks in which learning was highly unlikely. As a result, these counterfactuals are not considered functional, because participants were unable to learn and adapt towards better behaviors. However, these results may still be applicable to the content-specific pathway. When a description paints a more detailed picture of an event, it provides a vast assortment of tangible factors that an individual could use to create accurate and specific relevant counterfactuals that in turn may help them learn to avoid the negative outcome in future situations.

Additionally, intentions can refer both to abstract endpoints as well as to concrete behavioral means of reaching those endpoints, so it is important to distinguish between broad goal intentions (i.e., a general desire to achieve a goal), mid-level behavioral intentions (i.e., a plan to perform a behavior at an unspecified future time), and localized implementation intentions (i.e., a specific if-then plan to perform a behavior when a particular situation arises). Research has found that as the scope of the intention becomes narrower and more concrete, the effect of the intention on behavior gets stronger. For example, both behavioral intentions and implementation intentions may influence behavior, whereas goal intentions, on their own, do not (Gollwitzer, 1990, 1993, 1999; Sherman, 1980). Subsequent meta-analyses confirmed this pattern; behavioral intentions had a moderate effect on behaviors ($d = .36$; Webb & Sheeran, 2006) and implementation intentions produced an even stronger effect on behavior ($d = .65$, Gollwitzer & Sheeran, 2006). The powerful effects of implementation intentions on behavior change and goal attainment has been shown in student samples (Aarts, Dijksterhuis, & Midden, 1999), the general public (Orbell, Hodgkins, & Sheeran, 1997), and clinical samples

(Brandstätter, Lengfelder, & Gollwitzer, 2001), using both self-report and objective measures of performance (Gollwitzer & Brändstatter, 1997; Milne, Orbell, & Sheeran, 2002).

Implementation intentions are more successful at changing behavior because they expand and elaborate on existing behavioral intentions by detailing both an appropriate opportunity (the critical situation) as well as the proper steps to facilitate the action (the goal-directed behavior). Forming the if-then plan specified in an implementation intention heightens accessibility of the constructs involved in the critical situation (Gollwitzer, 1999), making it easier to detect and attend to relevant situational cues (Webb & Sheeran, 2004) as well as more effective recall of the intention (Gollwitzer, Bayer, Steller, & Bargh, 2002). Applied to the content-specific pathway, for a counterfactual to lead to adaptive changes in the actual behavior (Epstude & Roese, 2008; Roese, 1997), it should only facilitate intentions that are most effective at influencing behavior.

1.6 THE PRESENT RESEARCH

The goal of the current research is to directly test whether the type of relevant information impacts the effectiveness of the content-specific pathway in general, and the relationship between counterfactual thinking and behavioral intentions in particular. Although Smallman and Roese (2009) offered the first unambiguous demonstration that counterfactuals directly influence behavioral intentions, it did not address how the content of either the counterfactual or the behavioral intention may influence this relationship. In order for the content-specific pathway to regulate behavior successfully, the relevant information involved in the pathway must be both accurate and functional. Accordingly, changing the type of relevant information provided should directly impact the relationship between counterfactual thinking and behavioral intentions. Additionally, problems and negative events narrow attentional processes

and heighten sensitivity to detailed information relevant to the problem at hand. While promoting a more local focus of processing, these problems are simultaneously activating counterfactual thinking as part of the content-specific pathway. Accordingly, the present research is the first test of how this narrowed attentional processing may influence the effectiveness of functional counterfactual thinking. Using the paradigm developed in Smallman and Roese (2009), the current research presents five experiments that manipulate the type of relevant information provided and measure whether it impacts the relationship between counterfactual thinking and the formation of behavioral intentions.

Experiments 1 and 2 addressed the overarching question of whether the relationship between counterfactual thinking and the formation of behavioral intentions is sensitive to changes in the type of relevant information provided. Experiment 1 tested whether counterfactuals facilitate the formation of a related behavioral intention when both statements contain very concrete and detailed information, compared to when both statements include abstract and general information. Since counterfactuals are mainly focused on changing goal-directed behavior, Experiment 2 used a different conceptualization of specific and general relevant information taken from the goal cognition literature. Drawing from the cognitive hierarchies that exist for goals and goal-directed behaviors (Aarts & Dijksterhuis, 2000; Carver & Scheier, 1990; Gollwitzer & Moskowitz, 1996; Heckhausen & Beckmann, 1990; Kruglanski et al., 2002; Vallacher & Wegner, 1987), the counterfactual and intention statements included a specific behavior (i.e., a particular course of action or program), a category of behavior (i.e., an abstract action or principle) or a characteristic (i.e., a self-related trait or concept). For both studies, if the narrowed attentional processing impacts the effectiveness of the content-specific pathway, then counterfactuals should only facilitate the formation of behavioral intentions when

both the counterfactual and behavioral intention focus on concrete and detailed information that is relevant to the particular problem at hand.

Although the first two experiments test the overall hypothesis of whether the type of relevant information is important, they do not address whether it is necessary for both the counterfactual as well as the behavioral intention to include detailed information, or is it sufficient for *either* the counterfactual *or* the behavioral intention to contain concrete and specific relevant information. Experiment 3 focused on whether the counterfactual statement must contain detailed relevant information in order to facilitate the formation of behavioral intentions. In this experiment, the focus of the counterfactual was varied such that it contained either a relevant category of behavior or a trait, measuring whether they equally facilitated a behavioral intention that contained a relevant specific behavior. Experiment 4 focused on whether counterfactuals only facilitate the formation of behavioral intentions that include detailed relevant information. In this experiment, the content of the counterfactual was held constant, such that it always contained a specific behavior, measuring whether it equally facilitated behavioral intentions that included either a category of behavior or a trait. Together, Experiments 3 and 4 tease apart the broader question of how the type of relevant information impacts the effectiveness of the content-specific pathway by testing whether the counterfactual and the behavioral intentions are equally sensitive to changes in the type of relevant information.

A final question is whether it is necessary for the behavioral intention to focus on the same specific relevant information that is contained in the counterfactual. That is, even if a more local focus of processing makes the content-specific pathway more sensitive to detailed relevant information, it does not necessarily mean that both the counterfactual and the behavioral intention must focus on the same piece of concrete relevant information. Experiment 5 tested this

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possibility by examining whether a counterfactual containing one relevant specific behavior facilitated a behavioral intention that included a second relevant specific behavior. At a broader level, Experiment 5 makes further connections to the goal cognition literature by addressing whether the content-specific pathway has the goal priming property of equifinality (i.e., the ability to activate multiple means to a goal; Kruglanski et al., 2002; Shah, Friedman, & Kruglanski, 2002). Together, the current research provides a more nuanced understanding of the relationship between counterfactuals and relevant behavioral intentions within the content-specific pathway.

CHAPTER 2: EXPERIMENT 1

Experiment 1 is a preliminary test of whether the type of relevant information provided influences the effect of counterfactual thinking on behavioral intentions. A crucial part of the content-specific pathway's functionality is the information and insight evoked by the causal relationship between the counterfactual and desired behavior (Spellman et al., 2005; Spellman & Mandel, 1999). Additionally, problems and negative events have been shown to narrow attentional processes and heighten sensitivity to more concrete and detailed behaviors that can help an individual learn from their mistakes and adapt their behavioral choices (Baumeister et al., 2001; Baumeister et al., 2007). Therefore, it is important to know whether this more local focus of processing and sensitivity to concrete and detailed information will influence how the content-specific pathway functions.

In this experiment, the relevant information was manipulated such that the behavior was described using either specific or general terms. To do this, the wording of the action statements was altered so that half of the trials included statements that were described in a detailed and concrete manner, whereas the other half of the trials involved statements that were described in a broad and general manner. Since this first experiment is interested in the overall hypothesis that the type of relevant information is important in understanding the effect of counterfactuals on behavioral intentions, the type of information was held constant across prime and target tasks. That is, if the trial included a detailed statement in the prime task, they would see the same detailed statement in the target task (e.g., using a lid); if the trial included a general statement in the prime task, then they would see the same general statement in the target task (e.g., drinking more carefully). Based on earlier research showing that negative outcomes heighten the sensitivity to and importance of concrete and specific relevant information, we should see a

significant interaction, such that the facilitating effect is much stronger when the relevant information is very detailed, compared to when it includes more general relevant information.

2.1 METHOD

Forty-three students participated for course credit. In all research reported here, testing was implemented using desktop computers running MediaLab and DirectRT software.

The sequential priming paradigm was based on the one used in the previous work by Smallman and Roese (2009), with minor modifications so that the type of relevant information could be manipulated. Participants completed 100 trials consisting of 50 trials in the counterfactual and 50 trials in the control conditions. Within each condition, 25 trials included detailed relevant information and 25 trials included general relevant information. Each trial's condition, order, and information type were fully randomized.

In each trial, participants made two judgments in succession: the prime (action) judgment and the target (intention) judgment. As the trial began, participants first saw a negative event, designed to establish context. Events were selected to be representative of the mishaps that college students encounter (see Appendix A). A simple negative event (e.g., "got a bad sunburn") appeared on the screen first. Participants were asked to imagine that the event happened to them personally. Two seconds later, the prime task (a judgment related to this particular negative event) appeared. The prime judgment appeared below the event description and consisted of a judgment cue and an action statement. There were two prime conditions, manipulated on a within-subject basis: counterfactual versus control. The manipulation hinged on the judgment cue that preceded this action statement (i.e., counterfactual vs. control). A crucial aspect of the prime task is to hold constant the main informational content of the priming

judgment (i.e., the action statement) while varying only the presence of a counterfactual component. Therefore, the only thing that differed between the counterfactual and control trials was the judgment cue preceding the action statement. Thus, the cue contained either a counterfactual marker ("could have") versus a control marker focusing on non-counterfactual (i.e., factual) aspects of the statement that followed.

In the counterfactual trials, a counterfactual cue was paired with the action statement. For example, if the negative event was "got a bad sunburn," then a counterfactual cue would be paired with a relevant action (e.g., "Should have" + "worn sunscreen"). Participants decided if this action (e.g., wearing sunscreen) was something that could have changed the outcome of the event (e.g., getting a bad sunburn). Participants pressed a key labeled "yes" or "no" to indicate their decision. In the counterfactual trials, one of two cues was randomly inserted prior to the action statement ("could have" or "should have"). This variation was introduced to rule out the interpretation that effects depended on particular syntax.

In the control trials, a factual cue was paired with the action statement. The control trials involved a recency judgment. For example, if the event was "got a bad sunburn," then a control cue would be paired with a relevant action (e.g., "In the last week have" + "worn sunscreen"). Participants decided whether they had actually performed the action (e.g., wearing sunscreen) within the past week. As in the counterfactual trials, participants pressed a key labeled "yes" or "no" to indicate their decision.

Between the prime (action) task and the target (intention) task in each trial, a blank screen appeared, asking participants to press a key to continue. This "pause" screen was included to eliminate the influence of motor facilitation on RTs (i.e., remove the effect of successive identical key presses).

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The second judgment, the target task, was a behavioral intention judgment. Participants made a judgment about possible future actions, which were always related to the negative event included in the prime task (e.g., getting a bad sunburn). The target task consisted of a target cue and a future action. On each trial, the target cue "In the future I will" appeared first on the screen. After a 2 second delay, the relevant action appeared directly below the target cue (e.g., "wear sunscreen"). Participants decided whether they would be likely to perform the action in the future (e.g., "In the future I will wear sunscreen"), pressing a key labeled "yes" or "no" to indicate their decision. Thus, this procedure permitted a within-subject manipulation of counterfactual thinking that controlled for similarity in content across counterfactual and control trials (See Figure 2 for overview of procedure).

The type of relevant information was manipulated such that the actions in the prime and target task were described using either very specific and detailed language or more general and abstract language (See Appendix A). For example, when considering the event "got a bad sunburn," participants may be asked to consider the specific action of "wearing sunscreen" or the more general action of "taking precautions". The type of information was consistent across prime and target tasks within a particular trial. That is, if a trial had a detailed action in the prime task (e.g., "Could have worn sunscreen" or "In the past week have worn sunscreen"), then they would see the same detailed action in the target task (e.g., "In the future I will wear sunscreen"). Similarly, if a trial included a general action in the prime task (e.g., "Could have taken precautions" or "In the past week have taken precautions"), then they would see the same general action in the target task (e.g., "In the future I will take precautions").

2.2 RESULTS AND DISCUSSION

Outlier RTs, defined on a within-subject basis as RTs > 3.0 *SD*s above the within-condition mean, RTs < 3.0 *SD*s below the within-condition mean, or RTs < 200 ms, were trimmed (2.6% of RTs). Within each type of relevant information, outliers were distributed approximately equally between counterfactual and control conditions (specific: .8% and .7%; general: .7% and .4%). Data were log-transformed to correct for skewed distribution; untransformed means are presented for clarity.

To provide a more sensitive test of our hypothesis, we only examined RTs for intentions judgments in which participants responded "yes" (83% of all trials). Because we were interested in whether counterfactuals facilitated responding to an intention, the effect depends on subjects considering the intention plausible and desirable. The subset of intention RTs with "yes" responses were distributed evenly across the counterfactual and control conditions within each type of relevant information (specific: 24% and 24%; general: 26% and 26%).

A 2 (prime judgment: counterfactual vs. control) x 2 (information type: specific vs. general) ANOVA revealed a main effect of prime judgment, $F(1, 42) = 4.76$, $p = .03$, $d = 0.67$, and a non-significant main effect of information type, $F(1, 42) = .71$, $p = .40$, $d = 0.26$. The interaction effect indicated that the pattern of facilitation by counterfactual relative to control judgments varied as a function of the type of relevant information provided, $F(1, 42) = 3.93$, $p = .05$. When the action statements were very specific and detailed, the facilitation effect from Smallman and Roese (2009) was replicated: counterfactuals produced faster behavioral intention judgments relative to control judgments (Ms = 613 ms vs. 670 ms), $t(42) = 2.89$, $p = .006$, $d = 0.44$. When the action statements were more general and abstract, however, counterfactuals did not facilitate behavioral intentions relative to control judgments (Ms = 650 ms vs. 655 ms), $t(42)$

$= 0.26$, $p = .79$, $d = 0.04$. This experiment provides initial evidence that the focus of the relevant information is important in determining whether a counterfactual will facilitate a relevant behavioral intention (See Figure 3). Additionally, this is the first direct evidence that the content of the relevant information is an important factor for understanding the content-specific pathway of functional counterfactual thinking.

CHAPTER 3: EXPERIMENT 2

Experiment 1 provides preliminary evidence that the manner in which the relevant information is depicted is an important factor in determining whether a counterfactual will facilitate a relevant behavioral intention. However, manipulating the type of relevant information using specific and general descriptions may be a somewhat oversimplified classification. Whereas a specific statement would most likely include a detailed description of a behavior (e.g., using a lid), a general statement could be somewhat nebulous; while it might still focus directly on a general set of behaviors (e.g., drinking more carefully), it may also make an indirect reference to a behavior by focusing on a broader personal goal or personality trait (e.g., being neater). Since counterfactuals are often focused on changing goal-directed behavior, it may be more appropriate to make distinctions based on the cognitive hierarchies that exist for goals and goal-directed behaviors (Aarts & Dijksterhuis, 2000; Carver & Scheier, 1990; Gollwitzer & Moskowitz, 1996; Heckhausen & Beckmann, 1990; Kruglanski et al., 2002; Vallacher & Wegner, 1987). Accordingly, a separation is made between relevant information that focuses on a specific behavior (i.e., a course of action goal or program like using a lid), a category of behavior (i.e., an abstract action goal or principle like drinking more carefully) and a trait or characteristic (i.e., a self-related goal or system concept like being neater). Post-hoc coding of the relevant information used in Experiment 1 showed that 44% of the statements referred to specific behaviors, 41% of the statements referred to categories of behaviors, and only 15% referred to traits. This unequal distribution makes it difficult to draw any post-hoc inferences about how these types of relevant information influence the relationship between counterfactual thinking and the formation of behavioral intentions.

As a result, Experiment 2 expanded the relevant information used for Experiment 1 such that each negative event now has three possible corresponding actions: a specific behavior, a category of behavior, and a trait (See Appendix B). Using this new set of statements, the type of information was manipulated by randomly assigning trials to include prime and target statements that described a specific behavior, a category of behaviors, or a personality trait or characteristic. As in the first experiment, the type of information was held constant across prime and target tasks. Even though Experiment 2 uses a different way of altering relevant information, it should replicate the pattern of results found in Experiment 1. There should be a significant interaction, with evidence of facilitation only for trials in which the information focuses on specific behaviors, but not for trials which include information using categories of behaviors or personality traits.

3.1 METHOD

Forty students participated for course credit. As in Experiment 1, each trial included an event description, followed by two judgments in succession: the prime (action) judgment and the target (intention) judgment. Each trial's condition, order, and information type were fully randomized. The first judgment, the prime task, consisted of a judgment cue and an action statement. In counterfactual trials, the priming task included a counterfactual cue and action statement, with participants deciding if the action was something that could have changed the outcome of the event. In control trials, the priming task consisted of a factual cue and action statement, with participants deciding if they had performed the action within the past week. In both conditions, participants pressed a key labeled "yes" or "no" to indicate their decision. Between the prime (action) task and the target (intention) task in each trial, a blank screen

appeared (identical to the Pause Screen described in Experiment 1), asking participants to press a key to continue. The second judgment, the target task, consisted of an intention cue and a future action, with participants deciding whether they would be likely to perform the action in the future. The future actions were always related to the event in the prime task. Participants pressed a key labeled "yes" or "no" to indicate their decision. One hundred trials were used, evenly split between conditions and information type and fully randomized across participants (See Figure 2 for overview of procedure).

The type of information was manipulated such that the prime and target task statements described a specific behavior, a category of behaviors, or a trait (See Appendix B). For example, when considering the event "got a bad sunburn," participants may be asked to consider the specific behavior of "wearing sunscreen," the category of behavior of "taking precautions," or the trait of "being more responsible". As in Experiment 1, the type of information was consistent across prime and target tasks within a particular trial. That is, if a trial had a specific behavior in the prime task (e.g., "Could have worn sunscreen" or "In the past week have worn sunscreen"), then they would see the same specific behavior in the target task (e.g., "In the future I will wear sunscreen"). Similarly, if a trial included a category of behavior in the prime task (e.g., "Could have taken precautions" or "In the past week have taken precautions"), then they would see the same category of behavior in the target task (e.g., "In the future I will take precautions"). Likewise, if a trial included a trait in the prime task (e.g., "Could have been more responsible" or "In the past week have been more responsible"), then they would see the same trait in the target task (e.g., "In the future I will be more responsible").

3.2 RESULTS AND DISCUSSION

Outliers were trimmed as before, eliminating 2.0% of the RT data. Within each type of information, outliers were distributed approximately equally between counterfactual and control conditions (specific behaviors: .3% and .2%; categories of behavior: .4% and .3%; traits: .5% and .3%). As before, only the intention judgments in which participants responded "yes" (84% of all trials) were analyzed. The subset of intention RTs with "yes" responses were distributed evenly across the counterfactual and control conditions within each type of relevant information (specific behaviors: 16% and 16%; categories of behavior: 18% and 18%; traits: 16% and 16%).

A 2 (prime judgment: counterfactual vs. control) x 3 (information type: specific behavior vs. category of behavior vs. trait) ANOVA revealed non-significant main effects for both prime judgment, $F(1, 39) = 1.21$, $p = .28$, $d = 0.35$, and information type, $F(1, 39) = .62$, $p = .44$, $d = 0.25$. The interaction between prime judgment and information type, however, was significant, $F(1, 39) = 4.67$, $p = .04$, indicating that the pattern of facilitation by counterfactual relative to control judgments varied as a function of the type of information provided. When these statements described a specific behavior, counterfactuals produced faster behavioral intention judgments relative to control judgments (Ms = 622 ms vs. 675 ms), $t(39) = 2.14$, $p = .04$, $d = 0.34$. However, when these statements centered on a category of behavior, counterfactuals did not facilitate behavioral intentions relative to control judgments (Ms = 672 ms vs. 644 ms), $t(39) = 0.97$, $p = .34$, $d = 0.15$. Similarly, when the statements focused on a trait, counterfactuals did not significantly facilitate behavioral intention judgments relative to control (Ms = 634 ms vs. 657 ms), $t(39) = 0.96$, $p = .34$, $d = 0.15$. These findings replicate the pattern of results from Experiment 1, showing that the type of relevant information provided can impact whether or not counterfactual thinking can facilitate the formation of a relevant behavioral intention (See Figure

4). Importantly, these results further refine the findings from Experiment 1 by differentiating the types of information in a manner that is more compatible with goal-directed behavior (Kruglanski et al., 2002; Wegner & Vallacher, 1986). Although Experiments 1 and 2 provide evidence that the overall type of relevant information is an important factor in understanding the content-specific pathway, it does not distinguish between the type of relevant information contained in the counterfactual and the type of relevant information involved in the behavioral intention. These underlying questions are addressed in Experiments 3 and 4.

CHAPTER 4: EXPERIMENT 3

The first two experiments support the overall hypothesis that the type of relevant information influences both the functionality of the content-specific pathway in general and the relationship between counterfactual thinking and relevant behavioral intentions in particular. Accordingly, it appears that a counterfactual facilitates the formation of a behavioral intention only when both statements focus on concrete and detailed relevant behavioral information. However, it does not address whether it is necessary for both the counterfactual as well as the behavioral intention to include this detailed information, or is it sufficient for *either* the counterfactual *or* the behavioral intention to contain this type of information. Experiment 3 examines the first part of this hypothesis by varying the type of relevant information contained in the counterfactual such that it focuses on either a category of behavior (e.g., drinking more carefully) or a trait (e.g., being neater) and measuring whether these counterfactuals will facilitate a behavioral intention that focuses on a specific behavior (e.g., using a lid).

Counterfactual thinking is functional in part because it provides an opportunity to reflect on the particular behaviors that could have prevented the problem at hand and how one could apply those behaviors to future situations. As a result, a key aspect of a counterfactual's functionality is that it should be easily transformed into a future plan for preventing failure (McEleney & Byrne, 2006). Consider for a moment a typical negative event, spilling a cup of coffee. As you are cleaning up the mess, you may say something like, "I could have used a lid" or think "I should have drank more carefully" or "If only I was neater". The information in the first two counterfactuals translate easily into preventative actions (you can see yourself picking up a lid and putting it on the coffee cup to prevent it from spilling or focusing your attention on the coffee cup so that you drink it more carefully). In comparison, the latter counterfactual is not

so straightforward; it makes an indirect reference to a preventative behavior, but does not provide any functional behavioral details (e.g., how exactly do I go about "being neater"?). That is, when a counterfactual focuses on an abstract trait (e.g., I could have been neater), the behavior must be inferred; first one has to first think about what it means to be neater, retrieve a variety of possible behaviors, and finally, select an appropriate behavior from this vast assortment that may or may not be useful in preventing future failure. Inferring a behavior from a trait is neither an easy task (Carlston, 1992), nor a frequent occurrence (Maass, Colombo, Colombo, & Sherman, 2001), and it is generally difficult to predict a single behavior from a given trait (Epstein, 1979; Sherman & Fazio, 1983). Accordingly, it is unlikely that a counterfactual focusing on a trait would truly be considered functional.

Using the set of statements from Experiment 2, the type of information was manipulated so that the prime statement described a category of behavior (e.g., drinking more carefully) or a trait (e.g., being neater) while the target statements always focused on a specific behavior (e.g., using a lid). In this experiment, counterfactuals should only facilitate relevant behavioral intentions when the counterfactual contains information that focuses directly on behaviors (i.e., categories of behaviors) compared to when the counterfactual requires that behavior must be inferred (i.e., traits).

4.1 METHOD

Forty-six students participated for course credit. As in the earlier experiments, each trial included an event description, followed by two judgments in succession: the prime (action) judgment and the target (intention) judgment. Each trial's condition, order, and type of prime statement information were fully randomized. The first judgment, the prime task, consisted of a

judgment cue and an action statement, with participants deciding if the action was something that could have changed the outcome of the event (counterfactual condition) or if they had performed the action within the past week (control condition). Between the prime (action) task and the target (intention) task in each trial, a blank screen appeared (identical to the Pause Screen described in Experiment 1), asking participants to press a key to continue. The second judgment, the target task, consisted of an intention cue and a future action, with participants deciding whether they would be likely to perform the action in the future. One hundred trials were used, evenly split between conditions and type of prime statement information and fully randomized across participants (See Figure 2 for overview of procedure).

The type of information was manipulated such that the prime statement described either a relevant category of behaviors or a trait while the target statement always focused on a relevant specific behavior (See Appendix B). For example, when considering the event "got a bad sunburn," participants may be asked to consider whether "taking precautions," (category of behavior) or "being more responsible" (trait) would have helped them avoid getting the bad sunburn (counterfactual prime judgment) or whether they had taken precautions or been more responsible in the past week (control prime judgment). In that trial's target intention judgment, they would be asked to consider whether "wearing sunscreen" (specific behavior) was something they would be likely to do in the future. Unlike Experiments 1 and 2, prime statements focused on either relevant categories of behavior or relevant traits; specific behaviors only appeared in the intention statements.

4.2 RESULTS AND DISCUSSION

Outliers were trimmed as before, eliminating 2.9% of the RT data. Within each type of information, outliers were distributed approximately equally between counterfactual and control conditions (categories of behavior: .8% and .7%; traits: .7% and .6%). As before, only the intention judgments in which participants responded "yes" (83% of all trials) were analyzed. The subset of intention RTs with "yes" responses were distributed approximately evenly across the counterfactual and control conditions within each type of information (categories of behavior: 24% and 25%; traits: 26% and 24%).

A 2 (prime judgment: counterfactual vs. control) x 2 (information type: category of behavior vs. trait) ANOVA revealed a significant main effect for prime judgment, $F(1, 45) =$ 6.39, $p = .02$, $d = 0.75$, and a marginally significant main effect for information type, $F(1, 45) =$ 3.37, $p = .07$, $d = 0.54$. The interaction between prime judgment and information type, however, was not significant, $F(1, 45) = .5$, $p = .48$. Results indicated that when prime statements involved relevant categories of behavior, counterfactual judgments facilitated specific behavior intention judgments, relative to control judgments ($Ms = 1162$ ms vs. 1226 ms), $t(45) = 2.15$, $p = .04$, $d = 0.32$. However, when prime statements centered on traits, counterfactuals did not significantly facilitate specific behavior intention judgments relative to control ($Ms = 1219$ ms vs. 1248 ms), $t(45) = 0.82$, $p = .42$, $d = 0.12$. These findings show that there is some flexibility in the content of the counterfactual in order for it to facilitate a behavioral intention. As long as the information contained in the counterfactual is directly related to the behavior (i.e., a specific behavior or a category of behavior), it should facilitate the formation of a relevant behavioral intention. When the counterfactual focuses on a trait, it requires additional effortful steps to get from the particular trait to the desired behavior, so the facilitation effect is attenuated (See Figure 5).

CHAPTER 5: EXPERIMENT 4

Experiment 3 tested one aspect of the relationship between counterfactual thinking and behavioral intentions, finding that as long as a counterfactual focuses directly on an appropriate behavior (i.e., contains a category of behavior), it will facilitate a behavioral intention that describes a specific behavior. Experiment 4 tested the other possibility by examining whether a counterfactual containing a specific behavior (e.g., using a lid) will facilitate behavioral intentions focusing on either a category of behavior (e.g., drinking more carefully) or a trait (e.g., being neater).

A crucial part of the content-specific pathway is that a counterfactual should not only strengthen the relevant behavioral intention but also lead to adaptive changes in the actual behavior (Epstude & Roese, 2008; Roese, 1997). As discussed earlier, research on the differential impact of intentions on behavior shows that as the level of specific and detailed relevant information increases, so too does the effect of intentions on behavior (Gollwitzer, 1990, 1993, 1999; Gollwitzer & Sheeran, 2006; Webb & Sheeran, 2006). Accordingly, localized implementation intentions (i.e., specific if-then plans to perform a specific behavior during a particular situation) have a stronger impact on behavior compared to both mid-level behavioral intentions (i.e., a plan to perform a behavior at some unspecified point in time) as well as goal intentions (i.e., a general desire to achieve a goal). As a result, for a counterfactual to be adaptive, it should only facilitate the formation of intentions that are most effective at influencing behavior. In comparison to implementation intentions which provide a vast amount of concrete situational and behavioral details, intentions that focus on a category of behavior may not include enough contextual details to be truly effective at changing behavior. Similarly, intentions that focus on a trait are equivalent to broad-level goal intentions, which have been shown to have the weakest

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effect on changing behavior. Accordingly, a counterfactual containing a relevant specific behavior (e.g., using a lid) should not facilitate the formation of an intention based on either a category of behavior (e.g., drinking more carefully) or a trait (e.g., being neater).

Although counterfactuals containing specific behaviors are not expected to facilitate intentions involving either relevant categories of behavior or traits, the type of information in the intention may still influence target judgment reaction times. In particular, there is a strong link between a specific behavior and the corresponding trait. Being able to make trait inferences from a specific behavioral instance has an important survival function and makes social interactions more predictable and controllable (Heider, 1958; Kelley, 1973; Uleman & Moskowitz, 1994). Unlike the difficulty that exists when trying to infer a behavior from a given trait (Carlston, 1992), a considerable amount of research has found that people spontaneously infer traits from behavior, both when given explicit instructions (Bassili & Smith, 1986; Uleman, 1987) but also in the absence of any explicit instructions to do so (i.e., without attention or awareness; Winter & Uleman, 1984; Winter, Uleman, & Cunniff, 1985). Since these spontaneous trait inferences have been found to occur online, while participants are processing behavioral descriptions, it is possible that a similar process may occur when participants are reading the specific behavior prime statements, in both the counterfactual and control conditions. For example, thinking about using a lid may spontaneously activate the related trait of neatness, which then facilitates responding to the intention statement about being neater in the future. This facilitation should occur regardless of whether the participants think about using a lid in the counterfactual judgment (i.e., determining whether using a lid would have prevented them from spilling their coffee) or the control judgment (i.e., deciding whether they have used a lid on their coffee cup in the past week).

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Using the set of statements from Experiments 2 and 3, relevant information was manipulated so that the prime statement always described a relevant specific behavior (e.g., using a lid) while the target statement focused on either a category of behavior (e.g., drinking more carefully) or a trait (e.g., being neater). In this experiment, when counterfactuals focus on relevant specific behaviors, they should not facilitate relevant behavioral intentions that are based on either categories of behaviors or traits. However, the specific behavior prime statements should facilitate trait-based intention judgments equally in both counterfactual and control conditions.

5.1 METHOD

Forty-six students participated for course credit. As in the earlier experiments, each trial included an event description, followed by two judgments in succession: the prime (action) judgment and the target (intention) judgment. Each trial's condition, order, and type of target statement information were fully randomized. The first judgment, the prime task, consisted of a judgment cue and an action statement, with participants deciding if the action was something that could have changed the outcome of the event (counterfactual condition) or if they had performed the action within the past week (control condition). Between the prime (action) task and the target (intention) task in each trial, a blank screen appeared (identical to the Pause Screen described in Experiment 1), asking participants to press a key to continue. The second judgment, the target task, consisted of an intention cue and a future action, with participants deciding whether they would be likely to perform the action in the future. One hundred trials were used, evenly split between conditions and the type of intention statement information and fully randomized across participants (See Figure 2 for overview of procedure).

The type of information was manipulated such that the prime statement always focused on a relevant specific behavior while the target statement described either a relevant category of behavior or a relevant trait (See Appendix B). For example, when considering the event "got a bad sunburn," participants may be asked to consider whether "wearing sunscreen" (specific behavior) would have helped them avoid getting the bad sunburn (counterfactual prime judgment) or whether they had worn sunscreen in the past week (control prime judgment). In that trial's target intention judgment, they would be asked to consider whether "taking precautions," (category of behavior) or "being more responsible" (trait) was something they would be likely to do in the future. Unlike the earlier experiments, specific behaviors only appeared in the prime statements; all intention statements focused on relevant categories of behavior or relevant traits.

5.2 RESULTS AND DISCUSSION

Outliers were trimmed as before, eliminating .8% of the RT data. Within each type of information, outliers were distributed approximately equally between counterfactual and control conditions (categories of behavior: .1% and .3%; traits: .1% and .3%). As before, only the intention judgments in which participants responded "yes" (85% of all trials) were analyzed. The subset of intention RTs with "yes" responses were distributed evenly across the counterfactual and control conditions within each type of relevant information (categories of behavior: 26% and 26%; traits: 24% and 24%).

A 2 (prime judgment: counterfactual vs. control) x 2 (information type: category of behavior vs. trait) ANOVA revealed a non-significant main effect for prime judgment, $F(1, 45) = .004$, $p = .95$, $d = 0.02$, but a significant main effect for information type, $F(1, 45) = 3.97$, $p = .05$, $d = 0.58$. The interaction between prime judgment and information type, however, was not

significant, $F(1, 45) = .57, p = .45$. Results indicated that specific behavior prime statements elicited faster trait-based intention judgments (1130 ms) compared to category of behavior intention judgments (1174 ms). This difference occurred regardless of whether the prime statement was judged in a counterfactual or control manner (trait: 1138 ms and 1123 ms; category of behavior: 1170 ms and 1182 ms). These findings show that a counterfactual only facilitates the formation of a behavioral intention if the intention focuses on a specific behavior (See Figure 6).

CHAPTER 6: EXPERIMENT 5

The previous experiments provide evidence that the type of relevant information included in both the counterfactual and behavioral intention can impact the relationship between counterfactual thinking and the formation of behavioral intentions. In particular, as long as the counterfactual focuses directly on behavior (i.e., a specific behavior or a category of behavior) it can facilitate the formation of a relevant behavioral intention. However, the behavioral intention must include a specific behavior; intentions that describe a category of behavior or a trait are not facilitated even if the counterfactual contains a relevant specific behavior. An unanswered question, then, is whether it is necessary for the behavioral intention to focus on the same relevant specific behavior as the counterfactual, or can the counterfactual facilitate other relevant specific behaviors. That is, if after failing an exam, you think about how you could have read the textbook, would this counterfactual not only facilitate behavioral intentions focusing on that particular behavior (reading the textbook) but also other specific behaviors (e.g, taking better notes, going to class, forming a study group) that would help you achieve your goal of doing better on the next exam.

Underlying this question is the bigger issue of whether the specific insight evoked by the counterfactual is broad enough to facilitate other specific relevant behaviors, or is it limited only to the specific behavior contained in the counterfactual. That is, to what extent do highly specific counterfactual inferences generalize to a range of compatible behaviors? If the content-specific pathway is truly an example of goal-priming (as opposed to semantic priming), then it should have the characteristic of equifinality, or the ability to activate multiple means to a goal (Kruglanski et al., 2002; Shah et al., 2002). Additionally, if functional counterfactual thinking is

similar to learning generalization, then a specific counterfactual should facilitate more than one relevant specific behavior.

To explore this possibility, Experiment 5 tested whether the behavioral intention must focus on the same specific behavior as the counterfactual or would the counterfactual facilitate other relevant specific behaviors. In this study, a counterfactual statement based on one relevant specific behavior (e.g., using a lid) was matched with an intention statement based on another relevant specific behavior (e.g., holding the cup with both hands). Experiment 5 created a new set of action statements based off of the statements used in the earlier experiments such that each negative event now has two different possible relevant specific behaviors (See Appendix C). Using this new set of statements, relevant information was manipulated by randomly assigning the trials to include one of the specific behavior statements in the prime judgment and the other specific behavior statement in the target judgment.

6.1 METHOD

Fifty students participated for course credit. As in the earlier experiments, each trial included an event description, followed by two judgments in succession: the prime (action) judgment and the target (intention) judgment. Each trial's condition, order, and which specific behavior appeared in the prime and target were fully randomized. The first judgment, the prime task, consisted of a judgment cue and an action statement, with participants deciding if the action was something that could have changed the outcome of the event (counterfactual condition) or if they had performed the action within the past week (control condition). Between the prime (action) task and the target (intention) task in each trial, a blank screen appeared (identical to the Pause Screen described in Experiment 1), asking participants to press a key to continue. The

second judgment, the target task, consisted of an intention cue and a future action, with participants deciding whether they would be likely to perform the action in the future. One hundred trials were used, evenly split between conditions and fully randomized across participants (See Figure 2 for overview of procedure).

In this experiment, the prime and target statements focused on two different relevant specific behaviors (See Appendix C). For example, when considering the event "got a bad sunburn," participants may be asked to consider whether "wearing sunscreen" would have helped them avoid getting the bad sunburn (counterfactual prime judgment) or whether they had worn sunscreen in the past week (control prime judgment). In that trial's target intention judgment, they would be asked to consider whether "staying in the shade" was something they would be likely to do in the future. Which specific behavior appeared in the prime and target statement was randomized between participants.

6.2 RESULTS AND DISCUSSION

Outliers were trimmed as before, eliminating 2.9% of the RT data. Outliers were distributed approximately equally between counterfactual and control conditions (1.6% and 1.3%). As before, only the intention judgments in which participants responded "yes" (78% of all trials) were analyzed. The subset of intention RTs with "yes" responses were distributed approximately evenly across the counterfactual and control conditions (51% and 49%).

A one-way ANOVA (prime judgment: counterfactual vs. control) revealed a significant main effect for prime judgment, $F(1, 49) = 13.29$, $p = .001$, $d = 1.03$, indicating that counterfactual prime judgments focusing on one relevant specific behavior facilitated a behavioral intention judgment involving a second relevant specific behavior, compared to control

judgments (1316 ms vs. 1397 ms; See Figure 7). From these results, it appears that it is not necessary for the behavioral intention to focus on the same relevant specific behavior. Instead, a counterfactual focusing on one specific behavior generalizes so that it facilitates other relevant specific behaviors. By activating multiple means to goal achievement, the content-specific pathway shows the characteristic of equifinality, indicating that it may be an example of goal-priming, rather than semantic priming.

CHAPTER 7: GENERAL DISCUSSION

Counterfactual thinking can be a bittersweet experience. It can evoke painful emotional states and bias social judgments, but can also strengthen intentions and promote positive behavioral changes. By helping an individual identify how they could have gotten a better result had they engaged in a different behavior, these counterfactual ruminations elicit insights that can be applied to future situations. In order for a counterfactual to regulate behavior successfully, the insights and information extracted from the counterfactual must be both accurate and functional. Accordingly, if this information is crucial to changing the relevant behavior, then altering the type of relevant information provided will directly impact the effectiveness of the counterfactual. The current research confirmed this hypothesis by showing that the relationship between counterfactual thinking and relevant behavioral intentions is strongest when the relevant information is concrete and specific as opposed to more abstract and general.

The first two experiments supported the overall hypothesis that the relationship between counterfactual thinking and the formation of behavioral intentions is sensitive to changes in the type of relevant information provided. In Experiment 1, counterfactuals only facilitated the formation of a relevant behavioral intention when both statements contained very concrete and detailed information, compared to when both statements contained more abstract and general information. Since counterfactuals are mainly focused on changing goal-directed behavior, Experiment 2 used a different conceptualization of relevant information based on the cognitive hierarchies that exist for both goals and goal-directed behaviors (Aarts & Dijksterhuis, 2000; Carver & Scheier, 1990; Gollwitzer & Moskowitz, 1996; Heckhausen & Beckmann, 1990; Kruglanski et al., 2002; Vallacher & Wegner, 1987). Replicating the pattern of results from Experiment 1, counterfactuals only facilitated behavioral intention judgments when both

statements contained relevant specific behaviors, rather than relevant categories of behavior or traits. These results are the first direct evidence that the type of relevant information provided impacts whether the content-specific pathway will function properly.

The results from these two studies strengthen the connection between counterfactual thinking and the role of affect in behavior regulating processes. According to this perspective, emotions provide feedback and information about the current status of the environment and whether an individual is making proper progress towards their goals (Baumeister et al., 2001; Baumeister et al., 2007). Whereas positive affect confers safety, security, and adequate goal progress, negative affect signals a threatening situation, danger, and insufficient goal progress. To fix the problem at hand, a variety of cognitive process are activated that can help an individual learn from their mistakes and adapt their behavioral choices. These include narrowed attention, heightened sensitivity to relevant concrete information, and selective processing of relevant details (Fiedler, 1988; Schwarz, 1990; Schwarz & Bless, 1991; Taylor, 1991). Research has found that this narrowed attention influences how people process information, make a variety of perceptual judgments, and identify and characterize their behaviors (Beukeboom & Semin, 2005; Gasper, 2004; Gasper & Clore, 2002; Tyler & Tucker, 1982; Vallacher & Wegner, 1987). The results of these two studies provide evidence that it can also impact functional counterfactual thinking in general and the content-specific pathway in particular.

Although the current research shows that counterfactuals facilitate behavioral intentions when both statements focus on specific behaviors, certain conditions may exist in which a counterfactual could facilitate a more abstract or general intention. According to Construal Level Theory, distant situations are construed on a higher level, using more abstract and central features compared to closer situations, which depend more on concrete and localized features

(Liberman & Trope, 1998; Trope & Liberman, 2003). Applied to the current research, a negative event (spilling coffee on yourself) should facilitate a very detailed intention in the near future (Tomorrow, I will use a lid), but might facilitate a more global intention in the distant future (A year from now, I will be neater). Manipulating the temporal frame of the related behavioral intention might provide a unique environment in which a counterfactual may facilitate a more general intention. Future research may explore this possible caveat.

However, Experiments 1 and 2 did not address whether it is necessary for both the counterfactual as well as the behavioral intention to focus on a specific behavior, or is it sufficient for either the counterfactual or the behavioral intention to focus on a specific behavior. Experiment 3 examined the first half of this equation by testing whether a counterfactual was required to contain a specific behavior in order to facilitate a relevant behavioral intention. When a counterfactual made a direct reference to a behavior (i.e., contained a category of behavior), it facilitated a behavioral intention that included a specific behavior. However, when the counterfactual made an indirect reference to a behavior, such that it required the behavior to be inferred (i.e., contained a trait), the facilitation effect was attenuated. This result supports the idea that for a counterfactual to be functional, it should be easily transformed into a future plan for preventing failure. Earlier research showed that spontaneous upward counterfactuals are more likely to contain specific factors (i.e., behaviors) compared to general factors (i.e., traits; McEleney & Byrne, 2006). Experiment 3 extends this idea, showing that a counterfactual focused on a category of behaviors (i.e., a broader type of behaviors that can include numerous specific behaviors) can be functional as well. That is, for a counterfactual to be functional, it seems most important that the counterfactual makes a direct connection to an appropriate behavior; it is not limited only to counterfactual focused on one concrete specific behavior.

However, when a counterfactual focuses on a trait, it requires the individual to infer the appropriate preventative behavior from a myriad of possible behaviors, a process that has been shown to be difficult, rare, and inaccurate (Carlston, 1992; Maass et al., 2001; Epstein, 1979; Sherman & Fazio, 1983).

Experiment 4 tested the other part of this question; whether a counterfactual that contains a specific behavior will equally facilitate behavioral intentions that include either a category of behavior or a trait. Results showed that a counterfactual containing a specific behavior did not facilitate behavioral intentions that described either a category of behavior or a trait. This lack of facilitation may be due to the fact that the goal of functional counterfactual thinking is to effectively change behavior and improve performance, such that dysfunctional behaviors are replaced with more functional ones (Epstude & Roese, 2008; Markman & McMullen, 2003; Roese, 1994). With research showing that more specific implementation intentions are more effective at changing behavior compared to more general behavioral or goal intentions (Gollwitzer, 1990, 1993, 1999; Gollwitzer & Sheeran, 2006; Webb & Sheeran, 2006), it is possible that, over time, counterfactual thinking has evolved such that it now only facilitates behavioral intentions that focus on specific behaviors.

Although counterfactuals containing specific behaviors did not facilitate intentions involving either a relevant category of behavior or a trait, prime statements that focused on specific behaviors facilitated behavioral intentions that described relevant traits. That is, regardless of whether participants made a counterfactual or control judgment about the specific behavior during the prime task, they were faster to respond to target judgments based on relevant traits compared to those that focused on relevant categories of behavior. This result supports earlier research showing that there is a link between specific behaviors and their corresponding

traits (i.e., spontaneous trait inferences; Heider, 1958; Kelley, 1973; Uleman & Moskowitz, 1994). Since these inferences can occur relatively automatically (i.e., without explicit instructions; Winter & Uleman, 1984; Winter et al., 1985), it is possible that a similar process is occurring during the priming judgment task portion of the current paradigm. The effect of specific behaviors on traits should be stronger than the reverse effect (traits facilitating specific behavior inferences; tested in Experiment 3) because it is easier to draw inferences from a specific behavior to a trait than from a trait to a specific behavior (i.e., the induction-deduction asymmetry; Carlston, 1992). This asymmetry may be due to the fact that behavior to trait inferences are more frequent than trait to behavior inferences (Maass et al., 2001), as well as the fact that it is generally difficult to predict a single behavior from a particular trait (Epstein, 1979; Sherman & Fazio, 1983).

From the first four experiments, we can infer that a counterfactual will only facilitate a behavioral intention if it is focused on a specific behavior. A final question addressed in Experiment 5 is whether it is necessary for the behavioral intention to focus on the same specific behavior as the counterfactual. Results showed that a counterfactual focusing on one relevant specific behavior facilitated a behavioral intention that included a second relevant specific behavior. So it would appear that the insight elicited by the counterfactual is broad enough to facilitate other relevant specific behaviors. This could be taken as evidence that counterfactual thinking is similar to learning from our mistakes and that a specific counterfactual can generalize to a range of compatible specific behaviors.

It is important to note that it is possible that this result was due to a content-neutral mechanism, rather than a content-specific one. Previous work on counterfactual mindsets (a content-neutral mechanism) has shown that thinking counterfactually activates alternative

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solutions to a problem (Galinsky et al., 2000; Kray et al., 2006; Liljenquist et al., 2004). Applied to our current results, a counterfactual mindset may have momentarily activated alternative solutions to that trial's particular negative event. Although it is possible, this alternative seems unlikely. First, mindset priming is not something that can be turned on and off (and back on again) in a matter of seconds. If a counterfactual mindset was activated, then it should have influenced both counterfactual and control trials equally. That is, participants should have been equally fast to respond to these alternative behaviors regardless of whether they had viewed a counterfactual or control prime. Although content-neutral mechanisms have been shown to influence behavioral intentions and behavior change, earlier applications of this particular paradigm found that content-neutral mechanisms were unable to explain the facilitation effect (Smallman & Roese, 2009, Experiment 3).

7.1 THEORETICAL IMPLICATIONS

Together, these studies help further clarify our understanding of the relationship between counterfactual thinking and the formation of behavioral intentions. However, the possible mechanism that underlies this effect is yet unknown. That is, what is it about very specific and detailed relevant information that makes the content-specific pathway functional? Petrocelli and Sherman's (2010) work on how event descriptions influence counterfactual activation argued that detailed event descriptions provide more material for an individual to work with to mentally undo a negative situation. Accordingly, detailed descriptions provide the tools that the individual can use to figure out what factors they should change that would have prevented the negative outcome from occurring. Applied to the content-specific pathway, it is possible that specific relevant information could help an individual create a more vivid and powerful mental

simulation of him or herself doing the more appropriate and functional behavior, both in the current negative situation and in applicable future opportunities. If the mental image is powerful enough, it may heighten sensitivity to situational cues, facilitate recall of the desired behavior, or create better retrieval cues for use in future situations. In contrast, more general or abstract relevant information makes developing this type of detailed mental simulation more difficult. The individual must conjure up their own behavioral details, which may or may not be an accurate or appropriate preventative behavior.

Recent research has begun to test the idea that counterfactuals elicit mental simulation or imagery. For example, research on consumer goods consumption found that upward counterfactuals elicited imagery regarding future consumption opportunities, making them more likely to take advantage of a future opportunity. Interestingly, when cognitive resources were limited, participants were unable to create these vivid mental images, and the effect on future behaviors was attenuated, thus showing the driving role of imagery for strengthening behavioral intentions (Patrick, Lancellotti, & Hagtvedt, 2009). Additionally, other research has shown that imagining oneself performing a particular behavior produces corresponding changes in intentions towards that behavior (Anderson, 1983). More generally, being able to easily visualize the step by step process involved in performing a preventative action (i.e., process simulations; Taylor, Pham, Rivkin, & Armor, 1998), can promote goal attainment in a variety of areas including academic achievement (Pham & Taylor, 1999), health behaviors (Greitemeyer & Wuerz, 2006), and consumer purchases (Escalas & Luce, 2003). These powerful mental images can increase illusions of control and confidence about the situation (Langer, 1975; Sherman & McConnell, 1995), increase their perceived likelihood of occurrence (Carroll, 1978; Oettingen & Mayer, 2002), and make this new belief more resilient to change (Sherman, Zehner, Johnson, & Hirt,

1983). Other research has found an overlap between mentally simulated and physically executed action, such that mental practice can facilitate subsequent physical performance. There may even be a functional equivalence between the mental simulation of an action and actual action execution (Decety & Grezes, 1999). Additionally, during stressful situations (a category in which most negative events would qualify) mental simulation can improve both motivational skills and motor performance (Decety & Stevens, 2009; Wehner, Vogt & Stadler, 1984). So, even though mental simulation has not been directly tested as the driving force behind the content-specific pathway, we can infer from related research that it may be playing an important role. Future research may address this possibility.

Another concern is whether the content-specific pathway is an example of goal activation or another automatic activation-based phenomena like semantic priming (for discussion of this issue, see Kruglanski et al., 2002; Förster, Liberman, & Friedman; 2007; Moskowitz, Li, & Kirk, 2004). Although counterfactual thinking typically centers on goal-directed behavior, this does not automatically mean it is an example of goal priming; it could still be influenced by a non-goal related priming effect. Accordingly, it is important to determine whether processing relevant information in a counterfactual manner is activating a goal or merely enhancing the accessibility of semantic constructs related to this goal. According to Neely (1977), semantic priming occurs when a piece of information in memory is activated by another piece of information that is similar in meaning. For the present findings to be the result of semantic priming, it would require a greater similarity between the counterfactual prime and the intention compared to the control prime and the intention. That is, there would need to be a greater overlap in meaning between the counterfactual and the intention, which could have driven the facilitation effect. Under these circumstances, a counterfactual should *always* facilitate a behavioral intention when both

judgments involve the same relevant information, regardless of the particular type of relevant information. However, the current findings argue against this interpretation. Results showed that counterfactuals only facilitated relevant behavioral intentions when both statements contained specific relevant information (Experiment 1) or focused on a specific behavior (Experiment 2). When these statements involved general relevant information (Experiment 1), categories of behaviors or traits (Experiment 2), the facilitation effect disappeared. A semantic priming interpretation would also argue that any semantically relevant judgment should be facilitated, not just behavioral intention judgments. This possibility was addressed in an earlier series of studies, by showing that counterfactual only facilitated responses to behavioral intention judgments, but not response times to an alternative semantically related target judgment (Smallman & Roese, 2009, Experiment 3). This is not to say that we can conclusively rule out semantic priming as a contributor. Rather, semantic priming cannot account entirely for the current findings.

In contrast, goal priming is conceptualized as the activation of desired end-states (goals) and actions consistent with the goal (means to attain the goal). These representations can include information about the particular goal as well as the plans, strategies and behaviors that can help one achieve the goal (Carver & Scheier, 1998; Kruglanski et al., 2002). Since functional counterfactual thinking is typically focused on improving goal-directed behaviors, the content-specific pathway may be considered a situation in which both the overall goal (e.g., getting a good grade on the next exam) as well as the means to achieving this goal (e.g., reading the textbook) is activated. However, it is often difficult to distinguish goal priming from non-goal priming effects; it is possible to activate semantic constructs related to a goal, rather than the goal itself. To help tease apart these possibilities, Förster et al. (2007) developed a series of seven principles that can be used to help determine whether an effect can be attributed to goal

priming. Unfortunately, not all of these principles can be applied to situations in which functional counterfactual thinking is likely to be at play. That is, functional counterfactuals tend to occur in failure situations, where the goal has not been fulfilled or a setback has taken place. In contrast, testing these principles typically requires comparing fulfilled and unfulfilled goals in terms of concept activation. For example, goal priming should result in postattainment decrements in motivation towards the goal. In some sense then, these principles may 'require' that the goal be attained, a fact that does not easily transfer to counterfactual thinking. However, one principle that may be applicable to the content-specific pathway is that of equifinality, or the activation of more than one means to a goal (Kruglanski et al., 2002; Shah et al., 2002). For example, to achieve the goal of getting a good grade on an upcoming exam, a student may activate a variety of behaviors that may help them attain their goal, such as reading the textbook, taking better notes, or going to class. Experiment 5 provided evidence that the content-specific pathway has this characteristic of goal priming; a particular negative event (e.g., failing an exam) activated a counterfactual based on one specific behavior (e.g., reading the textbook) which in turn facilitated judgments based on another relevant specific behavior (e.g., taking better notes). Although the current paradigm is not capable of addressing whether the content-specific pathway follows the other principles of goal priming, future research hopes to adapt the procedure so that the remaining principles may be tested.

7.2 CONCLUSIONS

Functional counterfactual thinking may be one of those rare instances of positive pain. The current research shows however, that not all upward counterfactuals may be functionally equal. Although it can be excruciatingly painful to think in specific detail about all of the

shoulda-coulda-wouldas connected to a particular problem or negative event, it may actually be more adaptive to do just that. Instead of glossing over the details, take a moment to vividly imagine yourself doing the more functional behavior, and you may find that the short-term discomfort can lead to long-term improvement.

FIGURES

Figure 1. The content-specific pathway of functional counterfactual thinking. Adapted from Roese & Olson, 1997, and Segura & Morris, 2005.
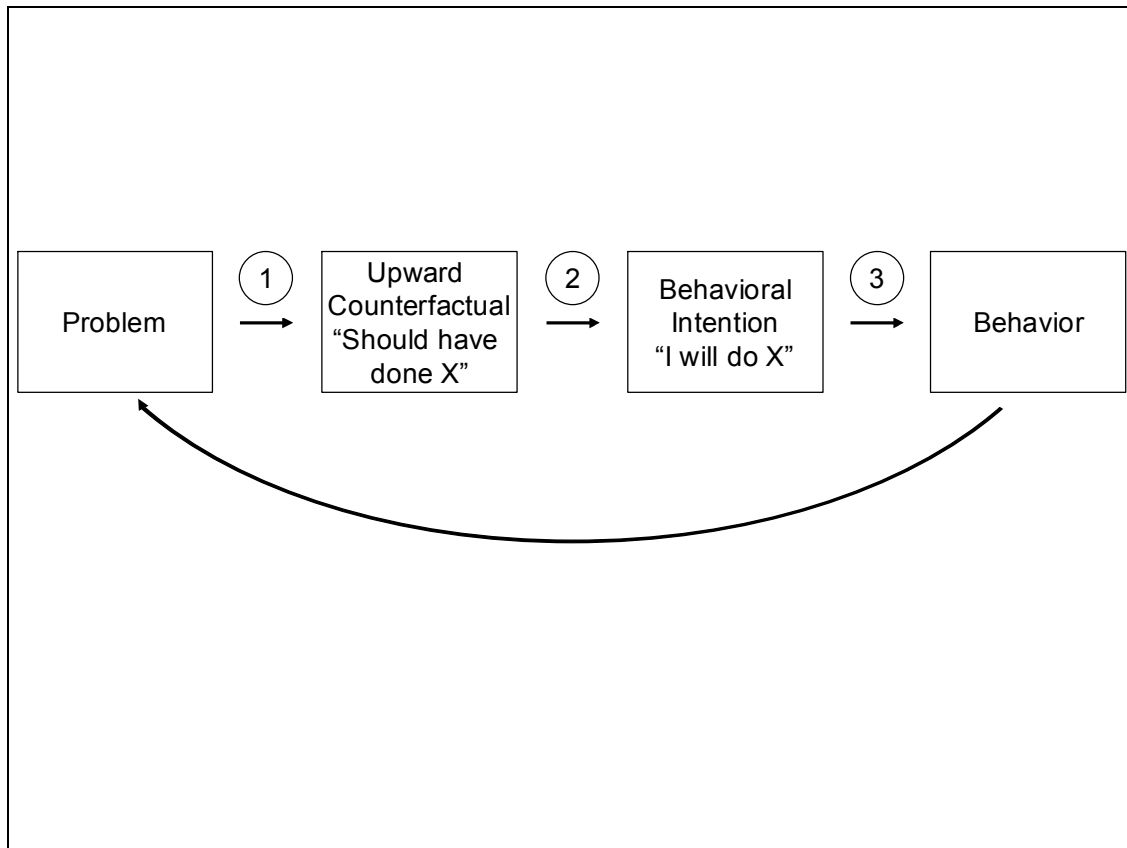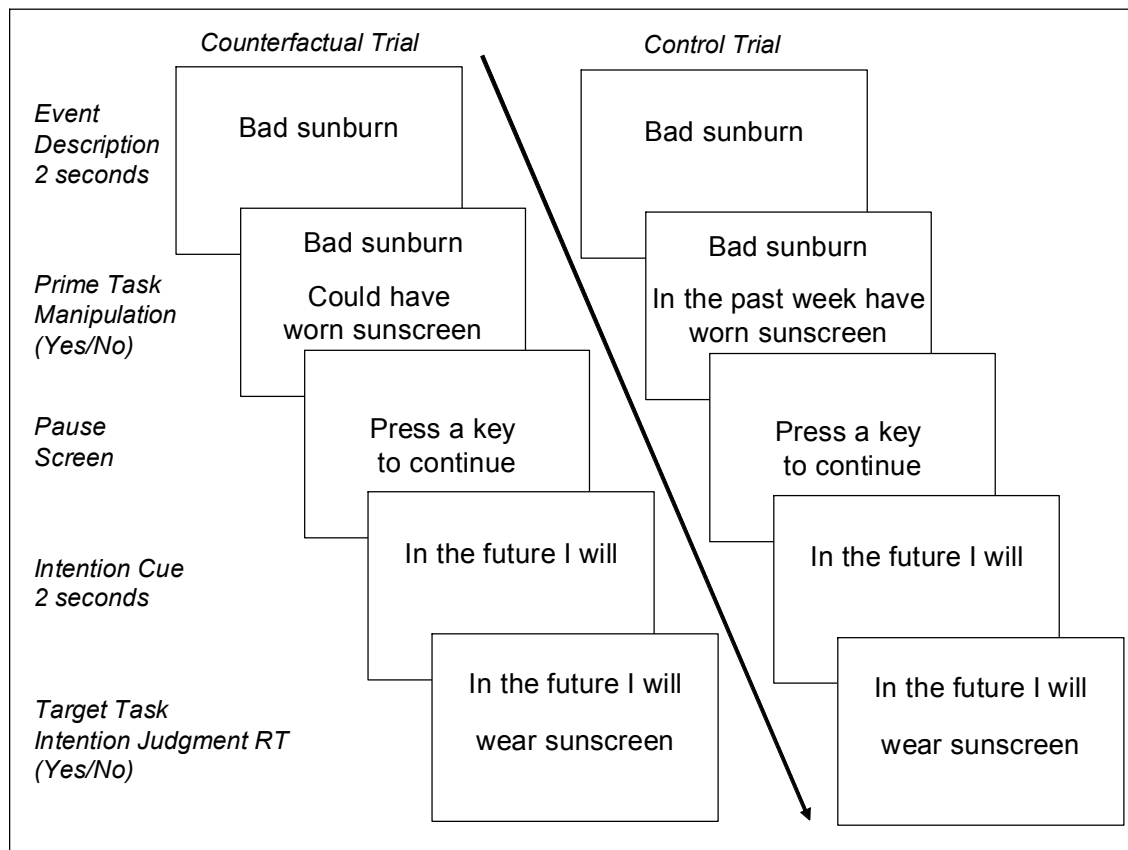
Figure 2. Overview of sequential priming paradigm

Counterfactual Trial   Control Trial

Event
Description   Bad sunburn   Bad sunburn
2 seconds

                     Bad sunburn   Bad sunburn
Prime Task
Manipulation   Could have   In the past week have
(Yes/No)   worn sunscreen   worn sunscreen

Pause   Press a key   Press a key
Screen   to continue   to continue

Intention Cue   In the future I will   In the future I will
2 seconds

Target Task   In the future I will   In the future I will
Intention Judgment RT
(Yes/No)   wear sunscreen   wear sunscreen

Figure 3. Intention RTs as a function of prime judgment task and relevant information type (Experiment 1).
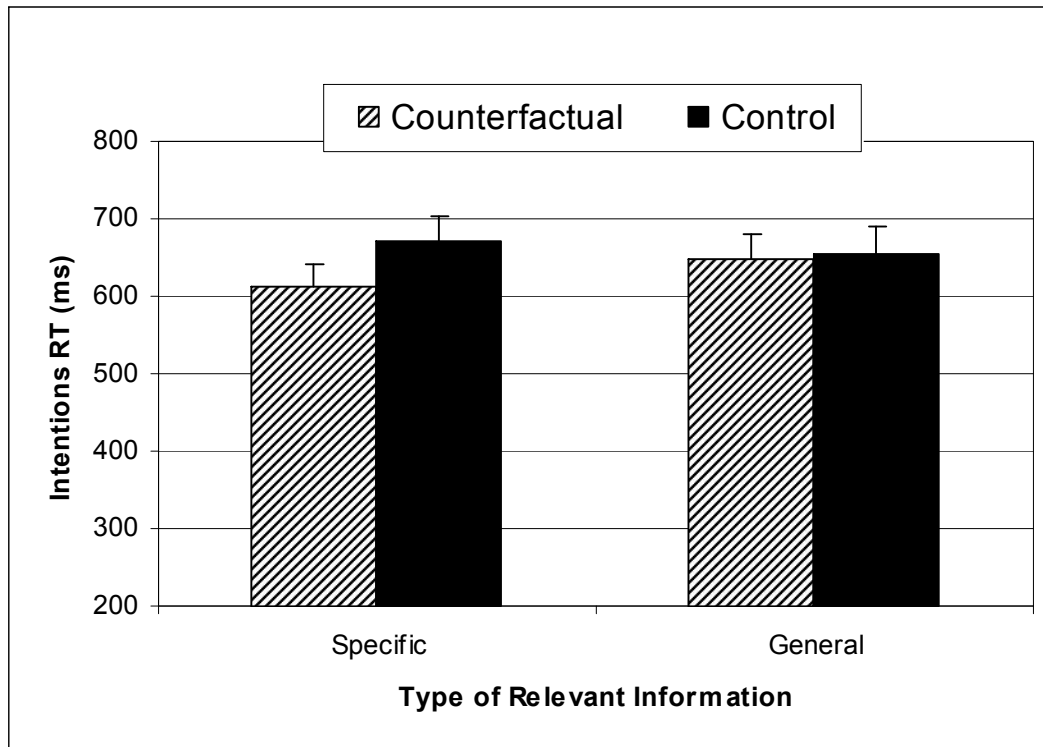
Figure 4. Intention RTs as a function of prime judgment task and relevant information type
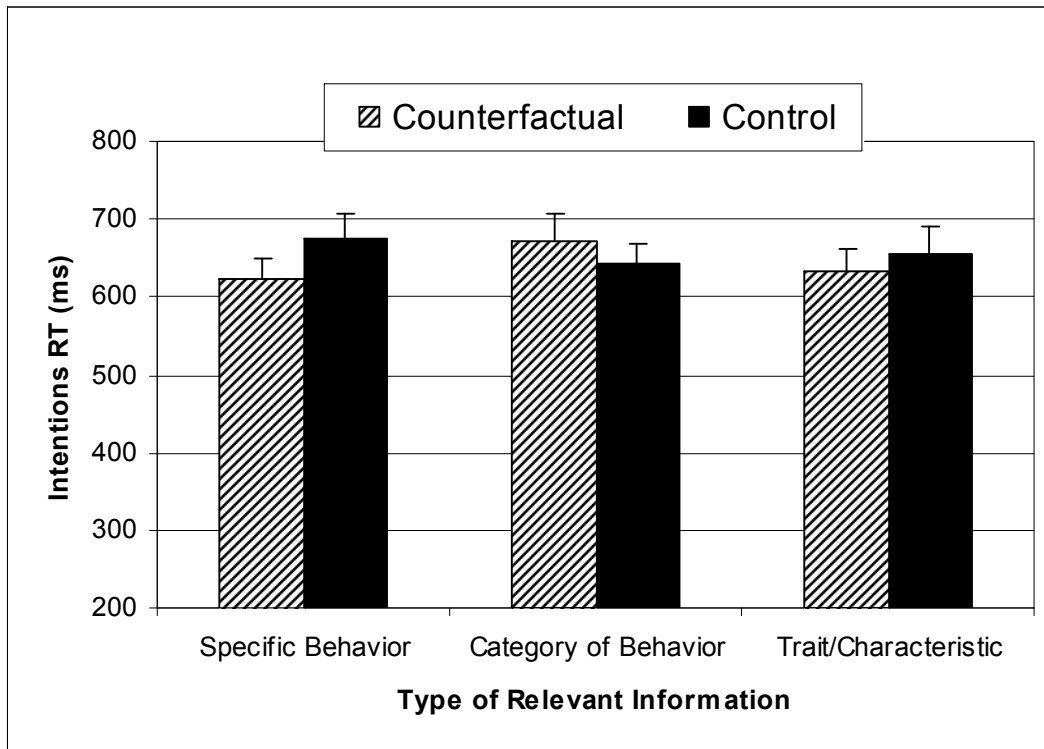
(Experiment 2).

Figure 5. Intention RTs as a function of prime judgment task and prime statement information type (Experiment 3).
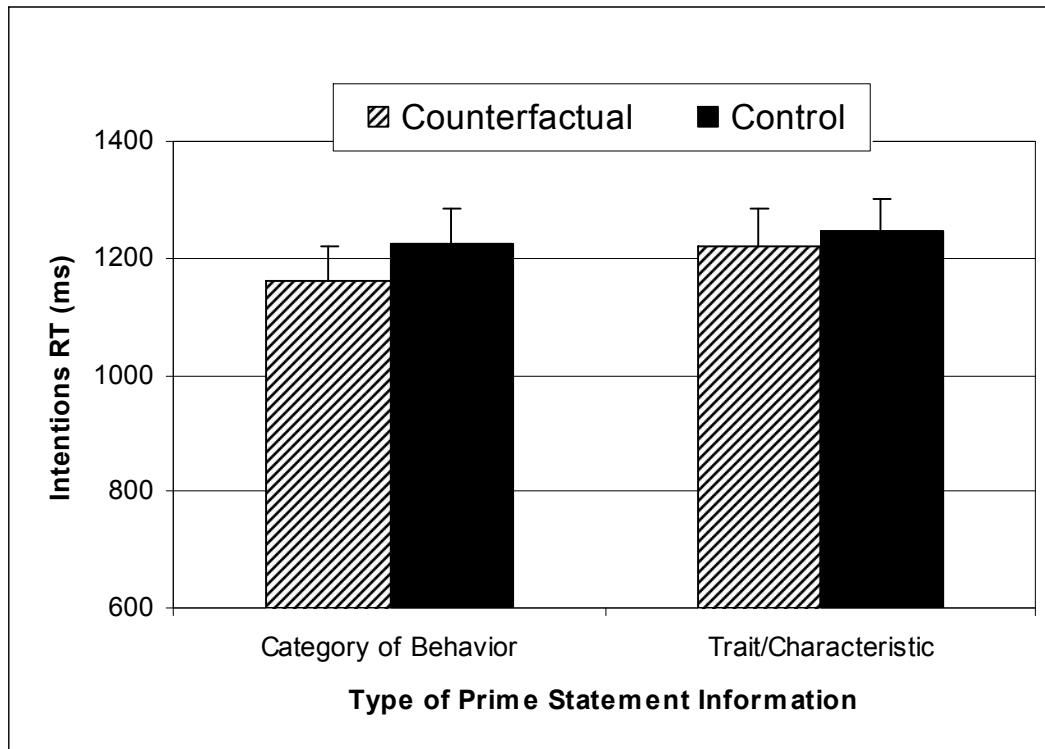
Figure 6. Intention RTs as a function of prime judgment task and intention statement information
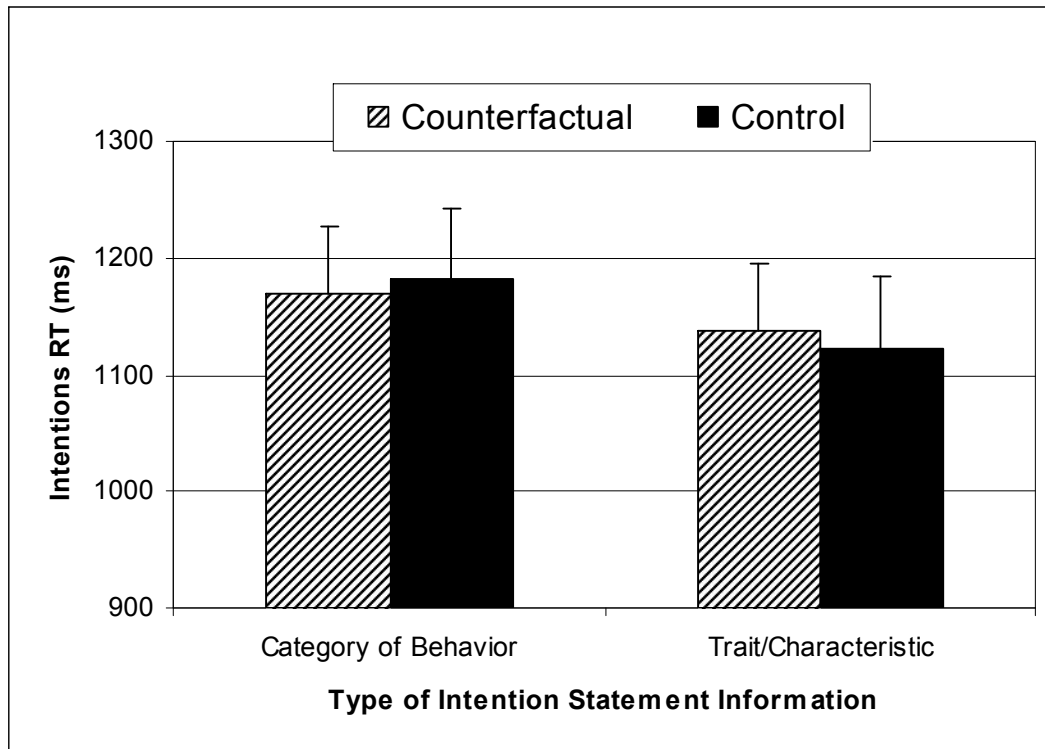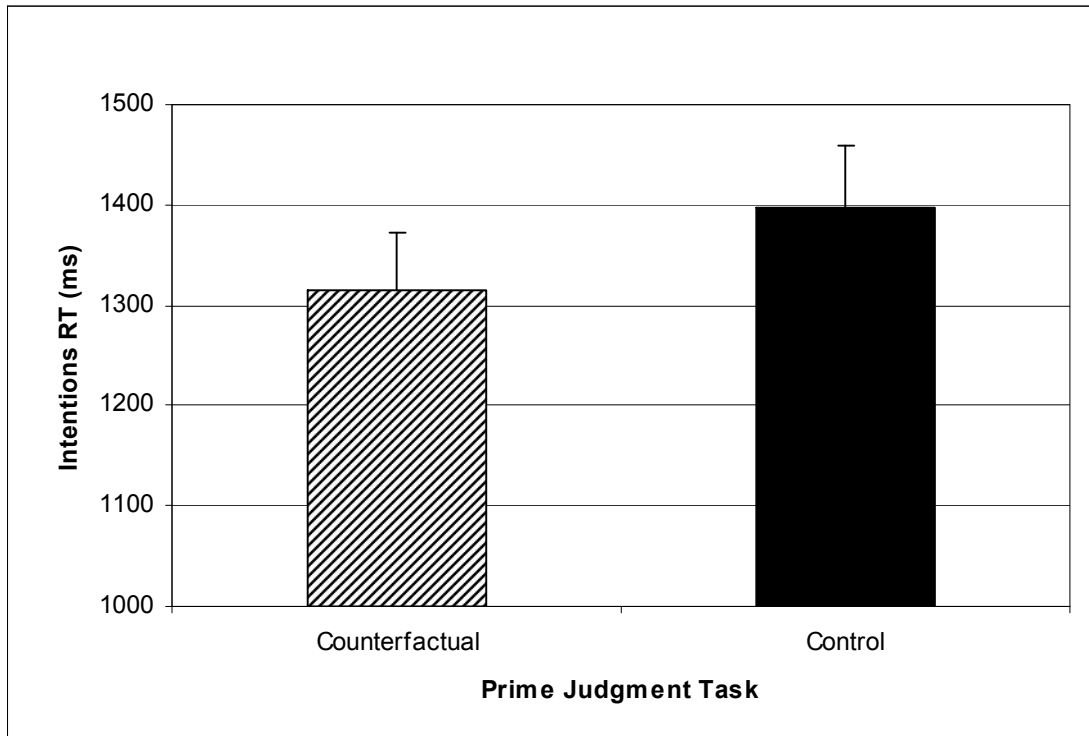
type (Experiment 4).

Figure 7. Intention RTs as a function of prime judgment task (Experiment 5).

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Sample of Experiment 1 Stimuli: Everyday Negative Events (and Relevant Specific and General

Action)

1. Got angry. (Keep temper under control/Be more tolerant)

2. Interrupted someone. (Wait turn to talk/Be more polite)

3. Had a bad hangover. (Have fewer drinks/Drink sensibly)

4. Argued with a co-worker. (Try to see their perspective/Be more understanding)

5. Drove into the curb. (Watch the road/Be a careful driver)

6. Got a speeding ticket. (Drive slower/Follow traffic laws)

7. Went over credit card limit. (Check card balance/Be responsible with money)

8. Got a cavity. (Brush teeth more/Have better dental hygiene)

9. Ate too much. (Eat smaller portion/Eat healthier)

10. Lost touch with a friend. (Talk to friend more often/Be more involved with friends)

11. Messy bedroom. (Put things away/Be better organized)

12. Sick for a long time. (Go to the doctor/Take care of health)

13. Had an infected cut. (Put on bandaid/Use proper first-aid)

14. Shrunk a favorite shirt. (Follow washing instructions/Follow directions)

15. Got blister on foot. (Wear comfortable shoes/Dress appropriately)

APPENDIX B

Sample of Stimuli used in Experiments 2, 3, and 4: Everyday Negative Events (and Relevant Specific Behavior, Category of Behavior, and Trait or Characteristics)

1. Got angry. (Take deep breaths/Control emotions/Be more tolerant)

2. Interrupted someone. (Wait turn to talk/Have self-control/Be more considerate)

3. Had a bad hangover. (Have fewer drinks/Drink responsibly/Be more sensible)

4. Argued with a co-worker. (Think before speaking/Behave appropriately/Be more reasonable)

5. Drove into the curb. (Watch the road closely/Be aware of surroundings/Be a more alert driver)

6. Got a speeding ticket. (Drive slower/Follow traffic laws/Be more obedient)

7. Went over credit card limit. (Check card balance/Control spending/Be more economical)

8. Got a cavity. (Brush teeth longer/Take care of teeth/Be more hygienic)

9. Ate too much. (Have a small meal/Eat sensibly/Be more self-controlled)

10. Lost touch with a friend. (Email friends/Keep in contact/Be more sociable)

11. Messy bedroom. (Put things away/Keep room neat/Be a cleaner person)

12. Sick for a long time. (Go to the doctor/Take care of health/Be more health-conscious)

13. Had an infected cut. (Put on bandaid/Use proper first-aid/Be more preventative)

14. Shrunk a favorite shirt. (Follow washing instructions/Do laundry properly/Be more precise)

15. Got blister on foot. (Wear comfortable shoes/Dress appropriately/Be more practical)

Sample of Experiment 5 Stimuli: Everyday Negative Events (and Two Relevant Specific Behaviors)

1. Got angry. (Take deep breaths/Avoid yelling)

2. Interrupted someone. (Wait turn to talk/Keep mouth shut)

3. Had a bad hangover. (Have fewer drinks/Avoid alcohol)

4. Argued with a co-worker. (Think before speaking/Walk away from fight)

5. Drove into the curb. (Watch the road closely/Make slower turns)

6. Got a speeding ticket. (Drive slower/Check speed limit)

7. Went over credit card limit. (Check card balance/Use cash to shop)

8. Got a cavity. (Brush teeth longer/Floss teeth frequently)

9. Ate too much. (Have a small meal/Take home leftovers)

10. Lost touch with a friend. (Email friends/Call friends regularly)

11. Messy bedroom. (Put things away/Throw out junk)

12. Sick for a long time. (Go to the doctor/Get more sleep)

13. Had an infected cut. (Put on bandaid/Clean cut thoroughly)

14. Shrunk a favorite shirt. (Follow washing instructions/Read labels)

15. Got blister on foot. (Wear comfortable shoes/Wear socks)