

RECONSIDERING COUNTERFACTUAL POTENCY TO IMPROVE AFFECT:  
TOWARDS AN INTERVENTION

BY

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## ABSTRACT

Research suggests that upward counterfactual thinking (i.e., mentally simulating more desirable alternatives to reality) influences the extremity of negative emotions to the extent that people believe in the plausibility, or likelihood, of the mentally simulated alternative antecedents and outcomes (i.e., *counterfactual potency*). The current research aimed to determine if reducing counterfactual potency, through a controlled intervention, led to improved affect. Participants were asked to summarize a previous behavior that they regret and to rate counterfactual potency and negative affect when considering their behavior. Similar to cognitive-behavioral therapy techniques, half of the participants were asked a series of questions designed to reduce counterfactual potency and thereby potentially reduce negative affect, whereas the other half of the participants were assigned to a comparable control task. Then participants reported counterfactual potency and negative affect again. It was hypothesized that assignment to the intervention condition would significantly reduce both counterfactual potency and negative affect relative to assignment to the control condition, especially among those whose negative affect was reported to be linked to counterfactual thinking. Change in counterfactual potency was also expected to mediate the link between the condition/source of negative affect interaction and change in negative affect. Although the treatment condition did significantly affect counterfactual potency, the hypothesized moderation and mediation models were not supported by the data. However, additional analyses indicated that a significant link between treatment condition and change in positive affect was mediated by change in counterfactual potency. This research provides support for the potential use of counterfactual potency in utilizing therapeutic techniques to improve affect.

## INTRODUCTION

Counterfactual thinking involves mentally simulating alternatives to reality (Epstude & Roese, 2008; Kahneman & Tversky, 1982). Specifically, counterfactual thinking is thinking characterized by consideration of what might have been with regard to an event's antecedents or causes and its outcomes or consequences. As the term "counterfactual" means contrary to the facts, neither the antecedent nor consequent actually occurred (Roese & Olson, 1995). The idea is that one can mentally change an actual antecedent (e.g., texting while driving) and imagine the ensuing consequences. The more counterfactual thoughts one is able to generate, the more likely the outcome is judged to be *mutable* (i.e., relatively easy to cognitively alter elements of reality; Kahneman & Miller, 1986; Tykocinski & Steinberg, 2005). The antecedent (e.g., "If only Suzy had not been texting while driving...") is a precursor to the consequent (e.g., "...then she would not have smashed into the police car in front of her."). Put together, the basic components of a counterfactual often form the conditional statement "if only...then...."

It is believed that people assess the flexibility or mutability of an outcome from the ease by which they generate counterfactual thoughts (Kahneman & Tversky, 1982). However, some aspects of reality are more mutable, or more likely to be imagined as alternatives, than others. For example, exceptions, controllable events, actions, unexpected events, unpredicted event, and recent events are more likely to be mentally altered than others (Byrne, 2016). When engaging in counterfactual thinking, a person mentally rehearses an experience, changing different aspects of one's behavior or the situation to estimates if such alterations would have made a difference in the outcome.

Depending on the different outcomes considered in a counterfactual, one might feel different emotions such as anger, sadness, relief, or regret (McMullen, Markman, & Gavanski, 1995; Miller & Taylor, 1995; Zeelenberg et al., 1998). In other words, the content of the counterfactual can determine the resulting affect.

Depending on the type of counterfactual, affect can be impacted in different ways. Although counterfactuals often take the structural form of mentally undoing inactions and/or actions (as with additive and subtract counterfactuals, respectively, see: Roese, 1994), the most frequent counterfactuals alter an undesirable outcome. The discrepancy between upward and downward counterfactuals involves the emphasis on betterment and worsening reality respectively (Epstude & Roese, 2008). An upward counterfactual focuses on improving an outcome, while a downward counterfactual maintains status quo by emphasizing potentially worse outcomes (Markman, Gavanski, Sherman, & McMullen, 1993).

A study conducted by Markman et al. (1993) examined the direction of counterfactuals and feelings of satisfaction while participants played a computer-simulated game of blackjack. Participants who were in conditions that elicited the most upward counterfactual thoughts (e.g., after losing or after nearly beating the dealer) experienced the least satisfaction after playing the game. Thus, it appears that the magnitude of negative affect is associated with the generation of upward counterfactual thoughts (see: Markman & McMullen, 2003). In fact, among depressed and nondepressed individuals, upward counterfactual thinking has been associated with more negative affect and greater perceived control (Quelhas, Power, Junos, & Senos, 2008).

Though upward counterfactual thought frequency is believed to be associated with negative affect, some research has shown that this is not always the case (see: Petrocelli, Percy, Sherman, & Tormala, 2011; Seta, Seta, McElroy, & Hatz, 2008). In addition to the direction of counterfactual thinking (upward vs. downward), affect is also determined by the mode of counterfactual thinking (Markman & McMullen, 2003; McMullen, 1997). The reflection-evaluation model (REM) states that upward counterfactual thinking can involve mental comparisons of actual events to more desired, alternative outcomes. Such thinking is known as the evaluative mode of counterfactual thinking. Evaluative counterfactual thinking typically elicits a contrast effect whereby people tend to experience negative affect as a result of the comparison of the more desirable alternative with reality. On the other hand, REM identifies that upward counterfactual thinking can focus exclusively on the alternative. Such thinking is known as the reflective/experiential mode of counterfactual thinking. The reflective mode tends to elicit an assimilation effect whereby people tend to experience positive affect as a result of focusing solely on what might have been. The current research is designed to target upward counterfactuals that were generated using the evaluative mode of counterfactual thinking, as these counterfactuals are much more commonly generated and induce negative feelings.

One somewhat undesirable aspect of upward counterfactuals is that they tend to be quite ubiquitous and spontaneous (Markman et al., 1993; McEleney & Byrne, 2006) and automatic (Goldinger, Kleider, Azuma, & Beike, 2003; Roese, Sanna, & Galinsky, 2005). Thus, it is unlikely that people will successfully avoid counterfactual thinking altogether. Furthermore, one theoretical assumption is that counterfactual thinking is

functional for learning, planning, and subsequent behavior modification and decision making (Epstude & Roese, 2008; Markman et al., 1993; Roese, 1994).

However, upward counterfactuals appear to make people feel bad, especially when people will not (or do not plan to) experience another similar event. In such cases, the behavioral prescription implied by the counterfactual does no good (e.g., “If only Joe had not missed his only daughter’s wedding...”). Thus, an unfortunate outcome of counterfactual thinking is negative affect. A major source of negative affect, and the focus of much counterfactual thinking research, is the emotion of regret. Regret is an emotion characterized by a sense of sorrow, disappointment, or distress over something done or not done (Landman, 1987). Regret is felt upon the realization that a different personal decision or behavior could have resulted in a better outcome (Zeelenberg et al., 1998). It is thought to emerge from a discrepancy between what actually happened and what could have occurred if one had acted differently. It involves thinking one should have known better, recognizing a personal behavior as a mistake, and feeling a desire to undo the experience by changing the behavior (Zeelenberg et al., 1998). Regret implies personal control and involves internal attributions.

Despite the reasonable assumption that upward counterfactuals influence regret, the collective research has not always been so clear. In fact, some research has failed to find a relationship between the frequency of counterfactual thoughts and regret (N’gbala & Branscombe, 1997; Seta, McElroy, & Seta, 2001). Thus, alternative approaches to understanding regret have emerged from the literature.

According to the consistency-fit perspective, regret occurs when a decision yields an undesired outcome that is inconsistent with one’s personality, mood, or goals (Seta et

al., 2001, 2008). Additionally, one should experience greater regret when decisions yield very negative outcomes as opposed to less severe ones. In one study conducted by Seta et al. (2008), participants read about individuals eating an unsatisfying meal high or low in calories. Some were described as underweight with a goal of gaining weight and others were overweight with a goal of losing weight. Participants judged those who ate a meal inconsistent with their goal of weight loss or weight gain to have more regret than others. A second study conducted by Seta et al. (2008) asked participants to reflect on a time when they were in a positive mood and chose to go out (action) or stay in (inaction), but they would have had a better time choosing the other option. Participants reported greater regret following inaction, which supports the idea that decisions inconsistent with mood yield regret. A third study asked extroverts (introverts) to describe a time they chose to stay in (go out) when they would have had a better time if they made the opposite decision. Participants reported more regret following a decision inconsistent with their personality type (Seta et al., 2008). Each of these studies provides support for the consistency-fit model of regret. Importantly, such effects appeared to be independent of counterfactual thought frequency.

Concerning counterfactuals, self-focused counterfactuals can lead to more regret than other-focused counterfactuals. That is, a feeling of personal responsibility is essential to the experience of regret (Gilovich & Medvec, 1994). When one rehearses an upward counterfactual, he/she tends to experience regret, which can motivate behavioral change. The greater the perceived opportunity, the more regret one feels (Epstude & Roese, 2008).

## **Counterfactual Potency**

In attempt to clarify the role of counterfactual thinking in regret, Petrocelli et al. (2011) developed the construct of counterfactual potency. Counterfactual potency is the multiplicative effect of the “if likelihood” (the perceived likelihood of the antecedent in a counterfactual) and the “then likelihood” (assuming the antecedent is true, the perceived likelihood of the outcome of the counterfactual) (Petrocelli et al., 2011). Counterfactual potency reveals the strength or magnitude of a counterfactual. As counterfactual potency involves the combined effect of a given antecedent and outcome, both parts are important independent contributors. In order to be highly potent (i.e., have a strong effect on feelings and judgment), both parts of the counterfactual must be perceived to be probable (Petrocelli et al., 2011). In such cases, people tend to hold relatively strong convictions that counterfactual alternatives were in fact quite possible.

Multiple studies provide evidence of the effect of counterfactual potency on negative affect and judgment. In one study conducted by Petrocelli et al. (2011), participants read a modified version of the “Mr. Jones” scenario found in Kahneman and Tversky (1982). In this scenario, a number of different factors are at play in a situation that leads to a tragic automobile accident involving Mr. Jones. Participants were instructed to generate 1, 3, or 5 counterfactuals using the template, “If only Mr. Jones...then this terrible accident might have been avoided.” Then they rated the likelihood of the antecedents and outcomes of the generated counterfactuals and completed other dependent variables targeting perceived negative affect. Results indicated that the greater perceived likelihood of an antecedent and alternative outcome, the more responsibility and blame participants assigned to Mr. Jones. Additionally, the

higher the counterfactual potency, the greater perceived negative affect of Mr. Jones. A later study found that when individuals perceived that being with a previous romantic interest was a viable possibility, they felt greater regret about missing out on that alternative (Petrocelli, Kamrath, Brinton, Uy, & Cowens, 2015). Both of these studies support the idea that counterfactual potency is an important component to the counterfactual thinking-negative affect link.

Here it is proposed that counterfactual potency is an important factor to consider in any attempts to improve affective reactions tied to counterfactual thinking. In fact, perhaps it is the key mediator for whether or not an intervention will be successful; counterfactual thinking-based interventions designed to improve affect may first need to reduce counterfactual potency. Of course, counterfactual thinking is not the only source of positive and negative affect. For example, a couple aforementioned studies provide evidence that emotions, such as regret, can result from behaviors inconsistent with one's mood, personality, or goals (Seta et al., 2008, 2001). The present intervention is not designed to help those individuals. The intervention proposed here is only intended to work with those whose source of negative affect is counterfactual thinking.

### **Cognitive Behavioral Therapy and Negative Affect**

One of the most commonly employed psychotherapies known to improve affect is that of cognitive behavioral therapy (CBT). According to CBT, one's thoughts are the key determinant of one's negative affect and ensuing behavior (Beck, 2011). From this perspective, any psychological disturbance, including incapacitating regret, originates with dysfunctional thoughts. Activating events (e.g., becoming intoxicated) do not simply cause negative affect and behavioral changes. Rather, events trigger cognitions that lead

to changes in affect and behavior (DeSilvestri, 1989). Specifically, irrational or unrealistic thoughts lead to dysfunctional emotions and behaviors. Over time, an individual may experience an event and react without thinking due to repetitive pairing of the same event with the same emotions and behaviors (Wirga & De Bernardi, 2002). CBT was originally designed as a short-term intervention to treat depression, emphasizing the change of irrational beliefs and dysfunctional behaviors to solve an individual's current problems (Beck, 2011). Typically, CBT is adapted to each individual, targeting his or her specific maladaptive beliefs and behaviors to yield lasting improvements. Therapists embracing the CBT approach educate patients on how to cope with stressful situations, often using homework assignments so that patients may practice what they learn (Cristea et al., 2015).

CBT is a goal-oriented therapy that stresses straightforward solutions to present problems. Unlike psychoanalytic therapy, CBT does not emphasize making sense of early childhood experiences or relationships. Rather, CBT focuses on changing maladaptive reactions without necessarily understanding the origin of the malfunction (Beck, 1970). CBT targets automatic thoughts (i.e., people's unique misconceptions, distortions, and maladaptive assumptions) to induce substantial, lasting change (Beck, 2011). Additionally, CBT for psychopathology may address at least 15 different maladaptive schemas, which Young (1990) described as dysfunctional core beliefs about the self that are often triggered by circumstances or events in one's environment (Bricker, 1993; Young 1994). At the beginning of a therapy session, CBT therapists tend to ask clients what specific thought or thoughts are currently most distressing to them. Then, CBT therapists often ask guided questions (e.g., "What is the effect of believing that automatic

thought, and what could be the effect of changing your thinking?”). Such questions serve to help clients learn to distance themselves from their automatic thoughts (i.e., see them as thoughts rather than reality or facts) and determine if they are valid or useful. CBT clients then learn to challenge and replace dysfunctional thoughts with ones that are rational. Beck (1970) noted that it is useful for patients to identify the kind of thinking error that they are engaging in (e.g., arbitrary inference, overgeneralization, magnification, or cognitive deficiency). In CBT, a client may challenge an automatic thought about academic performance (e.g., “My thought that I am a failure because I earned a B on my last exam is irrational and an example of overgeneralization. Just because I did not earn the grade that I wanted this time does not mean I am a failure. By putting in more time and effort studying, I feel confident that I will do better on the next exam.”). This process, called cognitive restructuring, helps patients learn to identify, process, and respond to automatic negative thoughts on their own (Beck, 2011). Another component often used in CBT is behavioral intervention. While targeting and replacing automatic thoughts yields cognitive change with practice, behavioral interventions designed to test the validity of an irrational thought are effective at convincing a client that the thought is not useful, prompting an immediate change in thought (Beck, 2011).

CBT techniques, which are numerous, promote change in a patient’s thoughts, affect, and behaviors. Some of the techniques commonly used to identify, evaluate, and modify maladaptive beliefs include: Socratic questioning, behavioral experiments, role playing, imagery, listing advantages and disadvantages of beliefs, problem solving, making decisions, refocusing, relaxation and mindfulness, coping cards, graded task assignments, exposure, the “pie” technique, self-comparisons, and credit lists (Beck,

2011). The current study utilizes a CBT technique called Socratic questioning to encourage participants to carefully evaluate their counterfactual thoughts. Examples of Socratic questions included in the present study to target counterfactuals include “Is there an alternative explanation or viewpoint?” and “What is the evidence against your if-then statement?”

Here, it is proposed that counterfactual thinking can be a source of maladaptive processing and negative affect. Consistent with CBT, then, a reduction in counterfactual thinking should reduce negative affect. Because it is unlikely that people will stop generating counterfactual thoughts, one viable way to reduce negative affect may be to weaken the potency of one’s counterfactual thoughts. To date, there is little empirical research evaluating reduction of counterfactual potency as an effective treatment for reducing negative affect. However, research suggests that a treatment targeting aspects of counterfactual thinking may be useful. For instance, Hirt and Markman (1995) studied the use of counterfactual thinking for debiasing judgments. It is known that individuals maintain a bias for one of many potential outcomes after simply explaining how that specific outcome might occur. When participants explained alternatives to an original prediction, this counterexplanation task removed bias from the initial likelihood judgments. Though this was applied to reducing likelihood judgments of future outcomes, considering other alternatives may be effective for reducing the perceived likelihood of upward counterfactuals about the past.

However, it is unclear if directly altering counterfactual potency can be used to improve affect. The current study was the second empirical investigation designed to test this possibility. Marshall and Petrocelli (2016) sought to determine if reducing

counterfactual potency, through a controlled intervention, led to a reduction in negative affect. It was hypothesized that the Condition would lead to a change in Negative Affect, such that Negative Affect among the intervention condition would be significantly reduced compared to the Negative Affect observed in the control condition. It was also predicted that Condition would lead to a change in Counterfactual Potency, such that Counterfactual Potency among the intervention condition would be significantly reduced compared to the Counterfactual Potency observed in the control condition. It was also hypothesized that link between Condition and change in Negative Affect would be mediated by the reduction in Counterfactual Potency.

Participants read a conversation-scenario including a target's counterfactual thought (i.e., "If only I had communicated more when we were trying to make things work long-distance, then should would not have broken up with me. We could still be together now.>"). Participants then rated perceived counterfactual potency and negative affect of the scenario target. Similar to cognitive-behavioral therapy techniques, the target was asked a series of questions designed to evaluate counterfactual potency and reduce negative affect. Then participants rated the perceived counterfactual potency and negative affect of the social target again.

Marshall and Petrocelli (2016) revealed two important findings. First, consistent with expectations, the intervention condition significantly reduced both Counterfactual Potency and Negative Affect relative to the control condition. Though much research has demonstrated the effectiveness of CBT in reducing symptoms of depression including negative affect (Charkandeh, Talib, & Hunt, 2016; Cristea et al., 2015; Cuijpers et al., 2016), the effects of CBT on counterfactual potency had yet to be considered. This was

the first study to demonstrate that CBT-based questioning techniques can reduce the counterfactual potency of a mentally simulated alternative to an unwanted outcome.

Second, the results also showed support for the hypothesis that the link between Condition and change in Negative Affect can be mediated by the reduction in Counterfactual Potency. The CBT intervention was effective at reducing perceived negative affect via counterfactual potency in the intervention condition. The data suggested that the effectiveness of the intervention depends on change in counterfactual potency because the direct effect of intervention on negative affect was reduced to nonsignificance when counterfactual potency was added to the model. This finding was especially important as it demonstrates the important role counterfactual potency plays in determining negative affect when mentally simulating an alternative. As a whole, these results provided empirical support for the use of counterfactual potency in utilizing cognitive behavioral techniques to reduce negative emotions.

### **Positive Affect**

It may also be important to explore positive affect when evaluating changes in emotions. Watson and Tellegen (1985) conducted factor analyses of their own data along with reanalyzing the data of six prior studies that were all designed to conceptualize the dimensions of mood. Their data suggested that there are two independent, orthogonal dimensions of mood, positive affect and negative affect. Such findings stand in contrast to the assumption, held by prior research, that mood exists on a single dimension, with “good” and “bad” as the anchor labels at each end (Brandstätter, 1983; Eckenrode, 1984). Watson and Tellegen (1985) clarified that, the correlation between positive and negative affect depends on the particular words employed in research studies. For example, words

that convey pleasantness (e.g., joy and content) are negatively correlated with words that convey unpleasantness (e.g., sad and regret).

When psychotherapy is administered for mood disorders, positive and negative affect are often both measured as indicators of improvement. Consider major depressive disorder (MDD), which is characterized by both high negative affect (i.e., guilt and sadness) and low positive affect (i.e., diminished pleasure and reduced interest in previously enjoyed activities; American Psychiatric Association, 2013). In a meta-analysis of ten randomized trials that examined changes in positive affect and negative affect for psychotherapeutic interventions targeting adult depression, a decrease in symptoms of depression was associated with increases in positive affect (Boumparis, Karyotaki, Kleiboer, Hofmann, & Cuijpers, 2016). Additionally, the participants in the intervention condition had a significantly greater increase in positive affect as compared to those in the control condition. Surprisingly, Boumparis et al. found that a decrease in symptoms of depression was also associated with an increase in negative affect. Boumparis et al. suggested that the unexpected findings regarding negative affect might be attributed to the fact that some studies within the meta-analysis measured negative affect with the positive and negative affect schedule (PANAS) negative affect scale, developed by Watson, Clark, and Tellegen (1988), while others used the Beck Depression Inventory-II (BDI-II) measures of sadness and anhedonia, developed by Beck, Steer, and Brown (1996). The two aforementioned measures target different emotions, which may have clouded the negative affect results (Boumparis et al., 2016). Nevertheless, the findings suggest that for emotional distress marked by the presence of

high negative affect and/or low positive affect, measuring positive affect may be beneficial as an indicator of psychological and emotional improvement.

### **Overview of Experiment**

The current study was designed to determine whether reducing counterfactual potency leads to functional inferences thereby supporting desirable changes in affect (i.e., reduction of negative affect). In the current study, participants were randomly assigned to a treatment condition involving either an intervention or control task. All participants summarized a previous behavior that they feel bad about (e.g., “I hit a parked car while I was parking during one of my firsts trips with my full license.”). Subsequently, participants were asked to provide a conditional statement (i.e., “If only...then...” that usually comes to mind when they think about their behavior. (e.g., “If only I had taken more care and paid full attention while parking, then I wouldn’t have scraped up against the car next to me.”). Participants then rated Counterfactual Potency (e.g., likelihood of the IF and THEN part of the counterfactual thought actually occurring) and Negative Affect (e.g., regret) regarding their behavior and answered questions related to the behavior that they feel bad about (intervention condition) or related to their favorite pizza in town (control condition). Similar to CBT techniques, the participants were asked ten leading questions. For example, participants in the intervention condition were asked about the strength of evidence supporting their counterfactual thoughts and to provide evidence against their counterfactual thoughts. These questions targeted the “if likelihood” and “then likelihood” that comprise Counterfactual Potency. Thus, the questions were designed to evaluate Counterfactual Potency and ultimately reduce both Counterfactual Potency and Negative Affect among participants assigned to the

intervention condition. Participants in the control condition were asked leading questions about their favorite pizza in town. For example, they were asked to provide evidence supporting their favorite pizza selection and to consider the possibility that another place has better pizza. Next, all participants answered questions about the Source of Negative Affect to determine if the source of negative affect moderates the effectiveness of the intervention. Participants then rated Counterfactual Potency and Negative Affect again in order to assess changes in these variables.

### **Hypotheses**

**Hypothesis 1.** It is hypothesized that Treatment Condition (i.e., control vs. intervention) will lead to a change in Counterfactual Potency, such that Counterfactual Potency among the intervention condition will be significantly reduced compared to the Counterfactual Potency observed in the control condition.

**Hypothesis 2.** It is hypothesized that the main effects of Treatment Condition (i.e., control vs. intervention) and Source of Negative Affect on Change in Counterfactual Potency will be qualified by a Treatment Condition  $\times$  Source of Negative Affect interaction. Among participants assigned to the intervention condition, it is hypothesized that Counterfactual Potency will be significantly reduced among those whose source of negative affect was counterfactual thinking as compared to those whose source of negative affect was not counterfactual thinking. However, among participants assigned to the control condition, no significant difference in Change in Counterfactual Potency is expected to emerge between the Source of Negative Affect levels. For two people who receive the intervention treatment, they are expected to have different amounts of Change in Counterfactual Potency depending on their Source of Negative Affect. For a person

whose Negative Affect is not due to counterfactual thinking, the intervention is expected to be irrelevant and little to no Change in Counterfactual Potency is expected. For a person whose Negative Affect is due to counterfactual thinking, the intervention is expected to be relevant and greater Change in Counterfactual Potency is expected.

**Hypothesis 3.** It is hypothesized that Treatment Condition (i.e., control vs. intervention) will lead to a change in Negative Affect, such that Negative Affect among the intervention condition will be significantly reduced compared to the Negative Affect observed in the control condition.

**Hypothesis 4.** It is hypothesized that the main effects of Treatment Condition (i.e., control vs. intervention) and Source of Negative Affect on Change in Negative Affect will be qualified by a Treatment Condition  $\times$  Source of Negative Affect interaction. Among participants assigned to the intervention condition, it is hypothesized that Negative Affect will be significantly reduced among those whose source of negative affect was counterfactual thinking as compared to those whose source of negative affect was not counterfactual thinking. However, among participants assigned to the control condition, no significant difference in Change in Negative Affect is expected to emerge between the Sources of Negative Affect conditions. For two people who receive the intervention treatment, they are expected to have different amounts of Change in Negative Affect depending on their Source of Negative Affect. For a person whose Negative Affect is not due to counterfactual thinking, the intervention is expected to be irrelevant and little to no Change in Negative Affect is expected. For a person whose Negative Affect is due to counterfactual thinking, the intervention is expected to be relevant and greater Change in Negative Affect is expected.

**Hypothesis 5.** Lastly, mediated moderation is hypothesized to emerge, such that the Treatment Condition  $\times$  Source of Negative Affect interactive effect on Change in Negative Affect is mediated by Change in Counterfactual Potency. Mediated moderation, as described by Muller, Judd, and Yzerbyt (2005; see also Wegener & Fabrigar, 2000), occurs when distal variables interact to influence a mediator variable, with that mediator directly carrying the effects of the interacting variables to the dependent measure. Parallel Treatment Condition  $\times$  Source of Negative Affect interactions on Change in Counterfactual Potency and Change in Negative Affect are consistent with Change in Counterfactual Potency mediating the Treatment Condition  $\times$  Source of Negative Affect interaction on Change in Negative Affect. This type of mediated moderation would be reflected in a Treatment Condition  $\times$  Source of Negative Affect interaction on Change in Counterfactual Potency, coupled with a direct relationship between Change in Counterfactual Potency and Change in Negative Affect.

## METHOD

### Participants and Design

A total of 235 (58.1% female) undergraduate students enrolled in an introductory psychology course participated in the experiment in exchange for partial fulfillment of a research participation requirement. Participant ages ranged from 18-22 years old, with the mean age being 18.93 ( $SD = 1.03$ ). Of the total sample, 69.4% were freshmen, 19.7% were sophomores, 4.8% were juniors, and 6.1% were seniors. Participants were recruited through an online participation pool. No particular screening criteria were used. The current experiment employed a single factor design manipulating the intervention condition and measuring Change in Negative Affect, Change in Positive Affect, and Change in Counterfactual Potency as the dependent variables.

Given the prediction of mediation in the current study, guidelines for determining the appropriate sample size necessary to attain statistical power of .80 were consulted (Fritz & MacKinnon, 2007). When the  $\alpha$  and  $\beta$  mediation paths are both estimated to be medium (i.e., .39), a total of 142 observations are required to detect statistical mediation. Thus, sampling for the current study is considered more than sufficient to achieve adequate power when testing for mediation.

### Procedure

All participants were asked to complete a computerized self-administered questionnaire using the professional software program, MediaLab (Jarvis, 2012), in a private cubicle with a door and no windows. With this software program, each participant's responses were automatically stored in a database. All of the data

participants provided was collected only after permission and informed consent were secured.

**Life event and counterfactual thought-listing task.** Participants were asked to complete a task that measured their perceptions of a personal life event. Specifically, participants were asked to recall a time when they did something that makes them feel bad. Furthermore, they were instructed to think about an incident in which they took responsibility for committing a behavior and one that when they think about it, they often feel bad and generate thoughts such as, “If only I hadn’t...” (see: Wohl, DeShea, & Wahkinney, 2008). Participants were asked to type a summary of the event and then provide the conditional counterfactual statement (i.e., “If only...then...”) that usually comes to mind when they think about their behavior.

The frequencies of the direction (i.e., upward or downward) and structure (i.e., additive or subtractive) of counterfactual thoughts that participants provided were noted. An upward counterfactual focuses on improving an outcome, while a downward counterfactual emphasizes potentially worse outcomes (Markman et al., 1993). Additive counterfactuals involve engaging in a behavior that did not actually occur, while subtractive counterfactuals involve the withdrawal or omission of a behavior that did occur. A total of 94.3% of counterfactuals were upward counterfactual thoughts, and the direction of 5.7% of counterfactuals was unclear. That is, most all of the counterfactual thoughts provided focused on improving an actual outcome. Examples of upward counterfactual thoughts written by participants included: a) “If only I had been more respectful and tolerant of my mom, then we could have been on better terms before I left for college.” and b) “If only I had watched her more closely and made sure she was being

safe, then she would not have needed to be hospitalized and I would not have gotten in trouble with the school.” A total of 68.0% of the counterfactuals were additive, 30.7% were subtractive, and the structure of 1.3% of counterfactuals was unclear. That is, about two thirds of the sample provided counterfactuals involving behaviors they wish they had done, while about one third of the sample provided counterfactuals involving behaviors they wish they had not done. Examples of additive counterfactuals written by participants included: a) “If only I had just swallowed my pride and apologized to my friend for my false and damaging accusations then maybe we would still be friends today.” and b) “If only I had bet on PSG beating Barcelona, then I wouldn’t have lost all that money.” Examples of subtractive counterfactuals written by participants included: a) “If only I didn’t hit my brother in the face, then he wouldn’t have to suffer having a scar left on his face for the rest of his life.” and b) “If only I hadn’t reached for my sunglasses before I came to a complete stop in my car, then I wouldn’t have rear-ended the pregnant lady driving in front of me.”

**Counterfactual potency (pre-test).** Next, participants responded to items designed to measure counterfactual potency regarding their behavior. Specifically, participants were asked two questions: a) Take a closer look at the FIRST part of your if-then statement. How likely is it that your if statement would have occurred? i.e., Rate the likelihood of the “IF” part of your statement happening. and b) Take a closer look at the SECOND part of your if-then statement. Assuming that the “IF” part of your thought actually occurred, what was the likelihood of the THEN part actually occurring? Participants responded to these items using eleven-point response scales with *not at all likely/little to no chance* (0) and *extremely likely/sure thing* (10) as the anchor labels.

**Affect (pre-test).** Following the measure of Counterfactual Potency, participants indicated the degree to which they believe they experience each of eight negative emotions (i.e., *regret, anger, sadness, disappointment, frustration, grief, shame, and guilt*) when they think about their behavior, using nine-point response scales with *none at all* (1) and *a lot* (9) as the anchor labels. The negative affect items were internally consistent with a Cronbach's alpha of .86 at pre-test. Additionally, participants were asked to characterize the emotion they tend to feel most when they think about their regretted behavior and rate the intensity of that emotion using a nine-point response scale with *not at all intense* (1) and *extremely intense* (9) as the anchor labels.

Although this study primarily targeted and focused on negative affect, a case was made in the introduction for exploring the possibility that changes in positive affect may also be an indicator of the benefit of the present intervention. For this reason, participants also indicated the degree to which they believe they experience each of three positive emotions (i.e., *happy, joyful, and content*) when they think about their behavior, using nine-point response scales with *none at all* (1) and *a lot* (9) as the anchor labels. The positive affect items were internally consistent with a Cronbach's alpha of .81 at pre-test.

**Treatment condition.** Participants were randomly assigned to one of two Treatment Conditions that differed in their subsequent content. Participants assigned to the *intervention* [control] condition read and answered questions *related to the behavior that makes them feel bad* [related to their favorite pizza in town]. Specifically, participants read and answered the following questions:

1. *Do you have any evidence for your if-then statement?* [Do you have any evidence for your selection?]

2. *Is it possible that the actual outcome would have happened regardless?* [Is it possible that another place has better pizza?]
3. *Any other reasons the actual outcome would still happen?* [Any other reasons another place would still be better?]
4. *Were there multiple factors at play in this situation? Were any of those factors things that were outside of your control?* [Were there multiple factors at play in your selection? Were any of those factors things that were outside of your control?]
5. *What is the effect of believing your if-then thought?* [What is the effect of believing that your selection is the best?]
6. *What could be the effect of changing your thinking?* [What could be the effect of changing your thinking?]
7. *How strong is the evidence that supports your if-then statement?* [How strong is the evidence that supports your selection?]
8. *What is the evidence against your if-then statement?* [What is the evidence against your selection?]
9. *Is there an alternative explanation or viewpoint?* [Is there an alternative explanation or viewpoint?]
10. *Consider your answers to the 9 previous questions we asked you about the event you described. How do you think you should feel about yourself when considering your answers to the questions?* [Consider your answers to the 9 previous questions we asked you about the pizza you selected. How do you

think you should feel about yourself when considering your answers to the questions?]

**Moderators.** Following the intervention questions, participants rated statements and answered questions about their own thinking tendencies, source of negative affect, behavioral intentions, and the probability of the actual outcome occurring again.

Concerning thinking tendencies, participants were asked to indicate the degree to which they agree with ten statements when they think about the behavior that they described (e.g., “Things would have gone better if I had chosen another option”). Participants responded to these items using seven-point response scales with *strongly agree* (1) and *strongly disagree* (2) as the anchor labels.

Participants were asked two questions to determine the source of their negative affect: a) “When thinking about what I did (or didn’t do), I feel bad because I think about how things might have been different.” and b) “When thinking about what I did (or didn’t do), I can’t stop thinking about how I could have behaved differently or how things might have been.” Participants responded to these items using seven-point response scales with *strongly disagree* (1) and *strongly agree* (7) as the anchor labels. The two source of negative affect items were internally consistent with a Cronbach’s alpha of .79.

Participants were asked a single question to determine their behavioral intention for the future. Specifically, participants were asked: Imagine an identical situation in the future. What is the likelihood that you would do the same thing again? Participants responded to this item using an eleven-point response scale with *not at all likely/little to no chance* (0) and *extremely likely/sure thing* (10) as the anchor labels.

Participants were also asked a single question about the probability of the actual outcome occurring again in the future. Specifically, they were asked: Now we would like you to think about the possibility of the actual outcome occurring. That is, assuming that any of the “If parts” had actually occurred, what do you perceive is the likelihood of the actual outcome still occurring? Participants responded to this item using an eleven-point response scale with *not at all likely/little to no chance* (0) and *extremely likely/sure thing* (10) as the anchor labels.

**Counterfactual potency and affect (post-test).** Following the completion of the moderator questions, participants responded to the same Counterfactual Potency items, Negative Affect items, and Positive Affect items encountered earlier. The negative affect items were internally consistent with a Cronbach’s alpha of .92 at post-test. The positive affect items were internally consistent with a Cronbach’s alpha of .88 at post-test.

**Demographic questions.** Participants responded to demographic questions including general questions about their gender, age, college year, and major. Additionally, participants were asked to provide general comments about the study and to explain what they thought the study was about.

**Participant crosstalk prevention and debriefing messages.** After the final measures of counterfactual potency and negative affect, participants were presented with a message designed to dissuade them from discussing the present research study after participation (Edlund, Sagarin, Skowronski, Johnson, & Kutter, 2009). Finally, participants read a debriefing statement informing them of the basic purposes of the study. They were then thanked for their participation and dismissed.

## RESULTS

Because the primary analysis involved regression modeling, various collinearity diagnostics (e.g., Cook's distance, studentized residuals, DfFit) were examined using the recommendations set forth by statisticians (Belsley, 1991a, 1991b; Belsley, Kuh, & Welsch, 1980). From this analysis it was discovered that six participants were clear outliers. All subsequent analyses excluded the data of these six participants, resulting in a final sample of 229 participants. Analyses included Treatment Condition, Source Of Negative Affect, Counterfactual Potency, Positive Affect, and Negative Affect. All sample means are displayed in Table I. All correlations of continuous variables are displayed in Table II.

### **Change in Counterfactual Potency**

As previously noted, Counterfactual Potency was calculated by multiplying the “if likelihood” (the perceived likelihood of the antecedent in a counterfactual) and the “then likelihood” (assuming the antecedent is true, the perceived likelihood of the outcome of the counterfactual) of each participant's counterfactual thought (Petrocelli et al., 2011), creating a range from 0-100. Change in Counterfactual Potency was calculated by subtracting Counterfactual Potency Time 2 from Counterfactual Potency Time 1, such that greater scores indicate greater reduction in Counterfactual Potency.

Hypothesis 1, which states that Treatment Condition (i.e., control vs. intervention) will lead to a change in Counterfactual Potency, such that Counterfactual Potency among the intervention condition will be significantly reduced compared to Counterfactual Potency observed in the control condition, and Hypothesis 2, which states that main

Table I  
Descriptive Statistics of the Sample

Study Variable	<u>Treatment Condition</u>					
	<u>Sample</u>		<u>Control</u>		<u>Intervention</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Counterfactual Potency Time 1	46.33	26.43	45.77	27.75	46.89	25.17
Counterfactual Potency Time 2	41.33	28.26	44.35	30.09	38.34	26.10
Change in Counterfactual Potency	5.00	25.50	1.42	23.68	8.55	26.81
Negative Affect Time 1	5.64	1.66	5.63	1.68	5.65	1.65
Negative Affect Time 2	5.33	1.98	5.37	2.03	5.30	1.93
Change in Negative Affect	.31	1.11	.26	1.02	.36	1.19
Positive Affect Time 1	1.63	1.06	1.59	.98	1.66	1.15
Positive Affect Time 2	1.72	1.21	1.56	.98	1.88	1.38
Change in Positive Affect	.11	.86	-.03	.63	.26	1.02

effects of Treatment Condition and Source of Negative Affect on Change in Counterfactual Potency will be qualified by a Treatment Condition  $\times$  Source of Negative Affect interaction, were tested using a hierarchical multiple regression analysis recommended by Cohen and Cohen (1983). Counterfactual Potency Time 1 was entered in the first step, participants' Treatment Condition and Source of Negative Affect were centered and entered in the second step, and their interaction term was entered in the third step of the regression analysis. Counterfactual Potency Time 1 was a significant predictor of Change in Counterfactual Potency,  $\beta = .41$ ,  $t(227) = 6.74$ ,  $p < .001$ . As hypothesized (Hypothesis 1), a significant main effect of Treatment Condition was revealed, such that

Table II

## Intercorrelations of all Continuous Variables

Variable	1	2	3	4	5	6	7	8
1. Counterfactual Potency Time 1	–							
2. Counterfactual Potency Time 2	.05	–						
3. Change in Counterfactual Potency	.41**	.29**	–					
4. Negative Affect Time 1	.21**	-.14*	-.06	–				
5. Negative Affect Time 2	.16*	-.13	-.12	.83**	–			
6. Change in Negative Affect	.03	.02	.11	.02	-.54*	–		
7. Positive Affect Time 1	-.12	.03	.08	-.20**	-.27**	.18**	–	
8. Positive Affect Time 2	-.01	.04	.18**	-.14*	-.22**	.19**	.75**	–
9. Change in Positive Affect	.12	.05	.16*	-.004	.02	-.03	-.20**	.47**

\* $p < .05$ . \*\* $p < .01$ .

participants in the intervention condition had greater Change in Counterfactual Potency (i.e., greater reduction in Counterfactual Potency) than those in the control condition,  $\beta = .13$ ,  $t(225) = 2.12$ ,  $p = .04$ . A significant main effect was also observed for Source of Negative Affect,  $\beta = -.14$ ,  $t(225) = -2.33$ ,  $p = .02$ , indicating less Change in Counterfactual Potency among those who attributed their Negative Affect to counterfactual thinking. Surprisingly, the Treatment Condition  $\times$  Source of Negative Affect interaction term did not significantly predict Change in Counterfactual Potency,  $\beta = -.10$ ,  $t(224) = -1.20$ ,  $p = .23$ . Thus, the prediction that the main effect of Treatment

Condition on Change in Counterfactual Potency will be qualified by a Treatment Condition  $\times$  Source of Negative Affect interaction was not supported by the observed data.

### **Change in Negative Affect**

Negative Affect was obtained by calculating the mean rating of eight measured negative emotions (i.e., *regret*, *anger*, *sadness*, *disappointment*, *frustration*, *grief*, *shame*, and *guilt*). Change in Negative Affect was calculated by subtracting Negative Affect Time 2 from Negative Affect Time 1, such that greater scores indicate greater reduction in Negative Affect.

Hypothesis 3, which states that Treatment Condition (i.e., control vs. intervention) will lead to a change in Negative Affect, such that Negative Affect among the intervention condition will be significantly reduced compared to the Negative Affect observed in the control condition, and Hypothesis 4, which states that main effects of Treatment Condition and Source of Negative Affect on Change in Negative Affect will be qualified by a Treatment Condition  $\times$  Source of Negative Affect interaction, were tested using a hierarchical multiple regression analysis recommended by Cohen and Cohen (1983). Negative Affect Time 1 was entered in the first step, participants' Treatment Condition and Source of Negative Affect were centered and entered in the second step, and their interaction term was entered in the third step of the regression analysis. Negative Affect Time 1 was not a significant predictor,  $\beta = .02$ ,  $t(227) = .35$ ,  $p = .72$ . Counter to predictions (Hypothesis 3), no main effect of Treatment Condition on Change in Negative Affect was found,  $\beta = .03$ ,  $t(225) = .53$ ,  $p = .59$ . Interestingly, a significant main effect of Source of Negative Affect was revealed, such that greater

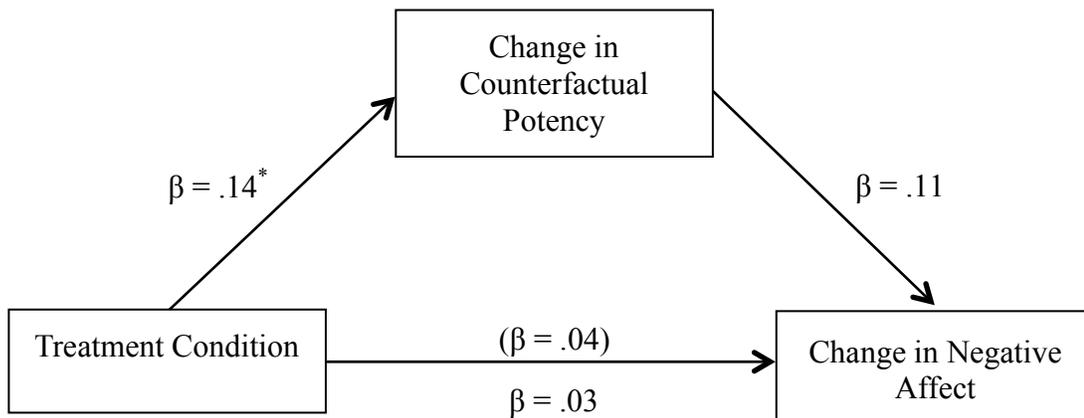
Change in Negative Affect was associated with absence of thinking about the event with regard to its alternative,  $\beta = -.24$ ,  $t(225) = -3.04$ ,  $p = .003$ . In other words, the more that participants attributed their affect to counterfactual thinking, the more resistant they were to the intervention, irrespective of the procedure used. The Treatment Condition  $\times$  Source of Negative Affect interaction term did not significantly predict Change in Negative Affect,  $\beta = .06$ ,  $t(224) = .85$ ,  $p = .39$ . Thus, the hypothesis (Hypothesis 4) that a Treatment Condition  $\times$  Source of Negative Affect interaction would predict Change in Negative Affect was not supported by the observed data.

Mediated moderation was hypothesized (Hypothesis 5), such that a Treatment Condition  $\times$  Source of Negative Affect interactive effect on Change in Negative Affect would be mediated by Change in Counterfactual Potency. This hypothesis entails two significant interactions. The lack of a significant Treatment Condition  $\times$  Source of Negative Affect interaction effect on either Change in Counterfactual Potency or Change in Negative Affect even after outliers were removed eliminated the need to conduct the mediation test. Thus, Hypothesis 5 was not supported by the observed data.

A test of mediated moderation was not conducted due to the lack of two significant interaction tests. However, a reduced model, testing the possibility that the effect of Treatment Condition on Change in Negative Affect is mediated by Change in Counterfactual Potency, was evaluated. Controlling for Negative Affect Time 1, a main effect of Treatment Condition on Change in Counterfactual Potency was found, such that participants in the intervention condition had greater Change in Counterfactual Potency (i.e., greater reduction in Counterfactual Potency) than those in the control condition,  $\beta = .14$ ,  $t(226) = 2.14$ ,  $p = .03$ . In a separate regression analysis, Negative Affect Time 1

was entered in the first step, participants' Treatment Condition was entered in the second step, and Change in Counterfactual Potency was entered in the third step of the regression analysis where Change in Negative Affect was employed as the criterion. As noted in the above analyses, Negative Affect Time 1 was not a significant predictor,  $\beta = .02$ ,  $t(227) = .35$ ,  $p = .72$ . No main effect of Treatment Condition on Change in Negative Affect was found,  $\beta = .04$ ,  $t(226) = .66$ ,  $p = .51$ . Additionally, no main effect of Change in Counterfactual Potency was found,  $\beta = .11$ ,  $t(225) = 1.64$ ,  $p = .10$ . Thus, mediation of the relationship between Treatment Condition and Change in Negative Affect was not supported by the observed data (see Figure 1).

Figure 1  
Mediation test of the relationship between Treatment Condition and Change in Negative Affect by Change in Counterfactual Potency



*Note.* Treatment Condition was coded using 0 for the control condition and 1 for the intervention condition.

\*  $p < .05$

### **Change in Positive Affect**

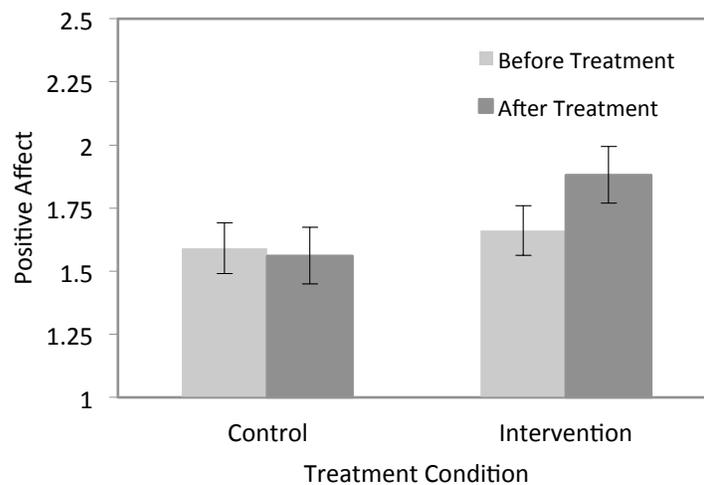
As explained previously, it may be important to explore change in positive affect as another indicator of the potential benefit of a CBT-based intervention targeting negative feelings by directly altering counterfactual potency. Positive Affect was obtained by calculating the mean rating of three measured positive emotions (i.e., *happy*, *joyful*, and *content*). Change in Positive Affect was calculated by subtracting Positive Affect Time 1 from Positive Affect Time 2, such that greater scores indicate greater improvement in Positive Affect.

In order to explore the role that Treatment Condition and Change in Counterfactual Potency played in Change in Positive Affect, a series of regression analyses were conducted. Controlling for participants' Positive Affect at Time 1, a main effect of Treatment Condition on Change in Positive Affect was found, such that the intervention condition was associated with greater improvement in Positive Affect,  $\beta = .17$ ,  $t(226) = 2.70$ ,  $p = .007$ . Controlling for participants' Positive Affect at Time 1, a main effect was also found of Treatment Condition on Change in Counterfactual Potency, such that the intervention condition was associated with greater reduction in Counterfactual Potency,  $\beta = .14$ ,  $t(226) = 2.09$ ,  $p = .04$ .

Pairwise contrasts were conducted to further explain the effect of Treatment Condition on Change in Positive Affect (see Figure 2). There was no significant Change in Positive Affect from before to after the intervention for participants in the control condition,  $t(227) = -.38$ ,  $p = .70$ , but there was a significant Change in Positive Affect from before to after the intervention for participants in the intervention condition,  $t(201) = 12.83$ ,  $p = .004$ . From another angle, there was no significant difference in Positive

Affect between control and intervention conditions,  $t(227) = .93, p = .35$  before the intervention. After the intervention, however, there was a significant difference in Positive Affect between conditions, such that participants in the intervention condition had significantly more Positive Affect than the control condition,  $t(227) = 4.22, p = < .001$ .

Figure 2  
Positive Affect by Treatment Condition and Assessment

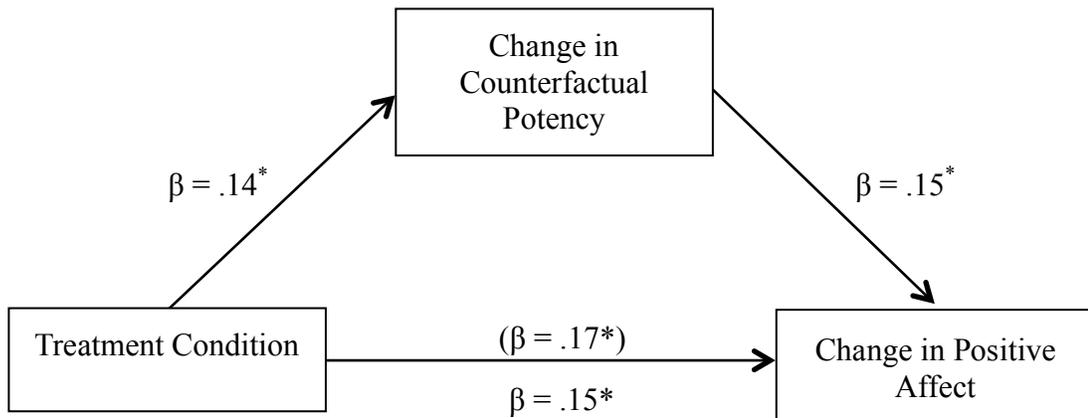


To test the possibility that Change in Counterfactual Potency mediates the link between Treatment Condition and Change in Positive Affect, a mediation analysis was computed using a bootstrap procedure to construct bias-corrected confidence intervals based on 5,000 random samples with replacement from the full sample (see: Preacher & Hayes, 2004, 2008) to examine the indirect effect of Treatment Condition on Change in Positive Affect through Change in Counterfactual Potency, controlling for Positive Affect at Time 1. The size of the indirect effect of Treatment Condition on Change in Positive Affect through Change in Counterfactual Potency was .04 ( $SE = .03$ ), and it was

significant with a 95% confidence interval which did not include zero, 95% CI [.001, .12] (see Figure 3). Thus, Change in Counterfactual Potency successfully mediated the relationship between Treatment Condition and Change in Positive Affect. This finding suggests that participants assigned to the intervention condition experienced greater reduction in Counterfactual Potency than those in the control condition, and as a result, they reported a greater increase in Positive Affect than participants assigned to the control condition.

Figure 3

Mediation of the relationship between Treatment Condition and Change in Positive Affect by Change in Counterfactual Potency



*Note.* Treatment Condition was coded using 0 for the control condition and 1 for the intervention condition.

\*  $p < .05$

## DISCUSSION

Research suggests that upward counterfactual thinking affects negative emotions to the extent that people believe in the plausibility, or likelihood, of the mentally simulated alternative antecedents and outcomes (i.e., *counterfactual potency*; Petrocelli et al., 2011). The current investigation serves as the first empirical investigation evaluating the reduction of counterfactual potency as a potential treatment for improving affect. Previous research indicates that a treatment targeting aspects of counterfactual thinking may be useful. For example, Hirt and Markman (1995) found that explaining alternatives to original predictions removes bias from initial likelihood judgments. Though this finding relates to likelihood judgments of future outcomes, considering other alternatives may be effective for reducing the perceived likelihood of upward counterfactuals about the past. From the established literature, it is unclear if directly altering counterfactual potency can be used to improve affect. Research conducted by Marshall and Petrocelli (2016) showed that reductions in counterfactual potency can lead to expectations of reduced negative affect for social targets. Building on their findings, the current study was the first empirical investigation designed to test the possibility that directly reducing counterfactual potency can lead to inferences supporting the improvement of affect for the self. The data of the current study reveal three important findings.

First, as hypothesized, Treatment Condition significantly reduced Counterfactual Potency in the intervention condition relative to the control condition. This result is consistent with Marshall and Petrocelli's (2016) finding that CBT-based questioning techniques can reduce the perceived counterfactual potency of a social target's counterfactual thought in a scripted scenario. However, the current study demonstrates

that CBT-based questioning techniques can reduce the counterfactual potency of mentally simulated alternatives to unwanted outcomes that people actually experienced for themselves.

Second, Hypotheses 2-4 were not supported by the observed data. These hypotheses depended on a significant main effect of Treatment Condition and/or a significant interaction between Treatment Condition and Source of Negative Affect. Due to the fact that Hypothesis 5 was contingent on a significant interaction between Treatment Condition and Source of Negative Affect on Change in Negative Affect, mediated moderation was not tested. Thus, Hypothesis 5 was also not supported by the observed data.

There are a number of reasons why Hypotheses 2-5 were unsuccessful. One factor to consider is the source of one's negative affect. The present study was designed to benefit individuals whose negative affect was attributed to counterfactual thinking. The main effects of Source of Negative Affect on Change in Counterfactual Potency and Negative Affect were in the opposite direction that would be expected. That is, greater reduction in Counterfactual Potency and Negative Affect was associated with those whose Negative Affect was not attributed to counterfactual thinking. Thus, it seems those whose Source of Negative Affect was counterfactual thinking were unaffected or minimally affected by the intervention. Perhaps those participants, convinced of their own counterfactuals, were especially resistant to change. Another explanation for the failed hypotheses is that perceptions of control may have changed during the experimental procedures for those in the intervention condition, potentially changing the type of negative affect participants experienced (see: Tycocinski & Steinberg, 2005).

Among those in the intervention condition, certain types of negative affect may have been reduced (e.g., guilt), while others increased (e.g., disappointment), thereby yielding no significant net change in negative affect.

Though most of the hypotheses of the present study were unsuccessful, the research provided some encouraging exploratory findings. Interestingly, the intervention significantly improved Positive Affect relative to the control condition. It is important to recall that there was no significant change in Positive Affect from pre- to post-treatment for participants in the control condition, but there was a significant change in Positive Affect from pre- to post-treatment for participants in the intervention condition. From another angle, there was no significant difference in Positive Affect between control and intervention conditions before the intervention. After the intervention, however, there was a significant difference in Positive Affect between conditions, such that participants in the intervention condition had significantly more Positive Affect than the control condition. Though the hierarchical regression analysis that yielded this finding was exploratory in nature, the finding is not surprising. Much research has demonstrated the effectiveness of CBT in reducing symptoms of depression, including improving affect (Charkandeh et al., 2016; Cristea et al., 2015; Cuijpers et al., 2016). Such findings support the use of positive affect as an indicator of emotional improvement during psychotherapeutic interventions that utilize CBT techniques.

Finally, the results also show that the link between the treatment condition and change in positive affect can be mediated by the reduction of counterfactual potency. That is, the CBT-based intervention was effective at increasing positive affect via change in counterfactual potency in the intervention condition. This finding indicates that

participants assigned to the intervention condition experienced greater reduction in Counterfactual Potency than those in the control condition, and as a result, they reported a greater increase in Positive Affect than participants assigned to the control condition. The data suggest that the effectiveness of the intervention depends on change in counterfactual potency because the direct effect of intervention on change in positive affect was reduced when counterfactual potency was added to the model. The mediation finding is especially important as it demonstrates the important role counterfactual potency plays in determining affect when mentally simulating an alternative. As a whole, the results provide empirical support for the use of counterfactual potency in utilizing cognitive behavioral techniques to improve affect.

### **Theoretical Implications**

The findings of the current research offer further insight into the psychological construct of counterfactual potency and how it may be useful in a psychotherapeutic context. Specifically, the findings highlight the potential benefits of using CBT techniques to improve affect through changes in counterfactual potency when an individual is ruminating on alternatives to reality. The current findings have implications for the use of CBT to treat cases of depression in which individuals are focused on counterfactual thoughts.

There is substantial empirical evidence that CBT is an effective treatment to reduce symptoms (e.g., regret) among those who are experiencing major depressive disorder. The American Psychiatric Association declared that CBT is the most effective psychotherapeutic treatment available for depression (American Psychiatric Association, 2013). According to Regulatory Fit Theory (RFT), depression is identified as a promotion

system failure, which involves a failure to attain an ideal outcome (Strauman et al., 2015). Strauman and colleagues (2015) attempted to reduce confidence in perceptions of failure by targeting counterfactuals. The intervention was designed to increase promotion of goal pursuit in attempts to decrease symptoms of depression. The researchers predicted that viewing a distressing situation as an obstacle to overcome would reduce depression symptoms, and results supported the hypothesis (Strauman et al., 2015). In a second study, the researchers showed that regulatory focus non-fit counterfactuals (i.e., subtractive counterfactuals for those with depression) decreased overall feelings of dysphoria.

A recent study, conducted by Charkhandeh and colleagues (2016), evaluated the effectiveness of CBT for adolescents with major depressive disorder in Iran. Among eligibility criteria were two indicators of depression: i) a minimum score of 20 on the Child Depression Inventory (Kovacs, 1985), which is a self-report measure and ii) meet criteria for MDD based on two separate structured interviews with clinical psychologists using the DSM-IV-TR (American Psychiatric Association, 2000). Participants were randomly assigned to one of three treatment conditions: a) CBT, b) Reiki, a holistic therapy commonly used in Asian countries that is designed to bring inner peace and harmony by inducing natural healing in the body, and c) waitlist control. Those in the CBT condition received two 1.5 hour sessions per week for 12 weeks. Those in the Reiki condition received one 20-minute session per week for 12 weeks. Results indicated a significant effect of condition such that there were significant differences between CBT and waitlist and between CBT and Reiki (Charkhandeh et al., 2016). These results provide support for CBT as an effective treatment for depression among adolescents.

Additionally, two meta-analyses provide support for CBT as a treatment for reducing symptoms of depression. The first meta-analysis included 15 randomized controlled trials comparing CBT to a control condition among 997 college students with MDD. The pooled effect size of CBT was large,  $g = 0.89$  (95% CI: 0.66-1.11) (Cuijpers et al., 2016). Another meta-analysis of CBT treatment for adults with depression used data from 26 randomized controlled trials with 2002 participants. When comparing CBT vs. control groups on dysfunctional thinking, researchers found a moderate effect of CBT at post-test ( $g = 0.50$ ; CI: 0.38- 0.62), which was maintained at follow-up ( $g = 0.46$ ; 95% CI: 0.17- 0.78) (Cristea et al., 2015). Given the evidence in support of CBT as an effective treatment for reducing symptoms of depression across multiple age groups and the current findings suggesting the usefulness of counterfactual potency in improving affect, it may be beneficial to consider targeting counterfactual potency with CBT techniques to benefit those experiencing depression.

### **Limitations**

The findings from the present study add to previous research by increasing our understanding of the psychological construct of counterfactual potency and how it may be useful in a psychotherapeutic context. The results suggest that targeting counterfactual potency using CBT techniques can be used to improve affect. Although these findings offer new considerations for future research, there are several notable limitations that should be taken into account.

One limitation is that perceptions of control of the outcome were not measured or accounted for in the present study. It is possible that participants felt a great deal of perceived control when they described their behavior and its outcome at the beginning of

the present study, thus feeling personal responsibility and negative emotions such as regret. For those who were randomly assigned to the intervention condition, considering and responding to questions such as “Were there multiple factors at play in this situation? Were any of those factors things that were outside of your control?” may have decreased their sense of perceived control in the outcome. If this occurred, their negative feelings may have changed from regret to disappointment (see: Tycocinski & Steinberg, 2005). In fact, a series of studies reported by Zeelenberg et al. (1998) were conducted to determine the types of experiences that yield feelings of regret as opposed to other negative emotions, such as disappointment (Zeelenberg et al., 1998). In their first study, participants provided an example of a personal event that induced feelings of regret or disappointment. They were instructed to undo the event with 4 counterfactuals before rating the extent to which they felt specific negative emotions and personal responsibility for the event. Those who provided examples of events that they regretted reported greater feelings of responsibility, guilt, and shame than those who detailed disappointing events. Additionally, personal behaviors were changed most often for those in the regret condition, while those who described disappointments tended to change aspects of the situation. In two additional studies conducted by Zeelenberg et al. (1998), participants were instructed to read scenarios involving a negative outcome and imagine it happening to them. Then, participants were either told to generate behavior-focused or situation-focused counterfactuals. Participants who made behavior-focused counterfactuals reported higher levels of regret, and those who made situation-focused counterfactuals reported more disappointment. These results confirm the findings from Zeelenberg et al.’s first study that experiences of regret are more strongly linked to counterfactuals

changing personal behavior than to the situation. Due to the fact that the current study did not examine perceived control of the outcome, the potential change in negative feelings (i.e., regret to disappointment) that align with variation in perceived control could not be tested by the observed data. Future research examining the role of counterfactual potency in interventions to improve affect would benefit from accounting for perceptions of control.

A second limitation involves the fact that consistency of behavior was not measured in the present study. According to the consistency-fit perspective, regret occurs when a decision yields an undesired outcome that is not in line with one's personality, mood, or goals (Seta et al., 2001). If individuals believe that what they did was inconsistent with what they usually do, they may become more convinced during an intervention that they normally would have done something different. It stands to reason that counterfactual potency and negative affect could increase when analyzing counterfactuals for those whose behavior was inconsistent with their typical behavior. Thus, a lack of consistency in participants' typical behaviors may explain why the expected change in negative affect (i.e., reduction) was not observed in the intervention condition in the present study. Future research on therapeutic techniques using counterfactual potency would also do well to examine the role of consistency of behavior on intervention outcomes.

Another limitation of the present study is that the salience of counterfactual thoughts was not measured. When more desirable alternatives to reality are made salient, experienced outcomes may be perceived as particularly negative and unfavorable. In three studies conducted by Seta, Seta, McElroy, and Hatz (2008), participants reported

perceiving or feeling greater regret in post-counterfactual as compared to pre-counterfactual measures. By asking questions that targeted the perceived likelihood of alternatives to reality, it is possible that the present intervention increased the salience of counterfactual thoughts. Thus, CBT-based questioning targeting counterfactual potency could be counterproductive for some people. For this reason, future research examining the role of counterfactual potency in interventions to improve affect would do well to measure salience of counterfactual thoughts.

A final limitation involves the use of participants from an undergraduate, nonclinical sample. Given the implications of the current research for the treatment of depression with CBT techniques, a critical step for subsequent research will be to test the hypotheses of the current research with a clinical sample. On the other hand, the current study asked participants to provide their own events and counterfactuals and to rate their personally experienced counterfactual potency and feelings. There appears to be little reason to believe that an intervention like that employed in the current research would fail to work among a clinical sample.

### **Future Directions**

Findings from the present research suggest several avenues for further investigation. First, the unexpected direction of the main effects of source of negative affect on change in counterfactual potency and change in negative affect should be addressed in future research. It will be important to determine a way to benefit those whose source of negative affect is counterfactual thinking, as those participants displayed resistance to change in the face of direct challenges to the potency of their counterfactual thoughts. The approach-avoidance model of persuasion posits that goals are comprised of

multiple motives, some of which push individuals towards their goal and others that pull behaviors away from their goal (Knowles & Linn, 2004). One way to reduce resistance to interventions similar to the one in the present study may be to decrease avoidance action tendencies, thereby promoting change in thoughts and emotions. Given the surprising direction of the main effects of source of negative affect, it is also possible that CBT-based interventions designed to reduce negative affect may work best for those who do not realize that their negative affect is due to counterfactual thinking. For this reason, the problem of resistance might also be addressed in future research by a covert intervention that indirectly challenges counterfactual thoughts.

Second, future research on interventions that aim to reduce negative affect associated with counterfactuals would do well to investigate temporal aspects of the events. For instance, two people may experience the same type of event but differ with respect to the length of time since the event occurred. Some participants in the present study recalled feeling bad about events that happened years ago (e.g., “In seventh grade, I overreacted at a friend after she was upset with me and I got angry and yelled. It made a scene for the whole class to see.”), while others recalled more recent events (e.g., “Last semester, I attended a off campus pregame for a date function I never made it to the pregame because I drank too much vodka and was incapacitated. My roommate took me home, put me to sleep, and then went back to the formal. I was discovered by an RA throwing up in my room and was sent to the hospital. I regret having drank so much and wasting my parents money on an avoidable hospital visit.”) An individual who has been rehearsing a counterfactual for years may be especially resistant to an intervention designed to challenge that thought. Future studies examining interventions for negative

affect due to counterfactuals should measure and account for time since the recalled events occurred.

Finally, it is also valuable to consider improving the present CBT-based intervention in future studies. The present intervention used 10 Socratic questions designed to encourage evaluation of participants' counterfactual thoughts. Future research might benefit from using additional CBT techniques (e.g., listing advantages and disadvantages of maintaining one's counterfactual thought) or supplementing the intervention with a miracle question, which asks individuals to consider how the future will be different when a current problem no longer exists (De Shazer, 1985). Such supplements might make an intervention targeting counterfactuals more potent, potentially solving the problem of resistance to the intervention.

### **Conclusion**

Results from the current study suggest that CBT-based questioning significantly reduced counterfactual potency among those in the intervention condition. The hypothesized moderation of treatment condition by source and mediation of the relationship between treatment condition and change in negative affect by change in counterfactual potency models were not supported by the data. Results indicated that improvements in positive affect did occur among those in the intervention condition, however. Additional analyses indicated that a significant link between treatment condition and change in positive affect was mediated by change in counterfactual potency. These results provide evidence that people estimate the likelihood of alternatives to experienced outcomes and these likelihood estimates have implicit consequences in that they impact emotions and behavior. The current research provides support for the

potential use of counterfactual potency in utilizing cognitive behavioral therapeutic techniques to improve affect.

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## CURRICULUM VITAE

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### EDUCATION

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Wake Forest University, May 2017 (Expected)  
Master of Arts in Psychology  
GPA: 3.84  
Thesis: *Reconsidering Counterfactual Potency to Improve Affect: Towards an Intervention*

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### HONORS AND AWARDS

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Full Tuition Scholarship, Wake Forest University (2015-2017)  
Graduate Assistantship, Wake Forest University (2015-2017)  
Psi Chi - The National Psychology Honors Society  
Furman University Dean's List  
Furman Advantage Summer Research Fellowship (2013-2014)

### PRESENTATIONS

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Marshall, R. D., Einstein, G. O., Wamsley, E. J., & Tucker, M. (2014, April). *How sleep affects prospective memory*. Poster session presented at Furman Engaged Research Exposition, Greenville, SC.

Marshall, R. D., Phillips, K. A., & Menard, W. (2014, April). *Therapy study for adults with Body Dysmorphic Disorder*. Poster session presented at Furman Engaged Research Exposition, Greenville, SC.

Marshall, R. D., Blomquist, K. K., & Roberto, C. A. (2013, November). *Media and weight bias: An examination of the role of food advertising*. Poster session presented at the 47th Annual Association for Behavioral and Cognitive Therapies Convention, Nashville, TN.

Marshall, R.D., Blomquist, K.K., Roberto, C.A. (2013, July). *Media and weight bias: An examination of the role of food advertising*. Oral presentation at Davidson-Furman Summer Psychology Research Conference, Davidson, NC.

## **RESEARCH EXPERIENCE**

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Graduate Research Assistant, Dr. John V. Petrocelli, Wake Forest University, Fall 2015- Present

- Current duties include proposing and coordinating research projects, creating study materials, submitting IRB proposals, running experiment sessions, analyzing data, and writing Graduate Thesis.

Research Assistant, Dr. Gilles O. Einstein, Furman University, Fall 2014- Summer 2015

- Responsibilities consisted of attending weekly lab meetings, designing methodology, creating study materials, writing IRB proposals, programming study conditions, running experiment sessions, analyzing and coding data via SPSS, and discussing results.

Summer Research Assistant, Dr. Katharine A. Phillips, Body Dysmorphic Disorder Program at Brown University/Rhode Island Hospital, May 2014-July 2014

- Responsibilities consisted of attending weekly lab meetings, providing methodological feedback, revising IRB proposals, entering and managing data, and proposing ideas for future research.

Research Assistant, Dr. Kerstin K. Blomquist, Furman University, Spring 2013- Spring 2014

- Responsibilities consisted of attending weekly lab meetings, designing methodology, creating study materials, writing IRB proposals, conducting phone screens, running experiment sessions, and managing data.

## **CLINICAL EXPERIENCE**

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Clinical Assistantship, Developmental Pediatrics, Wake Forest Baptist Health – Amos Cottage, Fall 2015- Present

- Administers two evaluations, Bayley-III and DAYC-2, to assess five areas of development among infants and toddlers
- Utilizes medical records, developmental evaluation results, parental report, and clinical opinion to determine eligibility for the NC Infant-Toddler Program
- Helps children attain their full potential by linking them with appropriate support services, such as speech therapy or occupational therapy

## **COMPUTER AND LABORATORY SKILLS**

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- Understanding of univariate and multivariate statistics
- Proficient with statistical software (i.e., SPSS, R, Excel)
- Proficient with study design programs (i.e., MediaLab, E-Prime, SurveyMonkey)
- Efficient at literature reviews (i.e., PsycInfo, Pubmed, etc.)
- Skilled at building and managing online surveys and databases (i.e., REDCap)

## **COURSEWORK**

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Graduate: Seminar in Social Psychology, Human Cognition, Seminar in Developmental Psychology, Seminar in Personality Psychology, Biological Psychology, Research Design and Analysis I and II, Psychology Practicum, Intro to Psychometrics & R I and II

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