THE EFFECTS OF AUTOMATIC EMOTION REGULATION ON THE DESIRABILITY BIAS

A Thesis

by

SHANE WILLIAM BENCH

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2011

Major Subject: Psychology

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Approved by:

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ABSTRACT

The Effects of Automatic Emotion Regulation on the Desirability Bias. (May 2011)

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The goal of the present investigation was to explore the effects of automatic emotion regulation on the desirability bias. The desirability bias is the tendency to believe that one will experience desirable outcomes and not experience undesirable outcomes. Previous research has demonstrated that the desirability bias is due to affective reactions to potential events. Further, deliberate emotion regulation has been shown to reduce the desirability bias. The present investigation explored whether the desirability bias can be reduced by priming a nonconscious goal to regulate emotion before experience of affective reactions to an event. Participants were primed to either express or regulate their emotions before playing a game of chance where cards could result in positive, negative or neutral outcomes. Results showed that the method of priming emotion regulation or expression did not effectively elicit nonconscious goals. Because the manipulation was not effective, the effect of automatic emotion regulation on the desirability bias could not be examined and there was no effect of the prime on bias. Despite the failed manipulation, the findings are still beneficial to the desirability bias literature in that they demonstrate a clear desirability bias in participants' predictions with the use of a within-subjects design. A follow up study using a stronger

prime of regulation to test the influence of automatic emotion regulation in reducing the desirability bias is discussed.

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION: THE DESIRABILITY BIAS

People are generally optimistic when judging the likelihood of future events (e.g., Taylor, 1983; Taylor & Brown, 1988; Weinstein, 1980). When considering the likelihood of events in their own future, people judge that positive events are likely to occur and negative events are unlikely to occur (Irwin, 1953; Irwin & Metzger, 1966; Marks, 1951; Weinstein, 1980; Weinstein & Klein, 1995; Weinstein & Lachendro, 1982; see Chambers & Windschitl, 2004, for a theoretical review). For example, when considering a high risk investment, people may view the potential returns as relatively likely, while viewing it as relatively unlikely that they would lose their investment.

Strong evidence that desire plays a role in predictions comes from studies that employ games of chance, as they provide an equal opportunity of receiving a positive or negative outcome. An exact probability of an event occurring is rarely, if ever, established in real life events, which makes games of chance ideal for studying predictions of event likelihood. Desire for outcomes in games of chance is generally created by participants receiving or losing points (or money) due to receiving a marked card, with the probability of the marked card being awarded systematically varied by the researcher (Irwin, 1953; Irwin & Metzger, 1966; Lench & Ditto, 2008; Marks, 1951; see Krizan & Windschitl, 2007, for a review). In these studies participants judge that they are less likely to receive the marked card when it is associated with a negative outcome and more likely to receive the marked card when it is associated with a positive

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This thesis follows the style of *Journal of Personality and Social Psychology*.

outcome, even when there is the same probability of receiving the marked card. This effect in experimental games of chance has been termed the desirability bias (Krizan & Windschitl, 2007).

These findings suggest that people frequently see their future as consistent with their desires, but the inferences that can be drawn from such studies are limited by the frequent omission of a neutral condition, making it unclear if the desirability bias results from reactions to positive outcomes, negative outcomes, or both. The inclusion of a neutral condition would allow comparison of the relative effects of reactions to positive outcomes and negative outcomes. Recent reviews have argued that negative reactions are more powerful than positive reactions across a variety of domains (Baumeister, Bratslavsky, Finkenaur, & Vohs, 2001; Rozin & Royzman, 2001). Contagion is thought to be one of the most powerful examples of negative holding a greater magnitude than positive, for example, a cockroach crawling on food will deter many Americans from consuming the food, but desirable food on cockroaches does not make the cockroaches any more palatable (Rozin & Royzman, 2001). Specific to judgment and decision making, studies demonstrate that potential losses exert a larger influence over decisions than potential gains (e.g., Tversky & Kahneman, 1991). This evidence suggests that reactions to negative outcomes may drive the desirability bias. If people respond more intensely to negative than to positive events across a multitude of other domains, it is likely that there would be a differential effect of negative and positive outcomes on the desirability bias as well. To date, exploration of the relative impacts of positive and negative outcomes has not been possible due to methodological limitations in research

on the desirability bias, specifically the lack of a neutral condition and few studies employing a within-subjects design (Krizan & Windschitl, 2007). The first goal of this investigation was to explore the potentially disproportionate effects of positive and negative outcomes on predictions through inclusion of a neutral condition in a within-subject design.

The second goal of this investigation was to explore one potential mechanism of reducing the desirability bias. Dual process theories provide a conceptual framework that allows for predictions regarding the desirability bias and how to reduce it. While variation exists among dual process theories (see Evans, 2008 for a review), most theories hold that there are two information processing systems working in parallel. The experiential system (System 1) processes information automatically and rapidly, and relies on affective information. The analytic system (System 2) is deliberate and slow, requiring more time to process information than the experiential system (Lench, Bench, Flores, & Ditto, 2009). While dual process theories suggest the systems work in parallel, the two systems also interact (Epstein, 1994; Kahneman, 2003). One such interaction occurs when the analytic system reviews responses from the experiential system to reduce the impact of emotional or irrational factors on judgment and behavior. Analytic review and regulation of the experiential system has been proposed by several theories (e.g., Amsel et al., 2008; Evans, 2003; Stanovich & West, 2000), however, it is unlikely that the analytic system reviews all (or even a large portion) of experientially generated responses due to the proposed cognitive demands of the analytic system (Amsel et al., 2008; Evans, 2003, 2008; Stanovich & West, 2000). Due to the relatively high resources

required by analytic review, it is probable that the analytic system can only override few experiential responses and that responses are often disproportionately influenced by the experiential system (Einhorn & Hogarth, 1981; Hogarth, 2005; Lench et al., 2009).

Based on this dual process framework, Lench (2009) posited that the desirability bias results from affective reactions to potential future events. Stimuli related to neutral future events were paired with positive, negative, or neutral stimuli in order to condition the initially neutral stimuli to evoke affective reactions. Across several studies, the same initially neutral events were judged as more likely to occur when they elicited positive affect than when they elicited neutral affect. Inversely, the same initially neutral events were judged as less likely to occur when they elicited negative affect than when they elicited neutral affect. Further, the desirability bias was reduced when participants' affective reactions could be attributed to things other than the outcome of the event (e.g., the lighting in the room). Overall, these studies experimentally demonstrated the affective base of the desirability bias, showing that affective reactions to both positive and negative event outcomes create biases in judgments about life events.

Lench, Bench, Sweeney, and Herpin (2011) explored when and how the desirability bias can be reduced. Participants were offered different outcomes if they received a marked card in a game of chance (e.g., Lench & Ditto, 2008; Marks, 1951; Irwin, 1953). Participants were assigned to one of four conditions that varied in the strength and valence of affective reactions elicited by the outcomes. Outcomes varied in the strength (strong, weak) and valence (positive, negative) of the affect they elicited. Results showed that outcomes that elicited strong positive and negative affect led to a

reduction of the desirability bias compared to outcomes that elicited weak affect. Further, this reduction in bias only occurred for participants who had analytic resources available, either due to individual differences in these resources or available time to consider judgments. These findings suggest that the intensity of a stimulus can lead to a response from the rapid and affectively influenced experiential system (weakly valenced stimuli) or the deliberate analytic system (intensely valenced stimuli), but only when the required processing time to respond analytically is available.

Because the desirability bias results from affective reactions, emotion regulation strategies may be an effective mechanism of reducing the bias. Emotion regulation is the deliberate or automatic regulation of an emotional experience, response or expression (Gross, 1998a; Gross, 1998b; Gross & Thompson, 2007). Emotion regulation may be applied in expectation of an emotionally arousing stimulus (antecedent-focused; Gross, 1998b). This form of emotion regulation allows for bracing for an emotional stimulus before it is introduced. Two studies by Lench, Bench, and Davis (2011) tested the possibility that the desirability bias could be reduced through deliberate antecedent-focused emotion regulation. Participants were assigned to an emotion regulation condition where they were told to avoid their feelings or a control condition where they were told to act naturally. Results showed a reduction of the desirability bias in the emotion regulation condition, and were consistent when using two different tasks; a game of chance (e.g., Lench & Ditto, 2008) and affectively conditioning an initially neutral stimulus (e.g., Lench, 2009). This suggests that emotion regulation can reduce the desirability bias. These studies used a form of antecedent-focused emotion regulation

to demonstrate that the effects of an experiential affective response to an outcome on judgment may be regulated by the analytic system. This not only attests to the role of affect in the creation of the desirability bias (Lench, 2009), but also to the role affective processes may play in reducing the desirability bias.

An interesting possibility raised by these preliminary studies on the conscious use of regulatory strategies is that people may be able to engage in automatic emotion regulation to reduce bias in judgment (Bargh & Williams, 2007; Gross, 1998a). Automatic emotion regulation is the regulation of emotion outside of consciousness and is likely to occur through the activation of nonconcious goal pursuits (Bargh, 1990). According to Bargh (1990), when mental representations of goals (e.g., emotion regulation goals) are activated, they may be pursued outside of conscious awareness (Bargh & Williams, 2007). Research has suggested that mental representations for higher order cognitive tasks can be primed unconsciously and then completed effectively, as if the tasks were intentionally engaged in and completed (e.g., Bargh, 1990; Bargh & Chartrand, 1999; Bargh & Ferguson, 2000). For example, self-regulation may be activated automatically through unconscious (i.e., situational) priming of regulatory goals. Once the goals of regulation are primed, regulation may be completed automatically and result in similar outcomes as intentional self-regulation (Bargh & Chartrand, 1999). Regulation occurring automatically is possibly a demonstration of the experiential system controlling a response or judgment. Analytic regulation would require cognitive energy and processing time (Lench et al., 2009), which are not proposed to be components of automatic emotion regulation. If a higher order cognitive

function such as regulation can be effectively completed automatically, the experiential system may possess a capacity to monitor the judgments it generates. The current study tested if responses can be regulated through the use of automatic emotion regulation which has been proposed as nonconscious and cognitively inexpensive.

To date, there have been few experimental examinations of automatic emotion regulation. Mauss, Cook, and Gross (2007) experimentally manipulated emotion regulation goals through the use of a priming task, in what is likely the first test of automatic emotion regulation. Participants were randomly assigned to either an emotion expression or emotion regulation condition and completed a sentence unscrambling task to prime the respective goals. Participants were then asked to count backwards in set increments from a large number (i.e., count down from 18,652 by 13's), while frequently being interrupted by a recording from the experimenter telling the participant how poorly they were doing, or that their data was useless. Participants then reported their experienced emotions, with anger being the emotion of interest (this was compared to their baseline reported emotions). Results showed that participants primed to regulate their emotions reported experiencing less anger than those that were primed to express emotions. There were no differences in physiological responses, suggesting that automatic emotion regulation may reduce anger experience without a physiological cost; however, there was also no demonstrated benefit to automatic emotion regulation as participants that reported experiencing less anger did not show a reduction in physiological arousal.

While few studies have explored the use of automatic emotion regulation, Bargh and his colleagues have proposed it to be both effective and efficient in regulating emotional responses and experiences (Bargh & Williams, 2007; Gross, 1998a; Mauss et al., 2007). The goals of the present investigation were to 1) explore the possibility of an asymmetrical effect of positive and negative outcomes on the desirability bias by employing a neutral condition and a within-subjects design, and 2) to examine whether automatic emotion regulation strategies can reduce the desirability bias. Automatic emotion regulation was expected to reduce or potentially eliminate the desirability bias in judgments about the likelihood of future events. A game of chance (i.e., marked card paradigm) was chosen to test these predictions because such games allow for the examination of the desirability bias in a highly controlled situation with a clear objective probability of an event (Windschitl, Smith, Rose, & Krizan, 2010; Krizan & Windschitl, 2007). A within-subjects design was employed because it allowed for the comparison of reactions to positive, negative, and neutral events within the same individual.

2. METHOD

2.1 PARTICIPANTS

Participants (n = 172) earned partial course credit for their introductory psychology course. Participants completed the study at individual computer terminals separated by dividing walls. Participants were 69% female with an average age of 18.54 years (SD = 0.93). Thirteen participants were removed due to experimenter or computer error that resulted in a loss of data.

2.2 PROCEDURE

Participants were told that they would play a game of chance and the study started with a description of the game. The game was described as similar to "blackjack", with blackjack occurring when the cards added to 21, and that receiving a score of 21 would result in one of three outcomes: being given an additional credit toward their course requirement, losing a course credit or being told that "absolutely nothing will happen" (used as a neutral condition with nothing happening for scoring 21). For each hand, they would be dealt a card face down that could be a jack (resulting in 21) or could be a queen (not resulting in 21) and they would be told the outcome associated with reaching 21 for each hand. After the instructions, as a check of the affective reactions engendered by each of the possible outcomes at the start of the game, participants rated the desirability of the outcomes of the game on a scale ranging from *definitely negative* (1) to *definitely positive* (7). Participants rated their affective reactions to the outcomes of the card game at four points during the study (before the

prime, at the beginning of the card game, at the end of the card game and at the completion of the study.

2.2.1 SENTENCE UNSCRAMBLING TASK

After being given the game instructions and before playing the game, participants were randomly assigned to complete one of three sentence unscrambling tasks designed to prime emotion regulation, emotion expression, or a control condition (Mauss et al., 2007). The task was comprised of 25, five-word groups (e.g., zoo animals confined throughout are). Participants were instructed to arrange four of the five words to make a grammatically correct sentence, leaving out one word. In the regulation condition, 19 of the word groups included words that were meant to prime emotion regulation (e.g., *restricted, confined, limited*), with the rest being neutral (i.e., free of words related to regulation). In the expression condition 19 of the word groups contained words that were meant to prime emotion expression (e.g., *release, liberate, burst*), with the rest being neutral. The control condition contained 25 neutral word groupings. This priming task has successfully primed regulation and expression in a previous pair of studies by Mauss and colleagues (2007). Mauss and colleagues (2007) generated the words meant to prime emotion regulation or emotion expression by having undergraduate students write the first 20 words that came to mind when they thought of the concepts "emotion control" or "emotion expression."

2.2.2 WORD COMPLETION TASK

To check the effectiveness of the priming task, participants completed a word completion task. These types of tasks have been shown to demonstrate a difference in

implicit memory between groups exposed to varying stimuli (e.g., sentence unscrambling task) which shows a difference in the content currently active outside of an individual's conscious awareness (Anderson, Carnegy, & Eubanks, 2003). In this task participants were given 12 partial words that can be completed as a regulation word (e.g., CON----; control) or a neutral word (concert), with a separate version having words with possible completions as an expression word (e.g., EXP----; express) or a neutral word (explain). The word completion task did not include stems identical to the words used in the sentence unscrambling task.

2.2.3 GAME OF CHANCE

Participants played the game described above (Lench & Ditto, 2008). They were always dealt an Ace, worth 11 points, and then the computer dealt an additional card face down. The card dealt to them was either a jack, giving them 21 points and resulting in the associated outcome, or queen which did not bring about the outcome.

All participants played a total of 15 hands of blackjack, playing five hands of varying probability for each outcome (i.e., positive outcome with a 3/10, 4/10, 5/10, 6/10, 7/10 chance of occurrence; negative outcome with the same probabilities; neutral outcome with the same probabilities). Participants were given one course credit at the onset of the "blackjack" game (students need 10 total credits to fulfill course requirements), and were informed that receiving a jack would either award them an additional credit (positive), take a credit from those they had earned (negative), or not affect their total number of credits (neutral). The outcome of the hands were block counterbalanced such that participants completed all of the positive, negative, or neutral

trials before moving to the next outcome and probabilities were counterbalanced within each of those blocks. The outcome associated with a jack appeared on the screen as participants made their judgments (e.g., all positive outcome trials stated that a jack resulted in an additional course credit). They were then told that they would learn the individual trial outcomes and be awarded the number of credits they earned at the end of the study. Actually, trial outcomes were not revealed to participants or even generated. The probability of the marked card was given for each hand, in randomized order: 3/10, 4/10, 5/10, 6/10, or 7/10. These probabilities were chosen because previous findings have demonstrated that the desirability bias is greatest at intermediate probabilities (Krizan & Windschitl, 2007). The probability for the specific trial was printed at the top of the screen as participants made their judgments. For each hand participants made three judgments about the card dealt face down to them. Participants rated the likelihood that they had the marked card (participants responded by moving a marker on a continuous line, anchored with "no chance" at one end and "strong chance" on the opposite) as originally employed by Windschitl and colleagues (2010). Participants also judged whether or not the face down card was the marked card ("Yes" or "No"). Finally, participants rated their certainty about their judgment on a continuous line, anchored with *not at all* (0) and *completely certain* (100).

3. RESULTS

3.1 PRELIMINARY ANALYSES

To test if the sentence unscrambling task effectively elicited regulation and expression goals, the number of responses generated on the word completion task that were congruent with participants' sentence unscrambling task condition were coded for participants in the expression and regulation conditions. Half of the participants in the neutral condition (n = 58) completed the word completion task designed to test if regulation had been primed (word stems could be completed as regulation or neutral words) and the other half completed the word completion task designed to test if expression had been primed (word stems could be completed as expression or neutral words). The participants in the neutral condition that completed the regulation word completion task were compared to the participants in the regulation condition and participants in the neutral condition that completed the expression word completion task were compared to participants in the expression condition. This was done to account for potential differences in the difficulty of generating words from the word completion task. Independent samples t-tests revealed that the number of regulate words generated by participants primed to regulate (M = 3.69, SD =1.70) did not differ from the number generated by those in the neutral condition (M = 3.24, SD = 1.64), $t(85) = 1.17$, $p = .24$. The number of expression words generated by participants primed to express (M = 2.80, SD = 1.31) also did not differ from the number generated by those in the neutral condition (M = 2.76, SD = 1.55), $t(83) = .14$, $p = .89$. Therefore, the sentence unscrambling task did not effectively prime goals of expression or regulation.

To test if regulation occurred, participants self-reported ratings of the outcomes associated with a marked card were compared across emotion regulation conditions. A repeated measures ANOVA was conducted to examine if ratings changed as an effect of emotion regulation condition with emotion regulation condition (regulate, express or control) as the between-subjects factor, and outcome valence (positive, negative, neutral) and rating timing (time 1, time 2, time 3, time 4) as repeated factors. There was a main effect of outcome valence across all four time points, $F(2, 340) = 1{,}034.89$, $p < .001$, $\eta^2 = 0.86$. Post hoc analysis revealed that positive outcomes ($M = 6.48$, $SD = 0.92$) were rated as more positive than negative outcomes ($M = 1.43$, $SD = 0.85$), $t(172) = 41.96$, $p < .001$, $d = 5.69$, and neutral outcomes ($M = 4.25$, $SD = 1.27$), $t(172) = 19.91$, $p < .001$, $d = 2.24$, and neutral outcomes were rated as more positive than negative outcomes, $t(172) = 28.03$, $p < .001$, $d = 2.92$. There was no main effect of timing, suggesting that ratings of outcomes remained stable during the experiment, $F(2, 340) = 0.73$, $p = .57$). Thus, the manipulation of outcome was effective, as participants found the positive outcome (receiving an additional credit) to be more positive than the neutral outcomes (nothing happening) which they found to be more positive than the negative outcome (losing a credit). However, there was no significant effect of emotion regulation condition, $F(2, 170) = 1.70$, $p = .19$, and no three way interaction between emotion regulation condition, outcome valence and rating timing $F(8, 680) = 0.50$, $p = .85$. This does not demonstrate regulation, as participants in the regulation condition did not rate the outcomes with less intensity than the neutral or the expression conditions. If regulation had been effectively primed, it would be expected that participants in the regulation condition would have

rated the positive outcome as less positive and the negative outcome as less negative after receiving the prime than participants in the other conditions.

3.2 THE DESIRABILITY BIAS

To test the effect of regulation condition and outcome valence on the desirability bias, an ANOVA was conducted with emotion regulation condition (regulate, express, control) as the between-subjects factor and outcome valence (positive, negative, neutral) as the within-subjects factor to examine differences in the mean number of judgments of having the marked card (from the forced yes/no response; (e.g., Lench, Bench, & Davis, 2011). Results showed a main effect of outcome valence on judgments of having the card, $F(2, 340) = 57.59$, $p < .001$, $\eta^2 = .25$ (see Figure 1). Post hoc analyses revealed that participants judged that they had the marked card significantly more often when the card was associated with a positive outcome than with a negative outcome, $t(172) = 8.73$, $p < .001$, $d = 1.04$. They also judged they had the card significantly more often when the card was associated with a neutral outcome than with a negative outcome $t(172) = 8.66$, $p < .001$, $d = 0.88$. Participants also tended to judge that they had cards associated with positive outcomes more than neutral outcomes, but this difference was only marginally significant, $t(172) = 1.75$, $p = .08$. Thus judgments were biased when the negative outcome was considered compared to a neutral outcome, but not significantly biased when the positive outcome was considered relative to a neutral outcome. This supports previous findings that negative outcomes exert a greater effect on judgments than positive outcomes (e.g., Rozin & Royzman, 2001). This is evidence that there is an asymmetrical effect of positive and negative outcomes on judgments, as the negative

condition differed from the neutral condition while the positive condition did not. There was no significant effect of emotion regulation condition, $F(2, 170) = 0.41$, $p = .66$, and no interaction effect of emotion regulation condition by outcome valence, $F(4, 340) = 0.65$, $p = .62$. Because preliminary analyses revealed no effect of the emotion regulation/expression prime, it was expected that there would be no effect of emotion regulation condition on the desirability bias. Due to this failure, the effects of automatic emotion regulation on the desirability bias were not tested.

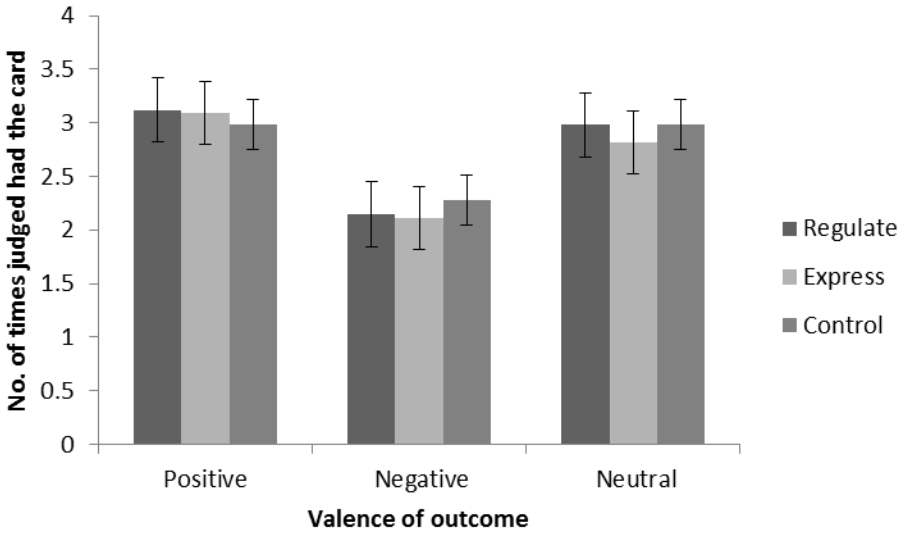

Figure 1 The Desirability Bias in Judgment. Participants demonstrated the desirability bias by exhibiting optimistically biased judgments in the frequency they had the card for the negative condition. Positive and neutral outcomes did not differ from one another, but both were judged as more likely than negative outcomes.

A similar ANOVA was conducted with the mean score of participants' likelihood judgment ratings on the continuous scale as the dependent variable. A main effect of outcome valence was found, $F(2, 340) = 3.83$, $p = .02$, $\eta^2 = 0.02$. Consistent with the findings above, post hoc analyses revealed that participants they were more likely to have the marked card when the card was associated with a positive outcome ($M = 49.84$, $SD = 4.15$) than when it was associated with a negative outcome ($M = 48.98$, $SD = 4.44$), $t(172) = 2.41$, $p = .02$, $d = 0.20$. Participants also judged that they were more likely to have the marked card when it was associated with a neutral outcome ($M = 49.75$, $SD = 4.05$) than when it was associated with a negative outcome, $t(172) = 2.28$, $p = .02$, $d = 0.18$. The difference between the positive and neutral condition was again not significant, $t(172) = 0.28$, $p = .78$. These results demonstrate the desirability bias, as participants judged that they were more likely to receive a card when it was associated with positive outcomes than when it was associated with negative outcomes. The findings also suggest, however, that the desirability bias in judgment is being driven by reactions to negative outcomes. This is evidence that there is an asymmetrical effect of positive and negative outcomes on judgments, as the negative condition differed from the neutral condition while the positive condition did not. There was no main effect of emotion regulation condition, $F(2, 170) = 0.29$, $p = .75$, nor an interaction effect of emotion regulation condition and outcome valence, $F(4, 340) = 0.24$, $p = .92$. However, it was not expected there would be an effect after establishing that participants were not effectively primed. Due to the failure of the priming task, the effects of automatic emotion regulation on the desirability bias were not tested.

Certainty about judgments is another way that the desirability bias has been examined and participants typically express more certainty when they make judgments consistent with their desires than when they go against their desires (e.g., Lench & Ditto, 2008). For trials on which judgments were congruent with desires (judging that a jack would was received if it was a positive outcome trial or not received if it was a negative outcome trial), a mean score of certainty was computed to represent the certainty of the biased judgments they had made (this was only possible for the positive and negative outcomes, as predictions about the neutral outcome do not demonstrate bias). An ANOVA was conducted on these mean certainty judgments with outcome valence (positive, negative) as the within-subjects repeated factor and emotion regulation condition (regulate, express, control) as the between-subjects factor. There was a main effect of outcome valence, $F(1, 167) = 20.76$, $p < .001$, $\eta^2 = 0.11$, such that participants certainty of their biased judgments was influenced by the outcome of the judgment they were making. Post hoc analysis revealed that participants were more certain of their biased judgments when outcomes were positive ($M = 35.75$, $SD = 11.16$) than when outcomes were negative ($M = 31.38$, $SD = 13.29$), $t(169) = 4.58$, $p < .001$, $d = 0.36$. There was no main effect of emotion regulation condition, $F(2, 167) = 0.39$, $p = .68$, and no interaction effect of outcome valence and emotion regulation condition, $F(2, 167) = 0.44$, $p = .65$. Due to the ineffectiveness of the emotion regulation prime, no effect of emotion regulation condition on participants' certainty judgments was expected.

4. CONCLUSIONS

4.1 THE DESIRABILITY BIAS IN JUDGMENT

The first goal of the present study was to explore the possibility of an asymmetrical effect of positive and negative outcomes on the desirability bias by employing a neutral condition and a within-subjects design. An important finding was a demonstration of the desirability bias in a within-subjects design. To date, examples of this nature have been rare (Krizan & Windschitl, 2007) and this study is one of only two studies that have used a within-subjects design to investigate the desirability bias (see also Windschitl et al., 2010). In the current study, participants judged that they did not have the card when it was associated with a negative outcome and did have the card when it was associated with both positive and neutral outcomes even though the card was equally likely to occur. This is a testament to the affective nature of the desirability bias consistent with previous findings in studies using a between-subjects design (Lench, 2009; Lench, Bench, Sweeney, & Herpin, 2011). Recent reviews have argued that negative stimuli have a stronger effect on judgments than positive stimuli in a variety of domains (Baumeister et al., 2001; Rozin & Royzman, 2001). The current findings demonstrate that negative outcomes introduce greater bias in predictions than positive outcomes. Intensely rated negative outcomes appeared to drive the effect of desire on participants' judgments, as judgments for negative outcomes differed significantly from judgments for neutral outcomes, but judgments for positive outcomes did not differ from judgments for neutral outcomes, despite participants viewing the positive outcomes as more positive than the neutral outcomes.

Prospect theory suggests that people demonstrate a tendency to judge increments in negative value as more negative than they judge the same increments in positive value to be (Tversky & Kahneman, 1991). Thus negative events have a greater impact on choice than similarly intense positive events. The present findings extend prospect theory's tenets related to the value of prospective events, to also include an asymmetrical effect of negative and positive outcomes on the judgment of event likelihood. Participants judged that negative outcomes were less likely to occur than positive or neutral outcomes, but did not judge positive outcomes as more likely to occur than neutral outcomes. This finding is potentially important for attempts to modify classic decision theory, which posits that decision stems from an analysis of event value and event likelihood (e.g., Edwards, 1962). Consider subjective expected utility models (e.g., von Neumann & Morgenstern, 1944), which hold that decisions stem from an analysis of the likelihood that an outcome will occur and an analysis of the outcome value. Once the likelihood and value of an outcome are established, the two are multiplied together with the factor ultimately deciding if the decision is made (depending on the amount of utility provided compared to the utility of alternatives). Research suggests that these equations are fundamentally flawed because the value associated with an outcome directly affects the perceived likelihood of the occurrence of that outcome (Lench, 2009). Prospect theory provided one important modification to classic decision equations, as it suggested that the value of events changed disproportionately for negative outcomes compared to positive outcomes (Tversky & Kahneman, 1991). The present findings suggest that a further modification is required in that negative value also exerts a relatively stronger

influence on perceived likelihood than positive value. When considering a potential event, people will make predictions that are more biased by their desires if the event is associated with a negative outcome than if it is associated with a positive outcome. This holds true even if the event has the same objective probability of occurring and the outcome has the same objective value (e.g., one unit is received or one unit is revoked). If judgments for negative outcomes are more biased, judgments may be skewed to allow risk taking. That is, people may take undue risks because they view negative events as especially unlikely to occur. Future research should explore how people subjectively construe the objective probability of positive and negative events (e.g., is a 7/10 chance of a negative event occurring viewed as equivalent to a 5/10 chance of positive event occurring?).

The desirability bias being demonstrated in a within-subjects design also supports the dual process model of affectively biased judgments (e.g., Lench et al., 2009). While there is not a demonstration of analytic regulation in the current results, participants were clearly motivated to see the likelihood of outcomes as consistent with their desires when faced with negative outcomes compared to positive/neutral outcomes of the same objective probability. It is intriguing that the likelihood of two events occurring can be judged differently when both events have the same objective probability, but would result in a different outcome. It is possible that when faced with a positive or negative outcome, participants judge the objective probability of the potential event occurring differently. For example, when an event would result in a positive outcome a 5/10 probability may be subjectively viewed as 5.5-6/10, but when the event

would result in a negative outcome the same 5/10 probability could be subjectively viewed as 3.5-5/10. Thus, the outcome associated with a potential future event could subjectively alter the perception of a probability, making positive things seem objectively more likely, while negative things seem objectively less likely. This is currently being examined in our laboratory.

4.2 REGULATING THE DESIRABILITY BIAS

The second goal of the current study was to examine whether automatic emotion regulation strategies can reduce the desirability bias. However, the relationship between automatic emotion regulation and the desirability bias remains to be effectively tested. Due to an unsuccessful prime, participants were not manipulated to regulate or express emotions. The priming manipulation was based on a methodology used in several well cited studies (e.g., Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001), and an identical version has been effectively used in at least one published report (Mauss et al., 2007). However, it seems in this case the manipulation was not strong enough to prime a goal of emotion regulation or emotion expression. As a result of this failed manipulation, the effects of automatic emotion regulation on the desirability bias could not be assessed.

Due to the apparent failure of the methodology employed in this study to effectively test the relationship between automatic emotion regulation and the desirability bias, a follow up study has been constructed. The current study was limited by a priming task (i.e., sentence unscrambling task) that was not strong enough to prime a goal of emotion regulation. With that in mind, a study has been designed with a more powerful manipulation of regulation. In this follow up study, participants first rate their

emotional reaction to a series of images, and then play the game of chance employed by the current study. The images participants will view and rate have been selected from a database of reliably rated images, the International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, 1995). Images were selected that were rated as very slightly positive or negative, but not significantly differing from neutral (e.g., a picture of a pizza). Prior to viewing the first image (in a series of 10) participants are told "To regulate any emotions they may feel while viewing the images. It is very important that you do not allow yourself to experience any emotion while viewing the images" or just told to simply view and rate the images. Immediately following the rating of the last image, participants will begin the game of chance (the exact game used in this study). Participants told to regulate their emotions should have regulation primed and continue to regulate their affective reactions during the game of chance. Previous research has demonstrated that regulatory resources can be depleted by overusing or exerting the ability to regulate (Baumeister et al., 1998). Depletion should not be a concern with this design as the images were chosen to elicit mild emotional reactions that should not require regulation. It is expected that this design will more effectively test the relationship between emotion regulation and the desirability bias as participants will be explicitly told to regulate their emotions on a prior task, but not told to stop regulation before beginning the game of chance.

Previous research has demonstrated the importance of affect in creating the desirability bias (Lench, 2009), and suggested that explicit instructions to regulate emotions can reduce the desirability bias (Lench, Bench & Davis, 2011). The present

study was meant to demonstrate that the desirability bias can be reduced through the use of automatic emotion regulation. Finding a relationship between automatic emotion regulation and the desirability bias would suggest the importance of the experiential system in promoting regulation of affectively biased responses, as analytic intervention could not have occurred due to the automatic nature of this form of regulation. Analytic regulation should require cognitive processing time and cognitive resources to occur (Lench et al., 2009), however, these factors are not proposed to be required for automatic emotion regulation to occur (Bargh & Williams, 2007). This suggests the possibility that automatic emotion regulation is a form of experiential system regulation. If emotion can be successfully regulated without conscious awareness, cognitive resources or processing time, it is likely that this is a demonstration of the experiential system encouraging, and potentially carrying out, regulation of an impulse.

If automatic emotion regulation does in fact reduce the desirability bias it would further the new and growing field of automatic emotion regulation by attesting to its theorized and demonstrated efficiency (Bargh & Williams, 2007; Gross, 1998a; Mauss et al., 2007). To date, there has only been one experimental study of automatic emotion regulation, completed by Mauss and colleagues (2007). The proposed results would bolster previous findings by adding replication and would demonstrate that the effects of automatic emotion regulation may extend to judgments where emotion is involved (i.e., predictions). The nature of automatic emotion regulation suggests that it occurs frequently in everyday life, without awareness of its effects. If this is true, understanding how automatic emotion regulation affects everyday functions could help in

understanding the impact automatic emotion regulation has on frequent behaviors, which could expand the known effects of emotion. For example, if a behavior/judgment is being impacted by emotion, but this emotion is automatically regulated, the effect of emotion could go unnoticed. Understanding if (and when) emotions are automatically regulated would broaden the understanding of the impact of emotions on everyday function.

Previous studies have explored the use of effortful and deliberate regulation in reducing the desirability bias (Lench, Bench, & Davis, 2011). This type of regulation has been found to be cognitively costly and to deplete with use, making subsequent use of regulation difficult (Baumeister et al., 1998). The present study did not directly test the cognitive or physiological costs of using automatic emotion regulation; however, previous research found no physiological cost of automatic emotion regulation (Mauss et al., 2007). Exploring the cognitive effects of automatic emotion regulation may be useful, as one of the benefits of this form of regulation is frequently stated that it is cognitively cost free (Bargh & Williams, 2007; Gross, 1998a; Mauss et al., 2007). With the failure of the current methodology to successfully prime a nonconscious goal of emotion regulation, the question of whether automatic regulation can influence the desirability bias remains untested. It is important for future research to explore the relationship between automatic emotion regulation and the desirability bias because it would further the current understanding of how to encourage people to make more realistic judgments and extend the developing area of automatic emotion regulation research.

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