# WHERE DISAPPOINTMENT AND REGRET COLLIDE: AGENCY, EMOTION, AND HINDSIGHT BIAS

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ABSTRACT

EULENA M. JONSSON: Where Disappointment and Regret Collide: Agency, Emotion, and Hindsight Bias
(Under the direction of Dr. Lawrence J. Sanna)

Emotions serve as sources of information to the decision-maker and thus can impact the judgment and decision-making biases people are prone to exhibit. This dissertation examines the role of specific emotions such as disappointment, relief, regret, and satisfaction in the generation of *hindsight bias* or the "knew-it-all-along" effect after self-relevant outcomes. I proposed that such emotions provide agency or attribution information to the decision-maker. Specifically, I hypothesized that when people do not feel responsible for the outcome received, or *circumstances-agency*, they experience disappointment and relief. Hindsight bias would be shown after disappointment but not after relief. When people do feel responsible for the outcome received, or *self-agency*, they experience regret and satisfaction. In this case hindsight bias would not be shown after regret, but would be shown after satisfaction. Study 1 ($n$ = 116) found support for the hypotheses made in the self-agency condition, but not in the circumstances-agency condition. Study 2 ($n$ = 260) demonstrated that it is difficult to change the emotions that participants feel, with some changes evidenced in direct emotion measures. In regards to hypotheses about hindsight bias effects, the findings of Study 2 largely replicated those of Study 1.

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# CHAPTER I

## BACKGROUND AND SIGNIFICANCE

Consider the following excerpt taken from an interview between Matt Lauer, co-host of NBC's morning show "Today" and then Secretary of State Colin Powell:

> *MR. LAUER: Mr. Secretary, good morning to you.*
>
> *SECRETARY POWELL: Good morning, Matt.*
>
> *MR. LAUER: You know better than most people how difficult and deadly war can be. You've served this country in different capacities in several wars. Did you ever think, sir, that we'd be sitting here a year and a half after the invasion of Iraq with 1,000 dead and almost 7,000 wounded and still no end in sight to the insurgency?*
>
> *SECRETARY POWELL: Well, of course, I couldn't have known that....*
> *(Lauer, 2004)*

Once people know the outcome of an event they tend to feel that the outcome was both inevitable and foreseeable, this phenomenon having been coined *hindsight bias* (Fischhoff, 1975; Fischhoff & Beyth, 1975; Wood, 1978). There are times, however, when people do not show hindsight bias, as the above statement from the former Secretary of State Colin Powell illustrates. What would lead former secretary Powell to state so forcefully that he "couldn't have known" the direction that the Iraqi war would take? Why would he make such a judgment, when several senior State Department officials insist that former Secretary Powell had earlier advised President Bush that there were too few troops in Iraq, a concern that had been at the forefront from the time US troops entered Iraq in March 2003 (Ricks & Wright, 2004)? Former Secretary Powell has declared on numerous occasions that

looking back to the beginning of the Iraqi war, the emotion that he feels most is regret that he played such a pivotal role in manufacturing support for US involvement in the war (e.g., Lehrer, 2005). Could this emotion that former Secretary Powell continues to feel, regret, be a factor in his lack of hindsight bias? Would he have shown hindsight bias, and said instead, "We knew it would turn out like this," if the Iraqi war had ended as quickly and bloodlessly as the most optimistic predictions before the war and he instead felt satisfaction? Would he have said, "We knew it would turn out like this," if the outcome was the same, an ongoing and bloody war, but if he had not had been one of the principal people soliciting the US people's encouragement of the war and he instead felt disappointment?

It is my contention that the emotions we experience following the outcome of an event depends on our appraisals of the event, these being the specific pattern of evaluations and interpretations of the event (van Dijk & Zeelenberg, 2002; for review see Scherer, Schorr, & Johnstone, 2001) factoring in elements above and beyond just the valence of the outcome (e.g. Lazarus, 1991; Ortony, Clore, & Collins, 1988; Roseman, 1984, 1991; Smith & Ellsworth, 1987). Moreover, I argue that the emotional experiences people have mold the information that people use to make judgments of outcome likelihood, thereby influencing whether or not hindsight bias is evidenced.

Following negative outcomes, people tend to consider either how different things would have been had the state of the world been different, the disconfirmed expectancies that lead to *disappointment*, or people consider how different things would have been had they made a different choice, the bad decisions that lead to *regret* (O'Rorke & Ortony, 1994; Ortony et al., 1988; Zeelenberg, van Dijk, Manstead, & van der Pligt, 2000). The positive complements to these two emotions have been relatively neglected, but help tell the full story

of these emotions' influence. Following a positive outcome, when people feel their negative expectancies have been disconfirmed, they experience *relief*, and when people feel that they have made a good decision, they experience *satisfaction*. These two pairs of specific emotions differ on several appraisal dimensions (Roseman, Antoniou, & Jose, 1996; van Dijk & Zeelenberg, 2002), but I proposed that the most important difference is *agency*, which distinguishes whether the cause of the event outcome is the self, some other person, or the circumstance, not unlike cause attribution. Disappointed and relieved people have circumstances-agency where they feel no responsibility for the outcome, while regretful and satisfied people have self-agency, so that they do feel responsibility for the outcome. I proposed that it is this distinction which leads to differential effects of these two pairs of emotions on hindsight bias.

## "I Knew It All Along": Hindsight Bias

People tend to believe that they "knew it all along" and tend to exaggerate how inevitable the outcome was after they are informed of the outcome of an event. People's memory of the event and the factors leading up to it become distorted as knowledge of the outcome causes people to update the mental models they have of events. Fischhoff (1975) coined the term *creeping determinism* to refer to this readjustment. New causal linkages are formed, and information that seemed important prior to outcome knowledge loses its salience, becoming de-emphasized. Hindsight bias effects are robust (see Christensen-Szalanski & Willham, 1991; Guilbault, Bryant, Brockway, & Posava, 2004; Hawkins & Hastie, 1990; for reviews). Hindsight phenomena has been observed in both laboratory and nonlaboratory settings, and in domains as diverse as news events (e.g., Fischhoff & Beyth, 1975), historical events (e.g., Fischhoff, 1975; Sanna, Schwarz, & Small, 2002[a]), findings of

scientific experiments (e.g., Slovic & Fischhoff, 1977), almanac questions (e.g., Hasher, Attig, & Alba, 1981), brainteasers (e.g., Hoch & Lowenstein, 1991), political elections (e.g., Leary, 1981; Leary, 1982; Synodinos, 1986), medical judgments (e.g., Arkes, Faust, Guilmette, & Hart, 1988; Arkes, Wortmann, Saville, & Harkness, 1981; Pennington, Rutter, McKenna, & Morley, 1980), legal judgments (e.g. Kamin & Rachlinski, 1995; Rachlinski, 1998; Sue, Smith, & Caldwell, 1973), and even for gustatory judgments (Pohl, Schwarz, Sczesny, & Stahlberg, 2003).

Why do people exhibit hindsight bias? Some of the possible explanations for the existence of the hindsight bias fall under the umbrella of motivational explanations, suggesting that hindsight bias is induced by our "hopes, fears, wishes, desires and apprehensions" (Renner, 2003, p. 455). Evidence of self-serving motivations behind the hindsight bias has been proffered by making links to personality variables such as the need for predictability, the desire to self-present (Campbell & Tesser, 1983), and the need for cognition (Verplanken & Pieters, 1988) as well as situational factors such as monetary incentives (Hell, Gigerenzer, Gauggel, Mall, & Müller, 1988), outcome favorableness (Louie, 1999; Louie et al., 2000), task involvement (Stanovich & West, 1998), and attributions (Wasserman, Lampert, & Hastie, 1991).

On the other hand, some explanations for the hindsight bias are purely cognitive (e.g., Beckerian & Bowers, 1983; Hawkins & Hastie 1990), such as memory impairments (e.g., Fischhoff, 1975; Hell et al., 1988) and reconstruction biases (e.g., Erdfelder & Buchner 1998). Hoffrage and colleagues (Hoffrage, Hertwig, & Gigerenzer, 2000) have proposed the Reconstruction After Feedback with Take The Best (RAFT) model, where hindsight bias is described as a by-product of the adaptive process of updating event knowledge. Given that

specific emotions are associated with appraisals that take into account people's needs, goals, ability to cope with consequences, self-ideals, and social norms (Scherer, 2003), I am especially interested the explanations for the hindsight bias that have implications for the self.

Why is there such a quantity of literature centered on the hindsight bias? The practical implications of the hindsight bias are significant, and can have consequences as profound as death, and losing billions of dollars, or as mundane as performing badly on an academic quiz. The significance of the hindsight bias goes beyond just affecting a person's perception of the probability that an event should have occurred. Essentially, hindsight bias prevents people from learning from their successes and their failures. It causes people to feel overconfident in their abilities since they feel as if they could have predicted the outcomes of events. In a medical setting, students may overestimate their diagnostic abilities after reading case studies that document the decisions others have made and the outcomes that have resulted (Henriksen & Kaplan, 2003). Louie (1999) gives an example of the ultimate cost of hindsight bias, citing Jon Krakauer's (1997) description of a tragic Mount Everest from his book *Into Thin Air* where several hikers lost their lives. A possible explanation suggested for their deaths was the overconfidence of their guide who, having led numerous climbing expeditions in the past, may have taken unnecessary risks. Hindsight distortion would have led to him to think that he made correct decisions in the past and therefore under-compensate for the bad weather they encountered.

Fearing the touted "dark side" of the hindsight bias, researchers have, almost from its identification, tried to reduce or totally eliminate this bias. It was first believed that since hindsight bias is associated with increased confidence in the known outcome, that just

thinking of many possible alternative outcomes would provide a remedy, but instead it was more often the case that a *back-fire effect* occurred and that the hindsight bias was intensified (Sanna, Schwarz, & Stocker, 2002[b]). Manipulating subjective accessibility experiences was found to cause attenuation of the hindsight bias, whether this manipulation was cognitive or physiological (e.g. Sanna et al., 2002[b]; e.g. Sanna et al., 2002[a]; see Sanna & Schwarz, 2007; Schwarz, Sanna, Skurnik, & Yoon, 2007; for review). This reduction in hindsight bias, termed the "it could never have happened" effect, was shown by participants in manipulations including those who had listed many thoughts about the known outcome and those who contracted their brows when considering the known outcome. In this dissertation I attempted to show that in addition to thought content and metacognitive experience, emotional experience too is a vital component of the cluster of influences on hindsight bias.

## "How Do I Feel About It?": Specific Emotions

Schwarz' Feelings-as-Information model suggests that the feelings that people have are important sources of information when judgments are being made (Schwarz, 1990; Schwarz & Clore, 1983, 2003, 2007). When this model was first unveiled, the focal point was the effect of moods and mood inductions on unrelated judgments, comparing the types of judgments made after positive or negative mood inductions (see Clore, Schwarz, & Conway, 1994; Elster, 1998; Forgas, 1995; Higgins, 1997; Schwarz & Clore, 1996; for reviews). More recently, researchers have suggested that such a limited focus (1) does not fully account for the results that past research has found when examining the effect of simple mood inductions on judgments, and (2) is lacking the complexity and predictive power that bringing specific emotions into the picture would provide (Lerner & Keltner, 2000; Lerner & Tiedens, 2006; Nabi, 2003). Consequently, the "Feelings" in this "Feelings-as-Information"

model has been expanded to include emotions as well as moods. Schwarz and Clore (1988, 2007) distinguished emotions from moods based on differences such as how specific the affect-inducing targets are where emotions tend to be specific, intense, and caused by a particular event whereas moods tend to be more amorphous (George & Brief, 1995; Frijda, 1986; Clark & Isen, 1982), and additionally based on duration where emotions tend to be more time limited.

Emotional experience has been investigated extensively in the realm of judgment and decision making where (1) emotional reactions are predicted based on pre-outcome information of expected probability and magnitude of the outcome (e.g. Bell, 1982, 1985; Mellers, Schwartz, Ho, & Ritov, 1997; Shepperd & McNulty, 2002; van Dijk & van der Pligt, 1997; van Dijk, Zeelenberg, & van der Pligt, 2003), and (2) behavioral choices are predicted based on the emotion elicited prior to people's choices (e.g. Mellers, Schwartz, & Ritov, 1999; Rucker & Petty, 2004; Simonson, 1992; Zeelenberg, 1999; Zeelenberg et al., 2000).

Research has expanded to look at the effect of emotions on certain types of judgments. Keltner, Ellsworth, and Edwards (1993) showed that even when their participants all felt affect of the same negative valence, when asked what forces were responsible for an ambiguous social event angry participants were more likely to blame dispositional factors than sad participants. DeSteno and colleagues (DeSteno, Petty, Rucker, Wegener, & Braverman, 2004; DeSteno, Petty, Wegener, & Rucker, 2000) found that angry participants are more likely to stereotype outgroup members than sad or neutral participants. Specific emotions such as anger, fear, and happiness have been found to impact perceptions of risk too (Lerner & Keltner, 2001, Lerner, Gonzalez, Small, & Fischhoff, 2003), as well as the

decision-makers' depth of processing (Bodenhausen, Sheppard, & Kramer, 1994, Lerner, Goldberg, & Tetlock, 1998; Tiedens, 2001).

## Counterfactual Emotions: Disappointment & Regret

Within the specific emotion literature there is a subset of emotions that cry out for a link to judgmental biases and specifically hindsight bias research. Hindsight bias has often been linked in the literature to counterfactuals, or alternatives to past reality (Roese, 1997), the idea being that when people consider how likely the known outcome was, they consider as well how likely the alternative outcome was. The emotions of interest, disappointment, relief, regret, and satisfaction, were first called *counterfactual emotions* by Kahneman and Tversky (1982) because they are emotions that result when "reality is compared to an imagined view of what might have been" (Kahneman & Miller, 1986, p. 139). In the case of disappointment and relief this alternate reality is one in which the situation was different; in the case of regret and satisfaction, this alternate reality is one in which the choices made were different.

### *Emotion Appraisals*

Research to date on these emotions has concentrated on the appraisals that are yoked to disappointment and regret, and exploring the differences between the two patterns of appraisals; relief and satisfaction have been ignored in this literature. According to Roseman (2001; Roseman et al., 1996), there are nine appraisal dimensions, or factors which differentiate specific emotions. These are: (1) *unexpectedness* (Was the outcome expected or unexpected?); (2) *situational state* (Did the outcome improve things or make them worse?); (3) *motivational state* (Is the outcome related to wanting to get less of something punishing, or more of something rewarding?); (4) *probability* (Is the outcome certain or uncertain?); (5)

*agency* (What or who caused the outcome?); (6) *control potential* (Was there something a person could do about the outcome or nothing that could be done?); (7) *problem type* (Did the outcome reveal the basic nature of someone or something or did it not?); (8) *own power* (Did the person feel powerful or powerless?); and (9) *legitimacy* (Did the person think of themselves as morally right or wrong?). The different appraisals that accompany the emotions of interest are discussed further below.

*Disappointment and Regret*

People who feel disappointment consider the outcome to be unexpected. They want something pleasurable, but are denied it. They are more likely to think that they are morally right, and that the outcome has been caused by circumstances beyond their control, or *circumstances-agency* (van Dijk & Zeelenberg, 2002). Disappointment is associated with phenomelogical components such as feeling as if something is missing and lethargy. Behavioral components include inaction, and expressions such as weeping. Strategies for reducing disappointment would be to stop moving towards the goal, or avoidance (Roseman, 2001). Disappointment is further associated with imagining how things could have turned out if the outcome had not been worse than expected, or thinking situational counterfactuals (Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen, & Reinderman, 1998[a]).

People who feel regret believe that they could have done something about the event, and that it was caused by them, or *self-agency* (van Dijk & Zeelenberg, 2002). Regret is not associated with thinking about how things could have turned out in a different state of the world, but instead with how things could have turned out if a different choice had been made, or generating behavior-focused counterfactuals (Zeelenberg et al., 1998[a]). Indeed, Zeelenberg and Pieters (2004) underlined the difference between disappointment and regret

by showing that disappointed customers are more likely to complain to others, while regretful customers are more likely to switch businesses. Regret is associated with phenomelogical components such as feeling like you have made a mistake, feeling sick, or a sinking feeling. Behavioral components include wanting a chance to do things over or differently, and expressions include closing the eyes, stretching the lips and rolling them together. Strategies for reducing regret would be to correct or improve the outcome, or approach (Roseman, 2001).

*Regret and Satisfaction*

Similar to disappointment, relief is associated with disconfirmed expectations, but instead of having been denied a pleasant outcome, people experiencing relief feel that they have escaped an unpleasant outcome (O'Rorke & Ortony, 1994; Ortony et al., 1988). As the positive counterpart to disappointment, I expected that relief would be coupled with circumstances-agency as well, where people experiencing relief would feel that the outcome was caused by a state of the world that they had no control over. Furthermore, I expected relief to be similar to disappointment in avoid or inaction tendencies where people feeling relief would want to get away from the event. Phenomelogical components of relief include amelioration and calming, with behavioral components such as resting and relaxing, and expressions such as exhaling and sighing (Roseman, 2001).

Satisfaction is not linked to alternative states of the world where things could have turned out better, but instead to some "chosen alternative" (Oliver, 1997) that resulted in a desired outcome. I thus expected satisfaction, as the conceptual opposite of regret, to be associated with self-agency, where people believe that they did have some control over the past event. I expected too that satisfaction would approximate regret in approach or action

tendencies, so that people feeling satisfaction would not want to get away from the event, but instead would want to go back and change things to make the outcome even better. No phenomelogical reactions have been reported in the literature for satisfaction.

## Where Disappointment and Regret Collide: Agency

Let us examine the appraisal dimension of interest more closely. What exactly do I mean when I refer to "agency"? Roseman (2001, p. 68) defined agency as "who or what caused the motive-relevant event" and sectioned it into three elements: circumstances-agency, other person-agency, and self-agency. The example Roseman (2001, p. 69) gave to explain this concept pertained to a couple whose relationship has broken up. An appraisal of circumstances-agency would be verbalized as "The difficulty of being in a two career couple caused the break-up." Another person-agency appraisal would be "My partner's inattention to the relationship caused the break-up." "My own inattention to the relationship caused the break-up," would represent a self-agency appraisal. According to Roseman (2001), it is combinations of appraisals that influence the emotions felt. For example, anger results when an event is appraised as having an outcome inconsistent with the motive, or being a failure, and this outcome is seen as being caused by another person, or other person-agency. Disappointment and regret have similar motive-inconsistent outcome appraisals, but the outcomes that induce them are further appraised as respectively circumstances-agency and self-agency.

Van Dijk and Zeelenberg (2002) have conducted research with the goal of making a distinction between relief and disappointment. They asked participants to recall and describe a situation where they felt disappointment, regret, sadness or anger. They then measured how much participants believed the different appraisal dimensions had contributed to their

felt emotions. They found that in regards to the emotions disappointment and regret participants differed on five of the appraisal dimensions: unexpectedness, motivational state, control potential, legitimacy, and agency. In this dissertation I focused on the appraisal dimension of agency, which has been suggested as being the chief difference between disappointment and regret (Frijda, Kuipers, & Ter Schure, 1989; van Dijk & Zeelenberg, 2002; Zeelenberg, van Dijk, & Manstead, 1998[b]), and which I expanded to distinguish relief and satisfaction.

Although this is a viewpoint that has been challenged by researchers who have asked if a feeling of responsibility is really essential to the experience of these two emotions, disappointment and regret, with the spotlight being on regret in this particular literature (Connolly, Ordóñez, & Coughlan, 1997; Ordóñez & Connolly, 2000), Zeelenberg and colleagues (Zeelenberg et al., 1998[b]; 2000) have noted that this difference is a robust phenomenon, especially when specific emotion measures are used, as opposed to omnibus happiness measures as have been used in studies from which contradictory conclusions were drawn. Connolly et al. (1997) contended that agency does not play a major part in the experience of regret. In a series of experiments participants judged the happiness of two students registering for a required undergraduate course, Alan or Bob, who before the start of the semester had had an opportunity to change to another course section, or were randomly assigned to another section. The students' outcomes and the average outcome in other sections, or the possible alternative outcomes were manipulated. Using this methodology, Connolly et al. (1997) did not find any effect of the responsibility or agency manipulation. Zeelenberg et al. (1998; 2000) replicated these studies and found the same null effect of responsibility using a happiness measure. However, they demonstrated that if

disappointment and regret were individually measured, the results were consistent with responsibility, or agency, being a defining factor of these two emotions. They found that when the student was randomly assigned to course sections so that self-agency was low and circumstances agency was high, and a negative outcome was the result, more disappointment was perceived for that student; when the student made a critical choice so that self-agency was high and circumstances-agency was low, and a negative outcome was the result, more regret was perceived for that student.

## "Am I Responsible?": Specific Emotions, Agency, and Hindsight Bias

No research to this point has looked at the influence of specific emotions on post-outcome judgment biases such as the hindsight bias. At the most specific emotions are measured, and are seen usually as a byproduct of the judgments made, not as a possible antecedent (for exceptions see Tykocinski, 2001; Tykocinski, Pick, & Kedmi, 2002[1]). In attempting to bring emotions more fully under the umbrella of hindsight bias influences, a model was generated (Figure 1) where I proposed not only that appraisals of agency lead to specific emotions and to specific patterns of hindsight bias, but furthermore that the emotions experienced can lead to certain appraisals which then lead to certain patterns of hindsight bias.

### *"I'm not responsible!" - Disappointment and Relief*

Disappointment corresponds to an appraisal of a motive-inconsistent, unexpected

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[1]In these exceptions (Tykocinski, 2001; Tykocinski et al., 2002), although the emotion disappointment is seen as an antecedent to the hindsight bias shown, specific emotions are not the focus of the literature. Ultimately, Tykocinski (2001; Tykocinski et al., 2002) uses the motivation of protecting the self from disappointment as the rationale behind the results obtained, but the influence of disappointment is neither directly manipulated nor compared to the influence of other negative emotions.

outcome and circumstances-agency, so people do not feel responsible for the outcome. Pezzo and Pezzo's (2007) Sensemaking Model of Hindsight Bias predicts that after a negative, self-relevant outcome where there is high expectation-outcome congruence, there is little to no hindsight bias. However, after an outcome where the expectation-outcome congruence is low and external reasons for the outcome are easy to generate, hindsight bias is evidenced. Pezzo and Pezzo (2007) explain this ironic prediction by suggesting that a negative, self-relevant, unexpected outcome activates a search for meaning. This increased search for causal linkages between antecedents and the outcome eventually increases a person's belief in the inevitability of the outcome, resulting in greater hindsight bias if this sense-making process is successful. Disappointment is primarily defined as a disconfirmed expectation, as is relief. Pezzo and Pezzo's (2007) model, revised from an earlier model (Pezzo, 2003) concentrates solely on negatively valenced events, and as such suggests no predictions for hindsight bias after emotions such as relief that occur following positively valenced events.

On top of this search for meaning, I suggested that there are self-serving motivations that will influence whether or not hindsight bias is shown after disappointment or relief. Consider the agency that is associated with the specific appraisals of disappointment and relief: circumstances-agency. People who feel disappointment and relief do not feel responsible for the event that has occurred. They want to distance themselves from the outcome by coping, as in the case of disappointment, or moving on, as in the case of relief. They are not motivated to learn from the event in the case of failure, or to take credit in the case of success. The retroactive pessimism literature posits that after extreme disappointment people are motivated to show coping mechanisms in order to keep going on,

and tell themselves that the negative outcome was meant to be and that there was nothing they could have done, effectively increasing hindsight bias (Tykocinski, 2001; Tykocinski et al., 2002). I thus predicted hindsight bias after disappointment. No predictions are made in the retroactive pessimism literature or any other literature for the possible effect of relief on hindsight bias. I posited though that since people do not feel responsible for the outcome when they feel relief, they will not attempt to take credit, and they will want to get away from the situation, because they feel that the outcome easily could have been otherwise and negative. I predicted no hindsight bias after relief.

*"I am responsible!" - Regret and Satisfaction*

Regret corresponds to an appraisal of a motive-inconsistent outcome where the choice made was bad, and self-agency, so people do feel responsible for the outcome. Louie (1999; Louie at al., 2000) predicts that people will take credit for successes by judging them as being more inevitable and that they will deny blame for failures by judging them as being less inevitable. In her research, participants have to make choices which turn out to be favorable or unfavorable, and she finds that after success, people have more internal thoughts focusing on reasons for success, whereas after failure people have more external thoughts excusing failure. In one study (Louie, 1999, Study 2), participants made an informed decision as to whether or not to purchase a company's stock after which they were given favorable or unfavorable outcomes with regard to stock performance. Favorable-feedback participants showed increased hindsight bias while the unfavorable-feedback participants showed decreased hindsight bias, as compared to no-feedback participants.

According to Louie (1999), motivation for this hindsight bias strategy is one of ego validation, or self-promotion. Consider the agency that is associated with regret and

satisfaction: self-agency. Participants who are regretful or satisfied do feel responsible for their outcomes. They are motivated to do over the experience and to make things right in the case of regret, and I proposed, to redo the experience and continue to make things right in the case of satisfaction. What is the link between these two emotions, regret and satisfaction, and self-serving self-promotional motivation and hindsight bias? It has been suggested that for the self-serving motive to be salient to people, they must feel that they had control over the outcome they received, or were responsible for it (Mark, Boburka, Eyssell, Cohen, & Mellor, 2003). In Mark et al. (2003), participants who made choices that led to negative self-relevant outcomes perceived the outcome to be unforeseeable in hindsight. If this is the case, only regretful or satisfied participants should use a self-serving motive, unlike disappointed or relieved people. Regretful people would want to deny blame for failure, and I predicted they would not show hindsight bias. This prediction would also be expected due to regretful people wanting to learn from their mistakes, so that they can "do over" the event in search of a more positive outcome. Satisfied people would want to take credit for their success, allowing them to say that the outcome was inevitable, and that they knew all along that they would succeed. I therefore predicted that satisfied people would show hindsight bias

## Overview of Current Research and Hypotheses

In this dissertation the main predictions, as illustrated in Figure 2, were that when a person has circumstances-agency, they will show hindsight bias when they feel disappointment after a negative outcome, but they will not show hindsight bias when they feel relief after a positive outcome. When a person has self-agency, they will not show hindsight bias when they feel regret after a negative outcome, but they will show hindsight

bias when they feel satisfaction after a positive outcome. I predicted the same basic pattern of findings for both studies, using different manipulations and measures.

To test these ideas, I conducted two studies in which the emotion experienced was manipulated both by prompting different antecedent appraisals and directly, and judgments of outcome likelihood were obtained. In Study 1, agency and outcome valence were manipulated by having participants perform a laboratory task. They were asked to generate two potential answers during the task and were either allowed to choose an answer to submit for evaluation, or had an answer chosen randomly for them. Participants were given false feedback that they had either succeeded or failed. The manipulation in essence created the appraisals expected to be linked with specific emotions, and measures were taken of how inevitable and how foreseeable participants perceived the outcome to be. In Study 2, an event-recall method was used. Participants were asked to reconstruct a past academic exam experience when they felt one of the four specific emotions, disappointment, relief, regret, or satisfaction, after they learned about the outcome. Study 2 extended Study 1 by investigating the bidirectionality of the path between emotions and appraisals. Moreover, Study 2 sought to examine the effect of a shift in emotions on hindsight bias. In order to encourage the experience of different emotions, some participants listed either different situations that could have occurred that would have led to a different outcome or different choices they could have made that could have led to a different outcome. Taken together, the findings of Studies 1 and 2 would provide support for emotional experience as an important source of information for judgments made and consequently a key factor influencing judgmental biases.

# CHAPTER 2

## STUDY 1

### Overview

The primary objective of Study1 was to provide initial evidence that appraisals paired with the emotions disappointment and regret, as well as their often neglected conceptual opposites relief and satisfaction, do influence hindsight bias. In addition the secondary objective was to add to previous findings suggesting that a key difference between disappointment and regret is the different appraisals of agency.

Participants' appraisal of the situation and their emotions were induced by manipulating the perceived agency and the outcome valence of a laboratory task. To manipulate agency, participants were either given a choice or not given a choice at a key juncture of the laboratory task. To manipulate outcome valence, participants were given false feedback indicating either that they had succeeded in the laboratory task, or that they had failed.

My general prediction was that each combination of agency and outcome valence would be matched with a specific emotion being experienced by the participant, as well as a distinctive pattern of hindsight bias. More specifically I predicted that when participants did not feel responsible for the outcome, circumstances-agency, they would show hindsight bias after a failure, when they felt disappointment, but not after a success, when they felt relief. When participants did feel responsible for the outcome, self-agency, I predicted that they would not show hindsight bias after a failure, when they felt regret, but they would show hindsight bias after success, when they felt satisfaction. In short, an interaction between agency and outcome valence on hindsight estimates was expected.

Study 1 used a laboratory task paradigm. The design was a 2 (agency: circumstances vs. self) x 2 (outcome valence: failure vs. success) between-participants factorial design. The inspiration for Study 1 came from a design used by Gilbert and colleagues (Gilbert, Morewedge, Risen, & Wilson, 2004).

## Method

### *Participants*

Participants were 116 undergraduate Introductory Psychology students at the University of North Carolina at Chapel Hill.

### *Procedure*

Materials used in this study are located in Appendix A. Participants were recruited for a laboratory experiment entitled "Making Judgments" in groups of ten. On arrival at the experimental session, participants completed a consent form, then received a handout that gave them instructions about the task they were to complete as well as the task itself. They were asked to put an ID number on the handout corresponding to where they were sitting, so that later in the experiment their handout with feedback could be returned to them. All participants were given the following initial instructions:

> Welcome to our experiment and thanks for participating. We are conducting a study to see how people make real-life decisions such as how much different items cost and whether or not to purchase those items. In this particular experiment, we will ask you to make judgments about the prices of certain items, specifically plane ticket prices, and to put these items in the order asked for. You will then be asked a series of questions about your reactions to this event.

All participants were asked to order five popular summer destinations in order of the average price of a round-trip plane ticket from Raleigh-Durham International Airport, North

Carolina, to that destination. They were asked to order the destinations descending from the most expensive ticket price to the least expensive ticket price. Participants were asked to create not just one but instead two different orders, and were told that these two orders should be their two best guesses for the correct order of ticket prices. All participants were informed that those participants who ordered the plane ticket costs correctly would be entered into a drawing for $35.

*Agency Manipulation.* Participants were told that of the two orders they created, only one would be evaluated, either one that was randomly selected for them or one that they themselves chose. In the *circumstances-agency* condition, participants received the following series of statements:

> You will create two different orders, each descending from 5, the most expensive location, to 1, the least expensive location. These orders will be your two best guesses, and different from each other. The experimenter will look at and evaluate both orders, *but only one will count, one that will be randomly chosen for you.* This order will be the submitted one….
>
> When you are finished, please continue on to the next page *to see which order has been randomly chosen to be submitted for you*, then give this questionnaire to the experimenter….
>
> *Order #2 has been randomly chosen to be submitted.*
>
> *Order #1 will be evaluated too but will not count….*

*In the self-agency* condition, participants were told instead:

> You will create two different orders, each descending from 5, the most expensive location, to 1, the least expensive location. These orders will be your two best

guesses, and different from each other. The experimenter will look at and evaluate both orders, *but only one will count, one that you will choose.* This order will be the submitted one….

When you are finished, please continue onto the next page *to choose the order to be submitted,* then give this questionnaire to the experimenter….

*Which order do you choose to be submitted? Circle your choice.*

*Order #1*

*Order #2…*

After all participants completed the ordering task, the experimenter collected the handouts and returned to the front of the class. The experimenter informed the participants that it would take a few minutes to evaluate the orders, and to please sit quietly while the evaluation occurred. The experimenter then sat and proceeded to ostensibly evaluate the submitted orders.

*Outcome Valence Manipulation.* The experimenter did not actually evaluate the submitted orders that participants created. Instead the experimenter gave false feedback and in so doing randomly placed participants into either failure or success conditions.

In the *failure* condition, participants were given the following false feedback: "Submitted: Incorrect (Unsubmitted: Correct)" while in the *success* condition, participants were given the following false feedback: "Submitted: Correct (Unsubmitted: Incorrect)."

*Manipulation Checks.* To assess participants' perception of the agency of the outcome, they were asked to rate on a scale of 0 (*Not at all responsible*) to 9 (*Very responsible*) their response to the question, "How responsible did you feel for the outcome of the event?" They were also asked to rate on a scale of 0 (*Not at all in control*) to 9 (*Very in*

*Control*) their response to the question, "How much control did you have over the outcome of the event?"

Participants' perception of the outcome valence of the outcome was assessed by two questions. They were asked to rate on a scale of 0 (*Not at all positive*) to 9 (*Very positive*) their response to the question, "To what extent was the outcome positive?" They were asked too to rate on a scale of 0 (*Not at all negative*) to 10 (*Very negative*) their response to the question, "To what extent was the outcome negative?"

*Specific Emotions Measures.* The specific emotions of interest were assessed using both direct and indirect measures. Participants were first asked to rate on a scale of 0 (*Not at all*) to 9 (*Very*) the extent to which they feel each emotion: disappointment, relief, regret, and satisfaction.

Disappointment and relief were then assessed indirectly by participants' responses to the following questions: "To what extent was the outcome expected?" (0 = *Not at all expected*; 9 = *Very expected*); "To what extent was the outcome unexpected?" (0 = *Not at all unexpected*; 9 = *Very unexpected*); and "To what extent did you feel a tendency to want to get away from the event after you knew the outcome?" (0 = *I did not at all want to get away from the event;* 9 = *I very much wanted to get away from the event*).

Regret and satisfaction were also assessed indirectly through the following measures: "To what extent was the outcome of the event the result of a choice you made?" (0 = *Not at all a result*; 9 = *Very much a result)*); and "To what extent did you feel a tendency to want to go back and change things after you knew the outcome?" (0 = *I did not at all want to change things*; 9 = *I very much wanted to change things*).

*Probability Judgment.* The hindsight bias that participants showed regarding their

task outcome was assessed using three items. "To what extent would you say that the outcome you experienced was inevitable?" (0 = *Not at all inevitable*; 9 = *Very inevitable*); "To what extent would you say that the outcome you experienced was foreseeable?" (0 = *Not at all foreseeable;* 9 = *Very foreseeable*); and (3) a third measure:

> Think back to right before you were given feedback on your ordering. If someone had asked you at that point how likely you were to get the feedback that your submitted order was correct, what would you have said?
>
> Give a percentage ranging from 0% to 100%, where 0% would mean "I thought there was no chance of it being correct," and 100% would mean "I thought it would definitely be correct."
>
> _____%

Participants were thanked, debriefed, and informed that all participants would be entered into the $35 drawing.

## Results and Discussion

*Manipulation Checks.* The two agency manipulation check questions were significantly correlated, $r(116) = .68$, $p < .001$. A combined agency score was created for purposes of analysis, by addition of the responses to the two questions. Participants in the self-agency condition ($M = 14.25$, $SD = 3.93$) viewed themselves as being more in control of and having more responsibility for the outcome than participants in the circumstances-agency condition ($M = 10.40$, $SD = 5.62$), $F(1, 114) = 18.04$, $p < .001$. The agency manipulation was effective.

The two outcome valence manipulation check questions were also significantly correlated, $r(116) = .54$, $p < .001$, with the question "To what extent was the outcome

negative?" reverse scored. A combined outcome valence score was created by addition of the responses to the two questions. Participants in the positive outcome condition ($M = 5.09$, $SD = 3.21$) viewed the outcome of the task as having been more positive than participants in the negative outcome condition ($M = 2.66$, $SD = 3.03$), $F(1, 114) = 170.52$, $p < .001$. The outcome valence manipulation was effective.

*Direct Emotion Measures.* The four direct emotion measures measuring disappointment, regret, relief, and satisfaction were first assessed by a MANOVA in which outcome valence and agency were between-subject factors. Only the main effect for outcome valence was significant, with multivariate $F(4,109) = 52.38$, $p < .001$. Individual means and standard deviations are presented in Table 1.

Individual ANOVAs showed that the main effect for outcome valence was valid for all four measures, $F$s > 50.00, $df$s = 1,112, $p$s < .01. Participants gave higher ratings of disappointment ($M = 4.44$, $SD = 2.54$) and regret ($M = 3.24$, $SD = 2.92$) in the negative outcome conditions than in the positive outcome conditions (respectively, $M = .17$, $SD = .64$ and $M = .17$, $SD = .78$). Higher ratings of relief ($M = 4.36$, $SD = 3.08$) and satisfaction ($M = 7.53$, $SD = 1.90$) were given in the positive outcome conditions than in the negative outcome conditions (respectively, $M = 2.94$, $SD = 2.48$ and $M = 3.48$, $SD = 2.15$). Even though the interaction effect was not significant, ratings of each emotion except for relief followed the expected patterns in the different experimental condition as Figure 3 illustrates. For example, not only were ratings of disappointment higher in the negative valence condition than in the positive valence condition, but additionally, within the negative valence condition, ratings increased going from the self-agency ($M = 4.30$, $SD = 2.55$) to the circumstances-agency condition ($M = 4.58$, $SD = 2.57$).

*Indirect Emotion Measures.* The five indirect emotion measures were similarly assessed by a MANOVA with outcome valence and agency as the between-subject factors. These measures gauged, respectively, how unexpected or expected participants viewed the outcome as being, whether they viewed the outcome as the result of a choice they had made, and whether they wanted to go back and change things or to get away from the event after knowing the outcome. The main effects for both feedback, multivariate $F(5, 108) = 35.04$, $p < .001$, and agency, multivariate $F(5,108) = 2.35$, $p < .05$, were significant, with the interaction effect approaching significance, multivariate $F(5,108) = 2.02$, $p = .08$. Individual means and standard deviations are displayed in Table 2.

Univariate ANOVAs confirmed that participants given positive feedback were significantly more likely to rate the outcome as having been unexpected ($M = 4.51$, $SD = 2.54$) and less likely to rate it as being expected ($M = 4.66$, $SD = 2.35$) than participants given negative feedback ($M = 3.62$, $SD = 2.03$ and $M = 5.79$, $SD = 2.03$ respectively), $F$s > 4.00, $df$s = 1,112, $p$s < .05. Participants given positive feedback were significantly less likely to want to go back and change the outcome ($M = .06$, $SD = .23$), but also less likely to want to get away from the event ($M = .77$, $SD = 1.73$), $F$s > 10.00, $df$s = 1,112, $p$s < .005 than participants receiving negative outcomes ($M = 5.60$, $SD = 3.26$ and $M = 2.16$, $SD = 2.63$, respectively). Generally negative outcomes tend to be seen as more unexpected than positive outcomes (Roese & Olson, 1996), so these results were a bit surprising.

Univariate ANOVAs confirmed too that participants in the self-agency conditions ($M = 7.61$, $SD = 2.25$) were significantly more likely to report that the outcome was a result of a choice they had made than participants in the circumstances-agency condition ($M = 5.93$, $SD = 2.95$), $F(1,112) = 79.48$, $p < .005$. This result supported my hypotheses.

In examining the interaction effects, univariate ANOVAS showed that to participants in the positive feedback condition, an outcome if they were in the self-agency condition ($M$ = 5.35, $SD$ = 2.33) was significantly more expected than if they were in the circumstances-agency conditions ($M$ = 4.00, $SD$ = 2.22). Conversely, for participants in the negative valence condition, an outcome if they were in the circumstances-agency ($M$ = 6.30, $SD$ = 1.98) condition was more expected than if they were in the self-agency condition ($M$ = 5.23, $SD$ = 1.98). This pattern of results fit what was hypothesized for the positive valence condition, but not for the negative valence condition.

*Probability Judgment.* To evaluate the probability judgments generated by participants, a MANOVA was run on the three hindsight bias measures, with outcome valence and agency as the two between-subject factors. The main effects for both feedback, multivariate $F(3,110) = 7.21$, $p < .001$, and the interaction effect, multivariate $F(3,110) = 2.75$, $p < .05$, were significant. Individual means and standard deviations for the three hindsight bias measures are presented in Table 3.

Examination of the univariate ANOVAs indicated that the main effect for feedback was valid for both the measure assessing how foreseeable participants viewed the outcome and the numerical probability judgment participants generated, $F$s > 5.00, $df$s = 1,112, $p$s < .05. Participants in the positive valence conditions ($M$ = 59.72, $SD$ = 24.64) reported a higher likelihood of having produced a correct order than participants in the negative valence conditions ($M$ = 49.24, $SD$ = 24.95). However, participants in the positive valence conditions ($M$ = 4.34, $SD$ = 2.47) viewed the outcome as having been less foreseeable than participants in the negative valence conditions ($M$ = 5.90, $SD$ = 2.10). This latter result does seem to fit

with the results from the indirect emotion measures analysis indicating that participants viewed a positive outcome as having been more unexpected.

The interaction effect was valid for the measure assessing how likely participants thought they were to be correct in their ordering, $F(1,112) = 4.85$, $p < .05$, and approached significance for the other two measures, $F$s > 3, $df$s = 1,112, $p$s < .09. The interaction effect was examined, and given the very specific predictions for hindsight bias effects several planned contrasts (Rosenthal, Rubin, & Rubin, 2000; Furr & Rosenthal, 2003) were conducted on the probability judgment data. As diagrammed in Figure 4, when feeling responsible for the outcome, in the self-agency condition, participants given positive feedback ($M = 68.42$, $SD = 20.94$) reported a higher likelihood of having produced a correct order than participants given negative feedback ($M = 47.73$, $SD = 22.80$), $t(112) = 3.18$, $p < .005$. In contrast, when not feeling responsible for the outcome, in the circumstances-agency condition, the reported likelihoods of producing a correct order were not significantly different from each other for participants in both valence conditions. Thus, my hypotheses for when hindsight bias would be shown were supported by findings in the self-agency conditions, but not by participants in the circumstances-agency conditions.

Study 1 provided initial evidence for some of my hypotheses. First, Study 1 suggested that the difference between disappointment and relief, and regret and satisfaction may be agency. The pattern of participants' ratings for direct emotions was promising. Although the scores for similarly valenced conditions were not significantly different, the overall pattern was as predicted, except for relief. Added support for the supposition that agency may be a key factor in differentiating the emotions of disappointment, relief, regret, and satisfaction, came from the finding that participants in the self-agency conditions felt that

the outcome was more of a choice made than participants in the circumstances-agency conditions.

Two factors may have led to less support for hypotheses concerning agency as an emotion differentiator. Although pilot testing and post-session interviews of participants revealed that participants had a reasonable expectation of completing the laboratory task successfully, end results found that participants receiving positive feedback found that to be unexpected. It could be that participants found the task harder than initially surmised. This could have affected the intensity of emotions felt, especially those with linked appraisals of disconfirmed expectations such as disappointment and relief. Secondly, even with participants in the circumstances-agency condition having their submitted order randomly chosen for them, the act of creating the two orders themselves could have acted as an impediment to the feeling of lack of control over the outcome.

In regards to hindsight bias, Study 1 provided initial evidence that people's appraisals of events do influence the estimates of outcome likelihood generated. In the self-agency appraisals condition, participants with positive feedback showed hindsight bias, whereas participants with negative feedback did not. On the other hand, in the circumstances-agency appraisals condition, participants in both valence conditions showed a similar lack of hindsight bias. Such a finding, though exciting, supported only half of the hypotheses put forth, for participants in the self-agency conditions. In Study 2 another test of the appraisal-hindsight bias link was carried out using different methodologies to observe if the results of Study 1 would be reproduced, and in that case, to supply enhanced clarification of Study 1's findings.

# CHAPTER 3

# STUDY 2

## Overview

In Study 1 the groundwork was set for showing that appraisals both induce emotions and influence hindsight bias. Study 2 was designed to build on this foundation, extending the findings of Study 1 by showing that emotions can actually lead to the appraisals that affect hindsight bias. Furthermore, in Study 2 the pattern of hindsight bias occurring as participants' emotions were manipulated was investigated.

For the second study participants were asked to recall and describe a past event when they felt a certain emotion. Participants' appraisal of agency and outcome valence were subsequently measured as well as outcome likelihood estimates. In some conditions participants were asked to list thoughts about ways the situation could have been different, leading to a different outcome while other participants were asked to list other choices they could have made that could have led to different outcomes. Asking participants to create these types of thoughts is a methodology that has been successful in inducing disappointment and regret (Zeelenberg et al., 1998[a]). When participants think of ways the situation could have been different they tend to feel disappointment following a negative outcome, whereas when participants think of different choices they could have made they tend to feel regret. I hypothesized that asking participants to list such thoughts would in effect prompt, in the relevant conditions, a shift in participants' emotions from disappointment to regret or from regret to disappointment, and the same with the emotions relief and satisfaction. The hindsight bias pattern was expected to change correspondingly.

My general prediction mirrored that of Study 1, namely that the specific emotions that

participants recalled experiencing would be paired with a combination of agency and outcome valence in addition to a distinctive pattern of hindsight bias. Specifically I predicted that when thinking back on an outcome that led to disappointment, participants would exhibit more hindsight bias in the control and circumstances-agency conditions than in the self-agency condition. After recalling an outcome that led to relief, participants would exhibit less hindsight bias in the control and circumstances-agency conditions than in the self-agency condition. Conversely, when thinking back on an outcome that led to regret, participants would exhibit less hindsight bias in the control and self-agency conditions than in the circumstances-agency condition. After recalling an outcome that led to satisfaction, participants would exhibit more hindsight bias in the control and self-agency conditions than in the circumstances-agency condition.

The design of Study 2 was a 4 (initial emotion: disappointment vs. relief vs. regret vs. satisfaction) x 3 (thoughts agency: control/no thoughts vs. circumstances-agency vs. self-agency) factorial design.

## Method

### *Participants*

Two hundred sixty-five Introductory Psychology students at the University of North Carolina at Chapel Hill participated and were distributed approximately equally among conditions. Five participants failed to properly complete the thoughts-listing task by which agency was manipulated (no thoughts vs. circumstances agency vs. self-agency); their data was dropped from the analyses. Usable data were thus obtained for 260 participants.

### *Procedure*

Materials for this study are located in Appendix B. Participants were recruited for a laboratory experiment entitled “Life Events”. On arrival at the experimental session,

participants completed a consent form, then were asked to complete the given questionnaire. The initial instructions in the questionnaire stated:

> We are conducting a study to see if people's recollections of past events are impacted by how they have been socialized. This is a collaborative research effort between researchers in universities across the country. In this particular experiment, we will ask you to recall a particular past event and then to answer questions about your reactions to it. We ask that you describe the event you are recalling in as much detail as you can, and try to imagine yourself in the situation as if it were actually occurring to you at this moment.

*Initial Emotion Manipulation.* Participants were given the following instructions, with the emotion induced being disappointment, relief, regret, or satisfaction:

> We want you to recall a past experience that happened within the last three years. Specifically we want you to recall an academic exam experience you have had where you felt *[emotion]* after you found out the outcome.
>
> Please use the space given below and on the next page if needed to describe this event when you felt *[emotion]*. Be vivid and detailed enough so that a reader experiences the event in the same way that you did.

Participants were given two pages in which to describe this event.

*Thoughts Agency Manipulation.* Participants in the control/no thoughts condition were given no additional instructions before being asked to continue on in the questionnaire.

In the *circumstances-agency* condition, participants in the negative emotion conditions, disappointment and regret, were further instructed: "In the spaces provided below, please list 5 *ways the situation could have been different* that would have led to a

*better* outcome occurring." Five spaces were provided, each with the given beginning, "*There* could have …."

In the *circumstances-agency* condition, participants in the positive emotion conditions, relief and satisfaction, were instructed: "In the spaces provided below, please list 5 *ways the situation could have been different* that would have led to a *worse* outcome occurring." Five spaces were provided, each with the given beginning, "*There* could have …."

In the *self-agency* condition, participants in the negative emotion conditions, disappointment and regret, were instructed: "In the spaces provided below, please list 5 *different choices you could have made* that would have led to a *better* outcome occurring." Five spaces were provided, each with the given beginning, "*I* could have …."

In the *self-agency* condition, participants in the positive emotion conditions, relief and satisfaction, were instructed: "In the spaces provided below, please list 5 *different choices you could have made* that would have led to a *worse* outcome occurring." Five spaces were provided, each with the given beginning, "*I* could have …."

*Manipulation Checks and Specific Emotion Measures.* The measures assessing the effectiveness of the initial emotion manipulation (control/no thoughts condition) as well as the thoughts agency manipulation were similar to those used in Study 1. These same emotion measures were used to determine whether the predicted emotion switching occurred in the circumstances-agency and self-agency conditions.

Some participants were asked to answer an additional manipulation check positioned at the end of the questionnaire. It assessed the ease or difficulty of the thought listing task with the question, "You were asked to list 5 thoughts about the past event described that

could have led to a different outcome. To what extent was it difficult or easy to generate those 5 thoughts?" (-4 = *Difficult to generate*; 4 = *Easy to generate*).

*Probability Judgment.* The hindsight bias that participants showed regarding the past event outcome was assessed using the same two measures of inevitability and foreseeability used in Study 1 as well as a third measure:

> Think back to a time before you knew the outcome of the exam.
>
> If someone had asked you at that point how likely you were to perform *badly/well* on the exam, what would you have said? Give a percentage ranging from 0% to 100%, where 0% would mean "I thought there was no chance of it turning out *badly/well*," and 100% would mean "I knew it would definitely turn out *badly/well*."
>
> _____%

The questionnaire was collected after which participants were thanked and debriefed.

## Results and Discussion

*Manipulation Check.* The analyses assessing the effectiveness of the emotion inductions were restricted to the control/no agency conditions, $n = 66$. Representative samples of the descriptions participants generated under the emotion inductions include, for *disappointment*:

> …I anxiously awaited the results, expecting at worst an A-. The day we got it back, I expected to be able to call home and tell about my excellent grade. Instead, a big C was scrawled across the top of the page….

Descriptions of events where participants felt *regret* include:

> …I should not have gone out of town and instead should have spent the week studying. In addition, I wasted my time reading the biology chapters instead of just

studying my class notes, which the teacher emphasized would be the most important….

Participants with a *relief* induction described events such as:

…Though my Spanish was good, I had only taken Spanish III (out of IV) prior to taking AP Spanish, so I felt to be in somewhat of a disadvantage...After those months of waiting, I finally got my scores. I had gotten 5s on 3 other exams, but the icing on the cake was the "3" next to AP Spanish….

Finally, participants presented with a *satisfaction* induction described the following kinds of events:

…I had kept up with the readings, found a tutor, and studied a week straight. I made sure I knew the material!...When the score finally was put up, I saw I made a 90, an A-. I was so excited b/c my work had paid off…

There was a main effect of emotion induced for all of the direct emotion measures, $F$s > 15.00, $df$s = 3, 62, $p$s < .001. Means and standard deviations are displayed in the control agency/no thoughts rows of Table 4. For each emotion induced, the mean score of that emotion condition on the measure assessing that particular emotion was the highest. For example, participants in the disappointment condition ($M$ = 7.65, $SD$ = 2.26) scored higher on the disappointment measure than participants in the relief ($M$ = 1.56, $SD$ = 2.19), regret ($M$ = 6.53, $SD$ = 2.62), and satisfaction ($M$ = .63, $SD$ = 1.31) conditions. Planned contrasts indicated that for each emotion measure the difference between the mean scores of an emotion induced and each of the oppositely valenced emotions induced was significant, $t$s > 4.00, $df$s = 62, $p$s < .001. However, on each emotion measure the difference between the mean scores of an emotion induced and the similarly valenced emotion was not significant.

The main effect of emotion induced was significant for three of the indirect emotion measures: the extent to which the outcome was expected, whether participants wanted to go back and change the outcome, and whether participants wanted to get away from the event after the outcome was known, $F$s > 3.00, $df$s = 3, 62, $p$s < .05. To participants induced to feel disappointment, the outcome was significantly less expected ($M$ = 3.06, $SD$ = 2.77) than to participants induced to feel satisfaction ($M$ = 5.38, $SD$ = 1.54) or relief ($M$ = 4.69, $SD$ = 1.99). Participants induced to feel either disappointment ($M$ = 7.88, $SD$ = 1.62 and $M$ = 6.76, $SD$ = 2.82, respectively) or regret ($M$ = 7.06, $SD$ = 2.93 and $M$ = 5.53, $SD$ = 2.79, respectively) were significantly more likely to say that they would like to go back and change the outcome or to get away from the event than participants in either the relief ($M$ = 2.06, $SD$ = 2.52 and $M$ = 3.25, $SD$ = 3.19, respectively) or satisfaction ($M$ = 1.63, $SD$ = 2.53 and $M$ = 2.56, $SD$ = 2.76, respectively) conditions.

*Direct Emotion Measures*. A MANOVA was used to assess the four direct emotion measures for disappointment, regret, relief, and satisfaction, with emotion induced and thoughts agency as the between-subject factors, using the full data, $n$ = 260. Both the main effect for emotion induced, multivariate $F(12, 648) = 54.39$, $p < .001$, and the interaction effect, multivariate $F(24, 856) = 1.73$, $p < .05$, were significant.

Individual ANOVAs showed that the main effect for emotion induced was valid for all four measures, $F$s > 110.00, $df$s = 3, 248, $p$s < .001. The interaction effect was significant only for two measures, those assessing regret and satisfaction, $F$s > 2.00, $df$s = 6, 248, $p$s < .05. A series of planned contrasts were carried out to assess the specific predictions made. Individual means and standard deviations are displayed in Table 4.

I expected that on the measure of disappointment, participants in the circumstances-agency condition instructed to describe outcomes after which they felt disappointment ($M$ = 8.00, $SD$ = .97) or regret ($M$ = 7.91, $SD$ = 1.08) would score significantly higher than participants in the control/no thoughts agency condition instructed to describe an experience after which they felt regret ($M$ = 6.53, $SD$ = 2.62). Both hypotheses were supported, respectively $t(248) = 2.48$, $p < .05$, and $t(248) = 2.40$, $p < .05$. Evidence was not found for any other predictions made for the direct emotion measures.

*Indirect Emotion Measures.* The five indirect emotion measures were similarly assessed by a MANOVA with emotion induced and thoughts agency as the between-subject factors. Only the main effect for emotion induced, multivariate $F(15, 674) = 25.21$, $p < .001$, was significant. Individual means and standard deviations are displayed in Table 5.

Individual ANOVAs pointed out that the main effect for emotion induced was significant for all five indirect emotion measures, $F$s > 6, $df$s = 3, 248, $p$s < .001. Interestingly, planned contrasts confirmed that the hypotheses for measures assessing the expectedness and unexpectedness of the outcome were supported. Participants were significantly more likely to see the outcome as unexpected and significantly less likely to see the outcome as expected in the disappointment ($M$ = 5.82, $SD$ = 2.11 and $M$ = 3.29, $SD$ = 2.34, respectively) and relief ($M$ = 5.33, $SD$ = 2.37 and $M$ = 3.79, $SD$ = 2.32, respectively) conditions than participants in the regret ($M$ = 4.26, $SD$ = 2.50 and $M$ = 4.74, $SD$ = 2.60, respectively) and satisfaction ($M$ = 4.30, $SD$ = 2.53 and $M$ = 6.00, $SD$ = 2.06, respectively) conditions, $t(256) = 4.35$, $p < .001$ and $t(256) = 5.19$, $p < .001$ respectively. This pattern was seen too in the measure assessing whether participants thought the outcome was a result of a choice they had made, where participants in the disappointment ($M$ = 5.00, $SD$ = 2.65) and

relief ($M$ = 6.91, $SD$ = 1.97) conditions were significantly less likely to agree than participants in the regret ($M$ = 7.00, $SD$ = 2.31) and satisfaction ($M$ = 7.37, $SD$ = 1.95) conditions, $t(256) = 4.42$, $p < .001$. On the other hand, for measures assessing wanting to go back and change the outcome or wanting to get away from the event after knowing the outcome, it was only the valence of the emotion induced that mattered, where participants in the disappointment ($M$ = 7.90, $SD$ = 1.69 and $M$ = 6.42, $SD$ = 2.36, respectively) and regret ($M$ = 7.72, $SD$ = 1.96 and $M$ = 6.49, $SD$ = 2.12, respectively) conditions were significantly more likely to both want to go back and change and to get away from the outcome than participants in the relief ($M$ = 2.31, $SD$ = 2.41 and $M$ = 2.69, $SD$ = 3.10, respectively) and satisfaction ($M$ = 2.00, $SD$ = 2.68 and $M$ = 2.38, $SD$ = 2.83, respectively) conditions, respectively $t(256) = 20.06$, $p < .001$ and $t(256) = 12.04$, $p < .001$.

*Thoughts Agency*. I did not expect to find a significant difference among thoughts agency groups for the ease or difficulty of generating the list of thoughts. However, although all but five participants properly completed the thoughts agency manipulation task, filling in five thoughts as required, participants asked to generate circumstances-agency thoughts ($M$ = -.28, $SD$ = 2.49) found these thoughts significantly more difficult to generate than participants asked to generate self-agency thoughts ($M$ = .97, $SD$ = 2.47), $F(1,192) = 12.13$, $p < .005$.

*Probability Judgment.* To appraise the probability judgments generated by participants, a MANOVA was run on the three hindsight bias measures, with emotion induced and thoughts agency as the two between-subject factors. Only the main effect for feedback was significant, multivariate $F(9,599) = 9.21$, $p < .001$. Individual means and standard deviations for the three hindsight bias measures are presented in Table 6.

Individual ANOVAs gave evidence that the main effect for emotion induced was valid for two of the hindsight bias measures, the likelihood estimate of the known outcome occurring, $F(3, 248) = 25.32$, $p < .001$, and how foreseeable the participants viewed the outcome as being, $F(3,248) = 14.62$, $p < .001$. Given the specific predictions for the hindsight bias measures, several planned contrasts were conducted. The results for both foreseeability and likelihood estimates followed similar patterns, where support was found for hypotheses concerning emotions linked to self-agency. Participants induced to feel satisfaction ($M = 76.16$, $SD = 20.10$) reported a significantly higher likelihood of producing the known outcome than participants induced to feel regret ($M = 52.97$, $SD = 29.52$), $t(256) = 5.17$, $p < .001$. The findings for the likelihood estimates are diagrammed in Figure 5. Similarly, participants induced to feel satisfaction ($M = 6.08$, $SD = 1.60$) were significantly more likely to rate the outcome as having been foreseeable than participants induced to feel regret ($M = 4.70$, $SD = 2.02$), $t(256) = 3.38$, $p < .005$. As in Study 1, hypotheses were not supported for emotions linked to circumstances-agency. Indeed, participants in the disappointment conditions ($M = 36.88$, $SD = 27.85$) reported a significantly lower likelihood of obtaining the known outcome than participants in the relief conditions ($M = 61.20$, $SD = 23.57$), $t(256) = 5.39$, $p < .001$.

In Study 2 the question of how appraisals are linked to emotions and to hindsight bias was examined using a recall task instead of a laboratory task. The approach of Study 2 allowed participants' appraisals of the past events to be potentially manipulated by having them think of either situational or behavioral counterfactuals in some conditions, in addition to the original emotion inductions. The purpose of such a manipulation was to examine if the agency of the induced emotional experiences could be increased or decreased. Results

suggested that the thought manipulations were not successful. It may be more difficult to change the agency of an emotional experience once it has been labeled, than to create a frame for an emotional experience before a label is given. This would be an interesting route to travel in future research.

In regards to the appraisals-emotion link, some results did change from Study 1 suggesting that they may have been artifacts of the Study 1 design. I refer to the unexpectedness and expectedness measures. The results of these indirect emotion measures did support predicted hypotheses in Study 2, where participants in the disappointment and regret conditions found their outcomes in that past academic event to be more unexpected and less expected than participants in the regret and satisfaction conditions. Other results, such as the association between agency, or in the case of Study 2, specific agency-associated emotions and participants' ratings of choice, were similar to the results of Study 1. Participants in emotion conditions associated with self-agency, regret and satisfaction, reported perceiving the outcome as more of a choice they had made than participants in the emotion conditions associated with circumstances-agency, disappointment and relief.

More importantly, when it came to hindsight bias, the results of Study 1 were replicated in Study 2 in that hypotheses were only supported for the self-agency conditions. For participants induced to feel emotions associated with self-agency, in the regret and satisfaction conditions, participants reported feeling hindsight bias after satisfaction but not after regret. However, for participants induced to feel emotions associated with circumstances-agency, some hindsight bias was actually displayed by participants in the relief conditions, with participants in the disappointment conditions not showing any hindsight bias.

# CHAPTER 4

## GENERAL DISCUSSION

In my dissertation I endeavored to find introductory evidence of the link between emotions, appraisals, and judgment and decision biases, specifically hindsight bias. One main goal of the two studies presented was to show that the emotions of interest, disappointment, relief, regret, and satisfaction are each linked to a distinct pattern of appraisals. A second main objective was to show that emotions generated and their associated appraisals lead to a characteristic pattern of hindsight bias being exhibited. Different methodologies were used in Studies 1 and 2, and in both studies partial support for my predictions was found.

Study 1 laid the important foundation for examining the relationship between emotions, appraisals, and hindsight bias. The feedback that participants received as well as their perception of how responsible they were for the outcome were manipulated. In terms of the emotion felt, I predicted that participants in the circumstances-agency/negative valence condition would score highest on the disappointment measure and that participants in the circumstances-agency/positive valence condition would score highest on the relief measure. I predicted too that participants in the self-agency/negative valence condition would score highest on the regret measure, and participants in the self-agency/positive valence condition would score highest on the satisfaction measure. The trend seen in the scores of emotions on direct emotion measures fit the predictions made for all emotions, except for relief. However

significant differences were only found between differently valenced emotions rather than an interaction effect between outcome valence and agency. The results on the indirect emotion measures supported hypotheses made for the measure assessing whether participants viewed the outcome as having been a result of choices made. Findings on other indirect emotion measures suggested that participants did not expect to receive a positive outcome on the task they performed.

Concerning hindsight bias effects, the results provided evidence supporting hypotheses made for self-agency, but not for circumstances-agency. When participants felt responsibility for the outcome received, they showed hindsight bias after positive feedback but not after negative feedback. When participants did not feel responsibility for the outcome received, there was no difference in the amount of hindsight bias shown after positive or negative feedback. Initially, I supposed that the chief possible explanations for the lack of support for predictions in the circumstances-agency conditions were that the emotion ratings for participants in the relief condition did not follow the predicted pattern and in addition that participants allotted negative feedback were expecting such an outcome. However, results from Study 2 led to an alteration in this line of thinking.

Study 2 further examined the association between emotions and appraisals, this time with emotions being directly generated first and as in Study 1, hindsight bias being measured. Additionally, in Study 2 an effort was made to change the emotions felt though manipulating the agency of thoughts participants were asked to generate. Evidence of a shift in emotions felt was found for a few conditions, but in general it seemed that once participants were led to think of and articulate a certain emotional experience, there was some difficulty in fully reconceptualizing that experience as having been followed by a different emotion, moreso

than if the thoughts manipulation had been the sole activator of emotion experience recall. Difficulty in emotion switching could be connected too to the minute though significant difference in difficulty of generation of thoughts in different thought agency conditions.

In regards to hindsight bias effects, the results of Study 2 were similar to Study 1 in that support was found only for predictions made for participants in self-agency associated conditions. When participants were induced to feel regret or satisfaction, emotions associated with self-agency, they showed hindsight bias after positive feedback but not after negative feedback. When participants were induced to feel disappointment or relief, emotions associated with circumstances-agency, the hypotheses were not supported, and indeed participants induced to feel disappointment showed an opposite trend to what was expected, a low probability estimate whereas participants induced to feel relief showed hindsight bias. What is worthy of note is that in Study 2 the results of some of the indirect emotion measures were dissimilar to the results of Study 1. In Study 2, participants in the disappointment and relief conditions perceived the outcomes to be more unexpected and less expected than participants in regret and satisfaction conditions. Yet, the hindsight bias patterns were largely similar in both studies, pointing to robustness of the influence on hindsight bias estimates.

*Agency and Hindsight Bias*

Do appraisals of agency affect the hindsight bias people show? There are findings that remain consistent across both Studies 1 and 2 that prompt an affirmative response. In both cases hypotheses were supported for the indirect measure assessing whether or not the outcome was a result of a choice the participant had made. In both studies participants scored higher on this measure of choice if they were in the self-agency or self-agency

associated conditions, and lower if they were in the circumstances-agency or circumstances-agency associated conditions. Additionally, in both cases, the sets of paired conditions, circumstances-agency, and self-agency, which differed consistently and significantly on this measure of choice, differed on the measure assessing hindsight bias.

Participants in the self-agency conditions showed a different pattern of hindsight bias than participants in the circumstances-agency conditions, above and beyond just valence. As proposed, when participants felt responsible for the outcome and it was positive, they perceived that outcome as inevitable. I suggested that they take credit for that success, a notion that has been suggested in prior research (Louie, 1999; Louie et al., 2000) and that would be easily testable in future research in this realm of emotionally driven judgment biases. When participants felt responsible for the outcome and it was negative, they did not perceive that outcome as inevitable. I suggested that instead they deny blame for failure, another testable future hypothesis. Even though the results for the circumstances-agency conditions were not in the predicted direction, the most important and exciting part of the story is that the differential effect of agency on hindsight bias seems to be relieable and ready to be delved deeper into by future research.

It is important to emphasize that the current research is focused on self-relevant outcomes, and specifically the effect of agency within self-relevant outcomes. In this way my dissertation differs from Fischhoff's (1975) work, where the events are not self-relevant to the participants of his studies, and as such self-relevant motivations would not be triggered.

*Agency and Emotion*

Does agency act as a differentiator, along with outcome valence, of the emotions disappointment and relief, and regret and satisfaction? It would appear that the answer to such a question is a "perhaps". The emotion scores followed the trends set forth for different emotion measures, but the results were not significant. However, even though scores on appraisal measures such as unexpectedness, expectedness, going toward, or getting away from the event were not consistent, scores on the measure assessing whether participants felt that the outcome was a result of a choice they had made were consistent. These results suggest that the differences seen in the effects of the pairs of different emotions was at least in part influenced by agency. They suggest too that more research may need to be focused on validating and testing the different types of appraisals said to distinguish emotions in general, specifically focussing on these four emotions. It may be that a hierarchy of appraisals exists. Indeed, it can be acknowledged that given the inconsistent effect of emotion across the studies, it could be the case that any effects following emotion inductions are due overall to manipulated valence. Unlike the clear effect of agency on hindsight bias evidenced in the studies run, it is not clear that there is an effect of emotion, and future research would be needed to shed light on this crucial matter.

Additionally, even the literature suggests that there is some confusion in conceptualizing, articulating, and differentiating similarly valenced emotions. For example, even though after a review of the literature the word "satisfaction" would seem to best match the emotion and appraisal given for "positive regret", other emotion names have been suggested. Some alternative names for regret's positive complement include rejoicing (Connolly & Butler, 2006), pride (Fogel & Berry, 2006), and contentment (Regret, 2006). Even relief is proposed as the name of the counterpart to regret, described by Guttentag and

Ferrell (2004) as being "an emotion that is experienced in situations in which (a) the actual outcome of a course of action is positive or neutral and (b) a possible alternative decision would have resulted in a more negative outcome." It is possible that participants too were somewhat confused when conceptualizing similarly valenced emotions of different agency, especially ones such as relief and satisfaction. This would be an appealing question to investigate in future research. I would recommend qualitative analysis of participants' descriptions of emotional experiences to evaluate exactly what participants envisage when using the different emotion words.

Another question that begs to be asked and answered is whether the agency of the outcome paired with the outcome valence of that outcome leads to the emotion felt only, or can feeling an emotion lead to a certain appraisal being generated as well? Specifying the directionality of these paths is beyond the scope of this dissertation, though findings do suggest that both pathways would work. In Study 2 induction of emotions triggered solely by the emotion words led to distinctive patterns of some indirect emotion ratings. This is another question that future research could look into.

*Colliding: Agency, Emotion, and Hindsight Bias*

I proposed that there is a point where disappointment and regret collide, that point being agency, and that the appraisal, paired with the emotion itself, has an impact on judgmental biases, specifically hindsight bias. The research presented here suggests that yes, there is definitely a collision point, as agency does seem to factor into distinguishing emotions such as disappointment and regret, and relief and satisfaction. It is clear too, however, that the collision described in this dissertation is still being viewed through somewhat murky glasses, and more research is needed to act as the cleansing alcohol wipes.

An intriguing future research question would be how do different degrees of agency affect hindsight bias. It is possible that that is one difference between Study 1 and Study 2, where participants in the circumstances-agency conditions from Study 1 appraised themselves as having more choice in the laboratory task than participants in the circumstances-agency conditions remembering a past event in Study 2. An experiment explicitly manipulating different degrees of choice perception would add some input to this question.

Other questions emerge from this research, one being the reasoning behind the lack of hindsight bias after disappointment in the studies as was hypothesized. More broadly, what is the motivation behind the findings when participants do not feel responsible for the outcome received? In Pezzo and Pezzo's (2007) work, a rationale is suggested where after negative self-relevant outcomes, when that outcome is unexpected, if the sense-making activity looking for external reasons for the outcome fails, it is hypothesized that no hindsight bias would be revealed. It is possible that this is what occurred in both studies, where the responsibility that participants felt for the outcomes received overwhelmed them, making it very difficult to come up with external reasons for their negative outcomes. Reinforcement for this explanation comes from Study 2 where participants found the disappointing outcome to be unexpected and the hindsight bias evidenced dropped even more than in Study 1. Future research could explore this supposition.

*Conclusion*

So, what would former Secretary of State Colin Powell have said if the situation in Iraq had been resolved quickly and with a minimum of bloodshed as White House representatives had assured would be the case? This current research would imply that if all

had worked out as in the best case scenario, he would undeniably be exhibiting hindsight bias. However, if former Secretary Powell had not had such a key role in stirring up support for the troops being deployed to Iraq, and the outcome had still been as negative as it is today, the implications of the current findings are less clear, with more research necessary.

Taken together, the two studies provide a gateway to researching emotions and judgment biases. The present studies demonstrate that emotions and the appraisals linked with them do have an influence on hindsight bias. There is still much work to be done in this area, but it is hoped that this dissertation will provide some of the intial pieces to this huge jigsaw puzzle.

Figure 1.

*Model of Influence of Specific Emotions on Judgment Biases*

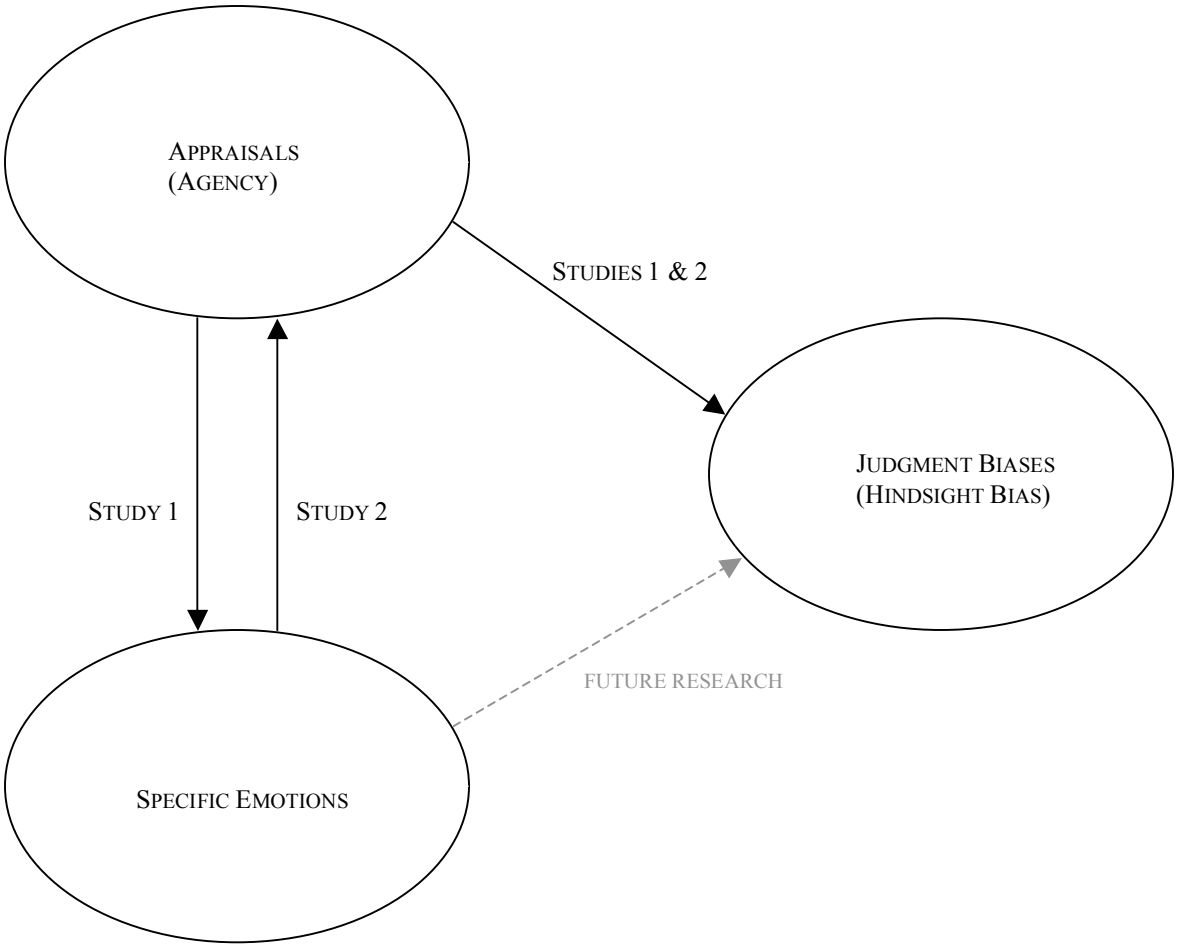


Figure 2.

*Predicted Hindsight Likelihood Estimates for Study 1 & Study 2*

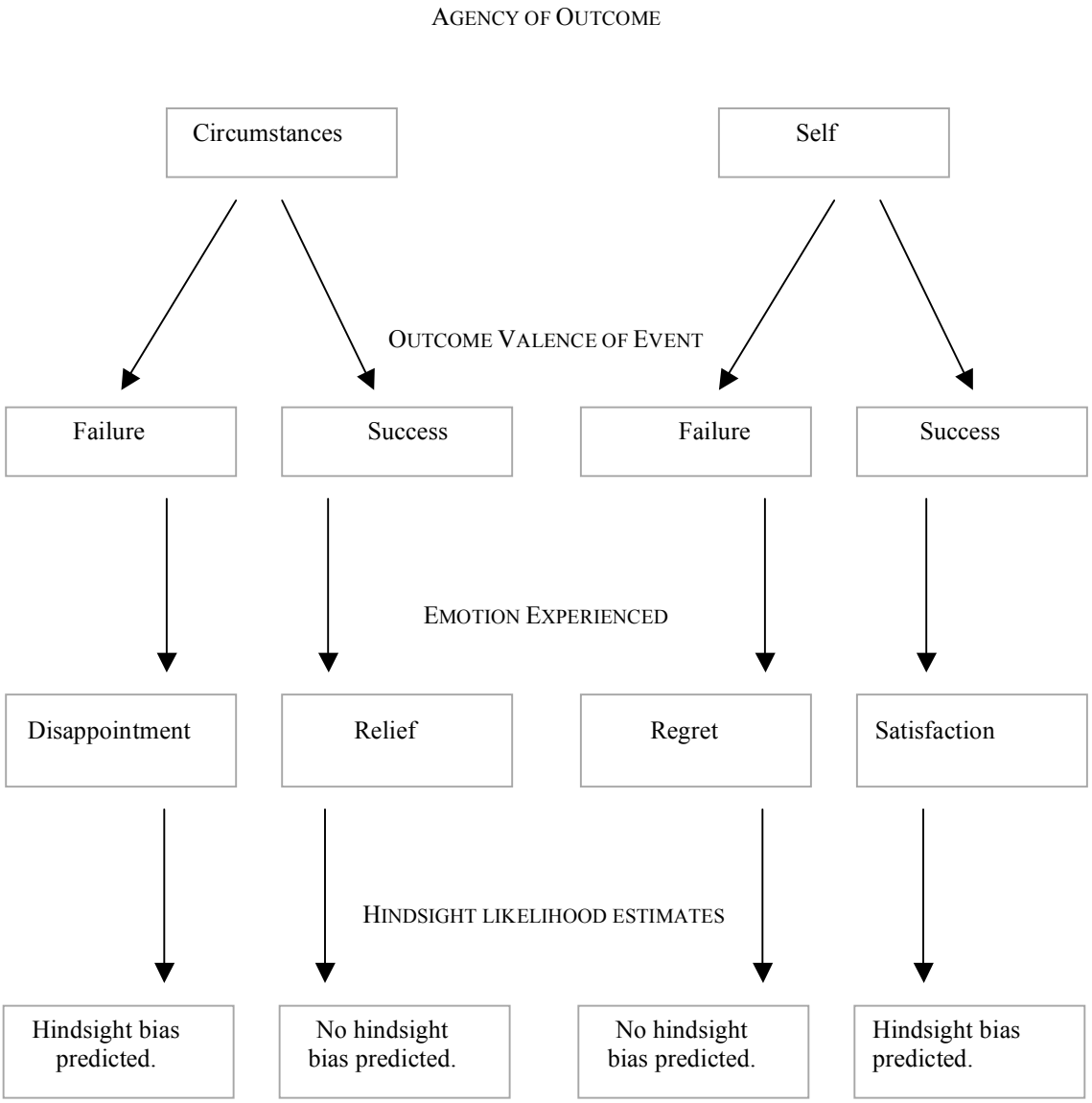
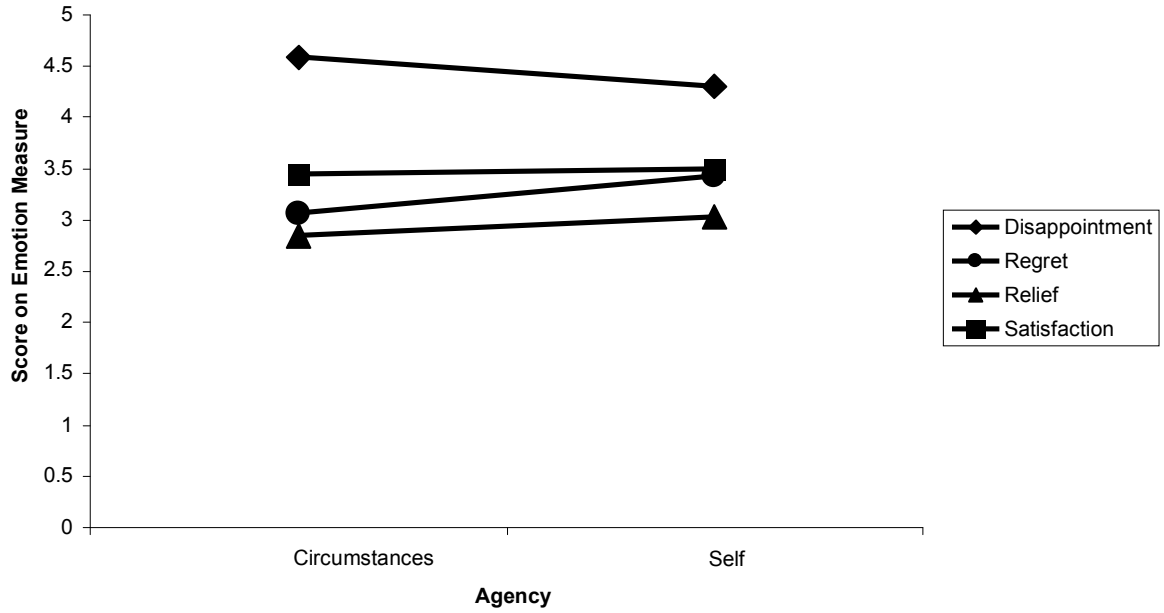


Figure 3.

*Study 1: Individual Ratings of Disappointment, Regret, Relief, and Satisfaction, by Outcome Valence and Agency*

**Negative Outcome Valence Condition**




**Positive Outcome Valence Condition**

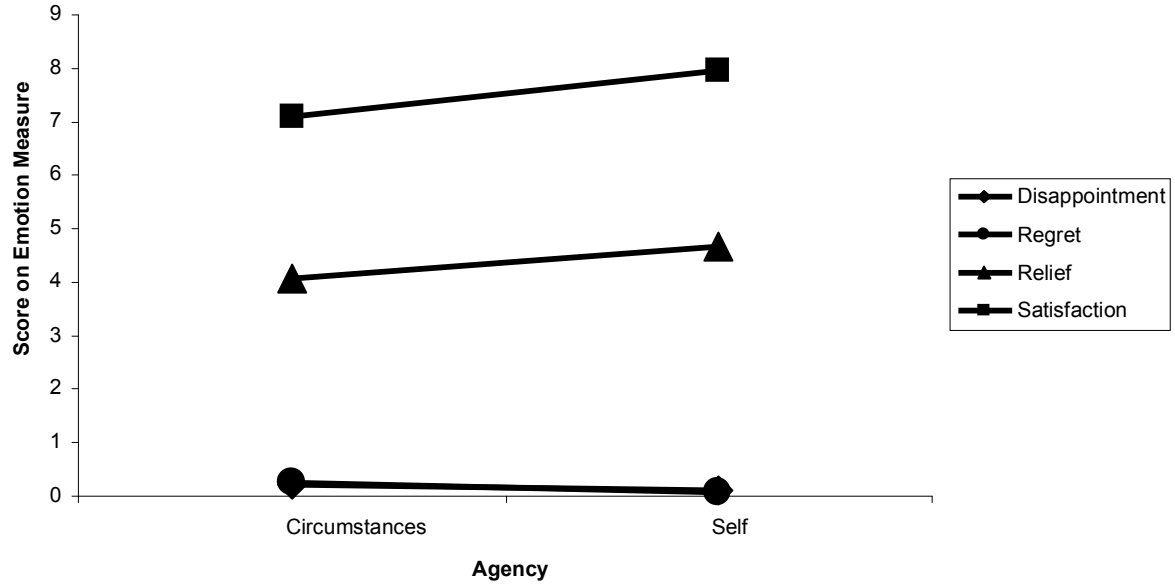


Figure 4.

*Study 1: Estimated Likelihood of Generating a Correct Order, by Outcome Valence and Agency.*

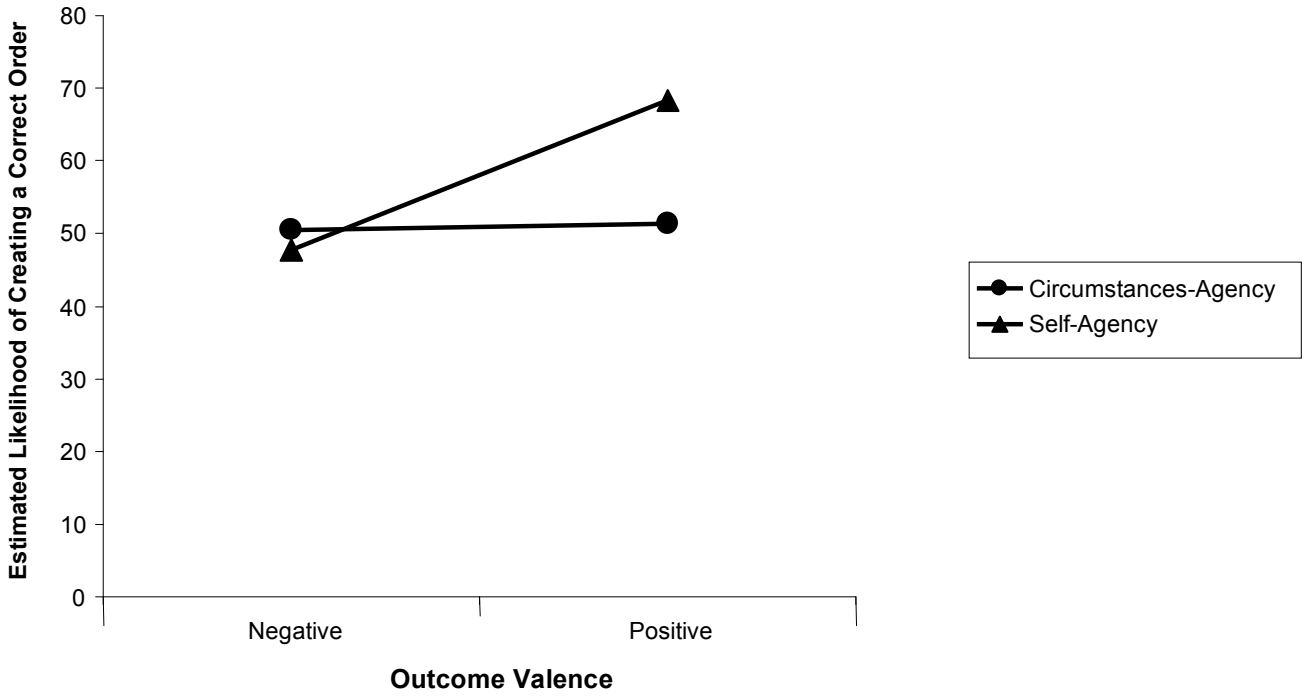


Figure 5.

*Study 2: Estimated Likelihood of Having Received the Known Outcome, by Emotion Induced.*

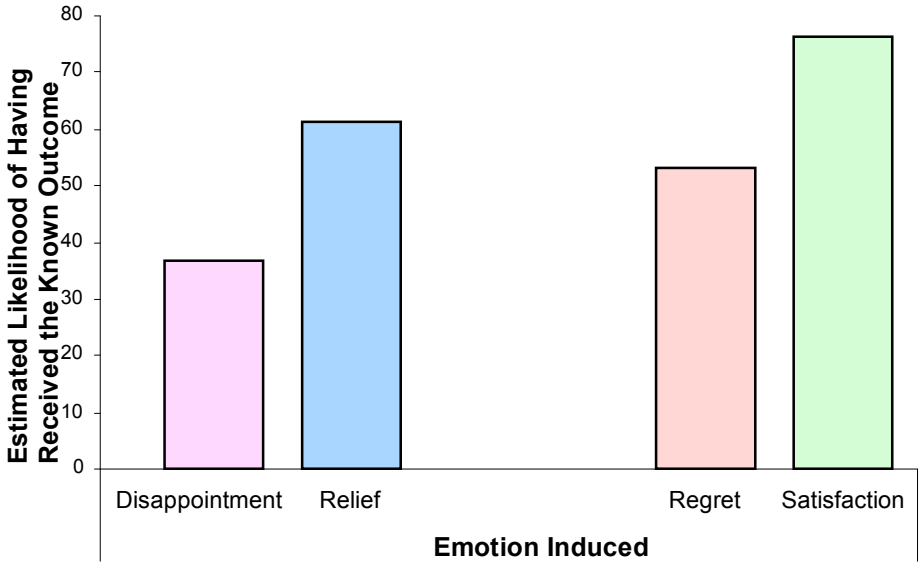


Table 1.

*Study 1: Mean Scores on Four Direct Measures of Disappointment, Regret, Relief, and Satisfaction, by Outcome Valence and Agency Conditions.*

| | Outcome Valence | |
|---|---|---|
| | Negative | Positive |
| Circumstances-Agency | | |
| Disappointment | 4.58 (2.57) | .22 (.80) |
| Regret | 3.06 (2.83) | .26 (1.02) |
| Relief | 2.85 (2.68) | 4.07 (3.19) |
| Satisfaction | 3.45 (2.02) | 7.11 (2.17) |
| Self-Agency | | |
| Disappointment | 4.30 (2.55) | .12 (.43) |
| Regret | 3.43 (3.05) | .08 (.39) |
| Relief | 3.03 (2.28) | 4.65 (3.01) |
| Satisfaction | 3.50 (2.32) | 7.96 (1.48) |

Note: Numbers in parentheses are standard deviations.

Table 2.

*Study 1: Mean Scores on Five Indirect Measures of Disappointment, Regret, Relief, and Satisfaction, by Outcome Valence and Agency Conditions.*

| | Outcome Valence | |
|---|---|---|
| | Negative | Positive |
| Circumstances-Agency | | |
| Expected | 6.30 (1.98) | 4.00 (2.22) |
| Unexpected | 3.30 (2.04) | 4.96 (2.53) |
| Get Away | 2.30 (2.66) | .85 (2.07) |
| Choice | 5.67 (3.19) | 6.26 (2.65) |
| Go Back | 5.12 (3.52) | .11 (.32) |
| Self-Agency | | |
| Expected | 5.23 (1.98) | 5.35 (2.33) |
| Unexpected | 3.97 (1.99) | 4.04 (2.51) |
| Get Away | 2.00 (2.63) | .69 (1.32) |
| Choice | 7.37 (2.53) | 7.88 (1.90) |
| Go Back | 6.13 (2.91) | .00 (.00) |

Note: Numbers in parentheses are standard deviations. "Expected" refers to the measure "To what extent was the outcome expected?"; "Unexpected" refers to the measure "To what extent was the outcome unexpected?"; "Get Away" refers to the measure "To what extent did you feel a tendency to want to get away from the event after you knew the outcome?"; "Choice" refers to the measure "To what extent was the outcome of the event the result of a choice you made?"; and "Go Back" refers to the measure ""To what extent did you feel a tendency to want to go back and change things after you knew the outcome?"

Table 3.

*Study 1: Mean Scores on Three Measures of Hindsight Bias, by Outcome Valence and Agency Conditions.*

| | Outcome Valence | |
|---|---|---|
| | Negative | Positive |
| Circumstances-Agency | | |
| Likelihood Correct | 50.61 (27.04) | 51.33 (25.37) |
| Inevitable | 4.64 (2.62) | 3.11 (2.75) |
| Foreseeable | 6.06 (2.18) | 3.78 (2.29) |
| Self-Agency | | |
| Likelihood Correct | 47.73 (22.80) | 68.42 (20.94) |
| Inevitable | 3.47 (2.61) | 3.85 (3.07) |
| Foreseeable | 5.73 (2.03) | 4.92 (2.56) |

Note: Numbers in parentheses are standard deviations. "Likelihood Correct" refers to the probability estimate participants gave for how likely they thought they were to have been told their order was correct; "Inevitable" refers to the measure "To what extent would you say that the outcome you experienced was inevitable?"; and "Foreseeable" refers to the measure "To what extent would you say that the outcome you experienced was foreseeable?"

Table 4.

*Study 2: Mean Scores on Four Direct Measures of Disappointment, Regret, Relief, and Satisfaction, by Emotion Induced and Thoughts Agency.*

| Emotion Induced/ Thought Agency | Direct Emotion Measure | | | |
|---|---|---|---|---|
| | Disappointment | Regret | Relief | Satisfaction |
| Control/ No Thoughts | | | | |
| | 7.65 (2.26) | 5.88 (2.78) | 1.18 (1.01) | .82 (1.24) |
| Disappointment | | | | |
| Regret | 6.53 (2.62) | 6.00 (2.62) | 3.06 (2.99) | 3.12 (2.59) |
| Relief | 1.56 (2.19) | 1.06 (1.65) | 8.63 (.72) | 8.06 (1.06) |
| Satisfaction | .63 (1.31) | 2.13 (3.10) | 7.88 (1.45) | 8.38 (.72) |
| Circumstances-Agency | | | | |
| | 8.00 (.97) | 4.90 (2.65) | 1.85 (2.01) | 1.70 (1.75) |
| Disappointment | | | | |
| Regret | 7.91 (1.08) | 7.91 (1.03) | 2.22 (2.43) | 1.17 (1.34) |
| Relief | 1.00 (2.68) | 1.33 (1.17) | 8.71 (.69) | 8.33 (.87) |
| Satisfaction | 1.00 (2.32) | 1.30 (2.18) | 7.75 (2.42) | 8.00 (2.00) |
| Self-Agency | | | | |
| | 7.96 (1.62) | 6.00 (2.49) | 2.14 (1.86) | 1.82 (2.09) |
| Disappointment | | | | |
| Regret | 7.50 (1.79) | 6.61 (1.77) | 2.32 (2.28) | 1.96 (2.04) |
| Relief | 1.38 (2.30) | 1.54 (2.23) | 8.08 (1.72) | 7.58 (1.86) |
| Satisfaction | 1.11 (1.60) | 1.19 (1.30) | 8.04 (1.83) | 8.26 (1.09) |

Note: Numbers in parentheses are standard deviations.

Table 5.

*Study 2: Mean Scores on Five Indirect Measures of Disappointment, Regret, Relief, and Satisfaction, by Emotion Induced and Thoughts Agency.*

| | Emotion Induced | | | |
|---|---|---|---|---|
| | Disappointment | Regret | Relief | Satisfaction |
| Control/ No Thoughts | | | | |
| Expected | 3.06 (2.77) | 3.94 (2.38) | 4.69 (1.99) | 5.38 (1.54) |
| Unexpected | 5.82 (2.35) | 4.59 (2.00) | 5.81 (1.56) | 5.13 (2.31) |
| Get Away | 6.76 (2.82) | 5.53 (2.79) | 3.25 (3.19) | 2.56 (2.76) |
| Choice | 5.41 (3.04) | 6.65 (2.64) | 6.63 (2.53) | 6.88 (2.03) |
| Go Back | 7.88 (1.62) | 7.06 (2.93) | 2.06 (2.52) | 1.63 (2.53) |
| Circumstances-Agency | | | | |
| Expected | 2.80 (2.12) | 4.35 (2.79) | 3.79 (2.32) | 5.80 (2.91) |
| Unexpected | 6.10 (1.68) | 3.96 (2.57) | 5.46 (2.69) | 4.35 (2.74) |
| Get Away | 6.55 (1.93) | 7.09 (1.59) | 2.50 (3.01) | 2.05 (3.03) |
| Choice | 3.95 (2.28) | 7.57 (2.11) | 6.75 (1.87) | 7.15 (2.70) |
| Go Back | 7.25 (1.80) | 8.09 (1.34) | 2.54 (2.06) | 2.15 (2.92) |
| Self-Agency | | | | |
| Expected | 3.79 (2.20) | 5.54 (2.44) | 4.96 (2.16) | 6.52 (1.40) |
| Unexpected | 5.61 (2.28) | 4.32 (2.76) | 4.88 (2.49) | 3.78 (2.45) |
| Get Away | 6.11 (2.38) | 6.57 (1.89) | 2.50 (3.20) | 2.52 (2.81) |
| Choice | 5.50 (2.51) | 6.75 (2.26) | 7.25 (1.67) | 7.81 (.96) |
| Go Back | 7.68 (1.68) | 7.82 (1.61) | 2.25 (2.72) | 2.11 (2.65) |

Note: Numbers in parentheses are standard deviations. "Expected" refers to the measure "To what extent was the outcome expected?"; "Unexpected" refers to the measure "To what extent was the outcome unexpected?"; "Get Away" refers to the measure "To what extent did you feel a tendency to want to get away from the event after you knew the outcome?"; "Choice" refers to the measure "To what extent was the outcome of the event the result of a choice you made?"; and "Go Back" refers to the measure ""To what extent did you feel a tendency to want to go back and change things after you knew the outcome?"

Table 6.

*Study 2: Mean Scores on Three Measures of Hindsight Bias, by Emotion Induced and Thoughts Agency.*

| | Emotion Induced | | | |
|---|---|---|---|---|
| | Disappointment | Regret | Relief | Satisfaction |
| Control/ No Thoughts | | | | |
| Likelihood Known | 34.71 (25.40) | 46.88 (28.34) | 59.69 (23.84) | 72.81 (22.43) |
| Inevitable | 2.53 (2.24) | 3.76 (2.59) | 4.06 (2.20) | 3.56 (2.13) |
| Foreseeable | 3.24 (1.82) | 4.76 (2.02) | 4.63 (1.89) | 5.38 (1.67) |
| Circumstances-Agency | | | | |
| Likelihood Known | 33.10 (26.44) | 51.96 (26.83) | 61.46 (23.01) | 78.60 (19.59) |
| Inevitable | 3.60 (2.04) | 3.35 (2.21) | 2.92 (2.53) | 3.40 (2.60) |
| Foreseeable | 3.30 (1.75) | 4.74 (2.78) | 4.42 (2.25) | 6.30 (1.75) |
| Self-Agency | | | | |
| Likelihood Known | 40.89 (30.55) | 57.50 (32.47) | 61.96 (24.90) | 76.33 (19.53) |
| Inevitable | 3.43 (2.08) | 3.46 (2.59) | 3.04 (2.40) | 3.63 (2.15) |
| Foreseeable | 4.21 (2.23) | 5.07 (2.31) | 5.04 (1.92) | 6.33 (1.24) |

Note: Numbers in parentheses are standard deviations. "Likelihood Known" refers to the probability estimate participants gave for how likely they thought that the outcome was to have occurred; "Inevitable" refers to the measure "To what extent would you say that the outcome you experienced was inevitable?"; and "Foreseeable" refers to the measure "To what extent would you say that the outcome you experienced was foreseeable?"

# APPENDIX A: STUDY 1

Initial Instructions to All Participants

**ID #:**
(On the desk in front of you)

## Making Judgments!

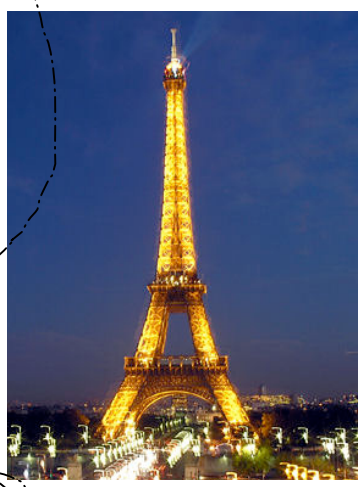
**Welcome to our experiment and thanks for participating.**

We are conducting a study to see how people make real-life decisions such as how much different items cost and whether or not to purchase those items.

In this particular experiment, we will ask you to make judgments about the prices of certain items, specifically plane ticket prices, and to put these items in the order asked for. You will then be asked a series of questions about your reactions to this event.

Continue

# Wish you were traveling right now?



Traveling the world, seeing new things, meeting new people…what can compare? Maybe you are a seasoned world traveler, or maybe you have not yet been outside of North Carolina; whatever the case, summer is coming, and with it the opportunity to go somewhere!!

Imagine that you are thinking of taking a trip this summer by yourself or with friends. There are so many possible places to see, so many potential destinations that you could potentially visit. How do you choose where to go?

Usually it comes down to the budget. Where do you think you can afford to go? How much do you think the plane tickets will cost?

Continue

Start:

In this experiment we will ask you place 5 potential destinations in order of plane ticket price, the average price of a round-trip ticket from Raleigh-Durham International Airport to that destination.

You will create two different orders, each descending from 5, the most expensive location, to 1, the least expensive location. These orders will be your two best guesses, and different from each other.

The experimenter will look at and evaluate both orders, but only one will count, one that will be randomly chosen for you. This order will be the submitted one.

**Participants whose submitted order is correct will be entered into a drawing for $35.**

Continue

Please put your order numbers in the spaces given below. The two guesses you give should be different from each other. When you are finished, please continue on to the next page to see which order has been randomly chosen to be submitted for you, then give this questionnaire to the experimenter.

| **Order #1:** | **Order #2:** |
|---|---|
| **5 = Most Expensive**<br>**1 = Least Expensive** | **5 = Most Expensive**<br>**1 = Least Expensive** |
| | |
| ☐ Paris, France | ☐ Paris, France |
| ☐ Bridgetown, Barbados | ☐ Bridgetown, Barbados |
| ☐ Bangkok, Thailand | ☐ Bangkok, Thailand |
| ☐ Stockholm, Sweden | ☐ Stockholm, Sweden |
| ☐ Puerto Vallarta, Mexico | ☐ Puerto Vallarta, Mexico |

Continue

**Experimenter Only**

**Submitted:**

(Unsubmitted: )

**<u>Order #2</u>** has been randomly chosen to be submitted.

Order #1 will be evaluated too but will not count.


**Please turn this document in to the experimenter once you reach this point.**

Agency Manipulation & Task: Self-Agency

Start:

In this experiment we will ask you place 5 potential destinations in order of plane ticket price, the average price of a round-trip ticket from Raleigh-Durham International Airport to that destination.

You will create two different orders, each descending from 5, the most expensive location, to 1, the least expensive location. These orders will be your two best guesses, and different from each other.

The experimenter will look at and evaluate both orders, but only one will count, one that you will choose. This order will be the submitted one.

**Participants whose submitted order is correct will be entered into a drawing for $35.**

Continue

Please put your order numbers in the spaces given below. The two guesses you give should be different from each other. When you are finished, please continue onto the next page to choose the order to be submitted, then give this questionnaire to the experimenter.

| **Order #1:** | **Order #2:** |
|---|---|
| **5 = Most Expensive**<br>**1 = Least Expensive** | **5 = Most Expensive**<br>**1 = Least Expensive** |
| | |
| ☐ Paris, France | ☐ Paris, France |
| ☐ Bridgetown, Barbados | ☐ Bridgetown, Barbados |
| ☐ Bangkok, Thailand | ☐ Bangkok, Thailand |
| ☐ Stockholm, Sweden | ☐ Stockholm, Sweden |
| ☐ Puerto Vallarta, Mexico | ☐ Puerto Vallarta, Mexico |

Continue

**Experimenter Only**

**Submitted:**

(Unsubmitted: )

Which order do you choose to be submitted? Circle your choice.

**Order #1**

**Order #2**


**Please turn this document in to the experimenter once you reach this point.**

Outcome Valence Manipulation

*Failure:*

**Submitted: Incorrect**

(Unsubmitted: Correct)

*Success:*

**Submitted: Correct**

(Unsubmitted: Incorrect)

Items Measured

## Event Questions

Keeping the task you just completed in mind, please answer the following questions about your reactions to this event. Circle the number that corresponds to your response.

1. To what extent was the outcome negative?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Negative | | | | | | | | | Very Negative |

2. Which 1 word listed below best describes how you feel in reaction to your outcome in this task? (Please underline one)

| | |
|---|---|
| Disappointed | Fearful |
| Angry | Relieved |
| Satisfied | Happy |
| Sad | Regretful |

3. To what extent was the outcome positive?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Positive | | | | | | | | | Very Positive |

4. Which face(s) listed below best express your reaction to your outcome in this task? (Circle all that fit)

5. To what extent were you fearful after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Fearful | | | | | | | | | Very Fearful |

6. To what extent were you disappointed after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Disappointed | | | | | | | | | Very Disappointed |

7. To what extent were you angry after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Angry | | | | | | | | | Very Angry |

8. To what extent was the outcome expected?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Expected | | | | | | | | | Very Expected |

9. Think back to right before you were given feedback on your ordering. If someone had asked you at that point how likely you were to get the feedback that your submitted order was correct, what would you have said?
Give a percentage ranging from 0% to 100%, where 0% would mean "*I thought there was no chance of it being correct*," and 100% would mean "*I thought it would definitely be correct*."

_____%

10. To what extent were you happy after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Happy | | | | | | | | | Very Happy |

11. To what extent were you regretful after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Regretful | | | | | | | | | Very Regretful |

12. To what extent would you say that the outcome you experienced was inevitable?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Inevitable | | | | | | | | | Very Inevitable |

13. To what extent was the outcome unexpected?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Unexpected | | | | | | | | | Very Unexpected |

14. To what extent would you say that the outcome you experienced was foreseeable?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Foreseeable | | | | | | | | | Very Foreseeable |

15. To what extent did you want to get away from the event after you knew the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Wanting to Get Away | | | | | | | | | Very Much Wanting to Get Away |

**FINISHED**
**Please turn this document in to the experimenter.**
**Thank you for your time.**

# APPENDIX B: STUDY 2

Initial Instructions to All Participants

# Life Experiences

**Welcome to our experiment and thanks for participating.**

We are conducting a study to see if people's recollections of past events are impacted by how they have been socialized. This is a collaborative research effort between researchers in universities across the country.

In this particular experiment, we will ask you to recall a particular past event and then to answer questions about your reactions to it. We ask that you describe the event you are recalling in as much detail as you can, and try to imagine yourself in the situation as if it were actually occurring to you at this moment.

We ask that you not rush through this task.

Emotion Manipulation

*Disappointment:*

**We want you to recall a past experience that happened within the last three years. Specifically we want you to recall an exam experience you have had where you felt disappointment after you found out the outcome.**

Please use the space given below and on the next page if needed to describe this event when you felt disappointment. Be vivid and detailed enough so that a reader experiences the event in the same way that you did.

*Relief:*

**We want you to recall a past experience that happened within the last three years. Specifically we want you to recall an exam experience you have had where you felt relief after you found out the outcome.**

Please use the space given below and on the next page if needed to describe this event when you felt relief. Be vivid and detailed enough so that a reader experiences the event in the same way that you did.

*Regret:*

**We want you to recall a past experience that happened within the last three years. Specifically we want you to recall an exam experience you have had where you felt regret after you found out the outcome.**

Please use the space given below and on the next page if needed to describe this event when you felt regret. Be vivid and detailed enough so that a reader experiences the event in the same way that you did.

*Satisfaction:*

**We want you to recall a past experience that happened within the last three years. Specifically we want you to recall an exam experience you have had where you felt satisfaction after you found out the outcome.**

Please use the space given below and on the next page if needed to describe this event when you felt satisfaction. Be vivid and detailed enough so that a reader experiences the event in the same way that you did.

Thought Manipulation (Agency)

*Circumstances-agency (for Disappointment and Regret Emotion Manipulation Conditions):*

In the spaces provided below, please list 5 ways the situation could have been different that would have led to a *better* outcome occurring.

1. There could have _____.
2. There could have _____.
3. There could have _____.
4. There could have _____.
5. There could have _____.

*Circumstances-agency (for Relief and Satisfaction Emotion Manipulation Conditions):*

In the spaces provided below, please list 5 ways the situation could have been different that would have led to a *worse* outcome occurring.

1. There could have _____.
2. There could have _____.
3. There could have _____.
4. There could have _____.
5. There could have _____.

*Self-Agency (for Disappointment and Regret Emotion Manipulation Conditions):*

In the spaces provided below, please list 5 different choices you could have made that would have led to a *better* outcome occurring.

1. I could have _____.
2. I could have _____.
3. I could have _____.
4. I could have _____.
5. I could have _____.

*Self-Agency (for Relief and Satisfaction Emotion Manipulation Conditions):*

In the spaces provided below, please list 5 different choices you could have made that would have led to a *worse* outcome occurring.

1. I could have _____.
2. I could have _____.
3. I could have _____.
4. I could have _____.
5. I could have _____.

# Items Measured

## Life Event Questions

**Keeping the event you just described in mind, please answer the following questions about your reaction to this event:**

1. Think back to a time before you knew the outcome of the exam.

   If someone had asked you at that point how likely you were to perform badly on the exam, what would you have said? Give a percentage ranging from 0% to 100%, where 0% would mean "I thought there was no chance of it turning out *badly/well*," and 100% would mean "I knew it would definitely turn out *badly/well*."

   _____%

2. To what extent were you happy after the outcome?

   0 1 2 3 4 5 6 7 8 9

   Not at all Happy — Very Happy

3. To what extent were you regretful after the outcome?

   0 1 2 3 4 5 6 7 8 9

   Not at all Regretful — Very Regretful

4. How much was the outcome of the event the result of a choice you made?

   0 1 2 3 4 5 6 7 8 9

   Not at all A Result — Very much A Result

5. To what extent were you satisfied after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Satisfied | | | | | | | | | Very Satisfied |

6. To what extent was the outcome unexpected?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Unexpected | | | | | | | | | Very Unexpected |

7. To what extent were you sad after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Sad | | | | | | | | | Very Sad |

8. How responsible did you feel for the outcome of the event?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Responsible | | | | | | | | | Very Responsible |

9. To what extent were you relieved after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Relieved | | | | | | | | | Very Relieved |

10. To what extent did you want to go back and change things after you knew the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Wanting to Change | | | | | | | | | Very Much Wanting to Change Things |

11. To what extent would you say that the outcome you experienced was inevitable?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Inevitable | | | | | | | | | Very Inevitable |

12. How much control did you have over the outcome of the event?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all In Control | | | | | | | | | Very In Control |

13. To what extent would you say that the outcome you experienced was foreseeable?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Foreseeable | | | | | | | | | Very Foreseeable |

14. To what extent did you want to get away from the event after you knew the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Wanting to Get Away | | | | | | | | | Very Much Wanting to Get Away |

15. To what extent was the outcome negative?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Negative | | | | | | | | | Very Negative |

16. To what extent were you fearful after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Fearful | | | | | | | | | Very Fearful |

17. To what extent were you disappointed after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Disappointed | | | | | | | | | Very Disappointed |

18. To what extent was the outcome positive?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Positive | | | | | | | | | Very Positive |

19. To what extent were you angry after the outcome?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Angry | | | | | | | | | Very Angry |

20. To what extent was the outcome expected?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Not at all Expected | | | | | | | | | Very Expected |

21. *(Only for thought manipulation conditions)* You were asked to list 5 thoughts about the past event described that could have led to a different outcome. To what extent was it difficult or easy to generate those 5 thoughts?

| -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| Difficult to Generate | | | | | | | | Easy to Generate |

**Please turn in both sections to the experimenter once you are finished.**

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