Running Head: PLANNING FALLACY

The Incidental Effects of Sadness on the Planning Fallacy

William V. Mangan III

Carnegie Mellon University

Abstract

The planning fallacy is a judgment bias in which people underestimate the time it takes to compete a task, even though they are aware that similar projects have taken longer than what they currently estimate (Kahneman & Tversky, 1979). Determinants of time estimation hinge on one's depth of processing and sense of uncertainty regarding the task (Griffin, et al., 1990); two domains that are relevant to the experience of sadness. Combined with evidence that incidental emotions carry over to affect normatively unrelated scenarios (Lerner, & Loewenstein, 2003), it is posited that sadness will have an effect in time estimations. Specifically, it is hypothesized that sadness will attenuate the planning fallacy because of its tendency to encourage systematic thought. The present study randomly divided participants into either a sadness or neutral condition and asked them to estimate how long it would take to complete a formatting task on the computer. It then asked participants to complete the task. Results replicated the planning fallacy but did not support the hypothesis of a sadness carry-over effect. The discussion considers limitations of the present study and proposes future directions.

The Incidental Effects of Sadness on the Planning Fallacy

People make decisions daily involving time estimation issues. For instance, we must estimate the time it takes to drive into work every morning; and we determine the amount of time it takes to complete tasks at work. Given that everybody makes many such decisions on a daily basis, one would imagine that our estimations become relatively well calibrated. However, we can see that this is often not the case. For instance, students often underestimate the amount of time it takes to finish homework assignments – leading to the popular college culture of "pulling all-nighters" and doctor's offices often have an overflow of patients in the waiting room because they over-book their schedules. Mostly, judgments of completion time are underestimated. Indeed, management books even recognize the highly pervasive effects of time underestimation: the "laws of project management" state, "A carelessly planned project will take three times longer to complete than expected; a carefully planned project will take only twice as long (Pfleeger, 1991, p. 41, as cited by Byram, 1997).

Even though time judgments are consistently flawed in individual decision-making, one might think that group decision-making and large-scale decision contexts would be free of such biases. However, against such intuition, history reveals a long list of documented mistakes regarding bad judgments of time estimation, resulting in serious consequences. For instance, the channel tunnel (Chunnel) to connect London and Paris was finally completed in May of 1994, even though initial estimates planned on it being completed in June 1993. The cost rose to over 10 million pounds, immensely more than the estimated 4.9 million pounds. Perhaps the most salient example is the case of the construction of the Sydney Opera House, where construction lasted 6 years longer than predicted, at a cost almost $100 million over budget (Hall, 1980).

Kahneman and Tversky (1979) first empirically researched this phenomenon, and they labeled it the “planning fallacy”: a judgment bias in which individuals underestimate the time it takes to complete a task – even when they know that similar projects in the past have taken longer than what they currently estimate. People rarely seem to be able to correctly calibrate subsequent estimates. Since the initial study, it has been experimentally recorded in a diverse array of judgments: how long senior honors theses would take to complete (Buehler, Griffin & Ross, 1994), waiting in line for gas (Konecni & Ebbesen, 1976), and walking specified distances (Burt & Kemp, 1994).

More generally, Byram (1997) offers three general explanations for time underestimation: bounded ability to think of surprises, inability to incorporate probabilistic reasoning correctly, and the planning fallacy. Therefore, time estimation is the super ordinate problem, with the planning fallacy being one of the postulated theories as to why time underestimation occurs. While the first two offer cognitive explanations for time underestimation, the planning fallacy serves as an affective/motivational mechanism. Most generally, the planning fallacy is an optimistic bias where individuals tend to focus too much “internally” – meaning people think too much about the case at hand, without truly updating their estimates based on prior, similar tasks (Kahneman & Tversky, 1979).

Kahneman and Lovallo (1991) expounded upon this idea, labeling the errors in judgment as “isolation errors”, where people base their judgments on scenarios of success in the future, without taking into account past failures or possibilities of delays. Beuhler, Griffin, and Ross (1994) found empirical support by demonstrating that people do, in fact, focus too much on successful situations. It was posited that ego involvement is a driving force in such optimistic thought. The optimism was mitigated when subjects were asked to focus on past experiences

and asked to think about hypothetical examples of problems that could have occurred in those previous situations that could also affect the current task at hand.

Not all evidence, however, is consistent with the Beuhler et al. (1994) findings. Based on the above theory, time estimates should be less biased when predicting the time it will take somebody else to complete a task (observer point of view). While this position is supported in Beuhler et al. (1994) using a computer assignment and again in estimation of completing tax returns in Newby-Clark (2005), two other studies show conflicting results. Byram (1997) revealed no difference between actors and observers in estimating how long it would take to assemble a computer stand. Similarly, Hinds (1999) found no actor-observer difference in judging the completion time of a cell phone task (Study 1) or a Lego building task (Study 2).

Roy, Christenfeld, and McKenzie (2005) argued that, because ego involvement cannot be solely responsible for time underestimation (otherwise, estimates for the observer would not be as biased as for the actor); there must be another mechanism at least partially responsible for the systematic error in time estimation. Unlike the Beuhler et al. (1994) theory that people focus solely on positive, forward-looking scenarios, an updated theory must be able to reconcile the fact that actors and observers both consistently underestimate completion times. They argued that people do, in fact, use their memory; but they incorrectly use their memory – people think that past situations took a shorter time than they truly did.

Roy et al. (2005) also reasoned against Buehler et al. (1994) in several ways. First, optimistic time estimations are systematic in nature, they are not just callously wrong in their judgment; suggesting some sort of calibration that is systematically wrong. Also, they discredit think-aloud protocols for determining what participants are focusing on by arguing that one's tendency to think back to prior events is so basic and natural, that stating such steps would not be

necessary in an experimental session. Either way, Roy et al. (2005) were careful to point out that neither theory was necessarily right or wrong; they could be mutually exclusive ideas.

While the aforementioned studies have disagreements over the processing effects and how exactly memory is used, they do share the idea that corrections of the planning fallacy can be made by focusing on comparing the current situation to other similar situations rather than focusing on information relating solely to the current task. Kahneman and Tversky (1979) labeled this as distributional versus singular perspectives. This is consistent with the finding of (Arkes et al., 1988) that people will primarily develop one representation of a given problem and not make any deviations from it when making predictions about that situation. However, not all evidence points to the same strategy for improving time estimation judgments.

Specifically, a few studies have been done demonstrating that a more thorough inspection of solely the task at hand can lead to improved judgments. Griffin, Dunning, and Ross (1990) demonstrate that people make overconfident predictions because they do not sufficiently take into account the situational constraints and uncertainties dealing with the current judgment situation that can affect their estimates. When participants in manipulated conditions were forced to account for some of these uncertainties, their overconfidence was reduced. This study is interesting because, while most of the prior studies made a distinction between singular (current situation) versus distributional (past circumstances) and suggested that people do not take nearly enough of an outside perspective, this study shows that more singular thinking can improve judgments.

Kruger and Evans (2004) also provide evidence that people do not think enough about the given situation. Over four different experiments, participants were asked to give an estimate of how long it would take to complete a task. While half were directed to just make their time

estimate, the other half of them were first asked to "unpack" the event into its multiple subcomponents. For instance, in estimating the time it would take to shop during the holiday season, the "unpack" group was first asked to list out all those whom they had to buy for and list the stores to which they would go before providing the estimate for when they would finish the shopping. Across all experiments, there was resounding evidence that those that "unpacked" the given task gave more reasonable time estimates, thus reducing the planning fallacy.

Strong empirical evidence has successfully documented the time underestimation phenomenon, but research into its mitigation is surprisingly limited. Moreover, the research that has attempted to debias time predictions is largely inconclusive (Roy, Christenfeld, & McKenzie, 2005). Byram (1987) conducted five studies trying different techniques, with none of them effectively eliminating biases in time estimation. The current study attempts to find another method of mitigating the time underestimation bias by focusing on the planning fallacy. Specifically, it combines the study of the planning fallacy with the growing body of evidence demonstrating the effects that emotions have on people's judgments. This study investigates the effects of sadness on time estimation.

Emotion in Judgment and Decision Making

A growing body of literature has demonstrated that affect can alter people's judgments and decisions (Loewenstein & Lerner, 2003). Furthermore, Lerner and Keltner (2000) developed the Appraisal Tendency Framework (ATF), which is an emotion-specific theory of how judgments can be affected by emotions carrying over to affect normatively unrelated situations. This tendency has been documented in a wide variety of domains: perceptions of likelihood (DeSteno et al., 2000), risk perceptions (Lerner & Keltner, 2001), and economic transactions (Lerner, Small, & Loewenstein, 2004). Central dimensions typifying each emotion

will characterize the individual's construal of the normatively unrelated situation, thus providing specific predictions of behavior for specific emotions.

The ATF is a composite of two broad approaches, functional (evolutionary) theories of emotion and cognitive appraisal theories. The functional approach states that emotion elicitation is a signal to draw the body's cognitive and physiological components into a coordinated effort to deal with that which evoked the emotion in the first place (Frijda, 1986). Cognitive appraisal theories, represented by Smith and Ellsworth (1985), demonstrates that emotions vary on a continuum of six different dimensions, with each emotion uniquely characterized by which dimensions are most pertinent to the person's response to the eliciting incident.

Sadness. Sadness is characterized by situational control and uncertainty (Smith & Ellsworth, 1985). According to the appraisal tendency framework, it follows that people in a sad condition would perceive events through the lens of situational control and uncertainty. The implications from this are that sad people should process information more systematically compared to those in a neutral emotion condition. This effect has been demonstrated robustly in the form of various scenarios: systematic processing of persuasive messages (Tiedens & Linton, 2001), a lesser dependency on stereotypes (Park & Banaji, 2000; Bodenhausen et al., 1994), and systematic processing of policy choices (Small & Lerner, 2006). From a functional perspective, people in a sad condition want to change from or reduce the negative so they participate in systematic processing so as to find a way of reducing that sadness (Bless et al. 1990).

Sadness and Time Estimation

The theoretical question this paper seeks to resolve is whether sadness carries over to affect normative unrelated judgments in the domain of time estimation. Specifically, it is posited that sadness will mitigate the planning fallacy. However, this paper does not predict a specific

mechanism through which this bias attenuation occurs. Instead, evidence is reviewed and synthesized to draw together a few possible mechanisms that would warrant empirical investigation in the future.

First possible mechanism: uncertainty appraisals

With robust results demonstrating that sadness is characterized by uncertainty, coupled with the work of Griffin, Dunning, Ross (1990) showing that manipulating people into thinking about more of the uncertain situations causes improved judgment accuracy, the systematic processing of sadness aimed at uncertainty will cause people to think more of the uncertainties of the current scenario, thus reducing the bias. The same prediction would be made based on the data from Kruger and Evans (2004): if unpacking scenarios into various subcomponents causes an improvement in judgment accuracy and sadness causes more systematic thought; then it could follow that sad people thinking naturally unpack the situation more than they would otherwise.

Second possible mechanism: memory

While the literature is still quite undecided about the true role of memory in time estimation, the stated hypothesis can still remain consistent through the perspective of either camp discussed earlier. The fact that sadness predisposes people to uncertainty (Smith & Ellsworth, 1985) could lead subjects to think more about scenarios that are less optimistic, attenuating the bias discussed by Beuhler et al. (1994). On the other hand, because sadness induces less heuristic thought (Bodenhausen et al., 2004), it is possible that sadness can mitigate the bias discovered by Roy, Christenfeld, and McKenzie (2005) that people just simply use incorrect representations of prior events of similar nature.

Third possible mechanism: associative networks

One stream of research into the mechanisms that cause people's judgment to be affected by emotion is evidence demonstrating affective associative networks (Forgas, 1995), with other theorists postulating that these networks could be emotion specific (Halberstadt & Niedenthal, 1997). In fact, Lerner and Tiedens (2006) add another level of granularity to this idea by stating that these emotion-specific networks could even contain those appraisal themes specific to that emotion. On the basis of these theories, it is possible that, if sad people have sad events (with uncertainty appraisals) most salient in their head, then their judgments of time estimation will be longer because the information from which they are basing their decision is less optimistic that it would be in a neutral condition. On a related but still distinct note, Schwarz and Clore (1983) argue that emotions can directly inform the decision-maker about how a judgment or decision should be made.

Fourth possible mechanism: motivation

The motivational mechanism can also explain a reduction in the planning fallacy due to the effects of sadness. Negative moods have a tendency to influence the person to take part in "mood repair" activities (Isen & Geva, 1987; Isen, Nygren, Ashby, 1988, as cited in Lerner and Tiedens, 2006). Those in a sad condition will process systematically because of the motive to find that which has caused the sadness and fix it, though Wegener and Petty (1994) point out that such a search will not be done if the person thinks that more thinking will only exacerbate that negative feeling.

Method

Participants

Sixty-six undergraduate and graduate students (34 males and 32 females) from Carnegie Mellon University participated in the study. After responding to one of the fliers found on

campus, each was scheduled by email as to when they would come to the lab. Each was paid $7 to participate in a "study about decision making" lasting one hour in total. Data could only used for 42 people, however, due to eligibility requirements. Students were excluded from participating in the study if they had previously participated in two other emotion studies at Carnegie Mellon University. The rationale for this criterion was that debriefing procedures after emotion studies reveal the hypothesis of the experiment and the goal of the induction procedure, which leads to an ineffective manipulation of emotion in subsequent experiments. In addition, students are excluded if they do not meet the basic eligibility requirements: they must be at least 18 years of age and a proficient English speaker.

Design

This study utilized a one factor, 2-level, between subjects design. After completing baseline measures, each participant was randomized to either the sadness or neutral condition. Subsequently, each participant received the same dependent measures. They were given a hardcopy of a fully formatted Word document (taking the form of dictionary definitions) and asked how long it would take them to take a completely non-formatted version (which was being shown on the computer screen) and make it look exactly like the fully formatted one passed to them in hardcopy by the experimenter. Therefore, the two primary measures were how long they estimated the task to take and how long it actually took them to complete the task.

Procedure

Upon entering the lab, each was asked to take a seat at one of the cubicles in the room and directed to read and sign the consent form sitting on their desk. They were next asked to complete a fluency test, which was graded on the spot by the experimenter to ensure that each participant was eligible to continue.

So as to keep the participants from guessing the hypothesis, the experimenter continued by explaining that the study actually encompassed two different experiments put together into one study for ease and efficiency. They were first told that they would be participating in a thought and imagination study where they would first have to fill out a few surveys followed by a movie clip. Then, they would complete the second experiment (a decision task).

Participants completed two surveys, the first being a self-enhancement measure developed by Taylor and Gollwitzer (1995). On a survey labeled "How I See Myself", participants were asked to respond on a scale from 1 (much worse than the average student of my age and gender) to 7 (much better than the average student of my age and gender). The second was a need for cognition survey developed by Cacioppo, Petty, and Kao (1984), where participants were asked to respond on a range from 1 (extremely uncharacteristic) to 5 (extremely characteristic). After these were completed, they filled out a baseline emotion survey, which would be compared with another emotion survey given after the manipulation to ensure proper manipulation of the independent variable. Both clips have been extensively studied in prior emotion research, and so it was not thought necessary to re-establish content validity of the emotion manipulation in the present study.

Participants were then randomly assigned to one of two conditions: sadness or neutral. Standard procedures for emotion induction (Gross & Levenson, 1995; Lerner, Small, & Loewenstein, 2004) where implemented. Each computer station had a video clip cued up before the participants entered the experiment. When it was time for the induction, the experimenter put a piece of paper on each desk and instructed them to turn the piece of paper over after the video clip was over and complete the task on the sheet. The sheet was a writing task designed to more thoroughly engross the participants in their induced emotion condition. Those in the

sadness condition watched a clip of a boxer dieing in front of his child (from The Champ), and they had to write about how they would feel if one of their personal mentors died. For the neutral condition, each participant watched a small clip of a National Geographic documentary of the coral reef, and then they had to write about their daytime activities for an average day.

At this point, participants were instructed that they were moving on to the second experiment. The experimenter passed out two sheets of paper: one with the fully formatted Word document and the other being the survey with the dependent measures. Participants were directed to pull up the unformatted version of the document that was on the taskbar of the computer. The formatted version passed out in hard copy looked like the following:

> **anthropophagus** *n., pl.* **–gi.** A cannibal. [Lat. *anthropophagus* < Gk. *anthropophagos,* man-eating: *anthropo-*, anthropo-+-*phagos*, -phagous.] - **anthropophagic, anthropophagous** *adj.,* **anthropophagy** *n.*

In contrast, this is what the participants saw on the computer:

> anthropophagus n pl gi a cannibal lat anthropophagus gk anthropophagos maneating anthropo anthropo phagos phagous anthropophagic anthropophagous adj anthropophagy n

Before filling out the survey, the experimenter explained the directions of the task. The survey first asked participants to make a guess as to how long it would take them to complete the document formatting task, along with a 99% confidence interval. The confidence interval was assessed with the following questions: “Please fill in a <u>high (low) estimate</u> of how long it will take you to complete the task (a number so high (low) that it is very unlikely – only a 1% chance – that your actual completion time will be higher (lower) than this value)”. Additionally, they were asked how long they thought it would take the average person of their age and gender to complete the task.

The participants then had as long as they needed to format the computer version to look like the fully formatted hardcopy they had sitting in front of them. Once they were done, the experimenter recorded how long it took them to complete the task. Immediately, the participant received a feedback sheet from the experimenter listing their completion time. They were then asked to estimate how many mistakes they made and then asked again how long it would take the average person of their age and gender to complete the task.

Before the participants were paid and debriefed, they were asked to fill out three more short surveys. First, they had to complete an emotion manipulation check, an inventory of twenty-six emotions (the same as the baseline measure). The second was a questionnaire trying to assess how much of the hypothesis the participant deduced during the course of the experiment or whether they had any previous instruction that would cause them to be biased during the study. Following that, they were given a demographics questionnaire to complete.

Results

Preliminary Analysis

Independent samples t-tests were run for gender on all the variables, and no significant differences emerged. Therefore, the following analyses collapse across gender. Analyses of the self-enhancement and need for cognition scales yielded no correlation with the dependent variables, so they were not included in the subsequent analysis.

Manipulation Check

The emotion manipulation check contained 26 items categorized into five emotion categories: sadness, neutral, anger, fear, disgust, and happiness. Independent samples t-test were performed between the emotion conditions on those five indices of emotion. There was no significant difference between conditions in any of the emotions (Table 1). A reliability analysis

was done on each index, yielding moderate to good reliability for each emotion across each index item. Because the manipulation check scale appeared at the end of the experiment, it was expected that the analysis would not reveal any differences between conditions, but they were included in the experiment for completeness.

Effects of Emotions

A paired-samples t-test was run on estimated completion times vs. actual completion times, collapsed across emotion conditions. The estimated completion time ($M = 5.96$, $SD = 2.90$) was significantly lower ($t = -16.32$, $p < .001$) than the actual completion time ($M = 15.74$, $SD = 3.00$). Thus, the planning fallacy was replicated across condition.

Because the estimation and actual variables did not follow a normal distribution curve, ANCOVA was used with three different dependent variables: logarithmic transformation of the participant's estimated time, logarithmic transformation of the estimated time as a proportion of the actual time, and the residuals of a best fit line for a correlation between the estimated and actual completion times. All of the baseline emotion indices served as covariates. All of the analyses yielded insignificant results (Table 2).

For completeness, the data was also analyzed without transformations. To determine the differences in estimation vs. actual performance between emotion conditions, a single index (actual time minus estimated time, henceforth label timediff) was used in an ANCOVA with condition as the independent variable, covarying all of the baseline emotion indices. Timediff for neutral ($M = 9.33$, $SD = 2.85$) was lower than in the sadness condition ($M = 10.83$, $SD = 2.81$), but the different was not significant. An independent samples t-test was done separately on the estimation time and the actual time. For time estimation, neutral participants estimated the task as taking longer to complete ($M_{neutral} = 6.36$, $SD = 3.46$; $M_{sadness} = 5.39$, $SD = 1.76$), but

the difference was not significant. The actual completion time was longer in the sadness condition ($M_{neutral}$ = 15.20, SD = 3.20; $M_{sadness}$ = 16.53, SD = 3.90), though it too was not significant.

Actor/Observer Difference

When estimating task length, participants also estimated the average time it would take the average person of their age and gender to complete the task. A paired samples t-test revealed a marginally significant effect (t = -1.68, p = .099), with participants estimating themselves as finishing the task quicker than the average (M_{self} = 5.96, SD = 2.90; M_{ave} = 6.49, SD = 3.66). The difference between their actual completion time and the participants' second rating of how long they thought it would take the average person to complete the same task. Independent samples t-tests revealed no differences between emotion conditions for either measure.

Discussion

This study showed a strong replication of the planning fallacy: the estimated completion times were significantly lower than the real completion times. However, no support was shown for the hypothesis that sadness would mitigate the bias. This study incorporated a new way of studying the actor/observer bias: instead of measuring means between subjects, this one looked utilized a within group set-up by measuring people's attitudes about their own times and others. There was no significant effect – consistent with previous literature – but it was marginally significant.

Limitations

A major limitation of this study was the failed manipulation check, which could have been caused by at least two different factors. First, the manipulation itself might not have worked, meaning the paradigm failed to make people in the sad condition sad. If this is the case,

inferential analysis is not valid because of the failure to properly create the levels of the independent variable. This is likely not the case, however, given the robust effects and consistency of finding emotion manipulations in prior studies using the same research lab and manipulation paradigm (for example, Lerner, Small, Loewenstein, 2004).

An alternative explanation, though, could be that the manipulation check simply did not capture the effect of the manipulation. The time in between the manipulation and the manipulation check was about 20 minutes (though not directly measured), leaving enough time for the emotion to fade away. Also, because the experimenter had to wait until each participant finished the formatting task in order to move on; those that finished first seemed to become impatient (observed by the experimenter). Another interesting effect was witnessed by the experimenter as well: as participants were getting ready to start the task, there seemed to be some general arousal in most participants, as if they were in some competition to finish the task before the others in the session. For instance, they started fidgeting in their chairs, sat up straight in the chairs, and started concentrating more heavily.

The measurement of the dependent variable could also have been a problem. All of the estimates were centered around five minutes, leaving very little room for lower estimates; in essence, there is the possibility of a floor effect. Neutral participants could have been more likely to write down faster completion estimates, but there was simply not enough room at the bottom of the scale for them to differ significantly from those in the sadness - explaining the non-significant effect. Controlled pilot studies are necessary to create a stimulus where the response set of reasonable estimation times is wide enough so as to provide enough room for conditions to significantly differ from each other.

Results must be taking cautiously due to the small sample size that was used in this study. Furthermore, the number of subjects per condition was skewed ($N_{neutral} = 27$, $N_{sadness} = 19$). Not only are inferences based on the data imprecise and premature with such a small sample size, but generalizability past the study itself is also severely limited.

Future Directions

Recent studies have found that it is valuable to code the open-ended, written responses of participants in the study, gaining another window into the participants' subjective experience (Cryder & Lerner, 2007). I would like to code each participant's writing task for intensity of emotion and self-focus. Following standard procedures, I will train two coders, each blind to hypothesis. They will establish inter-coder reliability and then code the dataset. I will then examine the dataset to see whether intensity of emotion is correlated with the dependent variables. I will also exam whether there are differences between conditions in participant self-focus, and then investigate whether that has any effect on the dependent variables.

Further studies can branch out in many ways. Time estimation can be studied with other emotions that vary on similar dimensions as sadness. For instance, with anger leading to appraisals of certainty and personal control, one might expect that anger could actually exacerbate the planning fallacy because of an increase in optimistic thinking. More creative studies can also be performed after the basic theoretical mechanisms are explored: for instance, the effects of incentives, repeated trials with and without feedback, and group decision-making.

Conclusion

A considerable amount of research has been reviewed illustrating the many conceptual ways in which the planning fallacy has been examined, which was then added to the emerging literature of the effects of emotion on judgment and decision making. Specifically, sadness was

posited to mitigate the planning fallacy. Though it is unclear what mechanisms might be responsible for this, many possible mechanisms were reviewed. While the sole purpose of the current study was to investigate whether sadness has an effect on time estimation, it is left to future studies to examine the specific processes through which emotions operate in this domain.

While no support was found for the hypothesis, basic replication of the planning fallacy was found. Though, in order to form a more picture of sadness' true effect on judgments, a more clean study needs to be performed, fixing those problems that were encountered in the current study.

References

Bless, H., Bohner, G., Schwarz, N., & Strack, F. (1990). Mood and persuasion: A cognitive response analysis. *Personality and Social Psychology Bulletin, 16*, 331-345.

Bodenhausen, G. V., Sheppard, L. A., & Kramer, G. P. (1994). Happiness and stereotypic thinking in social judgment. *Journal of Personality and Social Psychology, 66*, 621-632.

Buehler, R., Griffin, D., & Ross M. (1994). Exploring the "planning fallacy": Why people underestimate their task completion times. *Journal of Personality and Social Psychology, 67*, 366-381.

Burt, C. D. B., & Kemp, S. (1994). Construction of activity duration and time management potential. *Applied Cognitive Psychology, 8*, 155-168.

Cacioppo J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment, 48*, 306-307.

Cryder, C., & Lerner, J. S. (2007). The material self: Sadness, self-focus, and spending. *Manuscript under review*, Carnegie Mellon University.

DeSteno, D., Petty, R. E., Wegener, D. T., & Rucker, D. D. (2000). Beyond valence in the perception of likelihood: The role of emotion specificity. *Journal of Personality & Social Psychology, 78*, 397-416.

Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117*, 39-66.

Frijda, N. H. (1986). *The emotions.* Cambridge, England: Cambridge University Press.

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion, 9*, 87-108.

Halberstadt, J. B., & Niedenthal, P. M. (1997). Emotional state and the use of stimulus dimensions in judgment. *Journal of Personality & Social Psychology, 72,* 1017-1033.

Hall, P. (1980). *Great planning disasters.* London: Weidenfeld & Nicolson.

Hinds, P. J. (1999). The curse of expertise: The effects of expertise and debiasing methods on predictions of novice performance. *Journal of Experimental Psychology: Applied, 5,* 205-221.

Isen, A. M., & Geva, N. (1987). The influence of positive affect on acceptable levels of risk: The person with a large canoe has a large worry. *Organizational Behavior & Human Decision Processes, 39,* 145-154.

Isen, A. M., Nygren, T. E., & Ashby, F. G. (1988). Influence of positive affect on the subjective utility of gains and losses: It is just not worth the risk. *Journal of Personality & Social Psychology, 55,* 710-717.

Kahneman, D., & Lovallo, D. (1991). Bold forecasting and timid decisions: A cognitive perspective on risk taking. In R. Rumelt, P. Schendel, & D. Teece (Eds.), *Fundamental issues in strategy.* Cambridge, England: Cambridge University Press.

Kahneman, D., & Tversky, A. (1979). Intuitive prediction: Biases and corrective procedures. *TIMS Studies in Management Science, 12,* 313-327.

Konecni, V. J., & Ebbesen, E. E. (1976). Distortions of estimates of numerousness and waiting time. *Journal of Social Psychology, 100,* 45-50.

Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgment and choice. *Cognition and Emotion, 14*(4), 473-493.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology, 81,* 146-159.

Lerner, J. S., Small, D. A., & Loewenstein, G. (2004). Heart strings and purse strings: Effects of emotions on economic transactions. *Psychological Science, 15*, 337-341.

Lerner, J. S., & Tiedens, L. Z. (2006). Portrait of the angry decision maker: How appraisal tendencies shape anger's influence on cognition. *Journal of Behavioral Decision Making, 19*, 115-137.

Loewenstein, G., & Lerner, J. S. (2003). The role of affect in decision making. In R. Davidson, K. Scherer, & H. Goldsmith (Eds.), *Handbook of affective science* (pp. 619-642). New York: Oxford University Press.

Newby-Clark, I. R. (2005). Plans and predictions for exercise frequency change. *Basic and Applied Social Psychology, 27*, 97-106.

Park, J., & Banaji, M. (2000). Mood and heuristics: The influence of happy and sad states on sensitivity and bias in stereotyping. *Attitudes and Social Cognition, 78*, 1005-1023.

Pfleeger, S. L. (1991). *Software engineering: The production of quality software* (2nd ed.). New York: Macmillan.

Roy, M. M., Christenfeld, N. J. S., & McKenzie, C. R. M. (2005). Underestimating the duration of future events: Memory incorrectly used or memory bias? *Psychological Bulletin, 131*, 738-756.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: informative and directive functions of affective states. *Journal of Personality & Social Psychology, 45*, 513-523.

Small, D. A., & Lerner, J. S. (2006). Emotional politics: Effects of personal sadness and anger on public welfare preferences. *Manuscript under review*, Carnegie Mellon University.

Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality & Social Psychology, 48,* 813-838.

Taylor, S. E., & Gollwitzer, P. M. (1995). Effects of mindset on positive illusions. *Journal of Personality and Social Psychology, 69,* 213-226.

Tiedens, L. Z., & Linton, S. (2001). Judgment under emotional certainty and uncertainty: The effects of specific emotions on information processing. *Journal of Personality and Social Psychology, 81,* 973-988.

Wegener, D. T., & Petty, R. E. (1994). Mood management across affective states: The hedonic contingency hypothesis. *Journal of Personality and Social Psychology, 66,* 1034-1048.

Author's Note

This research was supported by a Small Undergraduate Research Grant (SURG) and by a grant awarded by the Center for Behavioral Decision Research awarded to William V. Mangan III. I would like to that the Emotion and Decision Research Lab for all their feedback and support. I would especially like to thank Cynthia Cryder and Seunghee Han for all of their help with performing the statistical analysis, Piper Lincoln and Sarah Scholl for their feedback on experiment stimuli, and Emily Clise for assistance in participant recruitment. I would lastly like to thank Dr. Jennifer Lerner, my thesis advisor, for all of her expertise and encouragement; without which, this project would not have been possible.

Table 1

Summary of Independent Samples T-Test for Differences in Emotion Indices between Conditions

Emotion Index	$M_{sadness}$ (SD)	$M_{neutral}$ (SD)	p-value
Sadness	1.78	1.49	.601
Neutral	2.17	1.36	.216
Anger	1.29	1.28	.968
Fear	1.45	1.55	.834
Disgust	.94	1.50	.424
Happiness	2.42	3.21	.143

Table 2

Summary of ANCOVA analyses

Dependent variables	$M_{sadness}$ (SD)	$M_{neutral}$ (SD)	p-value
Log transformation of estimate	1.64 (.049)	1.66 (.418)	.774
Log transformation of estimate as a proportion of actual time	-1.12 (.193)	-1.04 (.428)	.876
Residuals (correlation between estimated and actual completion times)	.327 (2.76)	-.685 (2.18)	.315