EXPANDING BEYOND THE FOUNDATIONS OF DECISION-MAKING: PERCEPTUAL DIFFERENCES OF RISK BETWEEN RESOURCES

by

PATRICK A. RAMIREZ JR.

Presented to the Faculty of the Graduate School of

The University of Texas at Arlington in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF SCIENCE IN PSYCHOLOGY

THE UNIVERSITY OF TEXAS AT ARLINGTON

December 2010

ACKNOWLEDGEMENTS

I would like to first thank my mentor and graduate advisor Dr. Daniel S. Levine for all the time, effort, and resources that have been use to develop me in to the scientist I have become. I would also like to thank my two other committee members Dr. Monica Basco and Dr. Tim Odegard who helped me in communication of ideas and methods used to test my research. Additionally, I would like to thank them for their faith and encouragement in my ability to take on such a daunting research topic.

I would also like to thank my lab mates Becky Robinson and Ife Togun for their insight and willingness to debate research topics, ideas, and possible outcomes. The discussions helped me in refining my ideas.

I would like to thank my parents and siblings who helped me to grow and become the inquisitive person I am today. Finally, I would like to thank my wife Denise for all of her support, encouragement and criticism. Her influence in all aspects of my life has helped to make this accomplishment possible.

November 8, 2010

ABSTRACT

EXPANDING BEYOND THE FOUNDATIONS OF DECISION-MAKING

PERCEPTUAL DIFFERENCES OF RISK BETWEEN RESOURCES

Patrick A. Ramirez Jr. M.S.

The University of Texas at Arlington, 2010

Supervising Professor: Daniel S. Levine

This research examined how resources such as life, food, and money are calculated in decision-making. Presently, the field assumes that various types of resources have the same value when a choice is being made. The study tested the assumption by comparing how individuals responded to two similar sunk cost scenarios (investing in a failing venture) where one task situation dealt with money and the other situation concerned life decisions. There were three hypotheses tested in this experiment. The first hypothesis predicted that participants would make more investments for an ill pet when compared with a failing business, which was confirmed. The second hypothesis predicted that the amount of pleasure experienced with gains and displeasure experienced with losses would be greater for the pet task when compared with the business task, which was also confirmed. The third hypothesis predicted that investing would be better predicted for the pet task than the business task by the participant pleasure ratings. The results followed a trend opposite to that which the third hypothesis had predicted.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Figure Page

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 General Overview of Decision-Making Theories

Decision science is a field of psychology that focuses on ways to make efficient choices, and the methods that people use to make decisions. Studies of decision-making have been useful in helping gain an understanding of how people respond to accumulations of wealth with regard to risk taking, risk perception from the way options are presented, and the impact that emotions have on decision-making. Despite the field's strengths, it also suffers from several methodological weaknesses that keep the field from addressing problems such as the continued use of cost benefit assessments in situations that are not dependent on finances (e.g., the use of business decision-making in medical settings). There is the question of how well the two situations concerning two different types of resources (e.g., money or life) can generalize to one another; this is indicative of the limitations that exist because resources are not considered by the current theoretic designs. The present study will address these limitations by examining how people make decisions by comparing behavioral responses for two types of resources (money and life), consider the role that emotions play in making decisions, and explore the degree that monetary tasks can be generalized to non-monetary situations.

According to decision-making theories, resources are defined as food, life, or money (Camerer, 2003). Since 1738, the field has assumed that all resources have the same value, meaning that the resources that are impacted by a choice do not influence how an option is assessed when making a decision (Bernoulli, 1738/1954). Simply stated, there is not a difference in making a decision to save a life, deal with money, or handle food. The original concept for the way resources were considered in decision-making theory allowed the focus of

decision research to be on the probability and value of gains or losses (Von Neumann & Morgenstern, 1964). Value is determined by the level of desirability, usefulness, or potential pleasure a choice has when making a decision (Bentham, 1780; Bernoulli, 1738/1954; Camerer, 2003; Plous, 1993; Savage, 1954; Von Neumann & Morgenstern, 1964). The use of resources as a mathematical constant, in terms of value, allowed for approximations of value associated with probability and the amount of a resource at risk to be applied to decision-making models in order to determine which choices maximized gains while minimizing losses (Savage, 1954; Von Neumann & Morgenstern, 1964). Von Neumann and Morgenstern gave a leading example when they explained that constants exist in the hard sciences to calculate volumes of gas or the amount of matter in an object and that it is possible to use similar methods in calculation to predict decision-making. These early decision-making models maintained the oversimplification that all resources are equal in value. Examination of how assorted types of resources influence choice will allow researchers in the field to justify the generalization of gambling tasks to how people make choices in non-monetary situations. If, however, resources are valued differently, this could influence current models that are applied to medical and business decision-making, as well as social economics.

Decision-making originally focused on expected utility theory, which describes the mathematical optimization of gains and losses when making decisions (Bell & Coplan, 1976; Bernoulli, 1738/1954; Savage, 1954; Von Neumann & Morgenstern, 1964). An example of expected utility theory's application is seen with assessing potential job applicants in terms of work productivity. A job applicant (applicant A) with a certain trait may be more prone to succeed than another (applicant B) with a different type of trait. If it costs $1000 to train applicant A and he has an 80% chance of being productive, gaining the business more profit than the cost of training, the applicant should be hired. If applicant B costs $1000 to train and he has a 30% chance of being productive, gaining the business less profit than the cost of training, then it is preferred not to hire applicant B.

Expected utility theory was helpful in understanding cost benefit assessment in decisions, but was not designed to describe or predict how people usually make decisions (Bell & Coplan, 1976; Bernoulli, 1738/1954; Camerer, 2003; Grossberg & Gutowski, 1987; Savage, 1954; Von Neumann & Morgenstern, 1964). In normal situations people do not calculate the probability of success and the amount that must be invested when making a choice. If people did the calculations, it would mean that every time a person went to the store and decided which brand of peanut butter he was going to purchase he would need to know the probability that he will be satisfied with that particular brand. Then, he would need to examine the potential cost and satisfactions with all the other brands before making a selection. Breaking down day-to-day decisions in such a manner is inefficient, demonstrating that expected utility theory does not capture how people normally make decisions.

Early works of Kahneman and Tversky initiated a change in the focus of decision-making away from expected utility theory, where the emphasis shifted towards explaining and predicting how people make decisions. They proposed prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), which accounted for changes in risk perception when making a choice that involved gains or losses. Prospect theory also accounted for how risk taking is influenced by probability.

Decision-making theory has further evolved with the inclusion of emotional and anticipated responses to better understand and predict how people make choices (Lichtenstein & Slovic, 2004; Mellers & McGraw, 2001; Mellers, Schwartz, & Ritov, 1999; Pham, 2007). Emotions can become linked to any situation (Pham, 2007). If, for example, a person was robbed in a supermarket parking lot, they are more likely to have negative emotions attributed to the store's parking lot. At the same time, if another person met their spouse in the same parking lot they are more likely to have positive feelings towards the lot. The amount of positive or negative emotions associated with this lot will impact the likelihood that either of

these two people would return to this store. In the example provided, the robbery victim is less likely to shop at that particular store than the person who met their spouse.

Even with the inclusion of emotions and their influence on decision-making, the handling of resources for decision theories has continued to be based on the assumption developed by expected utility theory, that all resources have the same value. Currently, most research that examines resources and how they function in decision-making has focused on studies of affect, where affect contributes to the amount of risk a decision maker is willing to take based on how positively or negatively a person sees a decision (Lichtenstein & Slovic, 2004; Pham, 2007). Affect is defined as positive or negative emotions (Lichtenstein & Slovic, 2004; Mellers & McGraw, 2001; Pham, 2007). The issue with past research is that it has failed to examine differences in the value of the resources at risk. As is, the models used in decision-making research have focused on monetary decisions, which have been applied to non-monetary situations (Von Neumann & Morgenstern, 1964). Choices studied in decision-making around life- such as fertility, euthanasia, pet care, or abortion- are still studied based on the original decision-making paradigm of maximizing gains while minimizing losses. This oversimplified model excludes humanistic aspects of how people form decisions, such as the emotional value of such decisions.

The specific aims of this research are:

1. To determine if people assign the same value to resources such as food, life, or money when making decisions under similar circumstances.
2. To examine the role that emotions play in decision-making processes specifically with regard to risk in decisions regarding money and quality of life.
3. To determine if affective responses are a better predictor of decision-making regarding quality of life than regarding money.

1.2 Expected Utility Theory

Expected utility theory provided a method that would allow a decision maker to assess the amount of risk that should be taken when considering the probability of having a desired outcome as well as the value associated with the potential gain or loss (Bernoulli, 1738/1954; Camerer, 2003; Savage, 1954; Von Neumann & Morgenstern, 1964). The purpose of the theory was to show the decisions that would yield the greatest potential gain while having the least amount of losses (Plous, 1993; Von Neumann & Morgenstern, 1964). The theory had a large number of assumptions or axioms that had to be followed in order for a decision strategy to be deemed rational or mathematically efficient (see Appendix A) (Grossberg & Gutowski, 1987; Mellers, 2000; Plous, 1993; Von Neumann & Morgenstern, 1964). The original architects of expected utility theory, Von Neumann and Morgenstern, took the position that the axioms of rational choice needed to be further explored using empirical methods, so the model would be able to predict descriptive decision-making. Expected utility theory, while not empirically supported, continues to influence policies in government, business, and medicine. The originators of expected utility theory acknowledged that the limitation of their model was that the theory cannot explain human choices, which can be influenced by factors other than logic; rather it specifies the choice that is most optimal (Von Neumann & Morgenstern, 1964).

1.2.1 Strategic Decision-Making Using Expected Utility Theory

Expected utility theory also provided a strategic framework for assessing different options in a decision problem (Bell & Coplan, 1976; Camerer, 2003). One method described by Bell and Coplans, referred to as “finding a lowerarchy”, involved examining a situation based on what a decision maker will not settle for and then ranking all other options from worst to best. The best option, based on the lowerarchy strategy, would be the choice that benefitted the decision maker the most while impacting all others the least. For example, suppose Person A wants to go out to eat pizza, but Person B wants hamburgers. Persons A and B discuss possible alternatives, such as hotdogs, tacos, and seafood. Based on the lowerarchy decision-

strategy, the decision maker should first determine what they do not want to eat. In this case, Person A decides they are not willing to eat hamburgers, but Person A is willing to eat seafood, hotdogs, tacos, and, of course, pizza. Person A would then rank each possible option from least favorable to most favorable. In a similar fashion, Person A would estimate what Person B would prefer to eat. Finally, Person A would select the option that would displease Person B the least while pleasing themselves the most (finding the middle ground or achieving equilibrium) (Camerer, 2003). A criticism with this pragmatic approach was that it does not account for emotional influence in decision strategies. Furthermore, it does not take into account changes that could take place during the evaluation of options.

1.2.2 Applications of Expected Utility Theory

When applied to competitive situations, expected utility theory accounts for the amount of risk decision makers should take as well as which course of action will be in their best interest. The use of expected utility theory for situations like the ultimatum game (Camerer, 2003) fails to capture the reciprocal ramifications of making choices that maximize the decision makers' gains while minimizing their losses. The ultimatum game is a situation with two people involving the exchange of money. The rules of the game are as follows: First, one of the players has to offer an amount of money to the other game player. They can offer as little or as much as they wish, and as long as they offer some money they can keep the remaining amount (Camerer, 2003). According to expected utility theory, the player offering money should offer as little as possible. This allows them to maximize what they have gained and minimize what they have lost. At the same time, the other person should willingly accept the amount offered because this gain is better than no gain at all.

There is an ethical dilemma not captured by expected utility theory that arises in situations where there is voluntary money being exchanged, for example tipping a waitress or paying for employment, much like the ultimatum game. Expected utility theory fails to capture that there are consequences for these types of actions (Dawes, 1980). First, it is possible that

the other person in the game may have access to another resource that the decision maker may need at a later time. So in the case of an employee, underpaying them may result in a loss of services. This may cost the employer more because they must maintain the workload left behind by the former employee, and they must train a replacement. Second, there are also internal mechanisms that elicit feelings of guilt or regret (negative affect) which may influence the perception of risk (Loewenstein, Weber, Hsee, & Welch, 2001). In the case of a waitress her income is based on the earnings she makes from tips. If a patron does not tip her, the patron runs the risk of being seen as cheap by his peers. The patron then runs the risk of having the peers form negative views about him, which would result in the non-tipper experiencing guilt or regret. These two potential issues are possible explanations for why people tend to offer greater sums of money, contrary to the principles of expected utility theory (Dawes, 1980; Ketelaar & Au, 2003).

1.3 Prospect Theory

Prospect theory is a descriptive theory of decision-making that accounts for why people do not follow the prescriptive rules of expected utility theory when making real world decisions and predicts the choices that people normally make (Grossberg & Gutowski, 1987; Plous, 1993; Tversky & Kahneman, 1981). Prospect theory accounts for deviations from expected utility theory while predicting how people make choices, by acknowledging that people perceive the value of a gain differently from a loss, and by accounting for the influence of known probabilities in a decision problem (Kahneman & Tversky, 1979; Plous, 1993; Tversky & Kahneman, 1981). For example, according to prospect theory, the value of a hypothetical gain of $100 is less than the negative value of a loss of $100. Additionally, the influence of probability tends to underweight high probability less than 1 and overweight low probability greater than 0, which had not been accounted for in prior decision-making theories.

Prospect theory accounts for differences in perception of risk when a decision problem is presented in terms of gains or losses, where losses result in increased risk taking and gains

result in a decrease in risk taking (Tversky & Kahneman, 1981). For instance, in an experiment performed by Tversky and Kahneman (1981) examining differences in gains and losses, participants chose between two gambles. The participants could choose to gain a guaranteed amount of money, $700, or they could choose to make a gamble where there is an 80% probability of winning $1000 and a 20% probability of receiving nothing at all. Participants tended to select the guaranteed option. If presented with a similar choice in terms of losses, where there was a guaranteed loss of $700 or a gamble with an 80% probability to lose $1000 and a 20% probability to lose nothing at all, the participants tended to select the gamble. The theory also accounts for how perceived value for an item will increase when the item is a person's possession (Plous, 1993). An example would be the amount a person is willing to pay for a new car compared to the amount the person is willing to pay to have the car repaired. More often than not, the repairs will begin to cost more than a new car, but because the car belongs to a person, the cost of repair seems worth the price. The theory explains this by showing that the value of gaining a new car does not offset the value of losing the car already in possession, because losses are weighted more heavily than gains according to the theory.

1.3.1 Criticisms of Prospect Theory

Prospect theory has failed to examine the types of resources and their perceived value, although the authors did acknowledge that testing between types of resources was possible (Tversky & Kahneman, 1981). The questionnaire that participants responded to in Tversky and Kahneman's research examined decision-making involving resources such as money, life, and food, but did not compare the differences between these resources when risk was involved. Failure to account for variations in value attributed to the types of resources is problematic because the models derived from prospect theory are used to predict human choices, which are based on monetary cost and then generalize behavioral responses to quality of life situations.

1.4 Affect and Decision-Making

Most of the refinements that have been made to prospect theory have been based on the impact of affect on decision-making, specifically how emotions influence the degree that a choice is perceived as better than the alternatives (Lichtenstein & Slovic, 2004; Loewenstein, et. al, 2001; Mellers & McGraw, 2001; Mellers, Schwartz, & Ritov, 1999; Pham, 2007). With the inclusion of affect in decision-making models, researchers have been able to show that positive and negative associations with outcomes influence choice (Mellers, Schwartz, & Ritov, 1999). The view that affect acts as a guide to making choices is supported by the affect as information hypothesis where the reactions, positive or negative emotional responses, from choices that people make impact the likelihood they will make the same choice again (Lichtenstein & Slovic, 2004; Loewenstein, et. al, 2001; Pham, 2007). Therefore, negative emotional responses result in a decreased tendency to make a choice and positive emotional responses increase the likelihood to make the choice.

The Iowa Gambling Task or IGT has been used to demonstrate that affect influences decision-making (Bechara, Damasio, Damasio, & Anderson, 1994). The IGT uses four decks from which participants choose cards to win hypothetical money. The four decks are fixed so that two of the decks have frequent high wins and less frequent high losses. The other two decks have less-frequent low losses and more frequent low wins. The first two decks' losses are so great that it offsets the wins participants have already made. However, the others two decks' wins are just frequent enough that participants should begin to favor them (Bechara, et. al, 1994; Lichtenstein & Slovic, 2004; Pham, 2007). Participants tend to make choices that have the greatest reward, but begin to gravitate towards the low win decks once they recognize that there is greater risk of losses in the high win decks (Bechara, et. al, 1994; Lichtenstein & Slovic, 2004; Pham, 2007). According to the affect as information hypothesis, the emotions generated from the loss in those decks makes them undesirable, and thus participants begin to favor the low loss, and low gain decks (Pham, 2007).

1.4.1 Decision Affect Theory and Subjective Expected Pleasure Theory

Research has demonstrated that it is possible to predict decision-making trends by assessing affect typically associated with certain types of outcomes, such as making a choice that results in a loss will elicit a negative response and a choice that results in a gain results in a positive response. The ability to describe and predict decision-making based on affect comes from two theories proposed by Barbara Mellers, decision affect theory and subjective expected pleasure theory. These two theories demonstrate how outcomes can elicit a positive or negative emotional response (decision affect theory), and show that with the use of the predicted emotional reactions researchers can predict which choice a decision-maker will select (subjective expected pleasure theory) (Mellers, 2000; Mellers & McGraw, 2001; Mellers, Schwartz, & Ritov, 1999).

With decision affect theory, research has shown that people will feel good about an expected gain, but even better when the gain is unexpected. In situations where the gain is less than that of the non-selected option, people will experience less satisfaction with the outcome. Similar findings exist with outcomes that result in losses, where if a loss was unexpected the outcome elicits a greater negative response than if the decision maker had been expecting the loss to occur. Additionally, if the loss a person receives is less than a potential loss from selecting an alternative option person will feel more satisfaction for the choice. These emotional or affective tendencies can be applied to subjective expected pleasure theory, which allows theorists to predict the choice a decision maker is most likely to take based on the greatest amount of pleasure a choice will elicit. The ability to predict both decision-making and affective responses was tested by having participants rate how they felt about gains and losses in a set of gambles (Mellers, Schwartz, & Ritov, 1999). The information obtained from the participants was compared to responses predicted by decision affect theory. The results showed that decision affect theory was a good fit for predicting the type of emotional responses people have when making decisions. Afterwards, the researchers used the emotional responses to

determine how well the emotions are indicators of which choice a decision maker will choose. Researchers applied the emotional response data to subjective expected pleasure theory, which was able to predict the choice participants made based on emotional responses.

1.4.2 Affect and Value

Affect also contributes to decision-making by altering perceived value for an option (Lichtenstein & Slovic, 2004; Peters, Slovic, & Gregory, 2003; Rottenstreich & Hsee, 2001). Research by Peters, Slovic, and Gregory examined differences in how much a person would sell and pay for a lottery ticket. In this experiment, the investigators found that people who were buying the ticket focused on the amount they could lose if the ticket did not win. In contrast, the sellers focused on the amount the buyer could possibly win. This demonstrates that value changes depending on the context (i.e., buyer versus seller). Additionally, the sellers felt that they should charge more if they believed the ticket was a winner, thus showing that the subjective value influences the degree that an option appears more or less desirable. Another study that has examined how affect influences the perception of value had participants rate how much they would pay if they had the option of gambling to win a discount on their tuition or the option of winning a trip to Europe (Rottenstreich & Hsee, 2001). The monetary value of the two options was equal. The researchers found that participants were willing to pay more for the trip to Europe than they would pay for the opportunity to win a tuition discount in situations with uncertainty, suggesting that perceived value changes with the degree that emotions are associated with an option confirming prior research showing that value is influenced by affect in decision-making.

1.5 Present Research

Examination of differences in value between different types of resources has yet to be examined in affective decision-making. Investigations concerning affect acknowledge that feelings influence choice, but they have not examined differences in risk perception when one resource is compared to another. Rottenstreich and Hsee (2001) tested gamble preference, but

they did not test strategies applied to decision-making scenarios. Rottenstreich and Hsee (2001) did ask participants how much they would gamble for different but comparable resources, but they did not account for repeated decision-making, having participants decide which option they preferred multiple times with feedback. They also did not account for behavioral responses, by assessing if the participants respond the same by making choices in a task rather than answering a questionnaire. Another problem with their experiment is that they used a different set of participants to determine if one choice was considered higher in affect than the other.

The present research investigated how people make decisions for two types of resources, in this case, money and life. Based on Mellers' research on affect and decision-making, the participants would be expected to be influenced by the pattern of gains to losses in the repeated decision-making of both tasks. According to decision affect theory and subjective expected pleasure theory, the participants would experience displeasure with the choices as the investments began to fail. A difference in responses to the investments was expected between life and money investments as seen with the research that was conducted by Rottenstreich and Hsee (2001), where the level of affect associated with a resource, life (high in affect) or money (low in affect), influenced how value was perceived resulting in individuals investing more for life and less for money.

This research attempted to help support Mellers' as well as Rottenstreich and Hsee's research by showing that affect plays a role in decision-making, which has not been previously explored by expected utility theory or prospect theory. Additionally, the research compensated for deficiencies in Rottenstreich and Hsee's research by considering how decisions were made when probabilities of success or failure are not explicitly given, rather the probability of success and failure were learned over a long duration from repeated decision-making with feedback. Based on research by Barron and Erev (2003), the use of repeated decision-making is a more accurate indicator of how people make decisions, which would have improved the validity of the

past findings. Additionally, this research included the amount of affect associated with each resource by the decision makers, which was not accomplished previously by Rottenstreich and Hsee.

1.6 Hypotheses

The first hypothesis was that participants would work to retain a resource associated with life longer than a resource associated with money. Life will be maintained longer than money because life has greater emotional attributes. The second hypothesis was that participants would rate greater degrees of displeasure and pleasure for the life task when compared with the money task suggesting that emotions influence value associated with a resource. The second hypothesis helps to support the first hypothesis tested by demonstrating that affect influences value in decision-making. The third hypothesis was that when examined with regression analysis, the affective responses would be a better predictor of decision-making for life when compared with money, where affect is the independent variable and the length that either task is maintained is the predictor or dependent variable.

CHAPTER 2

METHODS

2.1 Participants

Forty-eight (30 female and 18 male, mean age = 20.46 years, *S.E.* = 0.65) undergraduate volunteers from the University of Texas at Arlington (UTA) participated in this experiment where credit was given to meet course requirements. The ethnic make-up of the sample was 27% Whites, 16% Blacks, 33% Hispanics, 19% Asians, and 4% others, where the designation as other was for ethnicity reports of Indian. Out of the 48 participants, 21 had errors while conducting the experiment with nine errors in the experimental procedure (i.e. the computer locked and would not allow the participant to register a response or the participant received the same version of the experiment twice), six did not comply with the experiment (i.e. the participant failed to return for the second task or the participant refused to conduct the experiment as instructed), and six failed to exceed 100 trials for either of the two tasks meaning that the participant left the experiment before any losses were experienced.

Analysis of the 27 valid and 21 invalid sets of data collected from the participants was conducted to test for differences in the groups' make-up. Analysis of gender, ethnicity, and age did not show a significant difference between the valid and invalid data collected from the participants (see Table 2.1).

Table 2.1 Descriptive Information and Statistical Analysis of Demographic Data by Participant Group

Group	Gender		
	Male	Female	
Valid Dataset	9	18	
Invalid Dataset	9	12	
Analysis Results	χ^2 (1, *N* = 48) = .457, *p* = .499		
	Ethnicity		
	White	Non-White	
Valid Dataset	8	19	
Invalid Dataset	5	16	
Analysis Results	χ^2 (1, *N* = 48) = .028, *p* = .867		
	Age		
	M	*SE*	N
Valid Dataset	19.96	.95	27
Invalid Dataset	21.10	.87	21
Analysis Results	*t* (46) = -.854, *p* = .397		

2.1.1. Analysis of Experience with Pets and Businesses

Additional analysis of experience with pets or businesses was assessed between the valid (had pet experience *n* = 23, did not have pet experience *n* = 6) and invalid (had pet experience *n* = 4, did not have pet experience *n* = 9) sets of participant data with the analysis showing a larger number of participants having experience with pets for those who were included in the study when compared with the participants who were not included, χ^2 (1, *N* =

42) = 9.212, p = .001, η = .468. No difference was found for the groups' assessment for participants who had experience with businesses.

2.2 Materials

Two tasks programmed using E-Prime software (Psychology Software Tools Inc., Pittsburgh, PA, 2005) were used to test for differences in decision-making between two resources under similar conditions which is reasonable because changing of resources while maintaining the integrity of a task has previously been accomplished in other cognitive experiments (Crone & Van Der Molen, 2004). The programs were written with the intent to record behavioral responses from repeated decision-making where one investment task was designed to simulate actions of a private business owner and the other task was designed to simulate actions of a pet owner. Immediately following the participant's choice of action their results would display on the computer screen. After every sequence of 25 choices, participants were given cumulative performance feedback about the progress of their investment, and then they were asked to report how they felt about the outcome of their choices by using the self-assessment manikin or SAM affect scale.

2.2.1 Investment Tasks

For both of the experiments each choice of actions made by participants impacted the performance for the investment of the two tasks where the distribution of gains and losses resulted in a sunk cost scenario, whereby a person begins an investment, but the investment eventually begins to fail (Soman, 2001; Wong, 2005; see Table 2.2). For each task, the first 100 choices were designed to develop positive affect towards the participant's investment by having highly probable gains, but after the 100th choice the participants' actions gradually began to have no effect or hinder their investment (e.g., choices resulted in losses) resulting in an increase of negative affect or displeasure. Undisclosed to the participants, they could make up to 300 choices for each task.

Table 2.2 Probabilistic Distribution of Gains and Losses Generated for Both Tasks.

Quartile	Gain	Loss	No Gain or Loss
1-2	90%	10%	0%
3-4	70%	10%	20%
5	30%	70%	0%
6	20%	70%	10%
7	10%	80%	10%
8-12	0%	80%	20%

The random distribution for gains and losses were generated using random number generator for excel based off the probability of gains and losses noted for each quartile to generate a sunk cost effect.

2.2.2 Tasks Menus

The two investment simulations were designed to capture investment behavior where the menu layout for each task was relevant to the resource, but the actions were similar in regard to investment maintenance. For the business investment task, a main menu either allowed participants to care for the business or gave them the option to attempt to improve performance by using outside measures. Each of the two options presented the participants with a second set of menus where the investment menu allowed participants to choose to either clean their store, hold an employee event, order more products, or close the store for the day, and the outside measures options allowed the participants to hire an outside consultant or declare bankruptcy where declaring bankruptcy ended the game.

The pet investment game had a similar menu design, except the menu was for pet care and medical assistance. The submenu for pet care let the participants choose to teach their pet a new trick, feed the pet, groom the pet, or leave the pet outside, and the medical assistance menu, participants selected to have medical procedures performed on the pet or they could have the pet euthanized where euthanizing the pet ended the game. For the pet task, participants self selected if the pet was a dog or a cat when performing the task, this was done

to account for individuals who may have a personal bias against one of the animals. For full details on the task menus see Appendix B.

2.2.3 Self-Assessment Manikin

The SAM scale was used to measure how participants were reacting to gains and losses. As illustrated in Figure 2.1, the scale had three 9 point pictorial scales (e.g., pleasure, arousal, and dominance) for participants to rate (Bradley & Lang, 1994). For instructions presented to participants pertaining to the use of the SAM scale see Appendix C.

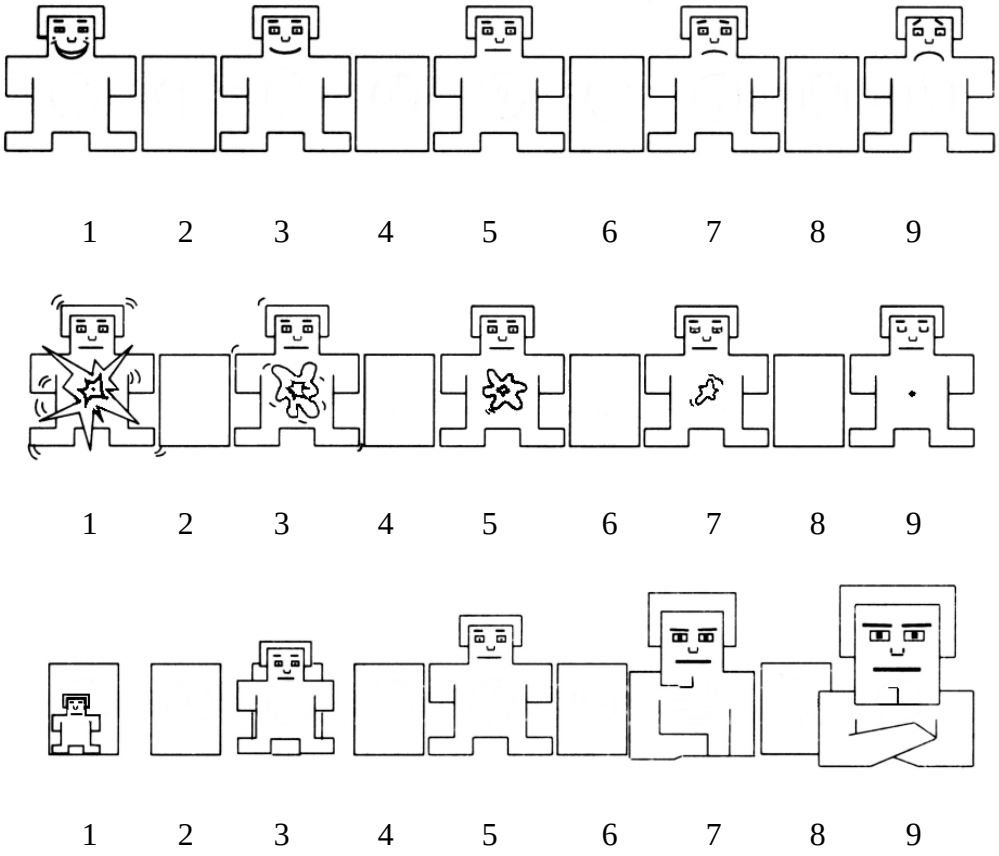


Figure 2.1 Samples of the SAM scale that participants rated 1-9 to describe how they felt about their investments as they conducted the experiment.

2.3 Procedure

For this within participant design, the participants sat at a computer and listened as well as read instructions that were presented by the program. Then participant began to make choices where they received feedback about how their choice of action improved or hindered their investment. After every 25 choices participants completed a SAM affect scale. Eventually participants either completed the full 300 possible choices or they chose to terminate their investment, which in both cases ended the experiment and lead to debriefing. If it was the first run of the experiment participants were reminded to return in two weeks to complete the other task.

2.3.1 Investment Task Instructions

The instructions for the experiment thanked participants for their volunteering and then explained that the purpose of the investment task was to mimic investing that one would give to either a business or a pet. The instructions pointed participants to use a reference next to the computer so they would understand what the different options represented. For a detailed presentation of instructions see Appendix D.

2.3.2 SAM Scale Instructions

The instructions for the SAM scale had participants look at samples of the scales that they were to answer. The instructions explained how each image was meant to represent a degree of pleasure or displeasure, arousal or boredom, control or being controlled and that the participant was to select the image that best matched their current emotional state.

2.3.3 Experimental Debriefing

When participants made 300 choices or they elected to terminate either of the investments they were given a debriefing that explained that the task was designed to investigate investing towards different resources (see Appendix E for details), and then the participants were given the option to have their data withdrawn from the experiment.

CHAPTER 3

RESULTS

3.1 Introduction

In the following section a series of analyses is presented that assess each of the three hypotheses. Each statistical test was conducted twice. First, an initial analysis was conducted using the limited dataset that excluded participants who had errors in their data. Second, the same analysis was conducted again using the full dataset. For all analyses the alpha level was .05.

3.2 First Hypothesis: Comparisons Between the Pet and Business Task

To test the first hypothesis, that there would be more selections for the pet task when compared to the business task, a dependent or paired samples *t*-test was conducted using the total number investments made as the dependent variable. Participants made significantly more investments in an ill pet (M = 217.81, SE = 11.44) when compared with a failing business (M = 183.04, SE = 12.84), $t(26) = 3.268$, $p = .003$. Thus, the results of the initial analysis that used the error free dataset supported the first hypothesis.

An additional analysis was performed using the full dataset, which included the 6 sets of data with errors. When all of the data were used participants still invested more in an ill pet (M = 193.09, SE = 13.64) compared with a failing business (M = 172.15, SE =14.25), but the difference was no longer statistically significant, $t(32) = 1.463$, $p = .153$. One reason why the difference was no longer significant could be attributed to the amount of error observed in the data (e.g., SE for the pet task was 11.44 for the error free data versus 13.64 in the data with errors). There was an increase in the amount of variability in the full dataset when data from non-compliant participants was included.

3.2.1 Kaplan-Meier Survival Analysis for the Pet and Business Task

To further explore the first hypothesis, a Kaplan-Meier survival analysis was conducted using the Breslow Generalized Wilcoxon test to compare for differences in the rate of participant dropout between the two tasks. The Breslow Generalized Wilcoxon was chosen because it accounts for changes in group composition as participants select to terminate their investment, and it is the most conservative of the comparison analyses for the Kaplan-Meier.

For the analysis conducted on the error free dataset, participants who had made the maximum number of investment choices were designated as censored, which is a means to account for the inability to predict when these participants would elect to terminate their investments. Table 3.1 lists the number of censored participants per task.

Table 3.1 Total Number of Censored Cases Per Task for the Kaplan-Meier Survival Analysis for the Error Free Dataset

Task	n	Percent of Group
Pet Task	6	22.2%
Business Task	4	14.8%

Note: Censored cases were the participants that made the total possible number of choices in the experiment without ever electing to terminate their investment.

As illustrated in Figure 3.1, the results for the error free dataset showed that participants terminated the task sooner when investing in a failing business, (*Estimated M* = 183.04, *SE* = 12.60), when compared with investing in an ill pet, (*Estimated M* = 217.82, *SE* = 11.23), χ^2 (1, *N* = 54) = 4.088, *p* = .043.

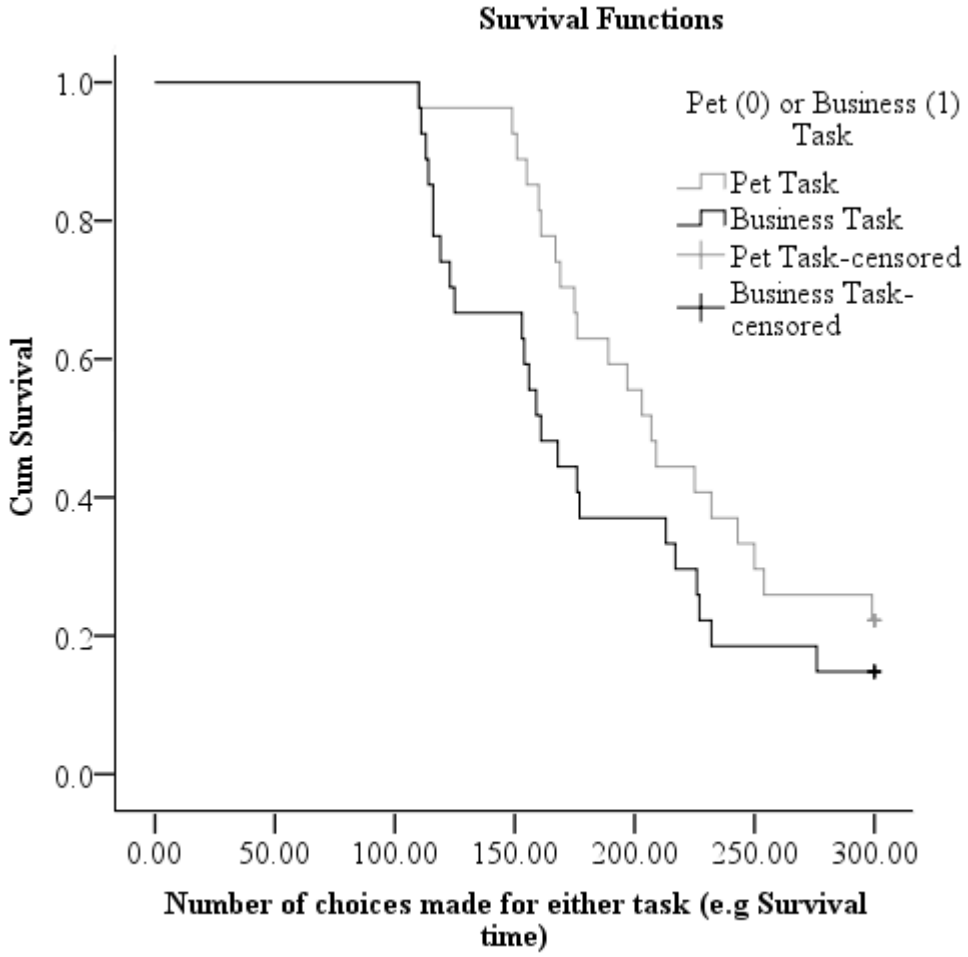


Figure 3.1 Cumulative Survival by Number of Participant Choices Participants Made For Kaplan-Meier Analysis Performed On the Error Free Dataset

An additional analysis was performed using the full dataset. As with the first analysis using the Kaplan-Meier, participants who made the full number of possible investment choices were censored (see Table 3.2).

Table 3.2 Total Number of Censored Cases Per Task for the Kaplan-Meier Survival Analysis for the Full dataset

Task	n	Percent of Group
Pet Task	6	18.8%
Business Task	5	15.2%

Note: Censored cases were the participants that made the total possible number of choices in the experiment without electing to terminate their investment.

As illustrated in Figure 3.2, participants terminated the task sooner when investing in a failing business, (*Estimated M* = 171.17, *SE* = 13.12), when compared with investing in an ill pet, (*Estimated M* = 196.08, *SE* = 12.66), but the difference in the survival rates was no longer statistically significant when the full dataset was analyzed, χ^2 (1, *N* = 72) = 1.988, *p* = .159.

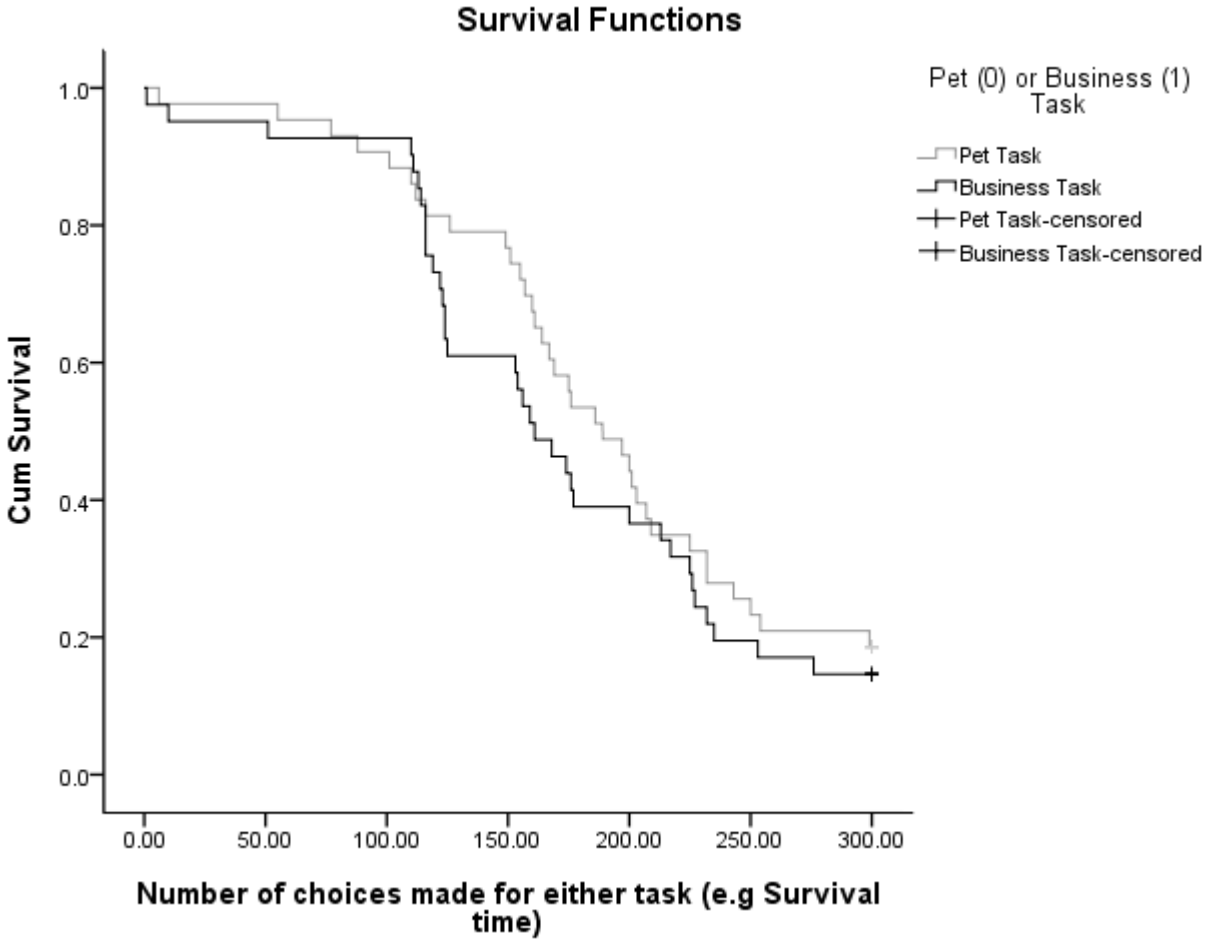


Figure 3.2 Cumulative Survival by Number of Participant Choices Participants Made For Kaplan-Meier Analysis Performed On the Full Dataset

3.2.2 Cox Regression Analysis for the Pet and Business Task

To determine if differences found in the amount of experience with pets influenced the results from prior analyses, a Cox Regression survival analysis was conducted using experience with pets as a covariant. The dependent variable was the length of investing and the predictor variable was the task (i.e., business or pet). The overall omnibus test for the error free dataset were not significant, χ^2 (2, N = 54) = 2.902, p = .235, likelihood ratio = 298.755. Additional analysis of the full dataset did not show a significant difference in the overall omnibus

test, χ^2 (2, N = 78) = .985, p = .611, likelihood ratio = 420.193. Details about the coefficients for either of the analysis can be found in Table 3.3.

Table 3.3 Summary of Cox Regression Analysis for Investing with Pets and Businesses with Experience as a Pet Owner as a Covariate.

	B	*SE B*	*p*
Error Free Dataset			
Tasks	-.467	.304	.124
Prior Pet Experience	.357	.444	.421
Full Dataset			
Tasks	-.249	.279	.372
Prior Pet Experience	.200	.339	.555

The results from the Cox Regression survival analysis demonstrated that prior experience as a pet owner did not significantly influence the number of investments made in either of the two tasks. However, the Cox Regression analysis also failed to support the findings from either the paired *t*-test or the Kaplan-Meier analysis.

3.3 Hypothesis Two: Comparisons of Pleasure and Displeasure Between Pet and Business Task

The second hypothesis stated that participants would have higher ratings of pleasure and displeasure for their investments in the pet task when compared with the business task. Specifically, the level of pleasure would be higher for the pet condition during the first 100 trials when participants experience repeated increases for their choices than the pleasure reported for the business condition. In contrast, when the participants have experienced repeated losses they would report greater displeasure for the pet condition than the business condition.

To test this hypothesis, a 2 (time of measurement: fourth quartile, prior to termination) X 2 (condition: pet, business) repeated measures analysis of variance (ANOVA) was conducted

on mean affect ratings obtained from the dataset without errors. Means and standard errors are available in Table 3.4.

Table 3.4 Mean Rating of Pleasure for Time by Task for the Error Free Dataset

	Fourth Quartile	Final Report
Pet Task	2.741 (.383)	6.667 (.492)
Business Task	3.704 (.287)	6.000 (.374)

Values in brackets are standard errors

The results showed a main effect for the time of measurement with more pleasure experienced at the fourth quartile (*M* = 3.222, *SE* = .251) than prior to termination (*M* = 6.333, *SE* = .366), *F* (1, 26) = 53.431, *p* = .001, partial η^2 = .673. No main effect of task was found when comparing the pet task (M = 4.704, SE = .334) with the business task (M = 4.852, SE = .223), *F*(1, 26) = 2.00, *p* = .658 , partial η^2 = .008.

As predicted there was a significant crossover interaction between time of measurement and task, *F*(1, 26) = 6.167, *p* = .020, partial η^2 = .192 (see Figure 3.3). Participants reported experiencing more pleasure at the fourth quartile for the pet condition compared with the business condition as well as experiencing more displeasure at the final pleasure rating prior to termination for the pet condition compared with the business condition. To confirm this interpretation difference scores were computed from the pleasure rating participants gave prior to termination and the ratings given at the fourth quartile for the pet and business tasks. A paired t-test conducted on the difference scores demonstrated significantly greater amounts of change in pleasure ratings for a pet (*M* = 3.93, *SE* = .577) when compared with a business (*M* = 2.30, *SE* = .494), *t*(26) = 2.483, *p* = .020.

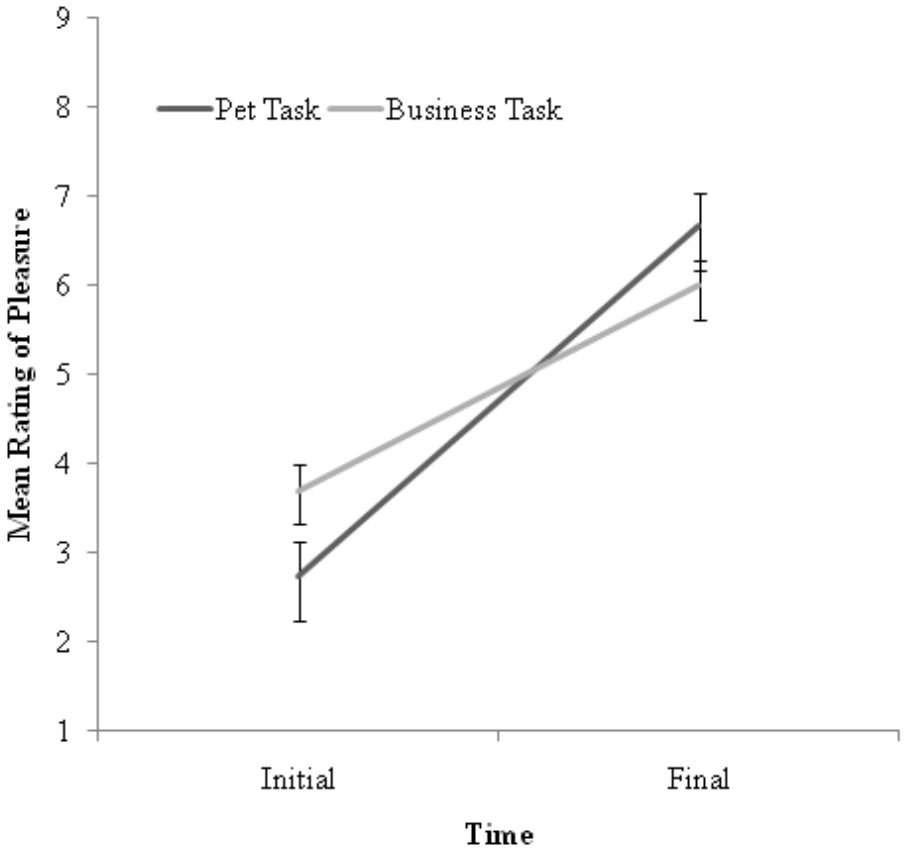


Figure 3.3 Line Graph of Time by Task Interaction.

Testing the hypothesis with the full dataset, a 2 (time of measurement: fourth quartile, prior to termination) X 2 (condition: pet, business) repeated measures ANOVA was conducted on mean affect ratings obtained from the dataset without errors. Means and standard errors are shown in Table 3.5.

Table 3.5 Mean Rating of Pleasure for Time by Task for the Full Dataset

	Fourth Quartile	Final Report
Pet Task	2.828 (.391)	6.759 (.465)
Business Task	3.621 (.274)	6.172 (.368)

Values in brackets are standard error

The results showed a main effect for the time of measurement with more pleasure experienced at the fourth quartile (*M* = 3.224, *SE* = .241) than prior to termination (*M* = 6.466, *SE* = .354), *F* (1, 28) = 60.160, *p* = .001, partial η^2 = .682. No main effect of task was found when comparing the pet task (*M* = 4.793, *SE* = .320) with the business task (*M* = 4.897, *SE* = .211), *F*(1, 28) = .106, *p* = .658 , partial η^2 = .004.

As predicted a significant interaction was observed between time of measurement and task, *F*(1, 28) = 4.305, *p* = .047, partial η^2 = .133. A paired t-test demonstrated a significant difference in the amount of change between the two tasks over the duration of the experiment with greater change in pleasure ratings for an ill pet (*M* = 3.93, *SE* = .572) when compared with a failing business (*M* = 2.55, *SE* = .492), *t*(28) = 2.075, *p* = .047.

3.3.1 Comparisons of Pleasure and Displeasure between Pet and Business Task While Accounting for the Initial Pleasure Report

To assess if initial pleasure influenced participant ratings while conducting the two tasks a 2 (time of measurement: fourth quartile, prior to termination) X 2 (condition: pet, business) repeated measures ANCOVA was conducted on mean affect ratings, with the initial rating of pleasure functioning as a covariate in the analysis. The analysis conducted assessed the dataset without errors. The results showed a main effect for the measurement of time with more pleasure experienced for the fourth quartile pleasure report (*M* = 3.222, *SE* = .169) than the pleasure report prior to termination (*M* = 6.333, *SE* = .363), *F*(1, 24) = 31.773, *p* = .001, partial η^2 = .570. The results also showed a main effect between tasks with the pet task (*M* = 4.704, *SE* = .295) being more pleasurable overall compared with the business task (*M* = 4.857, *SE* = .216), *F*(1, 24) = 4.498, *p* = . 044, partial η^2 = .158. The results also showed that no interaction effect was present when accounting for the participants' initial pleasure report for the two tasks *F* < 1.

Further analysis was conducted using the ANCOVA to assess the full dataset. The findings showed a main effect for time with more pleasure experienced at the fourth quartile

pleasure report (M = 3.224, SE = .173) compared with the final pleasure report prior to terminating the task (M = 6.466, SE = .364), $F(1, 26) = 25.731$, $p = .001$, partial $\eta^2 = .497$. The results did not show a main effect for task when comparisons were made between the pet (M = 4.793, SE = .292) and the business (M = 4.897, SE = .212) task, $F(1, 26) = 3.119$, $p = .089$ and did not show a significant interaction effect $F < 1$.

3.4 Hypothesis Three: Regression Analysis of Participant Choice and Pleasure Associated with Tasks

To test the third hypothesis that participant ratings of pleasure would be a better predictor for the pet task than for the business task, a simple linear regression analysis was conducted for each task. The dependent variable for the analysis was the number of investment choices participants made and the predictor variable was the final pleasure rating prior to termination. The results showed that for predicting the number of choices a participant would make for the pet task, an $r^2 = .023$ or 2% of the variation could be attributed to the final pleasure rating prior to termination. When predicting the number of choices a participant would make for the business task, an $r^2 = .219$ or 22% of the variation could be attributed to the final pleasure rating prior to termination. Details of the regression models are in Table 3.6.

Table 3.6 Regression models for Pet and Business Task for Final Pleasure Rating for the Error Free Dataset

Variable	*B*	SE B	β
Pet Task	3.52	4.597	.151
Business Task	16.082	6.073	.468*

Note: $R^2 = .023$ for Pet task; $R^2 = .219$ for Business task.
* $p < .05$

Looking at Table 3.7, the ANOVA did not show a significant contribution to the variance from final pleasure report prior to termination when predicting the number of choices that a participant would make for the pet task. The contribution of final pleasure to the variance of number of choice was, however, significant for the business task.

Table 3.7 ANOVA for Pleasure Rating Associated with Participants Choice per Task for the Error Free Dataset

Source	*df*	*F*	*p*
Pet Task	1	.586	.451
Error	25		
Business Task	1	7.013*	.014
Error	25		

* p <.05

For an additional analysis of the predictability of participant choice for either the pet or business task based on pleasure ratings, a simple linear regression analysis was conducted for the full dataset. The results showed that for predicting the number of choices a participant would make for the pet task a $r^2 = .035$ or 4% of the variation could be attributed to the final pleasure rating prior to termination. When predicting the number of choices a participant would make for the business task a $r^2 = .149$ or 15% of the variation could be attributed to the final pleasure rating prior to termination. Details of the regression models are in Table 3.8.

Table 3.8 Regression Models for Pet and Business Task for Final Pleasure Rating for Full Dataset

Variable	*B*	SE B	β
Pet Task	5.028	4.36	.186
Business Task	11.015	4.457	.385*

Note: $R^2 = .035$ for Pet task; $R^2 = .149$ for Business task.
* p < .05

Looking at Table 3.9, the ANOVA did not show significant variation was attributed to the final pleasure report when predicting the number of choices that a participant would make for the pet task, but the outcome did show that the variation was significant when assessing choice for the business task based on the final pleasure report prior to termination.

Table 3.9 ANOVA for Pleasure Rating Associated with Participants Choice per Task for Full Dataset

Source	*df*	*F*	*p*
Pet Task	1	1.33	.256
Error	37		
Business Task	1	6.108*	.018
Error	35		

* p <.05

The results for both the error free dataset and the full dataset did not support the third hypothesis that pleasure ratings would be a better predictor of risk taking for the pet task than the business task. It should be noted that the results were opposite to what was predicted.

CHAPTER 4

DISCUSSION

4.1 Introduction

The study of decision-making has been in existence for over two centuries, but our understanding of the processes involved still requires further exploration. To understand this line of research one must keep in mind that decision-making has its roots in the field of mathematics. This area of research has extended into psychology by attempting to explain how human choices tend to deviate from mathematical efficiency. Most of the current psychological research has continued the use of mathematical assumptions, which have been passed on from the origins of this field because they were useful for developing approximations to predict outcomes when a choice is being made. This research investigated one of the assumptions, specifically how resources may influence human choice, which has not been considered a factor by traditional means.

This research tested three hypotheses to determine if the assumption that value is not influenced by a resource is scientifically valid. The first hypothesis predicted that the number of choices a participant would make for a failing business would be significantly less than the number of choices they would make for an ill pet. To better understand the influences in the outcome of investment choices for business versus a pet the second hypothesis predicted that the amount of pleasure and displeasure experienced for a pet would be significantly greater than the pleasure and displeasure experienced for a business. Finally, to illustrate how emotions play a role in decision-making the third hypothesis predicted that the pleasure report for a pet would be a better predictor of investing than the pleasure report for a business.

For the hypotheses, two analyses were conducted for data that did not contain errors as well as the full dataset. The analyses of both datasets allowed for deeper investigations of the

information that was gathered meaning that the analysis provided further information for individual differences that may have impacted the results. The information that was gathered from the full dataset should not be equated to the error free dataset, but viewed as exploration to consider possible changes in trends that may have been overlooked. Additionally, the inclusion of the full dataset in the research provides transparency in how data was collected.

The emphasis on the error free dataset is justified because the analysis of group composition was conducted demonstrating that the errors that occurred were completely random. All the information gathered from the full dataset increased standard error even though the sample size has increased further supporting the use of the error free dataset as the focus of this research.

4.2 Differences in Investment Choices

Theory in the past has focused solely on the magnitude of gains and losses when assessing how a choice is made (Galanter & Pliner, 1974; Tversky & Kahneman, 1981). The research that I conducted examined two scenarios with equal magnitude of gains and losses with the only difference being the labels applied to the two tasks (i.e., business and pet). When assessments were made for the number of choices a participant made for either a pet or a business, the results showed that participants would make more choices for the pet than the business even though the expected amounts of increase and decrease were identical. This outcome demonstrates that the values of the two resources are not equal as stated by prior theories (e.g., expected utility theory, prospect theory, or decision affect theory). A similar trend was observed for the full dataset during the exploratory analysis.

Further analysis of the data using a Kaplan-Meier survival analysis showed that the dropout rate for the business task was significantly greater than the pet task further supporting the first hypothesis by demonstrating that the way participants responded to the losses between the two resources is statistically different. In other words, based on the dropout rate between the two resources the participants responded differently when they began to receive losses. As

with the assessment examining the number of investment choices for the exploratory analysis, the full dataset had the same trends for the business versus the pet with a decrease in the level of significance attributed to the increase of error in the sample.

Finally, when the attempting to determine if experience as a pet owner influenced the results, the Cox Regression analysis for both the error free and full datasets did not demonstrate a significant difference in termination of either pets or businesses. This outcome may be the result of how conservative the Cox Regression analysis is or possibly attributed to the sample size of the data.

The information that was gained points to differences existing in the way an individual will make decisions for a monetary resource compared with a social resource. Note that the analyses using the full dataset had trends that followed the predicted direction even though the amount of error increased with the sample size. The analyses that were supported using the error free dataset repeatedly showed longer investing with an ill pet compared with a failing business as well as demonstrating differences in responses based on participant dropout rate to repeated losses for pets and businesses.

The main concern in this research regards the results of the Cox Regression survival analysis when considering a covariate. The analysis did not show any significance for the overall model. This means that regardless of the inclusion of the covariate the analysis did not follow any predictable trend. With this stated there should be caution in attempting to completely disregard the results based on the outcome of the Cox Regression. Like most early research considering a novel direction, there are multiple factors that may need to be included or may require a refined experimental design thus further research is needed to have a complete picture to explain why significance is lost using this assessment.

The overall stance is that the first hypothesis was supported because the average responses indicate that the sample population differs in terms of how investments are made between resources, which is a violation of current theory for decision-making. This is significant

because it points to needed examination of the mathematical assumptions that are applied to decision-making theories currently used in the field of psychology. Further analyses in this area should provide more accurate predictions of how people make choices.

4.3 Differences in Pleasure and Displeasure

A possible explanation for differences being found between two resources is emotion. Based on other literature for affective decision-making, emotions tend to play a role in subjective value, meaning that individuals place more value on items that are seen favorably than on items that are seen negatively (Pham, 2007; Rottenstreich & Hsee, 2001). Additionally, this line of research has noted that the degree of pleasure or displeasure that is experienced with a decision is attributed to how much affect can be associated with the choice, meaning that the value of an item that is high in affect tends to have more subjective value than an item that is low in affect. Thus, it is reasonable to expect higher levels of pleasure as well as displeasure seen with the pet task compared with the business task.

The results of the analysis supported the hypothesis that the pet task would have higher ratings of pleasure and displeasure than the business task for both assessments. These findings help to support the perspective that participants emotionally respond to the two types of resources (a pet and a business) differently. The difference in the amount of pleasure and displeasure experienced may be one of the reasons that participants invest in a failing business less than an ill pet. These findings may be explained by theories like subjective expected pleasure theory and decision affect theory that consider differences in decision-making based on subjective value as well as experience.

Additionally, the first two results support the earlier findings help of Rottenstreich and Hsee (2001) that specific probabilities have different values for affect-rich versus affect-poor items; in particular, that there tends to be more risk seeking for affect-rich items. These two outcomes also help to eliminate questions concerning affect ratings in the Rottenstreich and

Hsee (2001) research by obtaining emotional ratings from the same participants that conducted the experiment and having similar results as their study.

For this analysis, a second interpretation is possible noting that differences attributed to emotional baselines specifically for pets and to some degree businesses may alter how gains and losses are experienced. It is possible that the reason pleasure and displeasure are different between the two resources is attributed to participants having prior experience as a pet owner. With experience participants will reflect on increases and decreases in quality of life more often and may have a better understanding of how losing a pet may feel compared with having a failing business.

4.4 Predicting Investment Choices

To develop a full picture of how emotions influence choice, I had predicted that participants' ratings of pleasure and displeasure would provide a more accurate prediction of investing with a more emotional resource (i.e., a pet versus a business). This prediction is consistent with subjective expected pleasure theory and adds to the research by considering how differences may exist in decision-making with a resource aside from money.

The findings of the analysis were contrary to the prediction which was that pleasure ratings for a pet would be a better predictor of investing compared with pleasure ratings of a business. In other words, the participants rating of pleasure was only a significant predictor of investing for the business task. In hindsight, this makes sense when one considers that past research using emotions to predict decision-making has been focused on choices concerning money (Mellers & McGraw, 2001). While this outcome did not follow the predicted trend, the results demonstrate that investing can be predicted in monetary decision-making as has been repeatedly demonstrated by Mellers research (Mellers, 2000). More importantly, the inability to predict investments that are not based on monetary value demonstrates that there is more to decision-making and emotions than has been previously considered because the level of pleasure experienced in the pet condition was not a significant indicator of investing.

Once again, it is worth noting that the subjective experience of gains and losses for pets versus businesses is considerably different. First, people have direct relationships with their pets and tend to see immediate outcomes of decreases in quality of life. Second, with businesses, the perception of finality tends to be experienced more indirectly, and depending on where an individual is in their life (i.e., young and starting a career versus older and near retirement) finality may not be perceived as a total loss.

4.5 Final Conclusion

As stated through this paper, the purpose of this research was to consider possible variations in decision-making that have yet to be accounted for in the field of psychology. The findings from this study have shown that differences do indeed exist in how decisions are made between different types of resources. While this research is one of the first of its kind, the results do follow predictions by the founders of such influential theories as prospect theory.

Based on other recent research (Rottenstreich & Hsee, 2001) it was likely that the differences that existed between the resources may be attributed to emotions and their impact on the value of an object. Issues were seen with current decision-making theories (e.g., subjective expected pleasure theory and decision affect theory), which failed to account for as well as predict the differences that exist in decision-making for two resources when emotions are accounted for. Prior research has shown the ability to use regret and disappointment as a predictor of decision-making (Mellers, Schwartz, & Ritov, 1999). Regret and disappointment seemed to account for the findings of this paper on monetary choice and emotion, but not when choice was associated with an affect rich item (a pet), as shown by the finding that contradicted the third hypothesis. For the pet, even with the most negative of emotions, participants continued to invest which has was not the case for the business. The future direction of this research is to expand on this paradigm and consider what factors must be in place for the outcomes to follow prior theoretical assumptions as a means to better understand differences

between actual choices made and the predictions of some existing mathematical decision theories.

APPENDIX A

AXIOMS OF EXPECTED UTILITY THEORY AND THEIR DEFINITIONS

The axioms of expected utility theory are sets of principles applied to decision-making. These principles when followed result in mathematically efficient choices that are referred to rational decision-making.

Axioms of Expected Utility Theory	
Ordering of Alternatives	The options in a decision problem should be comparable.
Dominance	A rational strategy does not choose an option if another option is better than it on some attributes and at least as good on all attributes
Cancellation	When options in a decision set are similar, the focus on preference should be on the traits that are different.
Transitivity	When comparing options in a decision-making problem, if option "A" is preferred over "B" and option "B" over "C" then" A" should also be preferred over option "C". There should be a constant rank order of preference that does not change.
Continuity	A gamble between the best and worst outcomes is preferred to a sure moderate outcome, if the odds for the best outcome outweigh the potential loss in a decision-making problem.
Magnitude	The potential for the amount of a loss or gain on both options does not influence preference between options in a decision problem.
Resources	The resource that is influenced by the choice in decision-making does not impact option preference.

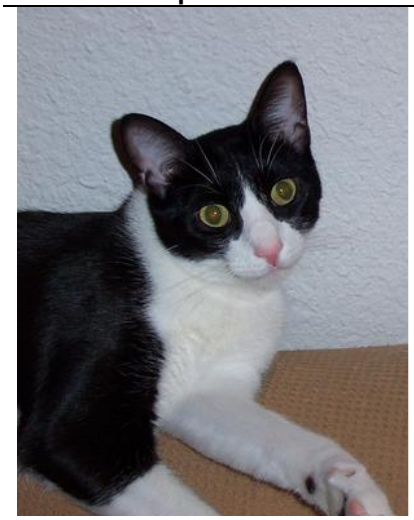
(Bernoulli, 1738/1954; Plous, 1993; Savage, 1954)

APPENDIX B

SAMPLES OF TASK MENUS FOR EACH TASK

The following is a list of the menu sets for each task.

First menu option for investment tasks



Press A to care for your pet.

Press B for a veterinarian visit

Press A for Business Investing

Press B for Loss Managment

The figure above is the first set of menus participants will see when performing either version of the investment tasks.

Menu Option for Choosing "A"

A. Teach a new trick

B. Feed

C. Groom and bathe

D. Put pet outside

A. Employee Function

B. Restock product and pay utilities

C. Clean and reset store

D. Close for the Day

A. Teach a new trick- You take the time to teach your pet a new trick.	**A.** Employee Function- You have a party to increase employee morale.
B. Feed- You feed the pet and make sure that it has water.	**B.** Restock product and pay utilities- You order more product to sale and pay for needed expenses.
C. Groom and bathe- You give your pet a bath, brush their fur, and trim their nails	**C.** Clean and reset store- You sweep, mop, and reset displays for your business.
D. Put pet outside- You place your pet outside.	**D.** Close for the Day- You close the store.

Menu Options for Choosing "B"

A. Pay for all medical procedures

B. Put to sleep

A. Hire an outside consultant

B. Declare bankruptcy

A. Pay for all medical procedures: attempt to help your pet get better by letting a vet treat them. **B.** Put to sleep (Putting your pet to sleep ends the game)	**A**. Hire an outside consultant**.** **B.** Declare bankruptcy (Declaring bankruptcy ends the game)

APPENDIX C

INSTRUCTIONS FOR SELF ASSESSMENT MANIKIN

The following are instructions given to participants to respond to the SAM scale.

If you look on the wall you will see three sets of figures each arranged along a continuum. The set of figures are called SAM. You will use these figures to rate how you felt when shown your outcome performance. SAM shows three different kinds of feelings happy versus unhappy, excited versus calm, and control versus in control.

You can see each SAM figure varies along each scale in this illustration (the happy versus unhappy scale is on the screen) the first SAM scale is very happy to very unhappy scale, which ranges from a smile to a frown. At one extreme of the happy versus unhappy scale you felt happy, pleased, satisfied, content, or hopeful. If you felt completely happy while view your feedback you can indicate this by selecting the corresponding number that is below the figure on the far left. At the other end of the scale is when you felt completely unhappy, annoyed, unsatisfied, melancholic, despair, or bored. You can indicate this by selecting the corresponding number that is below the figure on the far right.

The figures also allow you to describe intermediate feelings of pleasure. If you felt completely neutral neither happy or unhappy you can indicate this by selecting the corresponding number that is below the figure in the middle. If in your judgment your feelings of pleasure or displeasure fall between two of the pictures you can indicate this by selecting the corresponding number that is between the figure. This permits you to make a more finally graded rating for how you feel in reaction to your investment feedback.

The excited versus calm dimension is the second kind of feeling displayed here (an illustration of the excited versus calm scale is on screen as the instructions are given). At one extreme of the scale you felt stimulated, excited, frenzied, jittery, wide awake, or aroused. If you felt completely aroused you can indicated this by selecting the corresponding number that is below the figure on the far left. On the other hand, at the other end of the scale you felt completely relaxed, calm, sluggish, dull, sleepy, or unaroused, you can indicated this by selecting the corresponding number that is below the figure of the far right. As with the

happy/unhappy scale you can represent intermediate levels. If you are not at all excited nor at all calm you can indicate this by selecting the corresponding number of the figure in the middle. Again, if you wish to make a more finally tuned rating of how excited or calm you feel you can indicated this by selecting the corresponding number between the figures.

The last scale of feeling (an image of the control/being controlled scale is displayed to participant at this time) you will rate is the dimension of control versus in control. At one end of the scale you have feelings characterized as completely controlled, influenced, cared for, awed, submissive, or guided. You can indicate this by selecting the corresponding number that is below the figure on the far left. At the other extreme end of the scale you felt completely controlling, influential, in control, important, dominant, autonomous. You can indicate this by selecting the corresponding number that is below the figure on the right. Note that when the figure is large you feel important and influential and that it will be very small when you feel controlled and guided. You can indicate this by selecting the corresponding number that is below the figure. Remember that you can represent your feeling between these endpoints.

APPENDIX D

INSTRUCTIONS FOR THE TWO TASKS

Business game

Thank you for volunteering to participate in this experiment. You are about to play a game where you own a private business. It is your responsibility to make sure that your business is successful. You will be presented with options to take to improve your business. At different periods of time you will be asked to report the state of your business to others who have also invested in your business. After you have chosen an action to take you will be told the immediate impact that it has had on your business and you will be asked to report how good or bad you feel about the outcome. The choices you make can and will impact how well your business has performed at the end of the game. Because this is a scientific experiment it is important that you attempt to do as well as possible to provide meaningful information for the study.

Pet game

Thank you for volunteering to participate in this experiment. You are about to play a game where you have adopted a pet. It is your responsibility to make sure that your new pet is well cared for. You will be presented with options take to care for your pet. At different periods of time you will see a virtual veterinarian who will report to you the quality of your pet health. After you have chosen an action to take you will be told the immediate impact that it has had on your pet and you will be asked to report how good or bad you feel about the outcome. The choices you make can and will impact how well your pet is at the end of the game. Because this is a scientific experiment it is important that you attempt to do as well as possible to provide meaningful information for the study.

APPENDIX E

DEBRIEFING SCRIPT FOR THE TASKS

Debriefing after completing the first task

You have just completed the first of two tasks for decision-making. Please schedule a time for the second task after two weeks have passed. The researchers for this experiment are requesting that information about this project not be discussed with other students. If you have questions or would like more information please contact Patrick Ramirez or Dr. Daniel Levine.

Debriefing after the second task has been completed

Thank you for your participation. The experiment you performed was testing differences in decision-making between two resources under similar conditions. You have the option to retract your consent to participate in this research experiment at no consequence to you. Doing so will forbid researchers from using the data you have provided in this study. The researchers for this experiment are requesting that information about this project not be discussed with other students. If you have questions or would like more information please contact Patrick Ramirez (972-841-0451) or Dr. Daniel Levine (817-272-3598).

REFERENCES

Barron, G., & Erev, I. (2003). Small Feedback-based Decisions and Their Limited Correspondence to Description-based Decisions. *Journal of Behavioral Decision Making, 16*, 215-233.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognitiion, 50*, 7-15.

Bell, R., & Coplan, J. (1976). *Decisions, Decisions: Game Theory and You.* New York: Norton.

Bentham, J. (1780). *Principles of morals and legislation*. Retrieved June 24, 2009, from http://www.constitution.org

Bernoulli, D. (1738/1954). Exposition of a new theory on the measurement of risk. *Econometrica, 22*, 23-36.

Bradley, M. M., & Lang, P. J. (1994). Measureing Emotions: The Self-Assessment Manikin and the Semantic Differential. *The Journal of Behavioral Therapy and Experimental Psychiatry, 25*, 49-59.

Camerer, C. F. (2003). Behavioural studies of strategic thinking in games. *TRENDS in Cognitive Science, 7*, 225-231.

Crone, E. A., & Van Der Molen, M. W. (2004). Developmental changes in real life decision making: Performance on a gambling task previously shown to depend on the ventromedial prefrontal cortex. *Developmental Neuropsychology, 25*, 251-279.

Dawes, R. M. (1980). Socail dilemmas. *Annual Review of Psychology, 31*, 169-193.

E-Prime. (Version 2005.1.1.4.1). *Computer Program* . Pittsburg PA, http://www.pstnet.com: Psychology Software Tools.

Galanter, E., & Pliner, P. (1974). Cross-modality matching of money against other continua. In H. R. Moskowitz, S. Bertram, & J. C. Stevens, *Sensation and Measurement* (pp. 65-76). Dordrecht, Holland: D. Reidel Publishing Company.

G-Power. (Version 2008 3.0.10). *Computer Program* . http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3.

Grossberg, S., & Gutowski, W. E. (1987). Neural dynamics of decision making under risk: Affective balance and cognitive-emotional interactions. *Psychological Review, 94*, 300-318.

Kahneman, D. (1973). *Attention and Effort.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*, 263-292.

Ketelaar, T., & Au, W. T. (2003). The effects of feelings of guilt on the behaviour of uncooperative individuals in repeated social bargaining games: An affect as information interpretation of the role of emotion in social interaction. *Cognition and Emotion, 17*, 429-453.

Lichtenstein, S., & Slovic, P. (2004). Chapter 33: The Functions of Affect in the Construction of Preferences. In S. Litchenstein, & P. Slovic, *The Construction of Preferences.* New York: Camridge University Press.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267-286.

Mellers, B. A. (2000). Choice and the relative pleasure of consequences. *Psychological Bulletin, 126*, 910-924.

Mellers, B. A., & McGraw, P. A. (2001). Anticipated emotions as guides to choice. *Currrent Directions in Psychological Science, 10*, 210-214.

Mellers, B. A., Schwartz, A., Ho, K., & Ritov, H. (1997). Decision affect theory: Emotional reactions to the outcomes of risky options. *Psychological Science, 8*, 423-429.

Mellers, B., Schwartz, A., & Ritov, I. (1999). Emotion-based choice. *Journal of Experimental Psychology, 128*, 332-345.

Peters, E., Slovic, P., & Gregory, R. (2003). The role of affect in the wta/wtp disparity. *Journal of Behavioral Decision Making, 16*, 309-330.

Pham, M. T. (2007). Emotion and rationality: A critical review and interpretation of empirical evidence. *Review of General Psychology, 11*, 155-178.

Plous, S. (1993). *The Psychology of Judgment and Decision-Making.* New York: McGraw-Hill, Inc.

Rottenstreich, Y., & Hsee, C. K. (2001). Money, kisses, and electric shocks. *Psychological Science, 12*, 185-190.

Savage, L. J. (1954). *The Foundation of Statistics.* New York: Wiley.

Sitkin, S. B., & Pablo, A. L. (1992). Reconceptualizing the determinants of risk behavior. *Academy of Management Review, 17*, 9-38.

Soman, D. (2001). The mental accounting of sunk time costs: Why time is not like money. *Journal of Behavioral Decision-Making, 14*, 169-185.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185*, 1124-1131.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 453-458.

Von Neumann, J., & Morgenstern, O. (1964). *Theory of Games and Economic Behavior.* New York: John Wiley & Sons.

Wong, K. F. (2005). The role of risk in making decisions under escalation situations. *Applied Psychology: An International Review, 54*, 584-607.

BIOGRAPHICAL INFORMATION

Patrick Ramirez earned his undergraduate degree at the University of Texas at Arlington where he was a University and a McNair Scholar. Patrick stayed at UT Arlington to complete his Master's in Experiment Psychology. Mr. Ramirez's interest in research concern human decision-making and attempting to explain how and why people deviate from mathematical efficiency. His work ranges from investigations of caffeine on emotional decision-making to using functional magnetic resonance imaging while investigating the ratio bias. Patrick's future plans are to continue to earn his PhD in experimental psychology and from there enter the ranks of academia as a post-doc and eventually a professor.