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## The Effects of Discrete Emotions on Risky Decision Making

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THE EFFECTS OF DISCRETE EMOTIONS ON RISKY DECISION MAKING

A Thesis

Presented to

The Faculty of the Department of Psychology

San José State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Hoeun Sim

May 2016

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The Designated Thesis Committee Approves the Thesis Titled

THE EFFECTS OF DISCRETE EMOTIONS ON RISKY DECISION MAKING

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May 2016

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## ABSTRACT

### THE EFFECTS OF DISCRETE EMOTIONS ON RISKY DECISION MAKING

by Hoeun Sim

Contrary to the dominant view that generally equates feelings with poor thinking, converging evidence indicates that decisions – including those involving risk – are influenced by affective experiences. Research, however, is limited to studies on undifferentiated, global positive versus negative mood states; less is known about the influence of discrete emotions. The purpose of this research was to extend the affect-cognition literature by (a) examining the effects of discrete emotions varying along the dimensions of valence and arousal, and (b) identifying the systematic ways that discrete emotions underlie risky decision making. We used a set of emotion-laden IAPS images to elicit and compare the impact of incidental emotions on risky decision making. One hundred and twenty-two undergraduate students were randomly assigned to one of the four affective conditions: excitement, contentment, fear, and sadness. Following the emotion induction procedure, participants completed the Choice Dilemmas Questionnaire (CDQ) to assess their risk-taking propensity. Results indicated an interaction effect between valence and arousal for positive emotions, such that excited participants were significantly more risky in their decision making compared to contented participants. The discussion focuses on the theoretical and practical health implications of these findings. We recommend that future research capitalize on the insights gained from emotion research and use it favorably to improve decision making under risk.

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## **Introduction**

Affect influences nearly all aspects of cognition, ranging from how we perceive and interpret information, to how we process and utilize that information to inform our judgments and guide our behavior (Zajonc, 1980). Thus, as humans who make decisions about trivial and occasionally consequential matters, emotions are paramount to our everyday lives. Although the literature provides increasing empirical support for the affect-cognition relationship, support for this view falls short in comparison to traditional theorizing, which generally investigates affect and cognition in isolation, focusing primarily on the “cold” versus “hot” processes of thought (Hilgard, 1980).

The relative neglect of affect in the cognition literature can be largely attributed to the long-standing misconception that because emotions are primitive, they are disruptive and incompatible with reason and logic. Consequently, even when affective influences are acknowledged, they are typically assumed to have an undesirable or interfering role (Loewenstein, 1996), an outdated view that traces back to classic scholars such as Plato and Freud (Forgas, 2008)—both of whom believed rationality was contingent on the suppression of emotions. Bias towards affect-less cognitions is also apparent in the field of behavioral economics, where affective influences are either completely ignored or predominately overlooked by traditional decision theorists. Proponents of conventional utility models (e.g., Expected Utility Theory), for example, postulate that the decision maker behaves as a rational agent, systematically calculating and comparing every possible probability associated with each choice alternative before deciding on an option

that presumably reflects the optimal, utility-maximizing outcome (von Neumann & Morgenstern, 1944).

Conversely, the extant research suggests that animals, including humans, do not always adhere to the axioms of rational choice, that decisions – even those involving high risk – are colored by subjective, affective states. For example, it is well-documented that individuals readily employ heuristics or informal strategies when making judgments and decisions under uncertainty (Tversky & Kahneman, 1974). Rather than logically and methodically evaluating each alternative to arrive at the most optimal outcome, decision makers often rely on such shortcuts (e.g., representativeness, availability, anchoring and adjustment, etc.) to efficiently generate an acceptable outcome. To overcome these violations of Expected Utility Theory, Kahneman and Tversky (1979) proposed an alternative model of risky choice, termed Prospect Theory.

Unlike normative models, concerned with the way individuals should or ought to make decisions, Prospect Theory was developed as a descriptive model of decision making under risk. The theory replaces the notion of utility with a value function, which is defined in terms of gains and losses (based on decision weights) rather than final outcomes (based on probabilities). Moreover, it contends that individuals tend to overweight outcomes of low probability and underweight outcomes of moderate to high probabilities. These biases are captured by the S-shaped value function, which is concave for gains but convex for losses. That is, individuals evaluate gains and losses differently; we tend to be risk averse with respect to gains but risk seeking with respect to losses. Additionally, the value function is steeper for losses than for gains, reflecting loss

aversion. The effects of this cognitive bias have been replicated in number of experiments by varying the description of logically equivalent alternatives. In the classic Asian disease problem, for example, Tversky and Kahneman (1981) demonstrated that whether an alternative is framed positively (in terms of gains) or negatively (in terms of losses) can elicit systematically different decisions. Although framing can occasionally produce judgmental biases and do not guarantee utility-maximizing outcomes, such mental shortcuts are sufficiently accurate. That is, heuristics are accurate enough to be useful for decision-making, as they represent an adaptive strategy that enables one to quickly make decisions in an effortless and intuitive manner.

Similarly, affective states, such as one's feelings and emotions, can also serve as a heuristic (Finucane, Alhakami, Slovic, & Johnson, 2000; Pham, 1998; Schwarz & Clore, 1988). Anecdotal evidence, for example, provides ample cases of when decisions are made "in the heat of the moment" or based on temporary, salient emotions. Accordingly, *the affect heuristic* refers to the use of these momentary feelings as sources of information (Slovic, Finucane, Peters, & MacGregor, 2002). This strategy can be particularly useful in situations during which a thorough cost-benefit analysis may not always be possible or advantageous. With regard to risk assessments, Loewenstein, Weber, Hsee, and Welch refers (2001) describes a similar experiential mode of thinking, whereby individuals use their emotional reactions (e.g., fear responses) to gauge potential risks. Known as *risk-as-feelings*, this processing strategy deviates drastically from the analytical mode of thinking, central in traditional utility theories.

Furthermore, converging neurocognitive evidence demonstrates that emotions are not only useful but also essential for adaptive reasoning (Frijda, 1986; Northoff et al., 2006). As Damasio (1994) proposed in his *somatic marker hypothesis*, decisions are guided by instincts, previously learned emotional responses associated with specific situations. When the decision maker is confronted with risky choices, these emotional instincts automatically signal or mark information about the individual's bodily, and hence somatic state. In the same way that a threatening stimulus may signal alarm and activate the physiological processes (i.e., sympathetic nervous system) critical for preparing the individual to either challenge or withdraw from the threat (i.e., fight or flight response), decision alternatives evoke different emotions that signal either a positive or negative somatic state. Whereas a positive state generally indicates favorable outcomes, a negative state signals potentially dangerous consequences and warrant detailed analysis. Evidence for this is observed in patients with brain damage to the regions associated with the dispositional representation of emotional experiences. Due to their impaired ability to utilize previously acquired emotional experiences, patients with ventromedial prefrontal cortex damage are unable to generate hunches about the relative desirability of future outcomes and consequently perform poorly in simulated gambling tasks, despite having their general cognitive abilities intact (Bechara et al., 1997). Thus, somatic markers are essentially heuristics that aid the decision process by rapidly eliminating irrelevant choices and highlighting information that is most vital for further deliberation. Affect, then, does not imply irrationality. Both theoretical and empirical

findings suggest that rather than interfering or disrupting the cognitive processes involved in decision making, affective states, in most circumstances, play a supporting role.

Although the role of affect in decision making is fundamental, much of the supporting literature have been limited to studies on mood. One of the most robust findings is that positive mood tends to be associated with a more flexible, top-down, and optimistic approach, whereas negative mood tend to be associated with a more rigid, bottom-up, pessimistic approach (Bless et al., 1996; Bower, 1981; Fredrickson, 2001; Johnson & Tversky, 1983; Schwarz & Clore, 1983; for further review see Schwarz & Clore, 1996). Support for this finding is illustrated in studies examining the effects of mood on stereotyping (Bodenhausen, 1993; Worth & Mackie, 1987). The general finding is that individuals in a positive mood tend to process information less carefully, relying instead on simplified cognitive strategies (i.e., heuristics) such as schemata and stereotypes to inform their judgments.

In explaining the differential effects of mood on cognitive processing, Schwarz and Clore's (1988) *affect-as-information* model assumes that preexisting moods provide valuable information about one's current situation, and thereby influence the processing strategies that one adopts. That is, when faced with a task requiring a judgment call, individuals will often base their decision on their current mood, such as by asking themselves "How do I feel about it?" The subsequent processing strategy employed is dependent on the nature of their assessment. Whereas positive moods generally indicate a safe environment, negative moods signal a problematic situation that requires cautious action. Furthermore, with regard to risk-taking behavior, the *mood-maintenance*

*hypothesis* postulates that positive affect—rather than negative—results in higher risk aversion (Isen & Patrick, 1983). According to the model, individuals are generally motivated to maintain a positive state and minimize a negative mood state. Therefore, individuals experiencing positive affect should be reluctant to take risks that can potentially diminish their pleasant feelings. Individuals experiencing negative affect, on the other hand, should be more likely to seek risks, so as to replace their negative experience with more pleasant feelings (Hockey Maule, Clough, & Bdzola, 2000; Isen, 1985).

Building on the fact positive affect leads to greater cognitive flexibility and risk aversion, Isen (2000) proposed that positive affect should also promote efficiency and greater acceptance for decisions about gains, while promoting cautious deliberation and greater caution for decisions about costs. Indeed, inducing positive affect in participants, such as through the use of a small gift reward, resulted in higher inclinations to gamble when the probability of winning was high as opposed to low (Isen & Patrick, 1983). Participants in whom positive affect was induced also showed greater sensitivity to losses than controls, preferring to bet less money in gambles with large potential losses but more money in gambles with small potential losses (Nygren, Isen, Taylor, & Dulin, 1996). Similarly, Cahir and Thomas (2010) found that positive affect led to less risky decision making. Specifically, participants in the positive affect condition were more likely to make risk-avoidant decisions regarding a high-risk horse race game compared to those in the neutral affect condition. As the authors noted, this finding could be explained by the mood-maintenance hypothesis; individuals experiencing positive affect



were perhaps betting on the lower risk horses in an attempt to preserve their current pleasant states.

These findings collectively allude to the advantage of positive affect in inhibiting risky decision making, which appears to conflict with research documenting the heuristic-like processing style associated with positive affect. More specifically, they seem to contradict studies suggesting that negative affect is associated with analytic and cautious processing, characteristic of conservative decision making. For example, Yuen and Lee (2003) found that participants who viewed a sad (versus happy and neutral) movie clip were less likely to demonstrate risky decision making on a subsequent decision task involving life dilemmas. Further support for this finding has been demonstrated in studies investigating the influence of depression on affective decision making. As the authors noted, results suggested that depressed participants, compared to their non-depressed counterparts, displayed greater avoidance towards risky decisions and better overall performance on the Iowa Gambling Task (Smoski et al., 2008). Moreover, Chou, Lee, and Ho (2007) found that, regardless of age, happy participants showered greater risk taking tendency than sad participants. That is, the positive mood effect on risk-taking proclivity was observed for both young and older participants.

Taken together, the research reviewed indicates some disagreement regarding the role of affect on decision making, making it difficult to determine whether positive or negative affect is better suited to mitigate risky decisions. One possible explanation for the discrepant findings between positive and negative affect concerns the need to distinguish between general mood and discrete emotions. Although both fall under the

umbrella term of affect, emotions differ fundamentally from mood. Unlike mood, emotional states are not homogenous, nor are they easily categorized into either positive/negative or pleasant/unpleasant dimensions (Barrett, 1998; Pfister & Böhm, 2008). Whereas mood tends to be diffused, lower in intensity, and longer in duration, discrete emotions such as excitement and fear represent unique experiential states that typically result from distinct causes, are higher in intensity, and are relatively shorter in duration (Izard, 1977; Smith & Kirby, 2000). More precisely, emotions represent contextualized states that differ qualitatively from mood. According to Pfister and Böhm's (2008) framework on the multiplicity of emotions, emotions serves four main functions in decision making: they (1) provide evaluative information (2) enable rapid decisions under time pressure (3) direct attention to relevant information, and (4) promote commitment to selected decisions. Although discrete emotional states have varying degrees of functionality, the majority of studies on affect have nonetheless focused on the differential effects of positive versus negative moods. Emotions, however, are multidimensional; a one-dimensional, valence-based scale cannot sufficiently explain emotion-specific functions on decision making because neither all positive nor all negative affect are equal in the responses they produce.

Different affective states that are mapped under the same valence scale can influence decision making in distinct ways. A number of studies suggest that negative emotions, of varying intensity, can lead to differences in risk-taking (for a review, see Pham, 2007). For example, Pham and Rajagopal (1999) found that sadness and anxiety predicted different preferences for gambles involving risk and reward trade-offs.

Specifically, anxious participants were found to be more conservative than sad participants, preferring the lower payoff with higher probability (low risk) option to higher payoff with lower probability (high risk) option. These differences in risk-taking tendency were presumed to be due to the motivational bias underlying the need to repair one's mood. Whereas anxiety elicits the goal to reduce uncertainty and consequently leads to risk-avoidance, sadness elicits the goal to attain reward and consequently leads to risk-seeking behavior. Moreover, previous studies on fear and anger suggest that although both emotions are negatively valenced, fear leads to risk-avoidance while anger leads to risk-seeking behavior, presumably because the former is associated with pessimistic risk evaluations whereas the latter is associated with optimistic assessments (Lerner & Keltner, 2000). Consistently, Leith and Baumeister (1996) found that anger triggered a preference for long shot gambles over safe bets, while sadness did not lead to this bias. Thus, emotions have different functions, and depending on the specific emotions elicited (e.g., sadness, anxiety, fear, anger), such functions can influence one's perception of risks in contrasting ways.

To gain a coherent understanding of the cognitive consequences of affect, it is therefore critical to not only investigate beyond general mood effects, but also differentiate between the effects of discrete emotional states. As the aforementioned studies illustrate, affective states are not functionally equivalent; emotions of the same valence can have distinct effects on judgment and decision outcomes, depending on the intensity of the experience. Indeed, dominant models of affect (e.g., circumplex, vector, and Positive Activation – Negative Activation model) have traditionally classified

emotions as occupying both a valence and arousal space. Arousal differs from valence, in that it refers to bodily activation (e.g., intensity) as opposed to hedonic (e.g., pleasantness) value (Barrett, 1998). With regard to cognitive functions, Kaufman (1999) proposed a concept similar to the classic U-shaped effect, predicted by the Yerkes-Dodson Law. Cognitive performance is assumed to be optimum under moderate levels of emotional arousal; at extreme levels, however, fluctuations in emotional arousal can interfere and impair cognitive abilities. In a similar vein, Lewinsohn and Mano (1993)'s two-dimensional model of emotions, based on valence and arousal, suggests that while positive emotions can facilitate more thorough and careful deliberation of choices, this can be disrupted by aroused states which generally produces heuristic processing.

Moreover, studies that have taken into account discrete emotions are limited as nearly all pertains to negative emotions. In a meta-analysis on discrete emotional influences, Lench et al. (2011) found that while the differential effects of discrete emotions on cognition and judgment are well-documented, evidence for this derives from studies on negative emotions. The authors noted that because too few studies have included multiple positive emotions in their research design, a review of the differential effects of positive emotions was not possible. Indeed, to date, research on the cognitive consequences of positive emotions is sparse. The failure to consider the role of specific positive emotions constitutes a major limitation of decision research, as discrete positive emotions – like discrete negative emotions – can impact risk perceptions and subsequent choices in different ways.

To summarize, although the affect-cognition, hot-cold, irrational-rational dichotomy has waned considerably in the psychological literature, the majority of studies have focused primarily on contrasting the undifferentiated effects between positive and negative mood. Less is known about the role of discrete emotions, and particularly discrete positive emotions, on risky decision making. With these shortcomings in mind, the present study sought to extend the affect-cognition literature by investigating the effects of both positive and negative emotions with high and low levels of arousal. Emotions of interest were: excitement, contentment, fear, and sadness—as these affective states differ, both in terms of valence and in arousal level. Whereas excitement and fear are associated with higher arousal, contentment and sadness are generally associated with lower arousal. Seeing as heuristic processing tends to accompany aroused states, it was predicted that individuals in excited and fearful states would be more likely than individuals in contented and sad states to use the affect heuristic in judgments of risks. Additionally, because the affect heuristic generally involves relatively less exhaustive processing, it was predicted that individuals experiencing excitement and fear would also make greater risky decisions than individuals experiencing contentment and sadness.

Specifically, three hypotheses were devised for the present study. First, it was hypothesized that regardless of valence, individuals experiencing high arousal emotions (e.g., excitement and fear) will display greater risky decision making than individuals experiencing low arousal emotions (e.g., contentment and sadness) (*Hypothesis 1*). We expected to replicate Lewinsohn and Mano's (1993) findings, and hypothesized that individuals experiencing excitement will display greater risky decision making than

individuals experiencing contentment (*Hypothesis 1a*). A similar effect was expected for negative emotions; it was hypothesized that individuals experiencing fear will display greater risky decision making than individuals experiencing sadness (*Hypothesis 1b*). In the absence of high arousal, however, it was hypothesized that individuals experiencing sadness will display less risky decision making than individuals experiencing contentment (*Hypothesis 2*), replicating previous findings (Chou, et al., 2007; Smoski, et al., 2008; and Yuen & Lee, 2003). Based upon previous findings from mood research, it was lastly hypothesized that, in the presence of high arousal, individuals experiencing excitement (i.e., positive affect) will display greater risky decision making than individuals experiencing fear (i.e., negative affect) (*Hypothesis 3*).

## **Method**

### **Participants**

Following Institutional Review Board (IRB) approval (see Appendix A), participants were recruited from San José State University's research pool, through the SONA system. One hundred and fifty-four students participated in the experiment in partial fulfillment of a course requirement. Due to either missing or incomplete data, responses from 32 individuals were excluded from the analysis, resulting in a final sample size of 122 (59 female and 63 male) participants. The age of participants ranged from 17 to 24 ( $M = 19.31$  years,  $SD = 1.32$ ). All participants were required to have normal or corrected-to-normal vision, and no prior or current history of animal phobias, defined as a persistent, irrational, or abnormal fear of dangerous and/or threatening animals (e.g., sharks, bears, snakes, dogs, etc.). Each participant was randomly assigned

to one of the four conditions: positive valence + high arousal (excitement), positive valence + low arousal (contentment), negative valence + high arousal (fear), and negative valence + low arousal (sadness) (see Table 1).

Table 1

*Affective Conditions by Valence and Arousal*

		<b>Valence</b>	
		Positive	Negative
<b>Arousal</b>	High	Excitement <i>n</i> = 32	Fear <i>n</i> = 30
	Low	Contentment <i>n</i> = 30	Sadness <i>n</i> = 30

## **Materials**

**Affect induction procedure.** A subset of images obtained from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) was used to elicit the discrete emotions of interest. The IAPS is a widely used instrument for emotion research. The database contains a large collection of emotionally evocative images, depicting various semantic categories, such as objects, activities, and landscape, to name a few. Based on normative ratings, the standardized images are categorized along three emotional dimensions: valence (pleasant/unpleasant), arousal (excited/calm), and to a lesser extent, dominance (low/high). Because the objective of the present study was to

investigate positive (pleasant) and negative (unpleasant) emotions with varying arousal levels, valence and arousal were the only two dimensions considered, both of which Bradley and Lang (1994) demonstrated high reliability ( $r$ 's = .94 and .93, respectively) (Lang, Bradley, & Cuthbert, 1997). Scored on a 9-point scale, valence ratings ranged from 1 (*completely unhappy*) to 9 (*completely happy*), with 5 constituting *neutral* valence. Similarly, arousal ratings ranged from 1 (*completely calm*) to 9 (*completely aroused*), with 5 constituting neutral arousal. Standardized IAPS images of discrete emotional content were retrieved from Mikels et al.'s (2005) archived files. Specifically, 9 positive valence + high arousal images constituting excitement, 9 positive valence + low arousal images constituting contentment, 9 negative valence + high arousal images constituting fear, and 9 negative valence + low arousal images constituting sadness were selected for each of the corresponding affective condition. The subset of images was evaluated based on their individual mean valence and arousal ratings from the original IAPS database (see Table 2); this procedure resulted in a total of 36 images selected for the study. Appendix B contains the subset of IAPS images, along with their description and catalog number.



Table 2

*Descriptive Statistics of International Affective Picture System (IAPS) Images for Each Affect Condition*

Condition	Valence		Arousal	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Excitement	6.99	0.18	6.15	0.18
Contentment	7.33	0.21	3.89	0.21
Fear	3.89	0.23	6.28	0.13
Sadness	2.89	0.18	4.24	0.19

To ensure that participants, particularly those in the negatively valenced conditions, left the study in a positive mood, a second affect induction technique was employed near the end of the study. The Autobiographical Recollection Mood Induction Technique (see Appendix C) is a reflection exercise, generally used in depression research to elicit episodic memories. Baker and Guttfreund's (1993) modified format, based on Brewer, Doughtie, and Lubin's (1980) research, is a practical and effective procedure for inducing positive mood. The task consists of two paragraphs of instructions, prompting participants to vividly recall two happiest events in their lives, where they felt as if they were "on top of the world." After reflecting on these events for 10 minutes, participants were asked to answer a few, brief questions about the events they had just imagined.

**Decision-making task.** Participants' proclivity for risky decisions making was measured using the Choice Dilemmas Questionnaire (CDQ; Kogan and Wallach, 1964). The CDQ (see Appendix D) is one of the oldest and most extensively used measures of risk-taking propensity. The questionnaire consists of 12 detailed scenarios, describing

hypothetical but realistic life dilemmas. In each scenario, participants are asked to imagine themselves in the position of the main character, confronted with a dilemma involving a decision between a low risk/low reward (cautious) and a high risk/high reward (risky) option. Utilizing a multiple-choice format, participants indicated what they believe to be the acceptable probability, that is, minimum odds of success required before advising the protagonist to choose the more desirable but risky alternative. The following is a generalized example of the response scale used in the CDQ:

*Please check the lowest probability that you would consider acceptable to make it worthwhile for Mr. X. to choose the risky option.*

- The chances are 1 in 10 that the risky option will be successful.
- The chances are 3 in 10 that the risky option will be successful.
- The chances are 5 in 10 that the risky option will be successful.
- The chances are 7 in 10 that the risky option will be successful.
- The chances are 9 in 10 that the risky option will be successful.
- Place a check here if you think Mr. X. should *not* choose the risky option no matter what the probabilities.

Responses were scored using a 6-point scale, with the highest risk option (1 in 10) scored as 1 and the lowest risk option (the risky choice should not be taken, no matter what the probabilities) scored as 6. Thus, risk propensity is reflected in the total score, summed from participants' responses to the 12 items. Scores can range from 12 to 72, resulting in an inverse relationship between total score and risk taking, with lower scores indicating higher risk-taking. Overall, the CDQ demonstrated acceptable reliability, yielding a Cronbach's alpha of 0.69 for the 12 items.

**Affect manipulation check.** Two different manipulation checks were employed to validate the affect induction procedure and ensure that the images were successful in eliciting each emotion.

The Self-Assessment Manikin (SAM; Bradley & Lang, 1994) is a pictorial rating scale designed to quickly and effectively assess an individual's subjective emotional response along the IAPS' dimensional framework of emotion (see Appendix E). Each dimension is illustrated with five pictograms corresponding to the continuous values on the scale. The valence dimension is represented in the first row and ranges from a figure smiling (*pleasant*) to a figure frowning (*unpleasant*), whereas the arousal dimension is represented in the second row and ranges from a figure with wide eyes (*excited*) to a figure with sleepy eyes (*calm*). Scores are obtained following the presentation of the stimuli; participants are asked to indicate the emotion that best depicts their current reactions. This may be done by selecting any of the 5 figures or the spaces between the figures, which results in a 9-point rating scale for each dimension. For both scales, scores were recoded such that higher scores on the valence scale indicated more positive (i.e., pleasant) emotions and higher scores on arousal scale indicated more aroused (i.e., excited) emotions. The SAM has been shown to demonstrate high reliability (Bucks, da Silva, & Han, 2005), as well as strong convergent validity with previously validated self-report measures of emotion. For example, the Semantic Differential Scale (SDS; Mehrabian & Russell, 1974) is a relatively longer, verbal measure that employs the same affective dimensions as the SAM. For both valence and arousal, Bradley and Lang

(1994) found near complete agreement between SAM scores and SDS factor scores ( $r = .96$  and  $.95$ , respectively).

The Positive and Negative Affect Scales (PANAS; Watson, Clark, & Tellegen, 1988) is a valid and highly reliable self-report measure of affect ( $\alpha = .86$  to  $.90$  for Positive Affect [PA];  $\alpha = .84$  to  $.87$  for Negative Affect [NA]). It consists of 20 words that describe different feelings and emotions (see Appendix F). Participants are asked to read each adjective and indicate, on a 5-point Likert-type scale, the degree to which they experience the emotion at the given moment. The scales range from 1 (*very slightly or not at all*) to 5 (*extremely*), resulting in scores that range from 10-50 for both PA and NA. The PA score was calculated based on the sum of scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19, whereas the NA score was based on the sum of scores on items 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20. Lower scores for either PA or NA reflect low levels of the affect, and higher scores for either PA or NA reflect high levels of the affect. Internal consistency measures, for the present study, generated a Cronbach's alpha of  $.92$  for PA and  $.84$  for NA, verifying the scales reliability.

### **Procedure**

The experiment took place in a computer lab at San José State University. Participants used the standard desktop computers provided to complete the study online through Qualtrics, a web-based survey software.

Upon arrival at the lab, individuals were required to turn off all potentially distracting electronic devices. In addition, to minimize risk of emotional discomfort and ensure that all were fit to view the negatively valenced, fear images, individuals were

verbally screened for animal phobias. Only individuals without such phobias were considered qualified for participation; all reported that they met this eligibility requirement prior to beginning the study.

After completing the screening process and taking a seat at a standard desktop computer, individuals were instructed to read the online consent page (see Appendix G), which informed them that the study was concerned ostensibly with the effects of visual attention on judgment. Individuals who did not wish to participate were instructed to end their session by clicking the “No, I do not agree to participate in the research study. EXIT” button; otherwise, they clicked the “Yes, I agree to participate in the research study. CONTINUE TO STUDY” button, and were prompted to begin the study.

The first portion of the study involved the affect induction phase. Participants were assessed in groups ranging from one to ten persons, and were randomly assigned to one of the four affect conditions: excitement ( $n = 32$ ), contentment ( $n = 30$ ), fear ( $n = 30$ ), and sadness ( $n = 30$ ). In each condition, participants viewed nine corresponding color images, displayed individually on the computer screen for 30 seconds at a time. After viewing the set of images, participants completed the pre-decision affect manipulation check (SAM), followed by the decision-making task (CDQ), and subsequently, the post-decision affect manipulation check (PANAS). Upon completion of the aforementioned questionnaires, all participants underwent the positive mood induction procedure for 10 minutes. Following the exercise, participants completed a general demographic questionnaire (see Appendix H). Finally, participants were directed to the debriefing (see Appendix I), where they were informed of the study’s true purpose and thanked for their

time. Referral information for on-campus counseling services was provided should participants feel the need to seek support.

## **Results**

### **Validation of Emotion Induction Procedure**

To verify that the emotion induction procedure was effective in inducing the discrete emotional states, we calculated descriptive statistics for participants' self-reported affect ratings, following the exposure to the selected IAPS images. Means and standard deviations for the SAM valence and SAM arousal ratings can be found in Table 3. Consistent with predictions, participants in the positive affective conditions reported more pleasant feelings than participants in the negative affective conditions. An independent-samples *t*-test indicated a significant difference in mean ratings for the positive and negative conditions,  $t(120) = 3.66, p < .001$ . Contrary to predictions, participants in the high arousal affective conditions did not report more arousing feelings than participants in the low arousal affective conditions. An independent-samples *t*-test indicated a non-significant difference in mean ratings for the high and low arousal conditions,  $t(120) = .28, p > .05$ .

Table 3

*Descriptive Statistics of Self-Assessment Manikin (SAM) Dimensions for Each Affect Condition*

Condition	Valence		Arousal	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Excitement	5.91	1.30	3.38	2.04
Contentment	5.73	1.48	3.17	2.02
Fear	5.63	1.27	3.47	1.87
Sadness	4.20	1.00	3.87	1.74

To test whether the affective states were maintained throughout the study, Pearson correlation coefficients were computed for the SAM valence ratings (i.e., pre-decision affect) and scores on each of the PANAS factors (i.e., post-decision affect). SAM valence ratings yielded a significant positive correlation with PA scores ( $r = .37, p < .001$ ) and a non-significant negative correlation with NA scores ( $r = -.11, p > .05$ ), indicating that only positive affective states remained after the decision task. Overall, these results suggest that the affect induction procedure was effective in eliciting and maintaining positive affect, but less effective in conserving negative affect.

**Influence of Emotions on Risky Decision Making**

A two-way (2 x 2) between-subjects analysis of variance (ANOVA) was conducted to examine the effects of discrete emotional states on risky decision making. The two independent variables (IVs) were the affective conditions: valence (positive vs. negative) and arousal (high vs. low). The dependent variable (DV) was participants' risk scores on the decision-making task, with lower scores indicating higher risk-taking proclivity. The alpha level was set to .05 for all tests of significance.

*Hypothesis 1* predicted that regardless of valence, individuals experiencing high arousal emotions (e.g., excitement and fear) will display greater risky decision making than individuals experiencing low arousal emotions (e.g., contentment and sadness).

However, this was not supported as results for the two-factor ANOVA indicated no significant main effect for the arousal factor,  $F(1, 118) = 3.34, p > .05, \eta_p^2 = .028$ .

Participants were equally likely to be risk averse, regardless of whether they experienced high or low arousal emotions.

*Hypothesis 1a* predicted that individuals experiencing excitement will display greater risky decision making than individuals experiencing contentment. There was no significant main effect for the valence factor,  $F(1, 118) = .12, p > .05, \eta_p^2 = .001$ , but there was a significant interaction between the effects of valence and arousal,  $F(1, 118) = 4.54, p = .035, \eta_p^2 = .037$  (see Figure 1). Analysis of the simple main effects revealed that *Hypothesis 1a* was supported, as differences between high and low arousal conditions were significant for positive emotions, such that CDQ scores were lower in the excitement condition ( $M = 39.13, SD = 7.24$ ) than in the contentment condition ( $M = 44.80, SD = 9.71$ ),  $F(1, 118) = 7.96, p = .006, d = -.66$ .



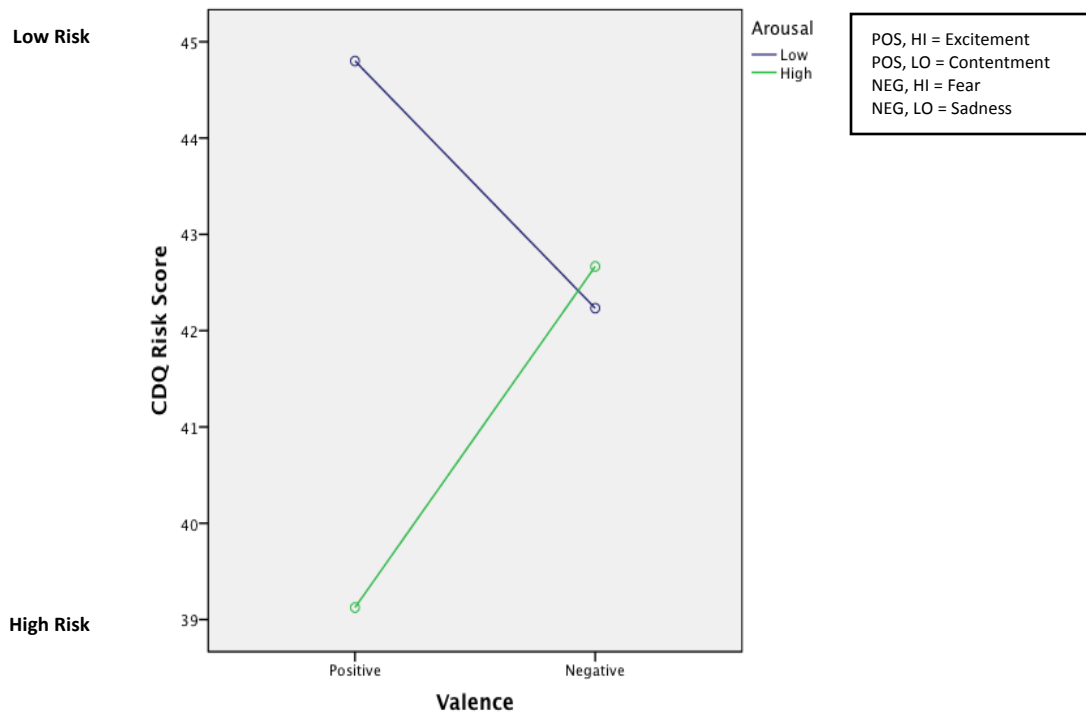


Figure 1. Mean Choice Dilemmas Questionnaire (CDQ) Risk Score as a Function of Valence and Arousal.

*Hypothesis 1b* predicted that individuals experiencing fear will display greater risky decision making than individuals experiencing sadness. However, this was not supported as analysis of the simple main effects revealed that differences between high and low arousal conditions were non-significant for negative emotions,  $F(1, 118) = .05, p > .05, d = .06$ . Participants in the fear and sadness conditions did not differ with regard to CDQ scores.

*Hypothesis 2* predicted that individuals experiencing sadness will display less risky decision making than individuals experiencing contentment. However, this was not supported as analysis of the simple main effects revealed that differences between

positive and negative conditions were non-significant for low arousal emotions,  $F(1, 118) = 1.58, p > .05, d = -.33$ . Participants in the sadness and contentment conditions did not differ with regard to CDQ scores.

*Hypothesis 3* predicted that individuals experiencing excitement will display greater risky decision making than individuals experiencing fear. However, this was not supported as analysis of the simple main effects revealed that differences between positive and negative conditions were non-significant for high arousal emotions,  $F(1, 118) = 3.10, p > .05, d = -.44$ . Participants in the excitement and fear conditions did not differ with regard to CDQ scores. The means and standard deviations are presented in Table 4.

Table 4

*Descriptive Statistics of Choice Dilemmas Questionnaire (CDQ) Scores for Each Affect Condition*

Condition	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Excitement	32	25	57	39.13	7.24
Contentment	30	27	69	44.80	9.71
Fear	30	28	66	42.67	8.76
Sadness	30	34	53	42.23	5.28

### **Follow-up Analyses**

Except for *Hypothesis 1a*, all other hypotheses were not supported. This may have been due to, in part, the fact that the emotion induction technique was unsuccessful in inducing some participants to the designated emotional states. As the findings from the manipulation check indicated, only positive affect was successfully manipulated.

Although negative affect was induced, it was not maintained; and neither high or low arousal level appeared to have been effectively manipulated. To address this, we conducted follow-up analyses focused on participants in each condition who appeared to be in the designated emotional state. Participants for each affect condition were identified based on their ratings on the SAM manipulation checks. For the valence scale, scores between 1-4 were defined as low in positive valence (i.e., negative valence), whereas scores between 6-9 were defined as high in positive valence. Similarly for the arousal scale, scores between 1-4 were defined as low in arousal, whereas scores between 6-9 were defined as high in arousal. Because a midpoint rating of 5 on either scales indicated neutrality, participants with this score were omitted from the analysis. This procedure resulted in a sample size of 49 participants ( $n = 7, n = 26, n = 3, n = 13$  for the excitement, contentment, fear, and sadness condition, respectively). A second 2 x 2 ANOVA was then conducted using this restricted sample. Overall, the follow-up analysis did not reveal any significant differences between the conditions. There was no significant effect of valence,  $F(1,45) = .33, p > .05$ ; no significant effect of arousal,  $F(1, 45) = .001, p > .05$ ; and no significant interaction effect between valence and arousal on CDQ scores,  $F(1,45) = .15, p > .05$ .

Figure 2 depicts the results of the follow-up analysis. A noteworthy visual trend is that for participants who reported unpleasant emotional states, greater risky decision making was observed for those feeling higher arousal. This is consistent with *Hypothesis 1b*, which predicted that fearful participants will display greater risky decision making than sad participants. Moreover, for non-aroused participants, less risky decision making

was observed for those feeling lower positive affect, a trend that is in line with *Hypothesis 2*, predicting that sad participants will display less risky decision making than contented participants.

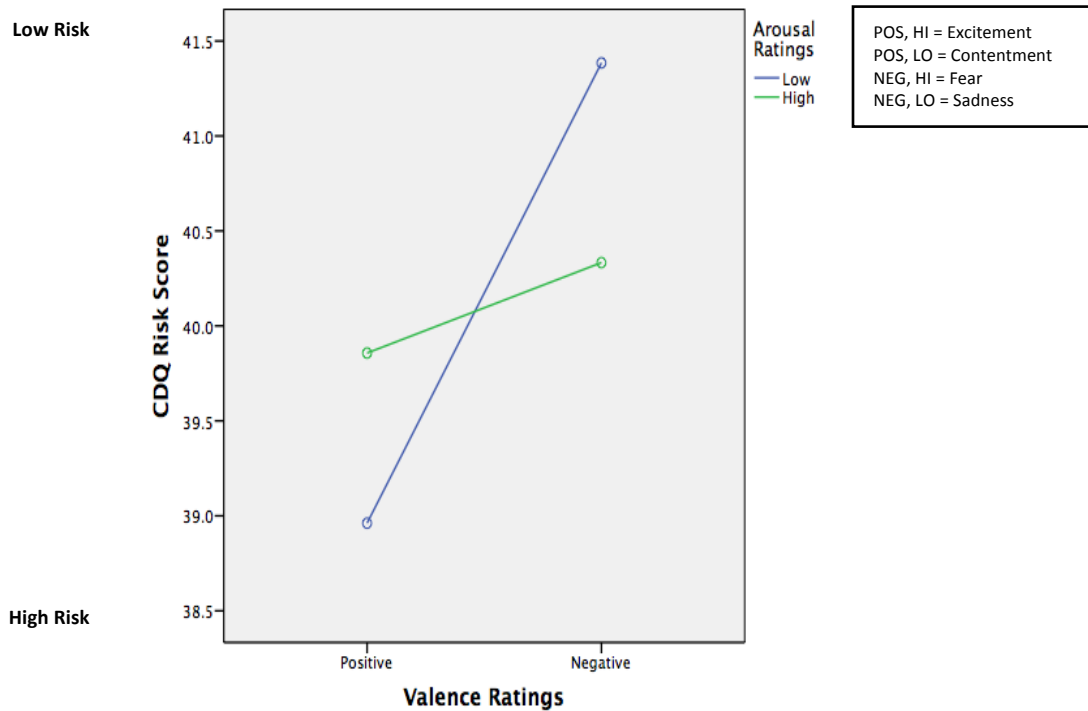


Figure 2. Mean Choice Dilemmas Questionnaire (CDQ) Risk Score as a Function of Valence and Arousal Ratings in Follow-up Analysis based on Restricted Sample.

To further investigate the relationship between self-reported affect and risky decision making, we also conducted correlation coefficients for participants' ratings on each of the SAM dimensions and their scores on the CDQ. Results indicated that subjective arousal ratings did not correlate significantly with CDQ scores ( $r = .09, p > .05$ ). However, there was a significant negative correlation between subjective valence

ratings and CDQ scores ( $r = -.16, p < .05$ ). Greater positive affect was associated with lower CDQ scores, and hence higher risk-taking tendency.

### **Discussion**

The purpose of this thesis was to investigate the influence of emotions on decision making under risk. In particular, we were interested in examining how risky decision making may be affected by discrete emotions, varying along two dimensions: valence (positive vs. negative) and arousal (high vs. low). Participants' risk-taking propensity was assessed immediately following the induction to one of the four emotional states: excitement, contentment, fear, and sadness.

Overall, the results partially supported *Hypothesis 1*; participants in the high arousal conditions displayed greater risk-taking behavior on the decision-making task than individuals in the low arousal conditions. However, this difference was only statistically significant for participants experiencing positive affect. That is, consistent with *Hypothesis 1a*, excited participants engaged in greater risky decision making than their contented counterparts. Contrary to *Hypothesis 1b*, participants in the fear condition did not differ significantly from those in the sadness condition. Moreover, there was no significant difference between the sadness and contentment conditions (*Hypothesis 2*), or between the excitement and fear conditions (*Hypothesis 3*) with regard to risk-taking behavior. Taken together, these results reveal important relationships between emotional states and risky decision making. In the subsequent sections, the implications of our findings, the limitations of the study, as well as future directions for research are discussed.

### **Limitations and Future Directions**

The present study has several limitations that warrant further investigation. A major caveat is that the data revealed no significant effect of negative affect (e.g., fear and sadness) on CDQ scores. As with any affect induction method, ranging from film and audio clips to unexpected gifts and feedback, the use of images does not guarantee perfect elicitation of emotions. It is possible that the images we utilized in our affect induction procedure were simply insufficient to elicit and maintain the target emotions. However, because we used a subset of standardized IAPS images that has been previously identified and validated to induce the discrete emotions of interest (Mikels et al., 2005), it is unlikely that the problem is due entirely to the inadequacy of the elicitation method.

An alternative explanation concerns the social context in which participants underwent the emotion elicitation, which varied from one to ten persons per experimental session. Whether participants were induced individually or among others can impact the emotional salience and intensity of the stimuli, moderating its effects on subsequent decision making. Indeed, in a meta-analysis examining the effectiveness of various experimental emotion elicitation methods, Lench et al. (2011) found stronger effects for studies that induced participants individually rather in groups. As proposed by the authors, it may be that the emotional experience becomes “diffused” or reduced by the presence of others. To be effective, emotion elicitation methods require participants’ attention and engagement; it is possible that participants assessed in groups were more distracted and less focused during the induction than those assessed alone. It is thus

imperative that future research recognize this threat, and consider eliciting emotions in more controlled settings as this may increase the efficacy of the study.

Additionally, individuals may differ in their tendency to experience, interpret, and react to certain emotions, all of which can impact the emotion-decision making relationship. For example, there is evidence indicating that different personality dispositions consistently render individuals more susceptible to certain affective stimuli across situations. Specifically, within the “Big Five” framework of personality (Costa & McCrae, 1980), extraversion and neuroticism are two dimensions that have been found to correspond with affective experience. In general, individuals who score high in extraversion tend to experience and report greater positive emotions, whereas individuals who score high in neuroticism tend to experience and report greater negative emotions (Watson & Clark, 1992; Rusting & Larsen, 1995). This sensitivity to either positive (e.g., rewards and benefits) or negative (e.g., threats and risks) events can contribute to affective influences on judgment either by strengthening or weakening the effects (Rusting, 1998). Although we attempted to minimize the probability of preexisting trait differences through the use of random assignment, this process does not ensure that all individuals were equivalent across experimental conditions. By chance, individuals may still differ on stable affective traits that can interact with affective states to alter their decision making. Therefore, depending on their personality traits, individuals may respond differently to the emotional stimuli, despite being induced to the same emotional state. To address this issue, researchers should take into account emotion-relevant personality traits and incorporate - rather than attempt to control - such variables into

future studies on emotions and decision making. Doing so will certainly add to our understanding of the role of emotion-relevant personality dispositions, and how they may moderate or mediate the extent to which emotional states influence decisions about risk.

Another possibility concerns the limitation inherent in self-report measures. In assessing the effectiveness of the emotion induction procedure, due to time and practical constraints, we relied solely on participants' self-reports of emotional experience. Although both the SAM and PANAS have been shown to be reliable and valid measures of affective experience, subjective measures are nonetheless likely to be biased—based at least partially on participants' perceptions and beliefs (i.e., cognitions) about their emotional experience, which may be different from their actual experience (Robinson & Clore, 2002). In the present study, we found that participants' self-reported ratings indicated no significant difference in subjective arousal, yet data from the post-hoc analysis detected that participants in the (positive) high and low arousal conditions differed in their performance on the decision task. Because of this discrepancy, we have reasons to suspect that self-reported affect may not accurately reflect experienced affect.

An alternative approach would be to supplement self-report ratings with more direct, objective assessments of affect. Although, it is uncertain as to whether they actually reflect or merely correlate with emotional arousal, physiological indices of emotional arousal, such as skin conductance activity, heart rate, cortisol levels, and so on, can provide unbiased indication of intensity. Moreover, technological advances in brain imaging techniques within the field of cognitive neuroscience have accelerated major progress towards mapping the neural bases of affective and cognitive processes. Studies



using functional magnetic resonance imaging (fMRI), for example, provide considerable observational evidence for a functional and anatomical overlap between lower level and higher level processes within the brain, with namely the limbic system and prefrontal cortex as the two critical brain regions implicated in affective decision making (Gutnik et al., 2006). Empirical findings such as these do not only corroborate previous conceptions of the intimate link between affect and cognition, but also provide opportunities to test their validity. Therefore, when feasible, future emotion studies should include both subjective and objective forms of measurement.

Finally, the lack of external validity of the CDQ raises another concern. Although the CDQ attempts to measure common and everyday decision making by utilizing a wide range of real life scenarios, the scenarios are nonetheless hypothetical and may not be sufficient to simulate real world choice dilemmas, limiting the validity and generalizability of our findings. Consequently, it is unclear whether results actually reflect participants' choice behaviors, or simply their imagined behaviors in the situations, which may not parallel their decision making in the real world. In an effort to guard against this threat, we instructed participants, for each situation, to place themselves in the position of the central character, that is, as the person making the decision. Although explicit, these instructions may not be enough to incentivize realistic decision making, as the absence of real risks and tangible rewards may have made the task less meaningful and personally relevant for participants. Given this limitation, future research would benefit from more ecologically valid measures of risky choice, such as

questionnaires and gambling tasks that require active engagement and involve weighing genuine risks and consequences.

Another solution is to move outside of the laboratory setting and extend decision research to naturalistic environments that are more conducive to risky decision making. In the medical domain, for example, individuals (e.g., clinicians, nurses, patients) are often required to process information and make critical decisions, involving major risks and consequences with respect to one's health. Furthermore, these high-risk decisions are frequently made under uncertain, intensified, and emotional conditions (Bagnara, Parlangei, & Tartaglia, 2010; Resnick, 2012). Greater awareness of how both pleasant and unpleasant emotional experiences, ranging in intensity, can influence risk perceptions and lead to fundamentally different decisions would prove valuable for optimizing health outcomes. Thus, future field research is needed to investigate the extent to which findings, found in the lab, may be replicated and applied beneficially to decision making in healthcare and similar practical settings.

### **Implications**

The current study demonstrated the multifaceted nature of emotions. Within the context of decision making, we found that positive emotions - irrelevant to the decision task - can impair judgment, resulting in more risky choices. However, this outcome was observed only for individuals induced to experience excitement; similar effects were not found for individuals induced to experience contentment. Thus, despite both being pleasant emotions, excitement and contentment, were discovered to have distinct effects on decision making, with the former leading to greater risky decision making.

Seeing as excited individuals made more risky decisions compared to contented individuals, it is reasonable to assume that arousal - the distinguishing factor of the two emotional states - accounted for the higher risk-taking behavior. This explanation is consistent with previous research contrasting the effects of elation with calmness. Compared to calm participants, Lewinsohn and Mano (1993) found that elated participants applied less cognitively demanding strategies on a multi-attribute choice task. They not only spent less time deliberating, but also examined less information before making their decision, indicating that it was the enhanced arousal associated with more elated emotions - not the positive hedonic tone per se - that resulted in the suboptimal decision strategies.

Accordingly, traditional theories posit that arousal impacts cognitive performance by adapting the focus of attention (Easterbrook, 1959; Kahneman, 1973), which can be beneficial or disruptive depending on the situation. Generally, under high arousal situations, attention is decreased and limited to only a few, more relevant attributes. In contrast, under low arousal situations, attention is increased and allocated to both relevant and less relevant attributes. Therefore, the greater arousal accompanying excited states may have caused attentional narrowing, forcing excited individuals to employ more simplified processing strategies and, consequently, make more risky decisions. Contented individuals, on the other hand, were not subjected to the arousal-induced narrowing; due to their broader attention capacity, they were able to process the choices more thoroughly and decide more cautiously. It appears, then, that risky decision making is influenced by not only affective valence but arousal level as well. Importantly, this

interpretation may help reconcile some of the inconsistencies regarding the role affective states on cognitive processes and decision outcomes.

Research examining the cognitive consequences of affect reveal somewhat conflicting findings, as the data suggests that affective states can be both facilitating and biasing to cognitive processing. However, it should be noted that previous research on affect were based predominately on the one-dimensional view (Pfister & Böhm, 2008), which assumes that essentially all affective states can be mapped into a single valence scale. Unlike global mood states, however, specific emotions are not easily reducible to either a positive or negative dimension, making the one-dimensional framework incomplete for the study of discrete emotions. Under this framework, the effects of conceptually different emotions may be inaccurately attributed to valence, when in fact a separate or additional dimension(s) may be contributing to the relationship. Indeed, our findings suggest that, consistent with the circumplex model of affect (Russell, 1980), affective experiences entail at least two dimensions: valence and arousal. Based on this two-dimensional view, we discovered that discrete positive emotions can assume either a functional or dysfunctional role, depending on the accompanying arousal level.

Both valence and arousal dimensions can affect the extent to which emotions are managed, which, in turn, may also influence decision making about risk. Congruent with mood-maintenance hypothesis (Isen & Patrick, 1983), the literature on emotion regulation (ER) notes that individuals are generally motivated to control their emotions, so as to prolong positive experiences and mitigate negative experiences (Gross, 2002). Importantly, this may explain the attenuation of negative affect and why such states did

not persist throughout the task. Participants were perhaps actively adapting their responses to maintain a positive emotional state, provided that the negative emotions of fear and sadness generated sufficient unpleasant reactions. With regard to positive emotions, two effective ER strategies include *cognitive reappraisal*, which occurs before the emotional experience and involves redefining the situation; and *expressive suppression*, which occurs after the emotional experience and involves inhibiting the emotional response (Gross, 2002; Heilman et al., 2010). Implementing either the reappraisal or suppression strategy, however, requires cognitive effort, which can be demanding especially for individuals already limited in attentional resources. Given that emotions coupled with high arousal (versus low arousal) are relatively intense and cognitively taxing, it is probable that individuals experiencing excitement (versus contentment) were ill-equipped and perhaps less keen to employ such strategies. Instead of attempting to regulate their affect, excited individuals may have adopted the more efficient approach, and relied on these emotional reactions to guide their decisions (i.e., the affect heuristic).

The implications of this research are particularly pertinent to the health domain where biased risk assessments, originating from emotional states, can affect physical well-being. With respect to health outcomes, previous research indicates a mood-congruent effect, with happy individuals reporting less physical complaints and symptoms than sad individuals (Croyle & Uretsky, 1987; Salovey & Birnbaum, 1989). If indeed contented individuals are more adept at ER and therefore better able to prolong positive emotional experiences, they may also be more likely to experience positive

health outcomes. On the other hand, feeling intensely positive can lead to overly optimistic assessments about one's vulnerability to illnesses. In their study on health perception, Salovey and Birnbaum (1989) found that positive mood resulted in biased estimates, such that happy individuals believed they were less likely to be affected by future diseases compared to their peers. As was the case with excited individuals in the present study, this bias can lead to risky decisions and potentially unhealthy behaviors.

Because disorders involving addiction and impulsivity tend to have a strong affective component, it is not surprising that emotions have also been shown to influence decisions related to impulse control, such as the decision to smoke cigarettes. As Slovic (2001) observed, the initial decision to smoke is heavily driven by emotional impulses rather than conscious thought. For most new smokers, the excitement preceding the initiation can be exacerbated with affectively salient advertising designed to associate positive emotions with the smoking experience, thereby leaving target populations especially prone to initiate the activity. Unfortunately, the long-term health risks of smoking are not recognized until after many unsuccessful attempts to quit, when it is often too late. This presents costs at both the individual and the societal level, as tobacco use remains the leading cause of preventable deaths in the United States, accounting for more than 480,00 deaths annually (Centers for Disease Control and Prevention [CDC], 2015). In addressing this issue, some researchers have advocated the use of the affect heuristic to combat smoking. For example, Hammond and colleagues (2004) found that cigarette warning labels that elicit discrete emotional responses, such as fear and disgust, can be a cost-effective deterrent to smoking. As the authors noted, smokers who reported

greater negative reactions to the graphic images were significantly more likely to report greater attempts to quit or reduce smoking on a follow-up survey, three months later.

Several studies have also found an association between perceived risk probability and subsequent risk-reduction behaviors. Individuals who perceive themselves to be susceptible to illnesses are more likely to take protective actions in the future, such as changing their behavior or seeking medical screening and treatment. In a longitudinal study on Lyme disease vaccination, Brewer et al. (2004) found that compared to participants with lower risk judgments, those who had higher risk judgment for the disease were more likely to get vaccinated, suggesting that risk perceptions about one's health status can encourage health-related behavioral changes. Seeing as affective states can influence perceived risk probability, and perceived risk probability can influence risk-reduction behaviors; it follows, then, that some emotions can serve as compelling mechanisms to guide decisions and improve behaviors related to health.

These findings collectively highlight, once more, how affective states can be both adaptive and maladaptive, depending on the situation and circumstances. As the significance of emotions is becoming increasingly recognized in the decision literature, however, it is important for researchers to extend beyond merely describing its positive and negative impact in decision making. A comprehensive understanding of how discrete emotions systematically influences risky decision making is necessary to identify which emotions are most supportive for fostering positive health and preventing or reducing adverse outcomes. Thus, a promising line of inquiry for future research concerns exploration into how knowledge about discrete emotions can be “leveraged” to

positively influence and improve decision making (Ferrer et al., in press), with the overarching goal of promoting healthy behavior for all.

### **Conclusions**

Although the role of affect in decision making is well-established, research has focused primarily on description, namely of the biases arising from broad positive and negative mood states. In an effort to better understand the relationship between feeling and thinking, we examined the effects of four discrete emotions, varying along the dimensions of valence and arousal. By experimentally manipulating these emotions, we were able to influence how participants in the positive conditions evaluated the probability of risk, effectively altering their decision making across a variety of dilemmas. The differential effects observed between excited and contented participants on the decision-making task does not only confirm that emotions are multidimensional, comprising of both valence and arousal, but also that its biasing effects on risk-taking is likely linked to the greater arousal experienced with more elated emotions. Overall, these findings have important implications for the health domain, as it suggests that discrete emotions can shape risk perceptions and, consequently, decision making about health-related issues in systematic ways. Given that the role of affect in risky decision making can be both enhancing and biasing, the fruitful question for future research concerns not whether emotions are inherently good or bad, but how these emotions can be used to improve decision making and overall well-being.



## References

- Backs, R. W., da Silva, S. P., & Han, K. (2005). A comparison of younger and older adults' self-assessment manikin ratings of affective pictures. *Experimental Aging Research, 31*, 421-440.
- Bagnara, S., Parlangei, O., & Tartaglia, R. (2010). Are hospitals becoming high reliability organizations? *Applied Ergonomics, 41*, 713-718.
- Baker, R. C. & Guttfreund, D. G. (1993). The effects of written autobiographical recollection induction procedures on mood. *Journal of Clinical Psychology, 49*, 563-568.
- Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275*, 1293-1295.
- Bless, H., Clore, G. L., Schwarz, N., Golisano, V., Rabe, C., & Wolk, M. (1996). Mood and the use of scripts: Does a happy mood really lead to mindlessness? *Journal of Personality and Social Psychology, 71*, 665-679.
- Bodenhausen, G. (1993). Emotions, arousal, and stereotypic judgments: A heuristic model of affect and stereotyping. In D. M. Mackie & D. L. Hamilton (Eds.), *Affect, cognition, and stereotyping: Interactive processes in group perception* (pp. 13-37). San Diego, CA: Academic Press.
- Bower, G. H. (1981). Mood and memory. *American Psychologist, 36*, 129-148.
- Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavioral Therapy and Experimental Psychiatry, 25*, 49-59.
- Brewer, N. T., Weinstein, N. D., Cuite, C. L., & Herrington Jr, J. E. (2004). Risk perceptions and their relation to risk behavior. *Annals of Behavioral Medicine, 27*, 125-130.
- Cahir, C., & Thomas, K. (2010). Asymmetric effects of positive and negative affect on decision making. *Psychological Reports, 106*, 193-204.
- Centers for Disease Control and Prevention (CDC). (2015). Smoking and tobacco use: fast facts. Retrieved from [http://www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/fast\\_facts/](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/fast_facts/).
- Chou, K., Lee, T, M. C., & Ho, A, H. Y. (2007). Does mood state change risk taking tendency in older adults? *Psychology and Aging, 22*, 310-318.

- Chuang, S. (2007). Sadder but wiser or happier and smarter? A demonstration of judgment and decision making. *The Journal of Psychology, 141*, 63-76.
- Costa, P. T., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology, 38*, 668-678.
- Croyle, R. T., & Uretsky, M. B. (1987). Effects of mood on self-appraisal of health status. *Health Psychology, 6*, 239-253.
- Damasio, A. R. (1994). *Descartes' error: Emotion, Reason, and the Human Brain*. New York: Putnam.
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66*, 183-201.
- Feldman Barrett, L. (1998). Discrete emotions or dimensions? The role of valence focus and arousal focus. *Cognition and Emotion, 12*, 579-599.
- Ferrer, R., Klein, W., Lerner, J. S., Reyna, V. F., & Keltner, D. (in press). Emotions and health decision-making: Extending the appraisal tendency framework to improve health and healthcare. In C. Roberto & I. Kawachi (Eds.), *Behavioral Economics and Public Health*. Cambridge, MA: Harvard University Press.
- Finucane, M. L., Alhakami, A., Slovic, P., & Johnson, S. M. (2000). The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making, 13*, 1-17.
- Forgas, J. P. (2008). Affect and cognition. *Perspectives on Psychological Science, 3*, 94-101.
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*, 218-226.
- Frijda, N. H. (1986). *The Emotions*. Cambridge, MA: Cambridge University Press.
- Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*, 281-291.
- Gutnik, L. A., Hakimzada, A. F., Yoskowitz, N. A., & Patel, V. L. (2006). The role of

emotion in decision-making: A cognitive neuroeconomic approach towards understanding sexual risk behavior. *Journal of biomedical informatics*, *39*, 720-736.

- Hammond, D., Fong, G. T., McDonald, P. W., Brown, K. S., & Cameron, R. (2004). Graphic Canadian cigarette warning labels and adverse outcomes: Evidence from Canadian smokers. *American Journal of Public Health*, *94*, 1442-1445.
- Heilman, R. M., Crişan, L. G., Houser, D., Miclea, M., & Miu, A. C. (2010). Emotion regulation and decision making under risk and uncertainty. *Emotion*, *10*, 257-265.
- Hilgard, E.R. (1980). The trilogy of mind: Cognition, affection, and conation. *Journal of the History of the Behavioral Sciences*, *16*, 107-117.
- Hockey, G. R. J., Maule, A. J., Clough, P. J., & Bdzola, L. (2000). Effects of negative mood states on risk in everyday decision making. *Cognition and Emotion*, *14*, 823-855.
- Isen, A. M. (1985). The asymmetry of happiness and sadness in effects on memory in normal college students. *Journal of Experimental Psychology: General*, *114*, 388-391.
- Isen, A. M. (2000). Positive affect and decision making. In M. Lewis & J. Hariland-Jones (Eds.), *Handbook of Emotions (2<sup>nd</sup> Ed.)*. New York: Guilford-Press.
- Isen, A. M., & Patrick, R. (1983). The effects of positive feelings on risk taking: When the chips are down. *Organizational Behaviour and Human Performance*, *31*, 194-202.
- Izard, C.E. (1977). *Human emotions*. New York: Plenum Press.
- Johnson, E. J., & Tversky, A. (1983). Affect, generalization, and the perception of risk. *Journal of Personality and Social Psychology*, *45*, 20-31.
- Kahneman, D. (1973). *Attention and effort*. Englewood Cliffs, NJ: Prentice-Hall.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263-291.
- Kaufman, B. E. (1999). Emotional arousal as a source of bounded rationality. *Journal of Economic Behaviour and Organization*, *38*, 135-144.
- Kogan, N., & Wallach, M. A. (1964). Risk taking: A study in cognition and personality. Oxford, UK: Holt, Rinehart & Winston.

- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). International Affective Picture System (IAPS): Technical manual and affective ratings. NIMH Center for the Study of Emotion and Attention.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2008). International Affective Picture System (IAPS): Affective ratings of pictures and instruction manual. Technical Report A-8. University of Florida, Gainesville, FL.
- Leith, K. P., & Baumeister, R. F. (1996). Why do bad moods increase self-defeating behavior? Affect, risk-taking, and self-regulation. *Journal of Personality and Social Psychology, 71*, 1250-1267.
- Lench, H. C., Flores, S. A., & Bench, S. W. (2011). Discrete emotions predict changes in cognition, judgment, experience, behavior, and physiology: A meta-analysis of experimental emotion elicitation. *Psychological Bulletin, 137*, 834-855.
- Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgment and choice. *Cognition and Emotion, 14*, 473-493.
- Lewinsohn, S., & Mano, H. (1993). Multi-attribute choice and affect: The influence of naturally occurring and manipulated moods on choice processes. *Journal of Behavior and Decision Making, 6*, 33-51.
- Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes, 65*, 272-292.
- Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267-286.
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. Cambridge, MA: MIT.
- Mikels, J. A., Fredrickson, B. L., Larkin, G. R., Lindberg, C. M., Maglio, S. J., & Reuter-Lorenz, P. A. (2005a). Emotional category data on images from the international affective picture system. *Behavior Research Methods, 37*, 626-630.
- Mikels, J. A., Fredrickson, B. L., Larkin, G. R., Lindberg, C. M., Maglio, S. J., & Reuter-Lorenz, P. A. (2005b). Mikels2005negativenorms.txt. Retrieved April 18, 2014 from Psychonomic Society Web Archive: <http://psychonomic.org/archive/>.
- Mikels, J. A., Fredrickson, B. L., Larkin, G. R., Lindberg, C. M., Maglio, S. J., & Reuter-Lorenz, P. A. (2005c). Mikels2005positivenorms.txt. Retrieved April 18, 2014 from Psychonomic Society Web Archive: <http://psychonomic.org/archive/>.

- Northoff, G., Grimm, S., Boeker, H., Schmidt, C., BERPohl, F., Heinzl, A., Hell, D., & Boesiger, P. (2006). Affective judgment and beneficial decision making: Ventromedial prefrontal activity correlates with performance in the Iowa gambling task. *Human Brain Mapping, 27*, 572-587.
- Nygren, T. E., Isen, A. M., Taylor, P. J., & Dulin, J. (1996). The influence of positive affect on the decision rule in risk situations: focus on outcome (and especially avoidance of loss) rather than probability. *Organizational Behavior and Human Decision Processes, 66*, 59-72.
- Pfister, H., & Böhm, G. (2008). The multiplicity of emotions: A framework of emotional functions in decision making. *Judgment and Decision Making, 3*, 5-17.
- Pham, M. T. (1998). Representativeness, relevance, and the use of feelings in decision making. *Journal of Consumer Research, 25*, 144-159.
- Pham, M. T. (2007). Emotion and rationality: A critical review and interpretation of empirical evidence. *Review of General Psychology, 11*, 155-178.
- Raghunathan, R., & Pham, M. T. (1999). All negative moods are not equal: Motivational influences of anxiety and sadness on decision making. *Organizational Behavior and Human Decision Processes, 79*, 56-77.
- Resnick, M. L. (2012). The effect of affect: Decision making in the emotional context of health care. *2012 Symposium on Human Factors and Ergonomics in Health Care*, 39-44.
- Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin, 128*, 934-960.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*, 1161-1178.
- Rusting, C. L. (1998). Personality, mood, and cognitive processing of emotional information: Three conceptual frameworks. *Psychological Bulletin, 124*, 165-196.
- Rusting, C. L., & Larsen, R. J. (1995). Moods as sources of stimulation: Relationships between personality and desired mood states. *Personality and Individual Differences, 18*, 321-329.
- Salovey, P., & Birnbaum, D. (1989). Influence of mood on health-relevant cognitions. *Journal of Personality and Social Psychology, 57*, 539-551.

- 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.
- Schwarz, N., & Clore, G. L. (1988). How do I feel about it? The informative function of affective states. In K. Fiedler & Forgas (Eds.), *Affect, cognition, and social behavior* (pp. 44-62). Gottingen: Hogrefe.
- Schwarz, N., & Clore, G. L. (1996). Feelings and phenomenal experiences. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: handbook of basic principles*. New York: Guilford.
- Slovic, P. (2001). Cigarette smokers: Rational actors or rational fools? In P. Slovic (Ed.), *Smoking: Risk, perception, and policy* (pp. 97–124). Thousand Oaks, CA: Sage.
- Slovic, P., Finucane, M. L., Peters, E., & McGregor, D. G. (2007). The affect heuristic. *European Journal of Operational Research, 177*, 1333-1352.
- Smith, C., & Kirby, L. D. (2000). Consequences require antecedents: Towards a process model of emotion elicitation. In J. P. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition*. New York: Cambridge University Press.
- Smoski, M. J., Lynch, T. R., Rosenthal, M. Z., Cheavens, J. S., Chapman, A. L., & Krishnan, R. R. (2008). Decision-making and risk aversion among depressive adults. *Journal of Behavior Therapy and Experimental Psychiatry, 39*, 567-576.
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Sciences, 185*, 1124-1131.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*, 453-458.
- Von Neumann, J., & Morgenstern, O. (1944). *Theory of Games and Economic Behavior*. Princeton, NJ: Princeton University Press.
- Watson, D., & Clark, L. A. (1992). On traits and temperament: General and specific factors of emotional experience and their relation to the five-factor model. *Journal of Personality, 60*, 441-476.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.

- Worth, L. T., & Mackie, D. M. (1987). Cognitive mediation of positive mood in persuasion. *Social Cognition, 5*, 76-94.
- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit formation. *Journal of Comparative Neurology and Psychology, 18*, 459-482.
- Yuen, K., & Lee, T. (2003). Could mood state affect risk-taking decisions? *Journal of Affective Disorders, 75*, 11-18.
- Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist, 35*, 151-175.

## Appendix A

## IRB Approval Form



**SAN JOSÉ STATE  
UNIVERSITY**

Division of Academic Affairs  
Associate Vice President  
Graduate Studies & Research  
[www.sjsu.edu/gradstudies](http://www.sjsu.edu/gradstudies)

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To: Hoeun Sim

From: Pamela Stacks, Ph.D.  
Associate Vice President  
Office of Research

*Pamela C Stacks*

Date: April 6, 2015

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

“The Effects of Discrete Emotions on Risky Decision Making”

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the confidentiality of the subjects' identity when they participate in your research project, and with regard to all data that may be collected from the subjects. The approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Dr. Pamela Stacks immediately. Injury includes but is not limited to bodily harm, psychological trauma, and release of potentially damaging personal information. This approval for the human subject's portion of your project is in effect for one year, and data collection beyond April 6, 2016 requires an extension request.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services that the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2479.

Protocol # S15076

cc. Clifton Qyamot 0120

The California State University:  
Chancellor's Office  
Bakersfield, Channel Islands, Chico, Dominguez Hills,  
East Bay, Fresno, Fullerton, Humboldt, Long Beach,  
Los Angeles, Maritime Academy, Monterey Bay,  
Northridge, Pomona, Sacramento, San Bernardino,  
San Diego, San Francisco, San José, San Luis Obispo,  
San Marcos, Sonoma, Stanislaus



## Appendix B

## IAPS Image Descriptions and Numbers

**Excitement**

<u>Description</u>	<u>No.</u>
Skier	8030
Skier	8031
Skier	8034
Football	8116
Hockey	8117
WaterSkier	8200
Runners	8220
Rafting	8370
Rafters	8400

**Fear**

<u>Description</u>	<u>No.</u>
Snake	1052
Snake	1110
Snake	1113
Dog	1301
Dog	1302
Bear	1321
Shark	1930
Shark	1931
Tornado	5972

**Contentment**

<u>Description</u>	<u>No.</u>
Dog	1500
NeutBaby	2260
Girl	2304
Family	2360
Couple	2530
Mother	2540
Picnic	2560
Couple	4700
Nature	5201

**Sadness**

<u>Description</u>	<u>No.</u>
Hospital	2205
Girl	2276
Mother	2312
Man	2490
ElderlyWoman	2590
DisabledChild	3300
Cemetery	9000
ScaredChild	9041
HomelessMan	9331

## Appendix C

### Autobiographical Recollection Mood Induction Procedure

I would now like to ask you to take a few minutes to look into your past and think about what have been the two happiest events in your life. When you finish reading these instructions, take 10 minutes to think of these events. The page will auto-advance when the time is over. I would like you to try and think of all the details of what was happening at the time, to the point that you could imagine this happening to you right now. Think about how old you were, who were the people or events involved, and what your feelings were.

When the time is over, I will ask you to answer a few questions related to the images you thought of. It is very important that you take this reflection exercise seriously. Think of those events that made you feel as if you were on top of the world and had everything going for you. Please sit back, close your eyes, put your head down or get into a position that will best allow you to get in touch with your feelings. Take your time and think about these happy events. Start now.

---

Please answer the following questions related to the images you thought of:

	Event One	Event Two
Approximately how old were you at the time of this event?	<input type="text"/>	<input type="text"/>
In what city did this happen?	<input type="text"/>	<input type="text"/>
Which event was the happiest of the two? (Please make an X under the event.)	<input type="text"/>	<input type="text"/>

## Appendix D

### Choice Dilemmas Questionnaire (CDQ)

**Instructions.** Below, you will find a series of situations that are likely to occur in everyday life. The central person in each situation is faced with a choice between two alternative courses of action, which we might call *X* and *Y*. Alternative *X* is more desirable and attractive than alternative *Y*, but the probability of attaining or achieving *X* is less than that of attaining or achieving *Y*.

For each situation below, you will be asked to indicate the minimum odds of success you would demand before recommending that the more attractive or desirable alternative, *X*, be chosen.

Read each situation carefully before giving your judgment. Try to place yourself in the position of the central person in each of the situations. There are twelve situations in all. Please do not omit any of them.

1. Mr. A, an electrical engineer, who is married and has one child, has been working for a large electronics corporation since graduating from college five years ago. He is assured of a lifetime job with a modest, though adequate, salary, and liberal pension benefits upon retirement. On the other hand, it is very unlikely that his salary will increase much before he retires. While attending a convention, Mr. A is offered a job with a small, newly founded company which has a highly uncertain future. The new job would pay more to start and would offer the possibility of share in the ownership if the company survived the competition of the larger firms.

Imagine that you are advising Mr. A. Listed below are several probabilities or odds of the new company's proving financially sound.

*Please check the lowest probability that you would consider acceptable to make it worthwhile for Mr. A. to take the new job.*

- The chances are 1 in 10 that the company will prove financially sound.
- The chances are 3 in 10 that the company will prove financially sound.
- The chances are 5 in 10 that the company will prove financially sound.
- The chances are 7 in 10 that the company will prove financially sound.
- The chances are 9 in 10 that the company will prove financially sound.
- Place a check here if you think Mr. A should *not* take the new job, no matter what the probabilities.

2. Mr. B, a 45-year-old accountant, has recently been informed by his physician that he has developed a severe heart ailment. The disease would be sufficiently serious to force Mr. B to change many of his strongest life habits—reducing his work load, drastically changing his diet, giving up favorite leisure-time pursuits. The physician suggests that a delicate medical operation could be attempted which, if successful, would completely relieve the heart condition. But its success could not be assured, and in fact, the operation might prove fatal.

Imagine that you are advising Mr. B. Listed below are several probabilities or odds that the operation will prove successful.

*Please check the lowest probability that you would consider acceptable for the operation to be performed.*

- Place a check here if you think Mr. B should *not* have the operation, no matter what the probabilities.
  - The chances are 9 in 10 that the operation will be a success.
  - The chances are 7 in 10 that the operation will be a success.
  - The chances are 5 in 10 that the operation will be a success.
  - The chances are 3 in 10 that the operation will be a success.
  - The chances are 1 in 10 that the operation will be a success.
- 

3. Mr. C, a married man with two children, has a steady job that pays him about \$6,000 per year. He can easily afford the necessities of life, but few of the luxuries. Mr. C's father, who died recently, carried a \$4,000 life insurance policy. Mr. C would like to invest this money in stocks. He is well aware of the secure "blue-chip" stocks and bonds that would pay approximately 6% on his investment. On the other hand, Mr. C has heard that the stocks of a relatively unknown Company X might double their present value if a new product currently in production is favorably received by the buying public. However, if the product currently is unfavorably received, the stocks would decline in value.

Imagine that you are advising Mr. C. Listed below are several probabilities or odds that Company X stocks will double their value.

*Please check the lowest probability that you would consider acceptable for Mr. C to invest in Company X stocks.*

- The chances are 1 in 10 that the stocks will double their value.
  - The chances are 3 in 10 that the stocks will double their value.
  - The chances are 5 in 10 that the stocks will double their value.
  - The chances are 7 in 10 that the stocks will double their value.
  - The chances are 9 in 10 that the stocks will double their value.
  - Place a check here if you think Mr. C should *not* invest in Company X stocks, no matter what the probabilities.
- 

4. Mr. D is the captain of College X's football team. College X is playing its traditional rival, College Y, in the final game of the season. The game is in its final seconds, and Mr. D's team, College X, is behind in the score. College X has time to run one more play. Mr. D, the captain, must decide whether it would be best to settle for a tie score with a play which would be almost certain to work, or, on the other hand, should he try a more complicated and risky play which could bring victory if it succeeded, but defeat if not.

Imagine that you are advising Mr. D. Listed below are several probabilities or odds that the risky play will work.

*Please check the lowest probability that you would consider acceptable for the risky play to be attempted.*

- Place a check here if you think Mr. D should *not* attempt the risky play, no matter what the probabilities.
  - The chances are 9 in 10 that the risky play will work.
  - The chances are 7 in 10 that the risky play will work.
  - The chances are 5 in 10 that the risky play will work.
  - The chances are 3 in 10 that the risky play will work.
  - The chances are 1 in 10 that the risky play will work.
-

5. Mr. E is president of a light metals corporation in the United States. The corporation is quite prosperous, and has strongly considered the possibilities of business expansion by building an additional plant in a new location. The choice is between building another plant in the U.S., where there would be a moderate return on the initial investment, or building a plant in a foreign country. Lower labor costs and easy access to raw materials in that country would mean a much higher return on the initial investment. On the other hand, there is a history of political instability and revolution in the foreign country under consideration. In fact, the leader of a small minority party is committed to nationalizing, that is, taking over, all foreign investments.

Imagine that you are advising Mr. E. Listed below are several probabilities or odds of continued political stability in the foreign country under consideration.

*Please check the lowest probability that you would consider acceptable for Mr. E's corporation to build a plant in that country.*

- The chances are 1 in 10 that the foreign country will remain politically stable.
  - The chances are 3 in 10 that the foreign country will remain politically stable.
  - The chances are 5 in 10 that the foreign country will remain politically stable.
  - The chances are 7 in 10 that the foreign country will remain politically stable.
  - The chances are 9 in 10 that the foreign country will remain politically stable.
  - Place a check here if you think Mr. E's corporation should *not* build a plant in the foreign country, no matter what the probabilities.
- 

6. Mr. F is currently a college senior who is very eager to pursue graduate study in chemistry leading to the Doctor of Philosophy degree. He has been accepted by both University X and University Y. University X has a world-wide reputation for excellence in chemistry. While a degree from University X would signify outstanding training in this field, the standards are so very rigorous that only a fraction of the degree candidates actually receive the degree. University Y, on the other hand, has much less of a reputation in chemistry, but almost everyone admitted is awarded the Doctor of Philosophy degree, though the degree has much less prestige than the corresponding degree from University X.

Imagine that you are advising Mr. F. Listed below are several probabilities or odds that Mr. F would be awarded a degree at University X, the one with the greater prestige.

*Please check the lowest probability that you would consider acceptable to make it worthwhile for Mr. F to enroll in University X rather than University Y.*

- Place a check here if you think Mr. F should *not* enroll in University X, no matter what the probabilities.
  - The chances are 9 in 10 that Mr. F would receive a degree from University X.
  - The chances are 7 in 10 that Mr. F would receive a degree from University X.
  - The chances are 5 in 10 that Mr. F would receive a degree from University X.
  - The chances are 3 in 10 that Mr. F would receive a degree from University X.
  - The chances are 1 in 10 that Mr. F would receive a degree from University X.
- 

7. Mr. G, a competent chess player, is participating in a national chess tournament. In an early match he draws the top-favored player in the tournament as his opponent. Mr. G has been given a relatively low ranking in view of his performance in previous tournaments. During the course of his play with the top-favored man, Mr. G notes the possibility of a deceptive

though risk maneuver which might bring him a quick victory. At the same time, if the attempted maneuver should fail, Mr. G. would be left in an exposed position and defeat would almost certainly follow.

Imagine that you are advising Mr. G. Listed below are several probabilities or odds that Mr. G's deceptive play would succeed.

*Please check the lowest probability that you would consider acceptable for the risky play in question to be attempted.*

- The chances are 1 in 10 that the play would succeed.
  - The chances are 3 in 10 that the play would succeed.
  - The chances are 5 in 10 that the play would succeed.
  - The chances are 7 in 10 that the play would succeed.
  - The chances are 9 in 10 that the play would succeed.
  - Place a check here if you think Mr. G. should *not* attempt the risky play, no matter what the probabilities.
- 

8. Mr. H, a college senior, has studied the piano since childhood. He has won amateur prizes and given small recitals, suggesting that Mr. H has considerable musical talent. As graduation approaches, Mr. H has the choice of going to medical school to become a physician, a profession which would bring certain prestige and financial rewards; or entering a conservatory of music for advanced training with a well-known pianist. Mr. H realizes that even upon completion of his piano studies, which would take many more years and a lot of money, success as a concert pianist would not be assured.

Imagine that you are advising Mr. H. Listed below are several probabilities or odds that Mr. H would succeed as a concert pianist.

*Please check the lowest probability that you would consider acceptable for Mr. H to continue with his musical training.*

- Place a check here if you think Mr. H should *not* pursue his musical training, no matter what the probabilities.
  - The chances are 9 in 10 that Mr. H would succeed as a concert pianist.
  - The chances are 7 in 10 that Mr. H would succeed as a concert pianist.
  - The chances are 5 in 10 that Mr. H would succeed as a concert pianist.
  - The chances are 3 in 10 that Mr. H would succeed as a concert pianist.
  - The chances are 1 in 10 that Mr. H would succeed as a concert pianist.
- 

9. Mr. J is an American captured by the enemy in World War II and placed in a prison-of-war camp. Conditions in the camp are quite bad, with long hours of hard physical labor and a barely sufficient diet. After spending several months in this camp, Mr. J notes the possibility of escape by concealing himself in a supply truck that shuttles in and out of the camp. Of course, there is no guarantee that the escape would prove successful. Recapture by the enemy could well mean execution.

Imagine that you are advising Mr. J. Listed below are several probabilities or odds of a successful escape from the prisoner-of-war camp.

*Please check the lowest probability that you would consider acceptable for an escape to be attempted.*

- The chances are 1 in 10 that the escape would succeed.

- The chances are 3 in 10 that the escape would succeed.
  - The chances are 5 in 10 that the escape would succeed.
  - The chances are 7 in 10 that the escape would succeed.
  - The chances are 9 in 10 that the escape would succeed.
  - Place a check here if you think Mr. J should *not* try to escape, no matter what the probabilities.
- 

10. Mr. K is a successful businessman who has participated in a number of civic activities of considerable value to the community. Mr. K has been approached by the leaders of his political party as a possible congressional candidate in the next election. Mr. K's party is a minority party in the district, though the party has won occasional elections in the past. Mr. K would like to hold political office, but to do so would involve a serious financial sacrifice, since the party has insufficient campaign funds. He would also have to endure the attacks of his political opponents in a hot campaign.

Imagine that you are advising Mr. K. Listed below are several probabilities or odds of Mr. K's winning the election in his district.

*Please check the lowest probability that you would consider acceptable to make it worthwhile for Mr. K to run for political office.*

- Place a check here if you think Mr. K should *not* run for political office, no matter what the probabilities.
  - The chances are 9 in 10 that Mr. K would win the election.
  - The chances are 7 in 10 that Mr. K would win the election.
  - The chances are 5 in 10 that Mr. K would win the election.
  - The chances are 3 in 10 that Mr. K would win the election.
  - The chances are 1 in 10 that Mr. K would win the election.
- 

11. Mr. L, a married 30-year-old research physicist, has been given a five-year appointment by a major university laboratory. As he contemplates the next five years, he realizes that he might work on a difficult, long-term problem which, if a solution could be found, would resolve basic scientific issues in the field and bring high scientific honors. If no solution were found, however, Mr. L would have little to show for his five years in the laboratory, and this would make it hard for him to get a good job afterwards. On the other hand, he could, as most of his professional associates are doing, work on a series of short-term problems where solutions would be easier to find, but where the problems are of lesser scientific importance.

Imagine that you are advising Mr. L. Listed below are several probabilities or odds that a solution would be found to the difficult, long-term problem that Mr. L has in mind.

*Please check the lowest probability that you would consider acceptable to make it worthwhile for Mr. L to work on the more difficult, long-term problem.*

- The chances are 1 in 10 that Mr. L would solve the long-term problem.
- The chances are 3 in 10 that Mr. L would solve the long-term problem.
- The chances are 5 in 10 that Mr. L would solve the long-term problem.
- The chances are 7 in 10 that Mr. L would solve the long-term problem.
- The chances are 9 in 10 that Mr. L would solve the long-term problem.

- Place a check here if you think Mr. L should *not* choose the long-term, difficult problem, no matter what the probabilities.
- 

12. Mr. M is contemplating marriage to Miss T, a girl whom he has known for a little more than a year. Recently, however, a number of arguments have occurred between them, suggesting some sharp differences of opinion in the way each views certain matters. Indeed, they decide to seek professional advice from a marriage counselor as to whether it would be wise for them to marry. On the basis of these meetings with a marriage counselor, they realize that a happy marriage, while possible, would not be assured.

Imagine that you are advising Mr. M. and Miss T. Listed below are several probabilities or odds that their marriage would prove to be a happy and successful one.

*Please check the lowest probability that you would consider acceptable for Mr. M and Miss T to get married.*

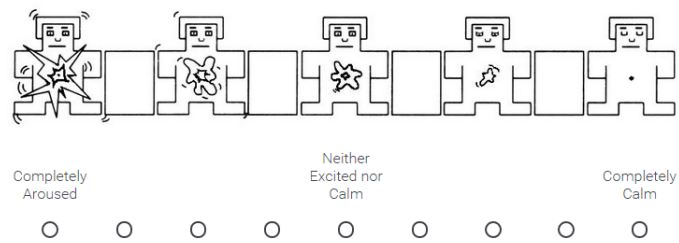
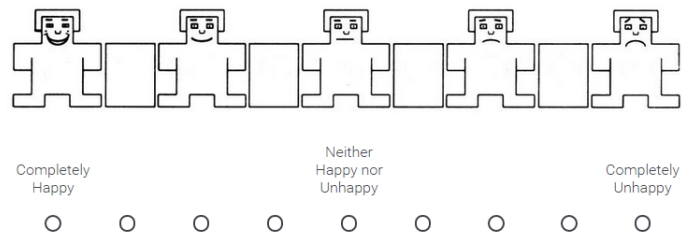
- Place a check here if you think Mr. M and Miss T should *not* marry, no matter what the probabilities.
- The chances are 9 in 10 that the marriage would be happy and successful.
- The chances are 7 in 10 that the marriage would be happy and successful.
- The chances are 5 in 10 that the marriage would be happy and successful.
- The chances are 3 in 10 that the marriage would be happy and successful.
- The chances are 1 in 10 that the marriage would be happy and successful.



## Appendix E

### Self-Assessment Manikin (SAM)

Below, you will see 2 sets of 5 figures, each arranged along a continuum. You will be using these figures to make two ratings about how you currently feel. Your ratings should reflect your immediate personal experience, and no more. Please rate the pictures *AS YOU FEEL THIS WAY RIGHT NOW, THAT IS, AT THE PRESENT MOMENT*. There are no right or wrong answers, so simply respond as honestly as you can.



## Appendix F

### Positive and Negative Affective Scales (PANAS)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

	very slightly or not at all	a little	moderately	quite a bit	extremely
	1	2	3	4	5
interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
distressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
excited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
enthusiastic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
proud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix G

### Consent Form

Consent Form For Participation In Research

**TITLE OF STUDY**

The Effects of Visual Attention on Judgment

**NAME OF RESEARCHERS**

Hoeun Sim, Graduate Student Researcher and Primary Investigator  
Dr. Clifton Oyamoto, Supervising Professor and Faculty Advisor  
Department of Psychology, San Jose State University

**PURPOSE**

You are being asked to participate in a study investigating the relationship between visual attention and judgment. The results of this study will be used to increase our understanding of the role that attention plays in influencing judgment.

**PROCEDURES**

You will interact with a computer throughout the experiment. The study contains 3 portions. In the first part of the study, you will be shown a series of images for approximately 5 minutes. Then, you will complete a simple questionnaire consisting of 2 items. In the second part of the study, you will be asked to complete a judgment task. The task consists of 12 questions about different situations and will take approximately 20 minutes to complete. Then, you will complete a second questionnaire consisting of 20 items. Lastly, in the third part of the study, you will be asked to think and write about 2 events. This will take approximately 20 minutes to complete. At the end of the experiment, you will be asked to complete a demographic survey, which will contain questions about your background characteristics. The total duration of the study is 60 minutes.

**RISKS**

Potential risks may be involved in this study. Although we do not expect any long-term harm to come upon you, you may experience minimal to moderate levels of emotional distress/discomfort. Some of the stimuli may make you feel temporarily uneasy, especially if you have an animal phobia, that is, an irrational/persistent fear of dangerous or threatening animals (e.g., sharks, snakes, bears, dogs, etc.). It is important that we minimize risk and protect you against possible harm; therefore, if you tend to become extremely frightened by such animals, it is advised that you do NOT continue with the study.

**BENEFITS**

There are no direct benefits for participants. However, it is hoped that through your participation, researchers will learn more about how judgment is affected by visual attention.

**CONFIDENTIALLY**

The results from the study will not be associated with you in any way. All data obtained from participants will be kept confidential and no information that could identify you will be included. All questionnaires will be concealed, and no one other than the supervising professor and primary investigator listed above will have access to them. The data collected will be stored in the HIPPA-compliant, Qualtrics-secure database until it has been deleted by the primary investigator.

**COMPENSATION**

You will receive 1 hour of course credit for your full participation in this study. Credit for either partial participation or early withdrawal from the study will be based on proportion of study completed. The minimum credit to be earned is 0.25.

**PARTICIPANT RIGHTS**

Participation in this research study is completely voluntary. You have the right to skip any question that you do not wish to answer, withdraw at anytime during the study, or refuse to participate entirely without any negative consequence on your relations with San Jose State University. If you desire to withdraw, please close your internet browser and inform the research assistant as you leave. No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose not to participate in the study.

**QUESTIONS OR PROBLEMS**

Questions about this study may be addressed to Dr. Clifton Oyamoto (Supervising Professor, Department of Psychology, San Jose State University) at: (408) 924-5650, [clifton.oyamoto@sjsu.edu](mailto:clifton.oyamoto@sjsu.edu)

Concerns or complaints about the study may be presented to Dr. Ronald Rogers (Chair, Department of Psychology, San Jose State University) at: (408) 924-5652, [ronald.rogers@sjsu.edu](mailto:ronald.rogers@sjsu.edu)

Questions about a research subjects' rights or research-related injury may be presented to Dr. Pamela Stacks (Associate Vice President, Office of Graduate Studies and Research, San Jose State University) at: (408) 924-2488, [pamela.stacks@sjsu.edu](mailto:pamela.stacks@sjsu.edu)

**AGREEMENT TO PARTICIPATE**

Please select from the choices below. If you click Yes, it is implied that you have read and understood the information above about the research, your rights as a participant, and give your voluntary consent to participate in this study.

- Yes, I agree to participate in the research. CONTINUE TO STUDY
- No, I do not agree to participate in the research. EXIT

## Appendix H

### Demographics Form

#### General Demographics

---

What is your age in years?

---

What is your sex?

Female  Male

---

Please mark the ethnicity with which you most identify:

- Hispanic or Latino  
 Not Hispanic or Latino
- 

Please mark the race with which you most identify:

- Black or African American  
 American Indian or Alaska Native  
 Asian  
 Native Hawaiian or Pacific Islander  
 White/European  
 Other:

---

What was your grade point average (GPA) in high school?

- 3.75 - 4.00 (A or A+)  
 3.25 - 3.74 (A- or B+)  
 2.75 - 3.24 (B)  
 2.25 - 2.74 (B- or C+)  
 1.75 - 2.24 (C)  
 Less than 1.75 (C- or below)
- 

What is your cumulative grade point average (GPA) at San Jose State University?

- 3.75 - 4.00 (A or A+)  
 3.25 - 3.74 (A- or B+)  
 2.75 - 3.24 (B)  
 2.25 - 2.74 (B- or C+)  
 1.75 - 2.24 (C)  
 Less than 1.75 (C- or below)
- 

Please check the bracket in which your *family's* average yearly income falls:

- Less than \$10,000       \$40,000 to \$49,999       \$90,000 to \$99,999  
 \$10,000 to \$19,999       \$50,000 to \$59,999       \$100,000 to \$149,999  
 \$20,000 to \$29,999       \$60,000 to \$69,999       \$150,000 or more  
 \$30,000 to \$39,999       \$70,000 to \$79,999
- 

What is your religion?

- No religion  
 Christian (all denominations)  
 Buddhist  
 Hindu  
 Jewish  
 Muslim  
 Sikh  
 Any other religion, write in

Generally speaking, I consider myself to be a(n):

- Strong Democrat  
 Somewhat Democrat  
 Independent  
 Somewhat Republican  
 Strong Republican  
 Do not know  
 Other

Have you ever been diagnosed with a mental health condition/disorder?

- Yes, I have been diagnosed with a condition in the past.  
 Yes, I am currently diagnosed with a condition.  
 No, never.
- 

Have you ever had a substance (drug and/or alcohol) abuse problem?

- Yes, I had a substance abuse problem in the past.  
 Yes, I currently have a substance abuse problem.  
 No, never.
- 

How would you rate your general health status?

- Poor      Quite poor      Neither good nor poor      Quite good      Very good
-

## Appendix I

### Debriefing Form

The Effects of Discrete Emotions on Risk Decision Making  
Debriefing Form

Thank you for participating in this study!

The goal of this study is to investigate the relationship between thinking and feeling. In particular, this study is concerned with how our decision making is influenced by specific emotional states. The primary hypothesis tested is that emotions of high intensity (versus low intensity) will evoke greater risky decisions, regardless of whether these emotions are positive or negative in nature. For example, although excitement is generally categorized as a positive emotion while fear is generally considered a negative emotion, both excitement and fear are associated with high arousal or intensity levels, especially compared to emotions such as contentment (positive emotion) and sadness (negative emotion). Therefore, it is predicted that feeling excited or fearful would make one more likely to take risks than if one is feeling contented or sad. The findings from this study should increase our understanding of how we assess and make decisions about risks, and whether certain emotions are more useful in helping us avoid such risks. For example, if our hypothesis is indeed true, then it would be highly advantageous for us, as decision-makers, to hold off on making decisions that involve high costs until we are in a relatively less emotionally aroused state.

It is important that you do not discuss this experiment with anyone until after the end of the semester, since this might affect our results. Please print out a copy of this page and keep it for your records.

Again, thank you for participating today. We appreciate your contribution to this research study!

#### **Contact Information**

Questions about this study may be addressed to Dr. Clifton Oyamoto (Primary Investigator, Department of Psychology, San Jose State University) at: (408) 924-5650, [clifton.oyamoto@sjsu.edu](mailto:clifton.oyamoto@sjsu.edu)

Concerns or complaints about the study may be presented to Dr. Ronald Rogers (Chair, Department of Psychology, San Jose State University) at: (408) 924-5652, [ronald.rogers@sjsu.edu](mailto:ronald.rogers@sjsu.edu)

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Free counseling services are available to students at San Jose State University. Should you feel the need to seek support, the Counseling Services office is located in the Administration Building (7th & San Fernando St.), Rm. 201. Information about services and appointment scheduling can also be found at: (408) 924-5910, <http://www.sjsu.edu/counseling/>

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