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Abstract

This study examined the effects of mood and cognitive processing on risky choice framing. A mixed between- and within-subject lab experimental design was conducted to investigate our hypotheses. As predicted, the results indicate that cognitive processing moderated the effects of scenario framing, with higher levels of intuitive processing leading to classical framing effects, whereas higher levels of analytical processing leading to no such framing effects. Self-reported valence, as in self-rated positive or negative mood, was found to significantly account for variation in cognitive processing. Cognitive processing was, however, not found to mediate the relationship between induced mood and framing effects.

Introduction

One of the most successful behavioural models for decision-making under risk is Tversky and Kahneman's prospect theory (Trepel, Fox, & Poldrack, 2005). Tversky and Kahneman (1981) argue that our choices are influenced by how prospects are cognitively represented, which is also referred to as framing effects. In other words, slightly changing how the same information is presented may influence whether decision-makers are risk seeking, or risk averse. Although recent reviews of framing conclude that framing effects seems to be a robust finding, framing effects are not always obtained. What becomes a key question is under what conditions framing effects are most likely to occur (McElroy & Seta, 2003).

There is a growing amount of evidence that mood influence judgment and decision-making (Blanchette & Richards, 2010). The role of mood and affective states in decision making under risk are also receiving increased attention (e.g., Peters, 2006; Kobbeltved, 2005). More recently, researchers have become interested in the role of anticipatory moods; as experienced *during* the decision-making process, in contrast to previous studies examining anticipated moods; those expected to result from the consequences of a decision (Wang, 2006; Loewenstein, Hsee, Weber, & Wlech, 2001).

A considerable amount of studies have examined the effects of positively and negatively valenced mood on judgment and decision-making (Chou, Lee, & Ho, 2007; Blanchette & Richards, 2010). Several of these findings suggest that negative and positive mood have a distinct impact on cognitive processing. Decision makers in positive mood are often found to increase reliance on intuitive, experiential processing, whereas decision makers in negative mood are found to engage in analytical, systematic processing (e.g., Cohen & Andrade, 2004; Blanchette & Richards, 2010; Tiedens & Linton, 2001). It is generally suggested that mood and cognitive evaluations work in concert to guide reasoning and decision-making (Loewenstein et al., 2001).

There are some findings indicating that analytical processing may moderate framing effects, suggesting that participants engaging in analytical processing does not show framing effects (e.g., McElroy & Seta, 2003; Simon, Fagley & Halleran, 2004) As mood and cognitive processing are suggested to work in concert, and since relatively little research examines how moods or cognitive processing impact the effects of risky choice framing, we derive at our research question:

How does mood and cognitive processing influence framing effects?

Literature Review and Hypotheses

Central topics for our literature review are risky choice framing, prospect theory, mood, and cognitive processing.

Risky Choice Framing

Prospect Theory and Framing Effects

According to the expected utility theory, the way information is framed should not influence the choices made by the decision maker (Plous, 1993; McElroy & Seta, 2003). On the contrary, Tversky and Kahneman (1981) demonstrated that how a decision problem was framed influenced individuals' tendencies to either be risk aversive, or risk seeking. Trepel et al. (2005) defines individuals who are risk aversive as someone who "…prefers a sure payment to a risky prospect of equal or higher expected value" (p. 35). Risk seeking, on the contrary, is defined as someone who "… prefers a risky prospect to a sure payment of equal or higher expected value" (Trepel et al., 2005, p. 35). In order to demonstrate decision frames, Tversky and Kahneman (1981) developed the Asian disease problem. They define a decision frame as referring to "…the decision-maker's conception of the acts, outcomes, and contingencies associated with a particular choice" (Tversky & Kahneman, 1981, p. 453). In the Asian disease problem, participants are asked to imagine the outbreak of an unusual Asian disease in the US, which is expected to kill 600 people. Next, they are presented with two programs to combat the disease and asked to choose the program they favor (Tversky & Kahneman, 1981). Half of the participants are presented with the gain-framed programs, A and B, whereas the other half of the participants is presented with the loss-framed programs, C and D. A gain frame refers to a situation where individuals perceive possible gain. On the contrary, a loss frame refers to a situation where individuals perceive the possibility of loss. The four programs in the Asian disease scenario will be presented to the participants in this study, and are presented as:

A: If program A is adopted, 200 people will be saved.
B: If program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

C: If program C is adopted 400 people will die.
D: If program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die (Tversky & Kahneman, 1981, p. 453).

Although the expected outcomes of problem A and B, and C and D are mathematically the same, Tversky and Kahneman (1981) demonstrated that individuals tended to be risk-aversive in the gain frame, and risk seeking in the loss frame. In fact, 72 % of the participants choose the safe program A over the more risky program B in the gain frame. When the alternatives were framed as losses, however, 78 % preferred the risk seeking option, program D (Tversky & Kahneman, 1981). This preference reversal is referred to as *classical framing effects* (Xie & Wang, 2003; Kühberger & Tanner, 2010). According to Tversky and Kahneman (1981), such framing effects occur since people commonly adopt a more intuitive way of processing information since this simplifies evaluation and reduces cognitive strain.

Prospect theory was developed as a critique of the expected utility theory, investigating and emphasizing how individuals actually behaved under decision-making involving risk (Tversky & Kahneman, 1979). In other words, their findings invalidated the expected utility theory as a descriptive model. Prospect theory uses the term value instead of utility, implying that in decisions involving risk, individuals consider the gains and losses of each alternative. Put differently, this value function is defined on deviation from a reference point.

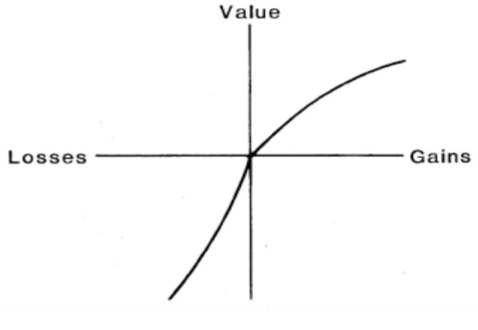


Figure 1.1

(Adopted from Tversky & Kahneman, 1979, p. 454)

As seen from figure 1.1, prospect theory predicts a value function that is generally concave for gains and convex for losses, implying that individuals tend to be risk aversive in a gain frame and risk seeking in a loss frame (Tversky & Kahneman, 1981; McElroy & Seta, 2003; Xie & Wang, 2003). This could further be exemplified through the notion that the "…displeasure associated with losing a sum of money is generally greater than the pleasure associated with winning the same amount" (Tversky & Kahneman, 1981, p. 454).

The Likelihood of Framing Effects

Several studies support framing effects as a reliable phenomenon (e.g. Wang, 1996; Kühberger, 1998). However, more recent reviews have concluded that although there is a moderately strong framing effect for manipulations that follow the Asian disease paradigm, framing effects are not always obtained (McElroy & Seta, 2003). For instance, Haerem, Bakken, Kuvaas and Karlsen (2010) conducted four experiments to explore the robustness of risky choice framing among military decision makers. The classical Asian disease scenario was used in the first experiment, whereas a military scenario was developed and used in the three other experiments in order to make the scenario more relevant to military officers. The structure and choice alternatives were identical to the classical Asian disease scenario (Haerem et al., 2010). In contrast to Tversky and Kahneman (1981), who found a bidirectional framing effect, risk aversive in gain frame and risk seeking in loss frame, Haerem et al. (2010) found a unidirectional framing effect, implying that the participants were risk seeking in both domains. One plausible reason for these findings could be the cultural and contextual factors that influence military decision makers (Haerem et al., 2010). Wang and Johnston (1995) also found support for this unidirectional framing effect. They found that participants were more risk seeking, in both domains, when a decision problem was described in a more personal relevant family context (Wang & Johnston, 1995).

A key question that arises from recent findings in the research field of judgment and decision-making is under what conditions framing effects are more, or less likely to occur. Mood are now receiving increased attention within the field of judgment and decision-making (Blanchette & Richards, 2010), and recent studies have been conducted to investigate how mood and emotions influence decisions under risk (Peters, 2006; Kobbeltved, 2005). Despite this growing interest little research has, to our knowledge, been conducted to investigate the impact of mood on framing effects, especially in concert with the role of cognitive processing.

Intuitive and Analytical Cognitive Processing

As opposed to expected utility theory there is a growing amount of evidence indicating that humans do not always process information in a deliberative and rational way, but rather that human's process information and make decisions in many different ways.

Several researchers have described two different modes of cognitive processing, referred to as *dual processing*, where one is systematic and analytical, and the other is intuitive and experiential (e.g., Epstein, 1994; Kahneman, 2002; Mukherjee, 2010; Sloman, 1996; Slovic, Finucane, Peters, & MacGregor, 2004; Stanovich & West, 2000). According to Sanfey, Loewenstein, McClure, & Cohen (2006) "there is a long legacy of research within psychology, strongly supported by findings from neuroscience, to suggest human behavior is not the product of a single process, but rather reflects the interaction of different specialized subsystems" (p. 111). While the analytic system is slow, serial, controlled, effort-full, rule governed, flexible, and neutral, the intuitive system is fast, parallel, automatic, effortless, associative, slow learning, and emotional (Kahneman, 2002). There is no doubt about the evolutionary value of the experiential system as it allows us to make snap and efficient judgments and decisions of our environment. As intuitive processing is fast and automatic, whereas the systematic system is slow and effort full, it is suggested that decision makers engaging in intuitive processing will use considerably less time on a decision problem than individuals engaging in analytical processing.

Sub-Scales of Cognitive Processing

Betsch and Glöckner (2010) question "… whether heuristics really cover the potentials of intuitive thought" (p. 279). They stress that much of the literature within judgment and decision making (JDM) merely describe heuristics as simplifications of analytic thought, claiming that heuristics, as described in

JDM literature, cope with cognitive limitations by excluding effortful information processes (Betsch & Glöckner, 2010). Thus, they emphasize that "… intuition is capable of dealing with complex tasks through *extensive information processing* without noticeable effort" (Betsch & Glöckner, 2010, p. 280).

Some researchers have further suggested that experiential processing may consist of several distinct aspects of intuition (e.g. Pretz & Totz, 2007). Glöckner and Witteman (2010) stress the fact that dual-process models assume a clear distinction between intuitive and analytic cognitive processes, but do not provide further differentiation within both categories. They propose that empirical testing should differentiate between cognitive processes subsumed in the category of intuition, to gain a better understanding of the processes and allow for more specific predictions. A distinction is made between heuristic and holistic aspects of intuition. Heuristic intuition refers to trust in snap judgments, and first impressions, whereas holistic intuition refers to a preference for abstract, holistic integration of complex information, and reliance on incubation in decision making (Pretz & Totz, 2007). Defining the concept of intuition, and operationalizing it efficiently remains a challenge, and we need to know more about the role of mood in the intuitive process (Langan-Fox & Shirley, 2011).

Cognitive Processing and Framing Effects

Shiomura & Atsumi (2001) investigated whether participants solving analytic and intuitive processing tasks differed in their response to framing. They found that participants in the intuitive processing condition showed classical framing effects; a preference for risk-seeking in loss frame, and a preference for risk-aversion in gain frame. In the analytic processing condition, however, the results suggested no framing effect. These findings suggest that when people engage in analytic processing they are less prone to framing effects compared to individuals engaging in intuitive processing. In the same vein, Simon, Fagley, and Halleran (2004) induced analytical processing by asking participants to write out the options as they would describe it to a friend, suggesting that analytical processing would moderate the effects of framing. Based on two studies including 257 participants they conclude that framing effects are not observed when participants engage in analytical processing (Simon, Fagley, & Halleran, 2004).

McElroy & Seta (2003) conducted two experiments testing both induced and predisposed analytic versus intuitive processing on framing effects. Processing style was manipulated by making the designed task more or less relevant, as suggested by Liberman and Chaiken (1996); that highly relevant tasks induce more analytical processing. Consistent with their predictions and other findings, participants in the intuitive processing condition showed classical framing effects, whereas participants engaging in analytical processing were relatively insensitive to framing effects (McElroy & Seta, 2003).

Based on empirical findings and theory on cognitive processing, we hypothesize that:

Hypothesis 1**:** cognitive processing will moderate the effects of risky choice framing. Specifically:

*Hypothesis 1a**:** Higher levels of intuitive processing will increase the likelihood of classical framing effects; decision makers with high levels of intuitive processing will be risk aversive in gain frame, and risk seeking in loss frame.*

*Hypothesis 1b**:** Higher levels of analytical processing will reduce the likelihood of classical framing effects; decision makers with high levels of analytical processing will be relatively insensitive to framing.*

Some research has also shown that framing may have an impact on processing style (Dunegan, 1991; Dunegan, 1993). Dunegan (1991) found that decisions following a positive frame (gain) appeared to be automatic and intuitive, whereas decisions following a negative frame (loss) were more deliberate and analytic. These findings are explained through image theory which states that a decision maker attempts to be cognitive economical when selecting a course of action (Dunegan, 1991). When in a positive frame, individuals experience compatibility between the decision problem and the desired future events, thus resulting in a more automatic and intuitive processing which are more cognitively economical. However, when individuals are presented with a negative frame, their experience of compatibility between the decision problem and desired future events becomes threatened, prompting a more deliberate, systematic and more cognitive demanding processing style (Dunegan, 1991). In an additional study conducted by Dunegan (1993), similar findings were obtained.

As seen from the literature review on the relationship between framing and cognitive processing, scholars have reached some conflicting conclusions for why framing effects occur. To investigate whether risky choice framing does not necessarily trigger intuitive processing, but rather distinct cognitive processing depending on loss or gain frame, we derive at our next and contradicting hypothesis.

*Hypothesis 2**:** Decision makers in gain frame will engage in higher levels of intuitive processing, whereas decision makers in loss frame will engage in higher levels of analytical processing.*

As framing are suggested to impact the decision makers' cognitive processing, we hypothesize that:

*Hypothesis 3**:** The relationship between scenario framing and response is mediated by cognitive processing.*

Mood and Risk

Scholars within the field of decision making usually view risk as "… increasing with the variance in the probability distribution of possible outcomes" (Trepel et al., 2005, p. 35). Much of the previous research on choices under risk has focused on cognitive aspects with little emphasis on how mood might influence risk assessments (Loewenstein et al., 2001; Lerner & Keltner, 2001; Wang, 2006). More recently, the influence of mood on risk has been studied more extensively (Lerner & Keltner, 2001; Kobbeltved et al., 2005; Peters et al., 2006; Wang, 2006; Blanchette & Richards, 2010), with the valence approach as the most dominant theory (Lerner & Keltner, 2000).

Defining Mood

There is some disagreement about how to define terms such as affect, emotions, and mood (Forgas, 1995; Luomala & Laaksonen, 2000). However, Forgas (1995) defines affect as a more general label that refers to both moods and emotion. Emotions might be defined as "…intense, short-lived and usually have a definite cause and clear cognitive content (e.g. anger or fear)" (Forgas, 1992 as cited in Forgas, 1995, p. 41). The main focus of this paper, however, is *mood*, which could be defined as "… low-intensity, diffuse and relatively enduring affective states without a salient antecedent cause and therefore little cognitive content (e.g. feeling good or feeling bad)" (Forgas, 1992 as cited in Forgas, 1995, p. 41). Other scholars define mood as an affective state that is pervasive, subjectively perceived by the individual, and are distinguished from the intense and short-lived character of emotions (Gardner, 1985). In the same vein, Kumar (1997) explain mood as an affective state that is usually more enduring than emotions. Luomala and Laaksonen (2000), states that the several definitions of mood emphasize the structural aspects of mood. In other words, they attempt to answer the question "what are moods?" (Luomala & Laaksonen, 2000). Contrary to the structurally oriented view on mood, the functionally oriented view on mood put a greater emphasis on the functional aspects of mood, trying to answer the question "why do moods exist?" (Luomala & Laaksonen, 2000). An example of a functional definition of mood is seen in (Morris, 1992 as cited in Luomala & Laaksonen, 2000, p. 200) "Moods signal the states of the self in terms of the physical, psychological, and social resources available to meet perceived environmental demands. Moods operate as a cue in a self-regulatory system". Thus, the functional view on mood highlight that moods may function as cues informing individuals on their general state of being.

Valence Theory and the Affect Infusion Model

Valence theory suggests that positive and negative mood will have distinct impact on cognitive processing and the perception of risk. Druckman and McDermott (2008), state that positive mood lead to risk-seeking behavior, whereas negative mood leads to risk-aversive behavior.

Several findings indicate that positive mood increase risk taking, whereas negative mood is more likely to reduce risk-taking tendencies. A general finding stated by Blanchette and Richards (2010) is that people in positive mood estimate positive events as more likely, whereas people in a negative mood increase estimates of the likelihood for negative events. Schwarz and Clore (2003) argue that when using their mood as information, decision makers misread their current mood as a response to the task of judgment, leading to favorable evaluations under positive mood and less favorable evaluations under negative mood.

Other studies also provide evidence for the impact of positive mood on risk taking tendencies (Forgas, 1994; Forgas, 1995; Chou, Ho & Lee, 2007). Chou et al. (2007) found that individuals who were in a happy mood showed more risk taking tendencies than those who were in a sad mood. They explain their findings through the Affect Infusion Model (AIM) (Forgas, 1995), which asserts that people in a positive mood rely on positive cues in making judgments and are thus "…more likely to access thoughts prone to positive aspects of risky situations than those who are in a negative mood" (Chou et al., 2007, p. 310). Moreover, individuals in positive mood perceive the outcome of risky choices as more favorable, resulting in an increase in the willingness to take risks. People in negative mood, on the contrary, are more likely to see the world as a threatening place, and are therefore more likely to process information systematically and carefully in order to avoid potential losses (Chou et al., 2007).

The Affect Heuristic

Heuristics may be defined as general rules of thumb. Heuristics are cognitive shortcuts and simplifications of complicated judgments and decisions, which in many cases yield close approximations to an optimal answer suggested by normative theories (Plous, 1993). Relying on heuristics may in this sense reduce the time and effort required to make optimal judgments and decisions, and the decision made could often be the 'correct' response. However, relying on heuristics may have disadvantages as well. In certain instances, relying on heuristics will lead to systematic biased decisions (Tversky & Kahneman, 1974; Plous, 1993).

Analyzing risk, alternatives and consequences are important in several decision-making contexts. However, reliance on mood could often be a quicker, easier and more effective way to navigate in an uncertain and complex decision environment. Using the experienced mood as information, and relying on the mood associated with a stimulus is often characterized as the affect heuristic (Slovic et al., 2005). According to Slovic et al. (2005), our mind consists of images that are tagged or marked to varying degrees of affect, and this 'affect pool' contains of positive and negative markers that are consciously or unconsciously associated with these images. In other words, we rely on, or consult the affect pool in the process of making judgments, and affect might serve as cues for judgments.

Numerous studies have shown support for the affect heuristic (e.g. Keller, Siegrist, & Gutscher, 2006; Siegrist, Keller, & Marie-Eve Cousin, 2006; Slovic et al., 2007). Furthermore, the affect heuristic also seems to have much in common with Epstein's (1994) dual process theory (as intuitive processing is more emotionally driven), and the mood-as-information theory.

Circumplex Model of Affect

One of the most widely studied models exploring valence and affect is the circumplex model of affect (Remington, Visser, & Fabrigar, 2000). Building on work done by Schlosberg (1941; 1952, as cited in Remington et al., 2000), Russell (1980) conducted a study where students were told to sort 28 words describing moods, feelings, temporary states, affect, or emotions into one of eight categories labeled arousal, contentment, depression, distress, excitement, misery, pleasure, and sleepiness.

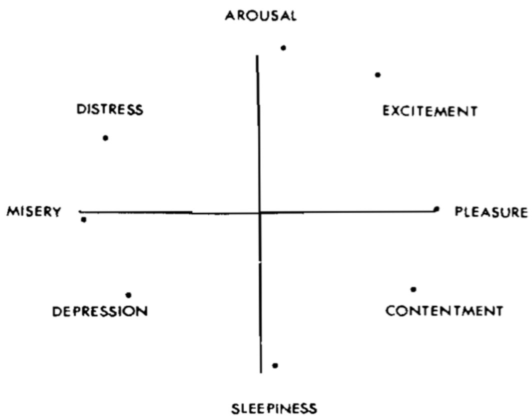


Figure 2.1 (Adopted from Russel 1980, p. 1164).

Furthermore, in a second task, the participants were instructed to place the aforementioned categories into a circular order so that the words opposite each other on the circle describes opposite feelings and the words closer together on the circle described more similar feelings (Russell, 1980). Similar to expectations, Russell (1980) showed that the categories were placed in to the predicted circular order. Moreover, the 28 words were also shown to fall along the proposed pleasure-displeasure and degree-of-arousal dimensions, indicating that "… laymen have a mental map of affective life on which they rely in a variety of situations" (Russell, 1980, p. 1170).

Elaborating on Russell's model (1980) Larson and Diener's model propose that mood differ in high and low arousal and between negative and positive valence (Larson & Diener, 1992 as cited in Remington et al., 2000). As seen from the literature review on mood and risk, scholars have concluded that positive and negative mood have a distinct impact on judgments and decisions regarding risk. Contributing to our understanding of why decision makers in positive and negative mood make dissimilar decisions, studying underlying and interacting mechanisms such as cognitive processing becomes essential.

The Interaction Between Mood and Cognitive Processing

Until quite recently, cognitive processes have been studied in a vacuum, separately from moods, as if cognitive processes are immune from such influence (Blanchette & Richards, 2010).

The majority of findings that have examined the effects of moods on cognitive processing have focused on a dual process framework (e.g., Chaiken, Liberman, & Eagly, 1989; Petty & Cacioppo, 1986). Several of these findings suggest that individuals in negative moods engage in more analytic processing, whereas individuals in positive moods engage in more intuitive processing (e.g., Cohen & Andrade, 2004; Tiedens & Linton, 2001). The "mood as information" approach is contributing to answering why positive and negative moods may trigger different cognitive processing paths. As negative mood may signal a threat to the achievement of desired goals, the situation calls for analytic processing. Positive mood on the other hand may signal that the situation is safe and, thus, that one has sufficient information to make a judgment (Bless, 2000; Schwarz, 1990; Bless et al., 1996).

It is suggested by the mood-as-information theorists that negative moods signals that something about the situation is problematic, and hence that information must be processed more carefully (Blanchette & Richards, 2010). Similarly, Schwarz and Clore (2003) propose that we usually feel bad when we encounter a threat of negative outcomes, and feel good when we are more certain that we will obtain positive outcomes. Hence, our moods reflect the state of our environment. If mood is used as information, then being in a bad mood may signal that the situation is problematic, whereas being in a good mood may signal a benign situation. Schwarz and Clore (2003) states that our cognitive processing are tuned to meet the processing requirements apparently posed by the situation. In this sense, negative mood may foster analytic processing with attention to the details at hand. Positive moods on the other hand may foster intuitive processing, relying more on general knowledge structures and having less focused attention. With regards to moods and measures of time, Clore and Tamir (2002) found that participants in positive moods tended to exit the decision process relatively early, whereas those in negative mood analyzed the same information to a further extent before making a decision.

Forgas (2001) attempts to explain how mood influences both what information is processed, and how this information is processed. His main argument is that positive and negative moods may function as heuristic cues that signal whether enough effort has been put forth to perform the task at hand. When in positive mood, individuals may produce suboptimal performance since they misread their mood state as an indication that they have put in enough effort to perform the task; negative mood may signal that more information is required to increase performance (George & Zhou, 2001, as cited in Forgas & George, 2001).

As theory and empirical research propose that there is an interaction between mood and cognitive processing, a key question arises regarding how these factors may interplay in relation to framing effects.

Mood and Framing Effects

There is considerable literature on positive and negative mood and its effect on judgment and decision-making (Chou, Lee, & Ho, 2007). However, to our knowledge, little or no research has examined moods' effect on risky choice framing, especially in concert with cognitive processing. As positive mood is suggested to trigger intuitive processing, and negative mood is proposed to trigger analytical processing, we hypothesize that:

Hypothesis 4**:** Induced mood will moderate the relationship between framing and response. Specifically:

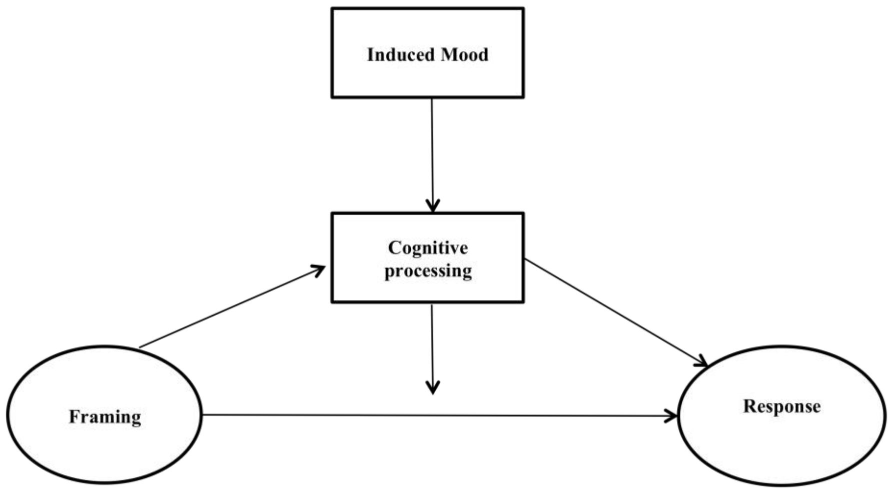
*Hypothesis 4a**:** Decision makers in positive mood will show classical framing effects; being risk aversive in the gain frame, and risk seeking in the loss frame.*

*Hypothesis 4b**:** Decision makers in negative mood will be relatively insensitive to framing, and not show classical framing effects.*

As cognitive processing is suggested to account for the presumed moderating effect of mood, we hypothesize that:

*Hypothesis 5**:** The moderating effect of mood on the relationship between framing and response will be mediated by cognitive processing, with the effect of positive mood being mediated by intuitive processing, and the effect of negative mood being mediated by analytical processing.*

Conceptual Research Model



Validation and Operationalization

Induced Mood, Self-Assessment and SCR

Two manipulation checks will be applied to validate our mood manipulation, as elaborated on in the methodology section. The first manipulation check will be a self-assessment system. To validate our mood manipulation, we predict that induced positive mood will be related with high levels of self-reported positive valence, whereas induced negative mood to be associated with lower levels of self-reported positive valence.

The second mood manipulation that will be applied is measures of changes in electrodermal activity (EDA); skin conductance response (SCR), which measures the arousal dimension of mood, indicating its intensity (Figner & Murphy, 2011). SCR is frequently used within the field of judgment and decision making when measuring arousal, and the method will be presented more in depth in the methodology section. However, as validation of the mood inducement, we predict that there should be no significant difference in the scores of self-reported arousal in the positive and negative mood inducement conditions. We also predict that high levels of self-reported valence and arousal will be significantly related to higher levels of SCR.

Cognitive Processing and Response-Time

To validate our cognitive processing measures, we predict that decision makers that reports high levels of intuitive processing use significantly less response time, in contrast to decision makers reporting higher levels of analytical processing.

Methodology

In this section we will describe how we tested and investigated our research model and hypotheses empirically.

Sample and Research Design

Eighty-nine students from BI Norwegian Business School voluntary participated in the study. After removing outliers and participants with missing data on one or more key variables, we ended up with a final sample of eighty-one participants. The study had a lab-experimental design. We used a 2 (positive vs. negative mood) by 2 (gain vs. loss frame) mixed between- and within subject design, randomly assigning 20 or more participants to each of our four experimental conditions.

Procedure and Key Variables

The experiment was conducted in the research lab at BI Norwegian Business School, with the software E-Prime 2.0 installed on the computers at use.

E-Prime 2.0 is a psychology software tool designed for computerized experiments, which allows for millisecond precision timing to ensure accuracy of the data collected (Pst. Inc., 2012). Participants were presented with the original Asian disease scenario and the following two alternative intervention programs, which they were asked to choose among. Half of the participants in the negative mood condition were presented with the loss-framed programs, and the other half was presented with the gain-framed programs. The same procedure was followed for participants in the positive mood condition. After completing the task and filling out the questionnaires, as explained more thoroughly in the next section, participants were presented with the intervention programs of the opposite frame (gain/loss), following the exact same experimental procedure. To clarify, participants in both mood conditions received either the loss or gain frame first, and after completion (composing the between-subject design), they received the opposite frame (composing the within-subject design).

Independent Variables: Mood and Scenario Framing

To manipulate the independent variable *scenario framing*, the alternatives were presented in terms of gains or losses, we used the original Asian disease scenario developed by Tversky and Kahneman (1981).

To induce and manipulate the independent variable *mood,* we applied two color photographs (Appendix 1) from the International Affective Picture System (IAPS), developed by the Center for Emotion and Attention (CSEA) at the University of Florida. The center provides standardized materials that are available for researchers who study emotions and mood, and the IAPS consists of photographs that are validated to induce affective states, including specific emotions and mood (Lang, Bradley, & Cuthbert, 2008). Our participants were presented with either a validated negative mood photograph (a starving child), or a validated positive mood photograph (a smiling, happy baby). Participants were instructed to focus on the screen at all times during the experiment. In addition we applied a focus point (“*”) in the middle of the screen using E-Prime 2.0, after they had pushed space to begin the experiment, to ensure that participants held their eyes on the computer screen when the photograph was displayed. The photograph was displayed for three seconds, before immediately receiving the Asian disease scenario. After providing their response and completing the following questionnaires, participants were exposed to the exact same experimental mood inducement, before receiving the opposite framed alternatives (composing the within-subject design).

Dependent Variables: Response and Cognitive Processing

The dependent variable *response* was recorded when participants indicated their decision to the Asian disease scenario by selecting the risk aversive or risk seeking option on the computer.

After making their decision, participants were asked to fill out a questionnaire reflecting characteristics of their decision. The questionnaire consisted of 43 items formulated as statements ranging on a Likert-scale from 1 ("I disagree") to 5 ("I agree"), measuring the dependent and independent variable *cognitive processing* (Appendix 2). The questionnaire consisted of Sinclair's (2004) two scales (13 items), and Bakken and Haerem's (2011) three scales (30 items) of analytic and intuitive processing. Haerem and Bakken (2011) developed and provided discriminant and convergent validity of the three scales, which includes items from the REI-factor (Rational-Experiential Inventory from Pacini & Epstein, 1999), a heuristic/holistic intuitive processing factor, and an affective intuitive processing factor.

Control Variables

We also controlled for *gender*, and *time*. Time as a possible additional indicator of the type of cognitive processing that was employed during the judgment and decision making, as previously predicted that participants engaging in analytic processing might use more time before giving their response to the Asian disease scenario.

Manipulation Checks

We applied two manipulation checks for mood inducement. One based on a self-assessment manikin (SAM), and the other measuring changes in electrodermal activity; skin conductance response (SCR). The two methods for manipulation checks are pretended in the following sections.

Self-Assessment Manikin

After being presented with the photograph and having made their decision relevant to the Asian disease scenario, all participants (N=81) received a self-assessment questionnaire (Appendix 3) reflecting their mood reactions to the photograph. The self-assessment system is called the Self-Assessment Manikin (SAM), which is an affective rating system devised by Lang (1980, as cited in Lang, Bradley, & Cuthbert, 2008). The system consists of graphic figures assessing the affective dimensions of valence (positive vs. negative mood) and arousal (low vs. high). Valence is presented to the participants as the dimension “Happy vs. Unhappy”, by figures ranging from a smiling, happy figure, to a frowning, unhappy figure. Arousal is presented as the dimension “Excitement vs. Calm”, and ranges from an excited, wide-eyed figure to a relaxed, sleepy figure. Participants were asked to place an “X” on one of the 5 figures compromising each scale, or between the figures that they found the most appropriate for the experienced mood reaction, resulting in a 9- point Likert scale for each dimension. Participants were asked to rate the picture as they actually felt while watching the picture, reflecting their immediate personal experience, and no more.

Skin Conductance Response (SCR)

The skin has electric properties that are closely related to psychological processes. Changes in electrodermal activity (EDA) and skin conductance are related to changes in eccrine sweating on the volar surfaces, which in turn are strongly related to the activity in the sympathetic branch of the autonomic nervous system (Weber & Johnson, 2009). Accordingly, EDA measures have been widely used in the study of psychological processes related to sympathetic arousal (Figner & Murphy, 2011). Skin conductance is one form of EDA, and within the research field judgment and decision-making, SCR measures are frequently used as an indicator of affective processes and emotional arousal (Weber & Johnson, 2009). Specifically, the term skin conductance refers to how well the skin conducts electricity when an external direct current of constant voltage is applied (Figner & Murphy, 2011).

The instrument we applied for measuring skin conductance is named “SudoLogger”, and is developed by the Norwegian company BioGauge AS (Appendix 4). BioGauge AS is a company that is dedicated to developing bioimpedance techniques and instruments based on the latest results from international research (BioGauge, 2012). The SudoLogger technology is based on more than 30 years of active research at the University of Oslo, and is an instrument for objective measurement of SCR.

Three electrodes were attached to participants' hands, and the SCR-data were transmitted wirelessly to a nearby computer recording the measurements. The electrodes were attached to the participants 5 minutes prior to beginning the experiment, to ensure a good and stable electrical connection. Our initial plan was to collect SCR measurements from all participants in the study. However, the SudoLogger instruments were unfortunately delayed shortly after we had scheduled participants for the study and reserved the research lab at BI Norwegian Business School. When the SudoLogger instruments arrived, we collected SCR measurements from the final 20 participants in the study, resulting in 5 SCR measurements from each experimental condition.

As suggested by other researchers studying SCR (e.g. Healey & Picard, 2005), we applied two methods for preparing the SCR measurements for analyses. Method one was calculating the number of peaks of the SCR. We did this within four time frames. The four time frames were 1) during the three-second onset time of the picture presentation, 2) during a ten-second time frame starting from the picture onset time, 3) during the scenario onset time, and 4) during the total onset time of both the picture presentation and the scenario. Method two was calculating the sum of increments for the calculated peaks. We did this in the exact same four time frames.

Results and findings

Descriptive Statistics

Descriptive statistics for the dataset showed a total N of 89 participants. Four of the participants had missing values on one or more key variables and were therefore removed from the dataset. An additional four participants were removed because they had values outside the tolerable 3 points of standard deviation (Hair, Black, Babin, & Anderson, 2010) on the variable time. This was a result of the software E-Prime 2.0 not stopping to record time, because these participants began answering the questionnaire before properly recoding their response. Final descriptive statistics for the dataset showed a total N of 81, with 51 females and 50 male respondents.

Outliers and Normal Distribution

As several of the statistical techniques performed to test our hypotheses are sensitive to outliers and assume that the distribution of scores on the dependent variables are 'normal' (Hair et al., 2010), we first assessed the normality of the data by using the explore option of descriptive statistics. The term normal describes a symmetrical, bell-shaped curve with greatest frequency of scores in the middle, with smaller frequencies towards the extremes (Gravetter & Wallnau, 2004). We inspected both Histograms and Boxplots and found no extreme outliers, except for the four values on the variable time that was improperly recorded and therefore removed. We compared all original means with the 5 % Trimmed Means of our dependent continuous variables and ensured that no extreme scores had a strong influence on the mean values (Hair et al., 2010). We investigated the Kolmogorov-Smirnov statistic to assess normality of the distribution of scores. Some of the variables did have significant values, suggesting a violation of the assumption of normality. Fortunately, most of the techniques are reasonably 'robust' or tolerant of violation of this assumption if the sample is larger than 30 participants (Hair et al., 2010). Moreover, further investigation of the actual shape of distribution in the Histograms, in addition to ensuring that the normal probability plots (Normal Q-Q) revealed reasonably straight lines, suggested a normal distribution of the data.

Measures, Validation and Manipulation Checks

To validate and test the effects of our mood manipulation, we investigated our two manipulation checks; the self-assessment system, and measures from skin conductance response.

Self-Assessment Manikin

Testing to ensure that our mood manipulation worked, we predicted that there would be a significant relationship between induced mood and self-reported valence. We ran linear regression to validate and test the mood manipulations, assessing the ability of induced mood to predict levels of self-reported valence. Inspecting the R-Square, induced mood explains 73.6 % of the variance in self-reported valence, indicating a success of the experimental manipulation with a β = -.85, p < .001 in the between-subject design. In the within-subject design, the R-Square indicates that induced mood explains 71.8 % of the variance in self-reported valence, indicating a success of the experimental manipulation with a β -.84, p < .001. High levels of induced negative mood were able to predict high levels of self-reported negative valence (ratings on the lower side of the valence continuum), in both the between- and within-subject design.

To further validate the mood manipulation and compare the valence scores for participants in the negative and positive mood condition, an independent-samples t-test was conducted. There was a significant difference in the scores for participants in the positive mood condition (*M* = 2.15, *SD* = 1.21) and participants in the negative mood condition (*M* = -2.30, *SD* = 1.48; *t* (81) = 14.66, *p* = .001, two-tailed). The magnitude of the difference in the means (mean difference = 4.45, 95 % *CI*: 3.84 to 5.05) was large (eta squared = .74), providing additional support for a successful mood manipulation.

We also predicted that there would be no significant differences in scores of self-reported arousal for the negative and positive mood condition. An independent-samples t-test was conducted to compare the scores on arousal for positive and negative mood inducement. There was no significant difference in scores for induced positive mood (*M* = 4.19, *SD* = 1.73) and induced negative mood (*M* = 4.58, *SD* = 1.99; *t* (81) = -.948, *p* = .35, two-tailed).

In sum, the findings reveal that as predicted, respondents in the positive mood condition reported higher levels of positive valence, whereas respondents in the negative mood condition reported higher levels of negative valence. Additionally, there were no significant differences in the levels of self-reported arousal between the mood conditions, indicating that both the positive and negative mood inducement had similar levels of experienced intensity. The results provide strong support for a validation of our mood manipulation.

Skin Conductance Response

Regarding the second manipulation check, we predicted that high levels of self-reported valence and arousal would be significant predictors of higher levels of SCR. To provide further support for a validation of the mood manipulation and investigate the relationship with SCR, we ran linear regression. To run linear regression, the guideline for the minimum ratio of observations to independent variables is 5:1 (Hair et al., 2010). As each of the independent variables valence and arousal consisted of a 9-point likert scale (potentially composing nine distinct groups), and since we did only have SCR-data from 20 participants, we divided the respondents into three categories of valence and arousal to fulfill the criterion of linear regression. On the valence continuum, responses were divided into the negative valence category (scoring from 1-4), the neutral category (scoring 5), and the positive valence category (scoring 6-9). The same procedure was followed for arousal, with low levels of arousal (1-4), medium levels of arousal (5) and high levels of arousal (6-9). Following, linear regression was performed to assess the ability of valence and arousal to predict levels of SCR.

The results showed that high levels of negative and positive self-reported valence was not found to be a significant predictor of higher levels of SCR, with no *p* values under .05, with the lowest reaching .136. Self-reported arousal, on the contrary, significantly accounted for variation in one of the SCR variables; picture-response, $F\ (1, 40) = 6.59$, $p < .005$, with a $\beta = .24$. Self-reported arousal was not able to significantly account for variation in the other three SCR variables, with the lowest *p* value reaching .072.

In sum, self-reported valence was not able to predict levels of SCR. However, self-reported arousal was significantly related with higher levels of SCR among decision makers during the display of the mood inducing photographs.

Factor Analysis of the Cognitive Processing Scales

We conducted a principal component analysis in order to establish construct validity of Sinclair's (2004) two scales (13 items) and Bakken and Haerem's (2011) three scales (30 items) of analytic and intuitive processing. Since our study was part of a bigger research project where similar respondents was subject to similar types of experimental stimuli, we chose to include these data points in our analysis in order to increase the reliability of the results.

Before performing analyses, the suitability of the correlation matrix for factor analysis was evaluated. A number of criterions were followed. First, according to Tabachnick and Fidell (2001), at least 300 cases are necessary to run factor analysis. Furthermore, Nunnally (1978) recommends a 10:1 ratio, were 10 cases are needed for each variable. As our dataset consisted of 635 cases (N = 635) and a 14:1 ratio (43 variables), both sample size criterions were fulfilled. Second, as recommended by Tabachnick and Fidell (2001), an inspection of the correlation matrix was conducted to ensure that several of the coefficients were greater than .30. Finally, as a step in further assessment of the dataset for factor analysis, we applied the Barlett's test of sphericity (Bartlett, 1954), and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1970). The Bartlett's test of sphericity was found to be significant ($p < .05$), and KMO was .89, reaching more than above the recommended value of .60, indicating the factorability of the correlation matrix.

A principal component analysis using promax rotation revealed a need to exclude a number of weak and cross-loading items. Subsequent to excluding these items, a 27-item questionnaire capturing five factors emerged. With eigenvalues exceeding 1, the five factors explained 24.4 %, 12.2 %, 8.2 %, 6.1 %, and 4.8 % (55.7 % of the total variance explained). Examining the scree plot, a sufficient break after the fifth factor was identified. Furthermore, a Parallel Analysis supported the retention of the five factors because they were the only factors with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (27 variables x 635 respondents).

Finally, a reliability analysis revealed that Sinclair's two scales proved good coefficient alpha reliability estimates of .87 (analytic) and .80 (affective intuition). With regards to Bakken and Haerem's three scales, acceptable coefficient alpha reliability estimates were found; .70 (analytic/double check), .77 (heuristic intuition), and .81 (intuitive speed). Furthermore, a reliability analysis on the analytic and intuitive components combined, alpha coefficients reached .87 for the analytic components and .80 for the intuitive components. These findings are in line with Bakken and Haerem's (2011) and Sinclair's (2004) predictions. Thus, the three variables of intuitive processing; *intuitive speed*, *heuristic-holistic intuition* and *affect intuition*, and the two variables of analytic processing; *analytic-sinclair* and *analytic double-check,* were retained in later analyses.

Cognitive Processing and Time-Validation

In order to further validate the cognitive processing measures, we predicted that decision makers reporting high levels of intuitive processing would use significantly less response-time in relation to the Asian disease scenario, in contrast to decision makers reporting high levels of analytical processing. We correlated the cognitive processing variables with time, as seen in table 1.

Table 1

Summary of intercorelations, means, and standard deviations for scores on response time and cognitive processing scales

Measure	1	2	3	4	5	6	7	8
1.Response Time	--							
2.General Intuition	-.25***	--						
3.Heuristic Holistic Intuition	-.25**	.82***	--					
4.Intuitive Speed	-.15**	.66***	.26***	--				
5.Affective Intuition	-.09	.63***	.25***	.29***	--			
6.General Analytic	.21***	-.12*	.12*	-.33***	-.18**	--		
7.Analytic Sinclair	.18**	-.12*	.11*	-.31***	-.18***	.93***	--	
8.Analytic Double-Check	.18**	-.09	.09	-.27***	-.12*	.82***	.55***	--
M	60.15	1.38	0.76	0.69	2.31	-2.13	-2.13	-1.74
SD	42.38	0.57	0.71	0.90	0.84	0.60	0.65	0.73

Note. The variable general intuition refers to the mean of all intuitive scale items, whereas general analytic refers to the mean of all analytic scale items. One-tailed test. Between-subject design N = 81, within-subject design N = 162. $*p < .10$; $**p < .05$; $***p < .01$.

No significant relationships were detected in the between-subject design. Whereas the findings in the within-subject design indicate that intuitive processing was negatively correlated with time, and analytical processing was positively correlated with time. The findings were in line with our predictions.

Effects

In this section we present the results from testing our research model and the hypotheses we derived at in our literature review.

The Moderating Effects of Cognitive Processing

In ***H1*** we predicted that cognitive processing would moderate the relationship between framing and response. We hypothesized that higher levels of intuitive processing would lead to classical framing effects, whereas higher levels of analytical processing would lead to no such framing effects. We centralized the variables, prior to creating the interaction terms, to improve their interpretability and to reduce the threat of multi-collinearity.

Hierarchical binary logistic regression was performed to test the hypothesis. A summary of the analyses is displayed in table 2.

Table 2

Results of moderated logistic regression analyses

	Response					
	Between-subject design			Within-subject design		
Variable	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Framing	1.62*** (.51)	1.54** (.52)	1.58** (.56)	.97** (.33)	.96** (.31)	.93** (.30)
General Intuition		.33 (.45)	-.85 (.82)		.13 (.28)	-.44 (.75)
Heuristic Holistic Intuition		.27 (.38)	-.15 (.63)		-.62 (.41)	.18 (.58)
Intuitive Speed		.19 (.29)	-.74 (.61)		.23 (.18)	.11 (.28)
Affective Intuition		.02 (.30)	-.46 (.41)		.15 (.20)	-.40 (.27)
General Analytic		-.51 (.43)	-.52 (.71)		-.27 (.27)	-.05 (.41)
Analytic Sinclair		-.55 (.40)	-.44 (.66)		-.27 (.25)	.03 (.37)
Analytic Double-Check		-.18 (.34)	-.36 (.56)		-.12 (.22)	-.14 (.34)
General Intuition X Framing			1.97 (1.0)			2.30* (1.06)
Heuristic Holistic Intuition X Framing			.66 (.79)			-1.60 (.84)
Intuitive Speed X Framing			1.32 (.71)			.21 (.37)
Affective Intuition X Framing			1.02 (.60)			1.08** (.41)
General Analytic X Framing			.01 (.89)			-.40 (.55)
Analytic Sinclair X Framing			-.17 (.84)			-.57 (.51)
Analytic Double-Check X Framing			.77 (.70)			.04 (.45)

Note. Standardized coefficients and standard errors (in paranthese) are shown. The variable general intuition refers to the mean of all intuitive scale items, whereas general analytic refers to the mean of all analytic scale items. Between-subject design N = 81, within-subject design N = 162. *$p < .05$; **$p < .01$; ***$p < .001$.

The analyses in the between-subject design yielded no significant effects, with the lowest *p* value of interaction effects reaching .060. In the within-subject design, two interaction effects were found to have a significant effect on response, general intuition (β 2.30, $p < .030$), and affect intuition (β 1.08, $p < .009$). High levels of general- and affect intuition were found to increase risk seeking tendencies when the scenario frame shifted from gain frame to loss frame, indicating that with higher levels of general and affect intuition, decision makers were more likely to demonstrate a preference shift; becoming more risk seeking in the loss frame. The findings indicate that general intuition and affect intuition had a moderating effect on the relationship between framing and response. Specifically, the interaction between framing and higher levels of intuition and affect intuition was significantly able to predict classical framing effects. Moreover, the interaction between framing and higher levels of analytical processing was not able to predict response. In other words, higher levels of analytical processing was not significantly associated with framing effects, providing support for ***H1***.

Framing and Cognitive Processing

As suggested in the literature review, framing may have a distinct impact on cognitive processing. In our contradicting hypothesis (***H2***), we predicted the gain frame to be positively associated with higher levels of intuitive processing, and the loss frame to be positively associated with higher levels of analytical processing. To investigate the potential differences between the two groups of frames, an independent-samples t-test was conducted to compare the cognitive processing scores for the gain and loss frame.

Contrary to our hypothesis, there was a significant difference in scores for gain frame (*M* = -.0920, *SD* = .549) and loss frame (*M* = .1753, *SD* = .555; *t* (81) = - 2.18, *p* = .032, two-tailed) in general intuition. There was also a significant difference in scores for gain frame (*M* = -.2034, *SD* = .745) and loss frame (*M* = .3037, *SD* = .921, *t* (81) = -2.72, *p* = .008, two-tailed) in intuitive speed. In contrast to our hypothesis, the findings indicate that decision makers engaged in more intuitive processing in the loss frame, in contrast to less intuitive processing in the gain frame. Thus, ***H2*** were rejected.

Cognitive Processing and Mediation

We hypothesized the relationship between framing and response to be mediated by cognitive processing (***H3***). To test this hypothesis we followed the three steps of Baron and Kenny (1986). A variable function as a mediator when it fulfills three criteria: 1) The independent variable significantly accounts for the variation in the presumed mediator, 2) the mediator significantly accounts for the variation in the dependent variable, and 3) a previously significant relationship between the independent and dependent variable is no longer significant when the mediator is entered into the model.

The first criterion is fulfilled as revealed by investigating ***H2***, framing did significantly accounting for variation in cognitive processing. The second criterion is fulfilled as seen in findings from ***H1***, with cognitive processing variables significantly accounting for variation in the dependent variable. Binary logistic regression was performed to test the third criterion. The results revealed that framing still was a significant predictor when the presumed mediators were entered into the model, violating the third criteria, meaning that we did not find support for mediation. Thus, ***H3*** was rejected.

Moods Moderating Effect on Framing

We hypothesized that mood would moderate framing effects. Specifically, that participants in the positive mood condition would show a classical framing effect (***H4a***), whereas participants in negative mood would show no such framing effect (***H4b***). Binary logistic regression was performed to test the relationships. Results are displayed in table 3.

Table 3

Results of moderated logistic regression analyses

	Response					
	Between-subject design			Within-subject design		
Variable	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Framing	1.62*** (.51)	1.64*** (.51)	.98 (.67)	.97** (.33)	.98** (.33)	1.09* (.47)
Induced Mood		.30 (.50)	-.57 (.81)		.21 (33)	.34 (.48)
Mood X Framing			1.45 (1.05)			-.25 (.66)

Note. Standardized coefficients and standard errors (in paranthese) are shown. Between-subject design N= 81, within-subject design N = 162. *p < .05; **p < .01; ***p < .001.

In step one, framing had a significant effect on response χ^2 (1, N = 81) = 11.26, $p < .001$ in the between-subject design, and in the within-subject design χ^2 (1, N =162) = 9.14, $p < .003$. However, induced mood was not found to have a direct effect on response, and the interaction effect of mood and framing on response was not found to be significant.

We further investigated the impact of mood on framing effects by splitting the variable mood. As predicted, decision makers in the positive mood conditions were found to be risk-aversive in the gain frame, both in the between-subject design (β -1.163, $p < .023$), and in the within-subject design (β -.916, $p < .007$). However, no significant results were obtained in the loss frame, in the between- ($p < .670$), nor the within- ($p < .547$) subject design. Participants in the negative mood conditions were also found to be significantly risk aversive in the gain frame in the between-subject design (β -1.735, $p < .006$), but not in the within-subject design ($p < .082$). The results yielded no significant framing effects for the participants in the negative mood condition in the loss frame, in both the within- ($p < .413$) and between-subject design ($p < .166$).

As predicted, decision makers in positive and negative mood were found to be risk aversive in the gain frame. However, and contrary to expectations, positive mood was not able to predict risk seeking in the loss frame. Since there was no significant interaction effect between mood and framing, ***H4*** was rejected.

Mood and Cognitive Processing

In ***H5*** we hypothesized that induced mood would moderate the effect of framing and response, mediated by cognitive processing. To test for mediation, we followed the same three steps of Baron and Kenny (1986). An independent-samples t-test was conducted to explore the relationship between induced mood and cognitive processing. There was no statistical significant difference in the levels of cognitive processing between the positive and negative mood inducement conditions. The first criterion for mediation was therefore violated, and we have no support for ***H5***.

Post-Hoc Analyses

Self-Reported Valence

In ***H5*** we did not find support for induced mood to significantly account for variation in cognitive processing. Based on the assumption that it is not necessarily the mood inducement in itself that is related to cognitive processing, but rather subjects' actual experienced mood as in self-reported valence; we investigated whether valence predicted levels of cognitive processing. Linear regression was performed to test the relationships. The results indicated that higher levels of positive valence significantly accounted for variation in the variables general analytic (β -.49, $p < .001$), analytic-sinclair (β -.51, $p < .001$), heuristic-holistic intuition (β -.28, $p < .010$), and intuitive speed (β .23, $p < .035$). The results indicate that participants reporting high levels of positive valence engaged in lower levels of analytical- and heuristic-holistic processing, and higher levels of intuitive cognitive processing.

To further investigate whether valence had a direct effect on response, or a moderating effect on the relationship between framing and response, binary regression analyses were performed. No significant results were obtained.

Gender Effects

We also ran a binary logistic regression analysis investigating our control variable gender in relation to mood and framing. The results indicated that females did not show framing effects ($p < .19$), whereas males showed classical framing effects ($p < .01$), being risk aversive in the gain frame and risk seeking in the loss frame. We conducted an independent-samples t-test to investigate the relationship between gender and cognitive processing. There was a significant different scores for females (M = -.1284, SD = .741) and males (M = .1469, SD = .657; t (162) = -2.50, p = .013, two-tailed) in heuristic-holistic intuition, and for females (*M* = -.1851, *SD* = .839) and males (*M* = 2037, *SD* = 925; t (162) = -2.80, p = .006, two-tailed) in intuitive speed, indicating the men were generally more intuitive than women.

Discussion

Although recent reviews conclude that framing effects seems to be a robust finding, framing effects are not always obtained. Investigating under what conditions framing effects are most likely to occur, mood and cognitive processing were inspected as key variables as little research has been conducted on these variables effect on the relationship between framing and response.

Interestingly, and as predicted, the analyses from the lab-experiment provide support for the relationship between framing and response to be significantly moderated by cognitive processing. Decision-makers with high levels of intuition was found to use less response time, in addition to showing classical framing effects; preferring the risk aversive option in gain frame, and the risk seeking option in loss frame. In contrast to this, decision-makers reporting higher levels of analytical processing used more time in giving their response to the scenario, and were additionally not found to show classical framing effects. These findings are specifically obtained in the within-subject design, suggesting that interestingly, the effects are more likely to occur when the same decision-maker solves more than one task.

We expected this moderating effect of cognitive processing to be a result of the positive and negative mood induction. Results from the analyses provide support for a successful mood manipulation, partially by SCR levels in relation to self-reported arousal, and significantly with regards to self-reported valence in both mood conditions. Even though the findings provide support for a successful mood manipulation, mood was not found to moderate the relationship between framing and response, nor being able to predict levels of cognitive processing. However, post-hoc analysis revealed that self-reported valence was significantly able to predict levels of cognitive processing, with higher levels of positive valence being related to lower levels of analytical processing, and higher levels of intuitive processing. These findings add to our understanding that it is not necessarily mood treatment, but rather the decision-makers actual experienced mood that influence cognitive processing.

Even though cognitive processing moderated the relationship between framing and response, we did not find sufficient support for mediation, meaning that other factors may be at play. We also found males to engage in higher levels of intuitive processing, and showing classical framing effects. Mood may have a distinct impact on gender, especially regarding cognitive processing, and further research is needed to understand these interactions.

Concerning the results for classical framing effects for the sample as a whole, we found decision makers to be significantly risk aversive in the gain frame, in line with previous research (e.g. Tversky & Kahneman, 1981; McElroy & Seta 2003; Xie & Wang 2003). We did, however, not find decision makers to be significantly risk seeking in the loss frame. A possible explanation for this finding is the influence of mood inducement. In line with expectations, we predicted that negative mood would not be related to risk seeking. Moreover, Isen and Patrick (1983) argue that individuals in a positive mood also may be generally risk aversive. They found that individuals strived to maintain their positive affective states. The mood maintenance hypothesis suggests that when in a positive mood, individuals are not willing to take risks, as this may result in a loss and thereby threaten their positive affective states. In a similar line of though, the positive mood experienced by our participants could have resulted in a more cautious and risk-aversive behavior when presented with the risky option in the Asian disease scenario.

Furthermore, Druckman and McDermott (2008) distinguish between negative valence and argue that anger encourage greater risk seeking, while distress encourage a more cautious approach. It is reasonable to assume that our negative mood induction may have triggered distress, rather than anger. Thus, in line with Druckman and McDermott (2008), decision makers in the negative mood conditions had a more cautions approach to risk in both the gain and loss frame. Moreover, Mano (1992) found participants high in negative affect to be more risk aversive in a loss domain than individuals low in negative affect. He explains these findings stating that individuals in a negative state of mind might by aiming at not worsening their already negative state of mind, resulting in self-defending mechanisms.

Future Research

Further research is needed to more extensively understand the influence of moods on risk, judgments and decisions. There is mixed evidence for whether positive and negative mood is associated with risk seeking or risk aversive behavior. Future research should shift focus by going beyond valence theory, beginning to investigate not necessarily how mood, but rather specific emotions influence framing effects and risky decisions.

Furthermore, as we did only find partial support for the use of SCR, researchers should continue to investigate SCR in concert with additional types of stimuli for mood induction, attempting to gain a more extensive understanding of the use of SCR in judgment and decision making research.

Moreover, there seems to be a relationship between mood, gender, and cognitive processing, which needs closer inspection in order to fully understand what accounts for these gender differences.

Limitations

A limitation to this study is the low levels of data collected from SCR measures. According to Figner & Murphy (2011), "it is well established that SCR covariates with the arousal dimension of affect, indexing its *intensity*" (p. 10). As a result of the delay of the SCR instruments, only one fourth of the participants were measured with SCR. It is reasonable to assume that an increase in the SCR sample could have led to more significant results. Additionally, more significant results could have been obtained if other stimuli of mood induction were applied. According to Finger and Murphy (2011), stronger stimuli such as videos with sound can trigger more reliable SCR measures than more subtle stimuli. Furthermore, alternately of displaying the mood inducing photographs for 3 seconds, the picture could have been displayed during the entire scenario decision. Other researchers (e.g, Shiomura, & Atsumi 2001; Hirt et al. 1999) have used sound or shown movie clips in order to manipulate mood. Perhaps such adjustments would have triggered stronger measures of SCR among or participants.

Clearly, another implication is not having a control group. By having a control group that did not receive any mood inducement, stronger implications from the lab-experiments could have been drawn.

Another limitation to the study is that the experiment was conducted in English, even though most of our participants have Norwegian as their mother tongue. According to Keysar, Hayakawa, and An (2012), framing effects are not always obtained when choices are presented in a foreign tongue. Hence, language barriers might explain why framing effects was not always obtained in our experimental conditions.

Moreover, problem relevance is generally shown to influence decisions in relation to framing. As the scenario frames were not necessarily relevant for the decision-makers, they may have been more risk aversive (Wang & Johnston, 1995).

Practical implications

In organizations, and everyday life alike, an understanding of how individuals make decisions is important as such knowledge could foster better decision making. This study has contributed to enhanced knowledge within the field of judgment and decision making, as underlying mechanisms such as cognitive processing may have an influence on framing effects. Relating this to an organizational setting, such knowledge is important as wrong risk-assessments could have fatal consequences for an organization. Business proposals could be framed and presented as gains or losses for key decision-makers in an organization. Thus, it becomes increasingly important to acknowledge that framing may influence our judgments and decisions regarding risk, especially in combination with intuition, like time pressure and the need for snap judgments. Moreover, in decisions involving high risk, individuals with a preference for intuitive processing might come to biased conclusions as they do evaluate the information presented based on heuristic cues.

Concluding Remarks

Ever since Tversky and Kahneman’s (1981) now famous work on framing effects, several studies have supported framing effects to be a reliable phenomenon. The underlying reasons for why framing effects occur are more debatable. As mood and cognitive processing are found to influence judgments and decisions, and to work in concert to guide reasoning and decision making, we examined whether these variables could contribute to explaining why framing effects occur. Mood did not moderate the relationship between framing and response. With that said, we did find self-reported valence to account for variation in cognitive processing. Cognitive processing was also found to moderate framing effects, as predicted. Intuitive processing was associated with classical framing effects, whereas analytical processing was associated with no framing effects.

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Appendices

Appendix 1: *Picture Manipulation, Positive Mood*

Picture Manipulation, Negative Mood

Appendix 2: *Cognitive Processing Questionnaire*

Questionnaire 1:

Subject numer: ________________

Session number: _______________

Think back on **the Asian disease scenario decision you just made on the computer** and please answer the following questionnaire. Your response will be treated confidentially.

Gender:

Male ❍

Female ❍

For each statement below, indicate on the scale whether you agree or disagree with the statement, from 1 = strongly disagree to 5 = strongly agree

	Strongly disagree 1	2	3	4	Strongly agree 5
I evaluated systematically all key uncertainties	❍	❍	❍	❍	❍
I considered carefully all alternatives	❍	❍	❍	❍	❍
When making decisions, I considered all options	❍	❍	❍	❍	❍
I analyzed all available information in detail	❍	❍	❍	❍	❍
I made the decision in a logical and systematic way	❍	❍	❍	❍	❍
I can describe step-by-step how I made my decision	❍	❍	❍	❍	❍
I considered all consequences of my decision	❍	❍	❍	❍	❍
Before I started deliberating, I double-checked the available information to make sure I had the right facts	❍	❍	❍	❍	❍

	1	2	3	4	5
I based the decision on my inner feelings and reactions	❍	❍	❍	❍	❍

	1	2	3	4	5
It was more important for me to feel that the decision were right than to have rational reasons for them	❍	❍	❍	❍	❍
I relied on my instinct	❍	❍	❍	❍	❍
I made the decision because it felt right to me	❍	❍	❍	❍	❍
I knew the answer before I started analyzing the data	❍	❍	❍	❍	❍

	1	2	3	4	5
There was little need to examine detailed information	❍	❍	❍	❍	❍
I had enough knowledge to make the best decision almost immediately	❍	❍	❍	❍	❍
I only examined the information that was relevant in the situation	❍	❍	❍	❍	❍
I based my decision on the overall picture	❍	❍	❍	❍	❍
My knowledge of similar situations led me to quickly recognize a solution	❍	❍	❍	❍	❍
I took time to read all available information carefully before making the decision	❍	❍	❍	❍	❍
I double-checked the description of the situation before making the decision	❍	❍	❍	❍	❍
There was little need to think because I know ”how things work” in this kind of situation	❍	❍	❍	❍	❍
I decided on the first solution that I could think of	❍	❍	❍	❍	❍
It was easy to get a clear picture of what needed to be done	❍	❍	❍	❍	❍
When I had made a decision there was no doubt that this was the right action to take	❍	❍	❍	❍	❍
I would be very surprised if my decision turned out to be wrong	❍	❍	❍	❍	❍
It was easy to make a quick decision because the alternatives looked very similar	❍	❍	❍	❍	❍
It was better to make a quick and perhaps faulty decision than making the decision too late	❍	❍	❍	❍	❍
If I made a mistake I would make sure that I did not make the same mistake again	❍	❍	❍	❍	❍
I did all I could in order to avoid mistakes	❍	❍	❍	❍	❍
It was more important to avoid violation of formal rules and procedures than to make a quick decision	❍	❍	❍	❍	❍
I could easily imagine the consequences of my decision	❍	❍	❍	❍	❍

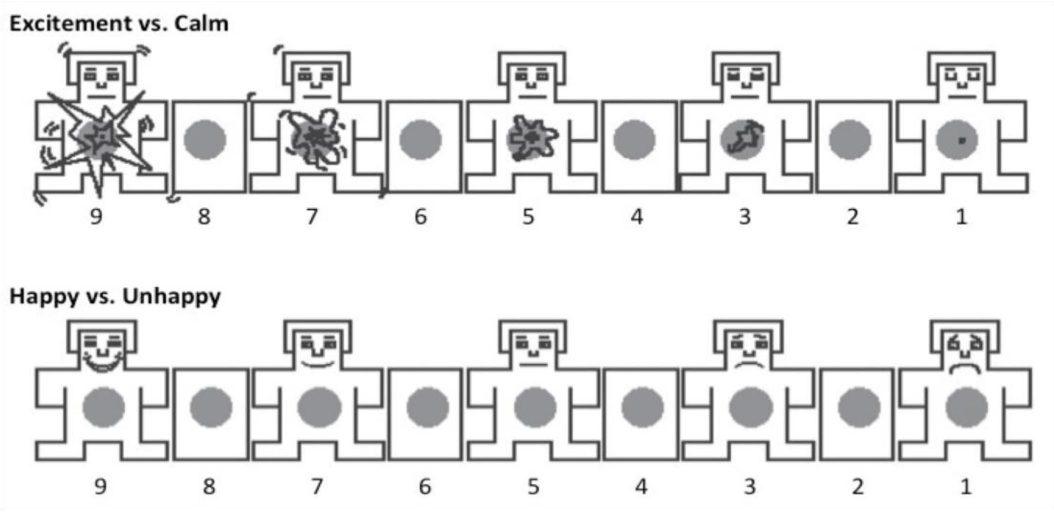
	1	2	3	4	5
I focused only on the most important information	❍	❍	❍	❍	❍
I knew my decision was correct even if I cannot explain my reasoning in detail	❍	❍	❍	❍	❍
If the information was conflicting I tried to look for additional information that could disconfirm my assumptions	❍	❍	❍	❍	❍
Even if the information was uncertain I tried to make a quick decision	❍	❍	❍	❍	❍
If I was uncertain about what to do I tried to look for information that would narrow the choices	❍	❍	❍	❍	❍
It was more important to make a quick decision than to wait for additional information	❍	❍	❍	❍	❍
Before I made my decision I tried to think if there was any information that could challenge my assumptions	❍	❍	❍	❍	❍
It was more important to make a quick decision than to think about all possible consequences	❍	❍	❍	❍	❍
I did not make any decision until I had thought about all possible outcomes, even if some were highly unlikely	❍	❍	❍	❍	❍
When I had made up my mind about what to do, I did not hesitate to put things into action	❍	❍	❍	❍	❍
Even if a decision seemed obvious I took time to think through if I might have overlooked something	❍	❍	❍	❍	❍
When I first got the idea of how to do it, I acted immediately	❍	❍	❍	❍	❍

Appendix 3: *SAM Questionnaire*

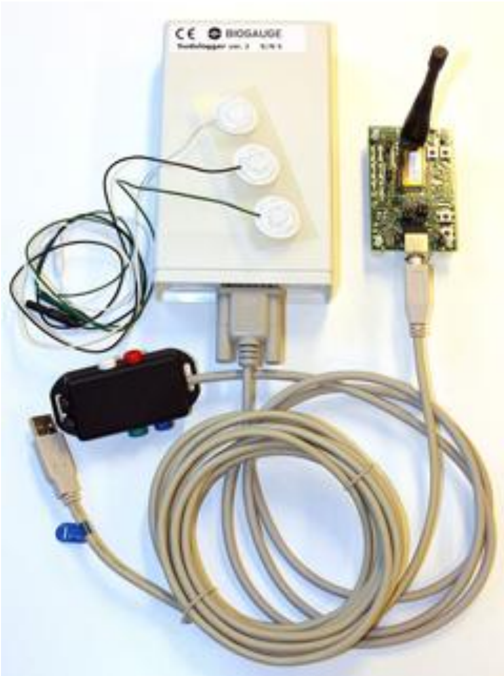
Here you will rate the picture you have just seen. As you can see below, there are 2 sets of 5 figures, each arranged along a continuum. We call this set of figures ”SAM”, and you will be using these figures to rate how you felt while viewing the picture (the smiling baby). There is no right or wrong answers, so simply respond as honestly as you can.

SAM shows two different kinds of feelings: Excitement vs. Calm and Happy vs. Unhappy. The Excitement - Calm rating refers to how aroused you feel when viewing the picture. The Happy - Unhappy rating refers to whether you experience positive feelings or negative feelings when viewing the picture.

Please circle around the numbers below to indicate how you felt when viewing the picture.



Appendix 4: *Equipment used to measure SCR ("Sudologger").*



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Preliminary Thesis Report

- Moods' Influence on Framing Effects -

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Abstract

For our master thesis we want to investigate moods' impact on cognitive processing and framing effects. Based on our literature review on the relationships between moods, cognitive processing, decision-making and framing, we identified a need for understanding when framing effects are most likely to occur. As moods and cognitive processing are suggested to influence judgment and decision-making, and few studies examine the effects of moods or cognitive processing on framing effects - these variables will be of interest in our study. Based on theory and empirical findings we derive at our hypotheses. We intend to conduct a lab experiment to test our hypotheses; the method and operationalization will be presented.

1.0.1 Introduction

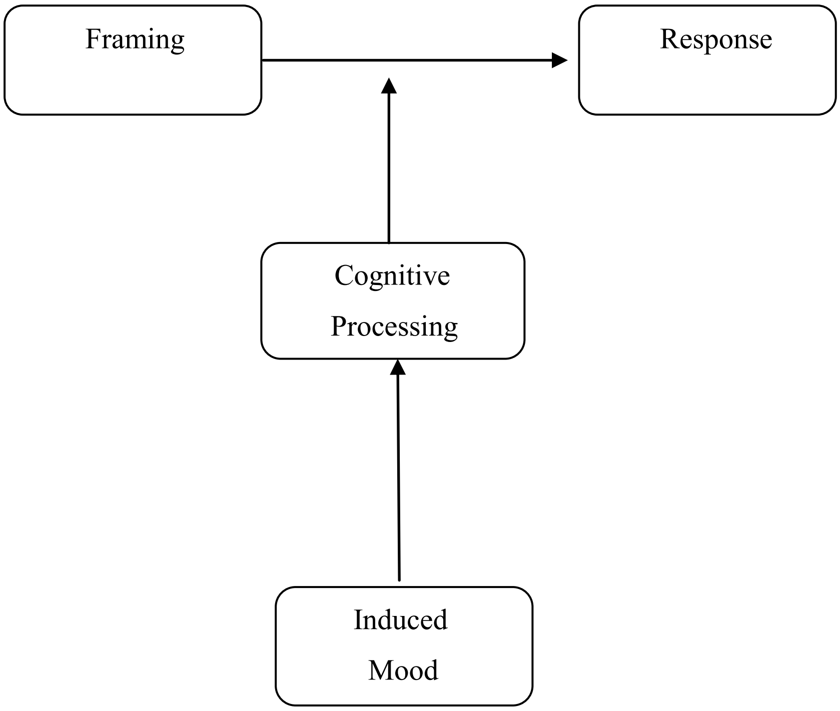
There is a growing amount of evidence that moods and affective states influence judgment and decision-making (Blanchette & Richards, 2010). The role of mood and affective states in decision making under risk are also receiving increased attention (e.g., Peters, 2006; Kobbeltved, 2005). More recently, researchers have become interested in the role of anticipatory moods; as experienced *during* the decision-making process, in contrast to previous studies examining anticipated moods; those expected to result from the consequences of a decision (Wang, 2006; Loewenstein, Hsee, Weber, & Wlech, 2001).

A considerable amount of studies have examined the effects of positively and negatively valenced mood on judgment and decision-making (Chou, Lee, & Ho, 2007). Several of these findings suggest that negative and positive moods have a distinct impact on information processing. People in positive mood are often found to increase reliance on experiential processing, whereas people in negative mood are found to engage in systematic processing (e.g., Cohen & Andrade, 2004; Blanchette & Richards, 2010; Tiedens & Linton, 2001). It is generally suggested that moods and cognitive evaluations work in concert to guide reasoning and decision-making (Loewenstein et al., 2001).

One of the most successful behavioural models for decision-making under risk is Tversky and Kahneman's prospect theory (Trepel, Fox, & Poldrack, 2005). Tversky and Kahneman (1981) argue that our choices will be influenced by how prospects are cognitively represented, which is also referred to as framing effects. Although recent reviews of framing conclude that framing effects seems to be a robust finding, framing effects are not always obtained. What becomes a key question is under what conditions framing effects are most likely to occur (McElroy & Seta, 2003). There are some findings indicating that systematic processing may moderate framing effects, suggesting that participants engaging in systematic processing does not show framing effects (e.g., McElroy & Seta, 2003; Simon, Fagley & Halleran, 2004) As mood and cognitive processes are suggested to work in concert, and since relatively little research examines how moods or information processing moderates the effect of framing, we derive at our research question:

How does mood affect cognitive processing and framing effects?

1.0.2 Conceptual model



1.0.3 Intended contribution

Our intended contribution is to more extensively understand some of the contextual factors that may influence framing effects, specifically by studying how mood meditated by cognitive processing may moderate the effects of framing. By examining the underlying mechanisms that might influence framing effects, we intend to contribute to prospect theory and the research field of judgment and decision-making.

2.0.1 Theory and hypotheses

2.0.2 Defining affect, emotion and mood

According to Forgas (1995) there is some disagreement about how to define terms such as affect, emotions, and mood. However, he defines affect as a more general label that refers to both moods and emotion. Emotions might be defined as "…intense, short-lived and usually have a definite cause and clear cognitive content (e.g. anger or fear)" (Forgas 1992, as cited in Forgas 1995, p. 41). The main focus of this paper, however, is mood which could be defined as "low-intensity, diffuse and relatively enduring affective states without a salient antecedent cause and therefore little cognitive content (e.g. feeling good or feeling bad)" (Forgas 1992, as cited in Forgas 1995, p. 41).

2.0.3 Moods and risk

Scholars within the field of decision making usually view risk as "… increasing with the variance in the probability distribution of possible outcomes" (Trepel et al., 2005, p. 35). Much of the previous research of choice under risk have focused on cognitive aspects with little emphasize on how affect might influence risk assessments (Loewenstein et al., 2001; Lerner & Keltner, 2001; Wang, 2006). More recently, the influence of affect on risk has been studied more extensively (Lerner & Keltner, 2001; Kobbeltved et al., 2005; Peters et al., 2006; Wang, 2006; Blanchette and Richards, 2010), with the valence approach as the most dominant theory (Lerner and Keltner, 2000). Valence theory suggests that positive and negative moods will have different impact on information processing and the perception of risk. Trepel et al. (2005) defines individuals who are risk aversive as someone who "…prefers a sure payment to a risky prospect of equal or higher expected value" (p. 35). Risk seeking, on the contrary, is defined as someone who "…prefers a risky prospect to a sure payment of equal or higher expected value (Trepel et al., 2005, p. 35). Druckman and McDermott (2008), state that positive emotions might lead to risk-seeking behavior, whereas negative emotions might lead to risk-aversive behavior.

Several findings indicate that positive mood increase risk taking, whereas negative mood is more likely to reduce risk-taking tendencies. A general finding stated by Blanchette & Richards (2010) is that people in positive moods estimate positive events as more likely, whereas people in negative moods increase estimates of the likelihood for negative events. Schwarz & Clore (2003) argue that when using their mood as information, participants misread their current moods as a response to the task of judgment, leading to favorable evaluations under positive moods and less favorable evaluations under negative moods.

One of the most widely studied models exploring valence and affect is the circumplex model of affect (Remington, Visser, & Fabrigar, 2000). Building on work done by Schlosberg (1941; 1952 as cited in Remington, Visser, & Fabrigar, 2000) Russell (1980) conducted a study where students were told to sort 28 words describing moods, feelings, temporary states, affect, or emotions into one of eight categories labeled arousal, contentment, depression, distress, excitement, misery, pleasure, and sleepiness. Furthermore, in a second task, the participants were instructed to place the aforementioned categories into a circular order so that the words opposite each other on the circle describes opposite feelings and the words closer together on the circle described more similar feelings (Russell, 1980). Similar to expectations, Russell (1980) showed that the categories were placed in to the predicted circular order. Moreover, the 28 words were also shown to fall along the proposed pleasure-displeasure and degree-of-arousal dimensions, indicating that "… laymen have a mental map of affective life on which they rely in a variety of situations" (Russell, 1980, p. 1170). Elaborating on Russell's model (1980) Larson and Diener's model propose that emotions differ in high and low arousal and between negative and positive valence (Larson and Diener, 1992 as cited in Remington et al., 2000). More recently, research has begun to examine how emotions of the same valence differ with respect to how individual's asses' risk (Lerner & Keltner, 2000; Lerner & Keltner, 2001; Blanchette and Richards, 2010). However, examining possible effects of specific emotions will not be the focus of this study.

Other studies also provide evidence for the impact of positive mood on risk taking tendencies (Forgas, 1994; Forgas, 1995; Chou, Ho & Lee, 2007). Chou et al. (2007) found that individuals who were in a happy mood showed more risk taking tendencies than those who were in a sad mood. They explain their findings through the affect infusion model (Forgas, 1995), which asserts that people in a positive mood rely on positive cues in making judgments and are thus "…more likely to access thoughts prone to positive aspects of risky situations than those who are in a negative mood" (Chou et al., 2007, p. 310). Moreover, individuals in positive moods perceive the outcome of risky choices as more favorable, resulting in an increase in the willingness to take risks. People in negative mood, on the contrary, are more likely to see the world as a threatening place, and are therefore more likely to process information systematically and carefully in order to avoid potential losses (Chou et al., 2007).

2.0.4 The affect heuristic

Heuristics may be defined as general rules of thumb. Heuristics are cognitive shortcuts and simplifications of complicated judgments and decisions, which in many cases yield close approximations to an optimal answer suggested by normative theories (Plous, 1993). Relying on heuristics may in this sense reduce the time and effort required to make optimal judgments and decisions, and the decision made could often be the ‘correct’ response. However, relying on heuristics may have disadvantages as well. In certain instances, relying on heuristics will lead to systematic biased decisions (Tversky & Kahneman, 1974; Plous, 1993).

Analyzing risk, alternatives and consequences are important in several decision-making contexts. However, reliance on affect and feelings could often be a quicker, easier and more effective way to navigate in an uncertain and complex decision environment. Using the experienced mood as information, and relying on the feelings associated with a stimulus is often characterized as the affect heuristic (Slovic et al., 2005). According to Slovic et al. (2005), our mind consists of images that are tagged or marked to varying degrees of affect, and this ‘affect pool’ contains of positive and negative markers that are consciously or unconsciously associated with these images. In other words, we rely on, or consult the affect pool in the process of making judgments, and affect might serve as cues for judgments.

Numerous studies have shown support for the affect heuristic (Keller, Siegrist, & Gutscher, 2006; Siegrist, Keller, & Marie-Eve Cousin, 2006; Slovic et al., 2007). Furthermore, the affect heuristic also seems to have much in common with Epstein’s (1994) dual process theory, which assumes that individuals process information through two parallel and interactive systems; a rational systematic system and an emotionally driven experiential system. The dual process theory will be elaborated on in a later section. Interesting to note here is the affective component of the experiential system. According to Slovic et al., (2007) “the experiential system encodes reality images, metaphors, and narratives to which affective feelings have become attached” (p. 1344). Moreover, Damasio (1994, as cited in Slovic et al., 2005) also recognize that affect is essential to rational action. Thus, there seems to be some similarities between Epstein’s (1994) dual process theory and the affect heuristic. The affect heuristic has also much in common with the risk as feelings hypothesis, which will be explained in the following section (Slovic et al., 2004).

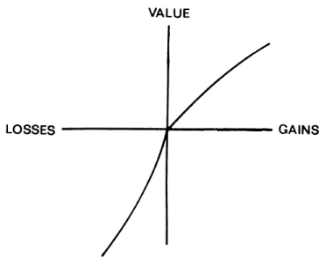
2.0.5 Risk as feelings

Loewenstein and his colleagues have developed the risk as feeling hypothesis, which state that individuals' response to risky situations are partially influenced by emotions, including feelings such as worry, fear, dread, or anxiety (Loewenstein et al., 2001). Furthermore, they distinguish between anticipatory emotions, immediate reaction to risk (e.g., fear, anxiety, dread) and anticipated emotions which are typically not experienced in the immediate present but rather experienced in the future (Loewenstein et al., 2001). Whereas previous research within the field of judgment and decision making have addressed anticipated emotions, the risk as feelings hypothesis includes anticipatory emotions during the decision making process (Loewenstein et al., 2001). Thus, they emphasize not only the effects of emotions experienced after a decision but also acknowledge the impact of emotions experienced during the decision-making process. Furthermore, Slovic et al. (2005) emphasize that risk is perceived and acted on in two ways; risk as feelings and risk as analysis. They explain risk as feelings as individuals' fast, instinctive, and intuitive reaction to danger, whereas risk as analysis brings logic, reason, and scientific deliberation to bear on risk management (Slovic et al., 2005). Clearly, this distinction between risk as feelings and risk as analysis also has much in common with Epstein's (1994) dual process theory. Whereas risk as feelings is closely related to the characteristics of the experiential system, risk as analysis is closely related to the analytical and systematic system.

2.0.6 Prospect theory

Before Tversky and Kahneman (1979) developed the prospect theory, expected utility theory was the dominant theory of decision making under risk (Tversky & Kahneman, 1979; Tversky & Kahneman, 1992). Expected utility theory was originally developed to provide an explicit set of assumptions that underlie rational decision making (Plous, 1993). This theory proposes that decision makers have complete information about the probabilities and consequences of each alternative when making a decision (Plous, 1993). In addition, expected utility theory assumes that the decision maker understands this information and are able to calculate the advantages and disadvantages of their alternatives, in order to maximize their expected utility (Plous, 1993).

Expected utility theory was proposed as a normative theory of behavior (Plous, 1993). Developed as a critique of expected utility theory, Tversky and Kahneman's prospect theory rather looked at how individuals actually behaved under decision making involving risk (Tversky & Kahneman, 1979). In other words, their findings invalidated the expected utility theory as a descriptive model (Tversky & Kahneman, 1979). Furthermore, the prospect theory uses the term value instead of utility, implying that in decisions involving risk individuals consider the gains and losses of each alternative. Put differently, this value function is defined on deviation from a reference point (Tversky & Kahneman, 1979). Moreover, as seen from the figure below, prospect theory predicts a value function that is generally concave for gains and convex for losses, implying that individuals tend to be risk aversive in gain frame and risk seeking in loss frame (Tversky & Kahneman, 1981; McElroy & Seta, 2003; Xie & Wang, 2003).



Adopted from Tversky and Kahneman, 1979

This could further be exemplified through the notion that "displeasure associated with losing a sum of money is generally greater than the pleasure associated with winning the same amount" (Tversky & Kahneman, 1981, p. 454).

2.0.7 Framing

According to expected utility theory the way a problem is framed should not influence the choices made by the decision maker (Plous, 1993; McElroy & Seta, 2003). On the contrary, Tversky and Kahneman (1981) demonstrated that how a decision problem is framed will influence individual's tendencies to either be risk aversive or risk seeking. Moreover, they define a decision frame as referring "… to the decision-maker's conception of the acts, outcomes, and contingencies associated with a particular choice (Tversky & Kahneman, 1981, p. 453). In order to demonstrate decision frames in decision theory, Tversky and Kahneman (1981) developed the Asian disease problem. In the Asian disease problem participants are asked to imagine the outbreak of an unusual Asian disease in the US, which is expected to kill 600 people. Next, they are presented with two programs to combat the disease and asked to choose the program they favor (Tversky & Kahneman, 1981). Half of the participants are presented with the gain framed programs, A and B, whereas the other half of the participants are presented with loss framed programs, C and D (Hærem et al., 2010). Gain frame refers to a situation where individuals perceive possible gain. On the contrary, loss frame refers to a situation where individuals perceive the possibility of loss. The different preference reversals showed in these two frames is referred to as a framing effect (Xie & Wang, 2003; Kühberger & Tanner, 2010). The four programs in the Asian disease problem are presented as:

A: If program A is adopted, 200 people will be saved.
B: If program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

C: If program C is adopted 400 people will die.
D: If program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die (Tversky & Kahneman, 1981).

Although the expected outcomes of problem A and B, and C and D are mathematically the same, Tversky and Kahneman (1981) showed that individuals tend to be risk-aversive in gain frame and risk seeking in loss frame. In fact, 72 % of the participants choose the safe program A over the more risky program B in the gain frame. When the program was framed as loss, however, 78 % preferred the risk seeking option (program D) (Tversky and Kahneman, 1981). This preference reversal is explained as a result of a framing effect (Tversky & Kahneman, 1981).

Several studies support the framing effect as a reliable phenomenon (Tversky & Kahneman, 1981; Wang, 1996; Kühberger, 1998). However, more recent reviews "…have concluded that although there is a moderately strong framing effect for manipulations that follow the Asian disease paradigm, framing effects are not always obtained" (McElroy & Seta, 2003, 611). For instance, Hærem et al. (2010) conducted four experiments to explore the robustness of risky choice framing among military decision makers. The classical Asian disease scenario was used in the first experiment, whereas a military scenario was developed and used in the three other experiments in order to make the scenario more relevant to military officers. The structure and choice alternatives were identical to the classical Asian disease scenario (Hærem et al. 2010). In contrast to Tversky and Kahneman (1981), who found a bidirectional framing effect, risk aversive in gain frame and risk seeking in loss frame, Hærem et al. (2010) found a unidirectional framing effect implying that the participants were risk seeking in both domains. One plausible reason for these findings could be the cultural and contextual factor that influences military decision makers (Hærem et al., 2010). Wang and Johnston (1995) also found support for this unidirectional framing effect. In this study they proved that participants was more risk-seeking, in both domains, when a decision problem was described in a more personal relevant family context (Wang & Johnston, 1995).

2.0.8 Moods' effect on decision-making and framing

There is considerable literature on positively and negatively valenced mood and its effect on judgment and decision-making (Chou, Lee, & Ho, 2007). However, to our knowledge, not much research has examined moods' effect on framing. Although risk is a central topic within the research field of judgment and decision-making, the decision-theoretic approach to decision making under risk has largely ignored the role played by emotions, especially the impact of moods or emotions experienced *during* the decision-making process (Loewenstein et al., 2001). More recently, there has been a growing interest in the role played by moods and emotions in decision making under risk (Wang, 2006).

Shiomura, & Atsumi (2001) examined the effects of moods on framing. They used pleasant music or an unpleasant sound to induce positive or negative mood, and their findings indicate that participants in the positive mood condition showed classical framing effects, in contrast to the negative mood condition where no framing effect was found. Based on the theory on mood, framing and decision-making, we derive at our first hypothesis:

H1.) Participants in negative mood will be relatively insensitive to framing, compared to participants in positive mood.

2.0.9 Dual Processing

As opposed to expected utility theory there is a growing amount of evidence indicating that humans do not always process information in a deliberative and rational way, but rather that humans process information and make decisions in many different ways.

Several researchers have described two different modes of cognitive processing where one is systematic and analytical, and the other is experiential (e.g., Epstein, 1994; Kahneman, 2002; Mukherjee, 2010; Sloman, 1996; Slovic, Finucane, Peters, & MacGregor, 2004; Stanovich & West, 2000). According to Sanfey, Loewenstein, McClure, & Cohen (2006) "there is a long legacy of research within psychology, strongly supported by findings from neuroscience, to suggest human behavior is not the product of a single process, but rather reflects the interaction of different specialized subsystems" (p. 111). While the systematic system is slow, serial, controlled, effort-full, rule governed, flexible, and neutral, the experiential system is fast, intuitive, parallel, automatic, effortless, associative, slow learning, and emotional (Kahneman, 2002). There is no doubt about the evolutionary value of the experiential system as it allows us to make snap and efficient judgments and decisions of our environment.

More recently, some researchers have suggested that experiential processing may consist of several distinct aspects of intuition (e.g. Pretz & Totz, 2007). Glöckner & Witteman (2010) stress the fact that dual-process models assume a clear distinction between experiential/intuitive and systematic processes, but do not provide further differentiation within both categories. They propose that empirical testing should differentiate between cognitive processes subsumed in the category of intuition, to gain better understanding of the processes and allow for more specific predictions. A distinction is made between heuristic and holistic aspects of intuition. Heuristic intuition refers to trust in snap judgments, and first impressions, whereas holistic intuition refers to a preference for abstract, holistic integration of complex information, and reliance on incubation in decision making (Pretz & Totz, 2007). Defining the concept of intuition, and opertationalizing it efficiently remains a challenge, and we need to know more about the role of mood and emotions in the intuitive process (Langan-Fox & Shirley, 2011).

2.1.0 The effect of mood on cognitive processing

Until quite recently, cognitive processes have been studied in a vacuum, separately from moods or emotions, as if cognitive processes are immune from such influence (Blanchette & Richards, 2010).

The majority of findings that have examined the effects of moods on cognitive processing have focused on a dual process framework (e.g., Chaiken, Liberman, & Eagly, 1989; Petty & Cacioppo, 1986). Several of these findings suggest that individuals in negative moods engage in a more systematic processing, whereas individuals in positive moods engage more in experiential processing (e.g., Cohen & Andrade, 2004; Tiedens & Linton, 2001). The "mood as information" approach is contributing to answering why positive and negative moods may trigger different cognitive processing paths. As negative mood may signal a threat to the achievement of desired goals, the situation calls for systematic processing. Positive mood on the other hand may signal that the situation is safe and, thus, that one has sufficient information to make a judgment (Bless, 2000; Schwarz, 1990; Bless et al., 1996). Based on these hypotheses researchers have found consistent evidence that participants in negative or sad moods tend to further scrutinize information and carry out systematic information processing before making judgments, whereas participants in positive mood rely more on experiential processing (e.g. Cohen & Andrade, 2004; Forgas, 2001; Blanchette & Richards, 2010).

It is suggested by the mood-as-information theorists that negative moods signals that something about the situation is problematic, and hence that information must be processed more carefully (Blanchette & Richards, 2010). Similarly, Schwarz & Clore (2003) propose that we usually feel bad when we encounter a threat of negative outcomes, and feel good when we are more certain that we will obtain positive outcomes. Hence, our moods reflect the state of our environment. If mood is used as information, then being in a bad mood may signal that the situation is problematic, whereas being in a good mood may signal a benign situation. Schwarz & Clore (2003) states that our cognitive processing are tuned to meet the processing requirements apparently posed by the situation. In this sense, sad moods may foster systematic processing with attention to the details at hand. Happy moods on the other hand may foster experiential processing, relying more on general knowledge structures and having less focused attention.

In the same line of thought, Forgas (2001) presents an affect infusion model (AIM), which attempts to explain how affect influences both what information is processed, and how this information is processed. His main argument is that positive and negative moods may function as heuristic cues that signal whether enough effort has been put forth to perform the task at hand. When in positive mood, individuals may produce suboptimal performance since they misread this affective state as an indication that they have put in enough effort to perform the task; negative mood may signal that more information is required to increase performance (George & Zhou, 2001, as cited in Forgas & George, 2001). With regards to moods and measures of time, Clore & Tamir (2002) found that participants in positive moods tended to exit the decision process relatively early, whereas those in negative mood analyzed the same information to a further extent before making a decision. Based on the empirical findings and theory on mood and cognitive processing we hypothesize that:

H2a.) Participants in the negatively valenced mood conditions will engage more in systematic than experiential processing.

H2b.) Participants in the positively valenced mood conditions will engage in more experiential than systematic processing.

2.1.1 The moderating effect of cognitive processing on framing

Shiomura & Atsumi (2001) investigated whether participants solving systematic and experiential processing tasks differed in their response to framing. They found that participants in the experiential processing condition showed classical framing effects; a preference for risk-seeking in loss frame, and a preference for risk-aversion in gain frame (Tversky & Kahneman, 1981). In the systematic processing condition, however, the results suggested no framing effect.

These findings suggest that when people engage in systematic processing they are less prone to framing effects compared to individuals engaging in experiential processing. In the same vein, Simon, Fagley, & Halleran (2004) induced systematic processing by asking participants to write out the options as they would describe it to a friend, suggesting that systematic processing would moderate the effects of framing. Based on two studies including 257 participants they conclude that framing effects are not observed when participant engage in systematic processing (Simon, Fagley, & Halleran 2004).

McElroy & Seta (2003) conducted two experiments testing both induced and predisposed systematic versus experiential processing on framing effects. Processing style was manipulated by making the designed task more or less relevant, as suggested by Liberman & Chaiken (1996); that highly relevant tasks induce more systematic processing. Consistent with their predictions and other findings, participants in the experiential processing condition showed classical framing effects, whereas participants engaging in systematic processing were relatively insensitive to framing effects (McElroy & Seta, 2003). Based on dual processing theory and findings related to framing, we hypothesize that:

> H3.) Participants engaging in systematic processing will be relatively insensitive to framing, compared to participants engaging in experiential processing.

2.1.2 Arousal and Affect

A substantial amount of research suggests that arousal and affect play a central part in decision-making under risk (e.g., Bechara & Damasio, 2005; Damasio, 1994; Finucane, Alhakami, Slovic, & Johnson, 2000; Loewenstein, Hsee, Weber, & Welch, 2001). An intriguing finding is that increased levels of arousal inhibit frontal cortex functioning (brain center of reasoning and deliberative thought) and increase amygdala activity (emotional brain center) (Arnsten, 2009). This finding goes hand in hand with Ku, Malhotra, and Murnighan's (2005) competitive arousal model of decision-making as they argue that through escalation of commitment and increased arousal, auctioneers make irrational economic decisions.

3.0.1 Method and operationalization

In our experiment we choose to only use gain frame when studying framing effects, this for the simple reason that the variance in individuals' preferences in gain frame seems to be greater than the more consistent findings in loss frame. Around 80 % to 91.1 % of the participants are found to be risk-seeking in loss frame (Tversky & Kahneman, 1981; Hærem et al., 2010). Thus, we find it more constructive to apply two differently formulated versions of the Asian disease problem in gain frame.

The experiment will be conducted using a 2 (positive vs. negative mood) by 2 (Asian disease original vs. Asian disease terror version) design. A random sample of around 120 Master of Science students will be used as participants, randomly assigning approximately 30 participants to each condition.

The experiment will be designed by using a program referred to as E-prime. Two of the conditions will receive the original Asian Disease Problem as formulated by Tversky and Kahneman (1981). Positive and negative mood will be induced by using the International Affective Picture System (IAPS), which is validated to induce various affective states including specific emotions or moods (Lang, Bradley, & Cuthbert, 2008). The two other conditions will receive a terror version of the Asian Disease Problem (which will be provided by our supervisor), and the same mood manipulation.

We will control for participants' time used on both problems, as an additional indicator of what cognitive processing where used during the decision-making process. Immediately after giving their response to the problem, participants are asked to fill out a questionnaire measuring cognitive style (Appendix 1 & 2). The cognitive style questionnaire consists of 40 items in total ranging on a likert-scale from from 1 = I disagree to 5 = I agree.

As a manipulation check we will attach SRS (skin response sensor) on a random sample of participants in each condition. As moods are hypothesized to increase arousal; an increase in sweat response during mood inducement will indicate whether the mood manipulation served its function.

4.0.1 References

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