WORRY OR PEACE OF MIND:

CONSUMER DECISION-MAKING UNDER RISK IN LOSS DOMAIN

By

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ABSTRACT OF THE DISSERTATION

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This research studies how individuals perceive risky situations, and after that, how they make choices.

Decisions are not decided by a single trait. However, they vary as a function of what the decision is about, which the decision domain (gain domain vs. loss domain), who is a subject facing a risky event, the situational difference (for example, the level of risk probability or the type of risky event, respectively, or their interaction), the extent of loss/damage, whether emotions are involved in the decision and so on. Understanding this mechanism behind decision-making under risk is particularly important in preventing loss (enjoy peace of mind) and inducing precautionary behavior in advance.

Unlike existing economic models or marketing studies related to hedonic vs. utilitarian consumption, this research found that people having low-probability risk with hedonic-event showed the strongest risk-averse attitude. In the gain domain, hedonic-benefit seeks for risk-taking attitudes. However, in the loss domain, when people perceive a risk as an emotion, they want to sustain their positive feeling activated from hedonic-benefit, increase their attention to an even low-probability risky situation, and

actively engage in precautionary behavior (risk-averse attitude). Therefore, as like *Prospect Theory* and *Construal Level Theory*, people may tend to risk aversion at a low-probability risk. *'Risk-As-Feelings hypothesis,'* which emphasizes the role of activated emotion and affection when judging risks, also explain that people perceive risk as feelings; they become insensitive to the objective probability of occurrence.

The four test results revealed that people's choice was influenced by the moment they were exposed to risk and had to make decisions (based on either *System 1* or *System 2*) rather than their usual personality or propensity.

Next, under small-loss conditions, people follow relatively rational judgment (*System 2*) to avoid risk, whereas, under big-loss status, they listen to relatively emotional judgment (*System 1*) to avoid risk.

Finally, this research found out impressive results that people trigger negative feelings to avoid risk in a big-loss condition, whereas they activate positive feelings to avoid risk in a small-loss scenario. These findings will present effective risk communication methods.

Keywords: Decision-Making under Risk, Probability, Utilitarian vs. Hedonic, Emotional vs. Rational Decision-Making, Prospect Theory, Construal Level Theory, Risk-As-Feelings hypothesis, System 1 (Heart) vs. System 2 (Head), Positive vs. Negative Feelings

Preface

The thesis entitled “Worry or Peace of Mind: Consumer Decision-Making under Risk in Loss Domain” is prepared by Mnji Jung through her Ph.D. program from 2012 to 2020, in the Department of Marketing at Rutgers University, The State University of New Jersey.

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I can do all this through him who gives me strength. Philippians 4:13.

Surely your goodness and love will follow me all the days of my life, and I will dwell in the house of the LORD forever. Psalm 23:6

Table of Contents

List of Tables

List of Illustrations

CHAPTER 1 INTRODUCTION

We face countless risky situations from trivial to death during our lives, and we have to make decisions, either risk-taking or risk-aversion. Each person perceives and reacts to such a risky situation differently. Do you prefer worry or peace of mind from unforeseen, unexpected, unplanned, or sudden risky situations? Even though such risky situations have a low-probability of occurrence, the consequence would be vast and catastrophic (e.g., whole property loss or even loss of life) such as a new virus (e.g., COVID-19) outbreak, 911 attacks, Boston Marathon Bombing, or natural disasters.

First of all, how can we define decisions? Decisions can be interpreted as an attempt to evaluate the probabilities associated with various options and choose the one that best suits the situation (Newell, 2015). Of course, the various options involve somewhat risk. Then, how do people make 'best' decision-making?

Economic models (e.g., *Expected-Utility Theory*) of decision-making allude that decision-makers should make decisions that accomplish utility maximization (von Neumann and Morgenstern, 1947). However, this assumption that decision-makers might show reasonable (or rational) economic behavior has occasionally been disproving in the literature. Indeed, as pointed out by *Bounded Rationality Theory*, people do not always rationally make the optimal choices. Sometimes they depend on their intuitions or heuristics to make decisions, and therefore, these decisions often lead to better outcomes (Raue et al., 2015). However, we should know that biases may arise during this process can distort our judgments, known as the *framing effect* of Tversky and Kahneman (1974; 1981). Objectively, it means the same decision-making problem, but the opposite

decision is made under the condition of gain and loss frames (Tversky and Kahneman,1974; 1981).

Especially, how about a ‘decision-making under risk’? ‘Decision-making under risk’ does not necessarily mean exposure to danger or harm. That risk should generally be viewed as uncertainty about the gain or loss we face due to that decision (Newell, 2015, p. 163). Thus, in order to understand consumer decision-making under risk, we must first look at the process of risk perception. Loewenstein et al. (2001) proposed *the ‘Risk-As-Feelings hypothesis’* which emphasizes the role of activated emotion and affection when judging risks. The moment people perceive risk as feelings, they become insensitive to the objective probability of occurrence (Loewenstein et al., 2001; Rottenstreich and Hsee, 2001). Kahneman and Frederick (2007) demonstrated that people who make decisions by relying on intuitions are susceptible to the *framing effect* (Raue et al., 2015).

Back to the origin, how do people make ‘best’ decision-making? Making the best or at least the right decision is not always easy. The decisions are not decided by a single trait. However, they vary as a function of what the decision is about, which the decision domain (gain domain versus loss domain), who is a subject facing a risky event, the situational difference (for example, the level of risk probability or risky event type, respectively, or their interaction), the extent of loss/damage, whether emotions are involved in the decision and so on. Understanding this mechanism behind decision-making under risk is particularly important in preventing loss and inducing precautionary behavior in advance.

In particular, each of these factors is a very import area, and each research has been conducted, but not all of them have been actively studied organically. For example, even

though the level of risk probability (low-probability risk versus medium-probability risk) and risky event type (utilitarian-purpose event or hedonic-purpose event) are two crucial factors affecting decision-making, there is no research exploring the interplay between these two variables on consumer decision-making under risk. Many researchers have shown that decision-making studies under risk have been successful in the area of gain, but the study of losses was not easy (Raue et al., 2015). For that reason, this study focuses on consumer decision-making under risk in the area of loss. Therefore, this research investigated these questions in four (4) studies that illuminate how people perceive risky situations and make decisions under risk. They are affected by the interplay of risk probability level and risky event type, the amount of loss, the influence between emotions versus rationality on decision-making process, and specific emotions such as positive feelings versus negative feelings.

That is to say, the goal of this study is how to increase individuals' attention to risky situations, which are even having a low-probability risk of occurrence, and draw their choices to engage in precautionary behavior actively. I believe that this preventive behavior can reduce the burden of cost to society. Furthermore, based on the results of this research, effective risk communication can be proposed. Therefore, this research starts with the following four (4) research questions.

Research Question 1: How do people perceive risk and make decisions under risk in the loss domain? (Study 1)

Research Question 2: If the amount of loss (Small-Loss versus Big-Loss) is different, do people make different decisions under risk in the loss domain? (Study 2)

Research Question 3: Do people rely on emotions or reasons in decision-making under risk in the loss domain? (Study 3)

Research Question 4: What emotions (positive versus negative) drive the best decision-making under risk in the loss domain? (Study 4)

The answers to the above research questions will materialize this research's purpose and provide a direction for effective communication under risk. I hope everyone will make the right choices under risk and enjoy peace of mind even if they face risks.

CHAPTER 2 LITERATURE REVIEW

2.1 Domain-Specificity of Decision-Making under Risk (Gains vs. Losses)

As many studies have shown, decision-making realms can be broadly divided into two areas: gain versus loss domain. Imagine, when you purchase a new cellphone, you would get positive benefits (e.g., the pleasure of possession and utilization, etc.) thanks to the consumption. Here, decision-making takes place in the gain domain. On the other hand, you would also get negative benefits (e.g., loss of your property or money). For example, when you are purchasing a cellphone, a sales clerk could ask you whether you want to buy a warranty or not, and you adamantly said, “No.” Then, a few days later, you dropped the cellphone on a marble tile. Without the warranty, you must pour a bunch of money into fixing it or buying a new one. If then, the decision-making you did not buy any warranty for the cellphone in advance pushes you into the loss domain.

Theoretically, *Prospect Theory* (Kahneman and Tversky, 1979), a theory of decision-making under conditions of risk, describes the decision processes in two stages (gain or loss domain) using a value function. The value function's S-shaped curve shows that a concave shape of the top-right quadrant depicts the diminishing marginal utility of the gains domain. Similarly, the bottom-left quadrant's convex shape illustrates the diminishing marginal utility of the losses domain (Kahneman and Tversky, 1979; Newell, 2015; Tversky and Kahneman, 1981; 1992).

Kurnianingsih and Mullette-Gillman (2015) also used the domain distinction between gains and losses using a monetary gamble task to test decision-makers’ risk preferences and choice strategies. Respondents showed on average risk-averse in the

gains domain, whereas risk-neutral or -seeking in the losses domain similar to the results of *Prospect Theory* (Kahneman and Tversky, 1979; Kurnianingsih and Mullette-Gillman, 2015; Tversky and Kahneman, 1981; 1986; 1992).

From *Prospect Theory* up to comparatively recent research, many studies prioritize and focus on the domain of gains to explore people's risk perception and their attitudes toward the perceived risk rather than the domain of losses.

Table 1_Domain-Specificity and Variables of Decision-Making under Risk (Chronological Order)

Paper (Year)	Domain	Theory	Variables	Test/Experiment
von Neumann John and Oskar Morgenstern (1947)	Gain	Expected-Utility Theory, Game Theory	Monetary amount and objective probabilities	Maximizing Winning
Kahneman, Daniel and Amos Tversky (1979)	Gain & Loss	Prospect Theory	Outcome and probability, framing effect	Monetary gamble task
Tversky, Amos and Daniel Kahneman (1981)	Gain & Loss	Framing Effect	Outcome and probability, framing effect	Monetary gamble task
Evan, J. ST., Julie L. Barston, and Paul Pollard (1983)	Gain	Evans (1982) two-factor theory	Cognitive bias	Categorical syllogisms
Tversky, Amos and Daniel Kahneman (1986)	Gain & Loss	Framing Effect	Outcome and probability, framing effect	Monetary gamble task
Slovic, Paul (1987)	Gain & Loss	-	Memory	Psychometric paradigm
Tversky, Amos and Daniel Kahneman (1992)	Gain & Loss	Prospect Theory	Monetary amount and probability, framing effect	Monetary gamble task

Tversky Amos and Peter P. Wakker (1995)	Gain & Loss	Cumulative Prospect Theory	Monetary amount and probability, framing effect, memory	Weighted function
Levin, Irwin P., Sandra L. Schneider, and Gary J. Gaeth (1998)	Gain & Loss	Framing Effect	Risk choice, attribute, goal, framing effect	Meta-Analysis
Pham, Michel Tuan (1998)	-	-	Feelings	Decision task
Byrnes, James P., David c. Miller, and William D. Schafer (1999)	-	-	Hormone	Meta-Analysis
Shiv, Baba and Alexander Fedorikhin (1999)		Berkowitz's theory	Emotion vs. Reason	Decision task
Hsee, Christopher and Yuval Rottenstreich (2004)	Gain	-	Emotion vs. Reason	Priming task
Schwarz, Norbert and Gerald Clore (2007)	-	Naïve theory	Feeling vs. Reason, memory, experience	Meta-Analysis
Hertwig, Ralph, Greg Barron, Elke. U.Weber, and Ido Erev (2004)	Gain	Prospect Theory and Recency Effect	Description, experience, rare event	Decision task
Jullisson, E.Asgeir, Niklas Karlsson, and Tommy Garling (2005)	Gain & Loss	-	Experience vs. Information	Investment scenarios
Stewart, Neil, Nick Chater, and Gordon D. A. Brown (2006)	Gain & Loss	decision by sampling (DbS)	Memory, experience vs. information, delays	Cognitive tools
Zak, Paul J., Angela A. Stanton, and Sheila Ahmadi (2007)	Gain & Loss	-	Hormone	Decision task

Shah, Anuj K. and Daniel M. Oppenheimer (2008)	-	Effort-reduction framework	Cognitive bias, heuristics	Decision task
West, Richard F., Maggie E. Toplak, and Keith E. Stanovich (2008)	Gain	-	Cognitive bias	Watson-Glaser Critical Thinking Assessment (WGCTA)
Croson, Rachel and Uri Gneezy (2009)	Gain	-	Emotions, hormone	Decision Task
Kusev Petko, Paul van Schaik, Peter Ayton, John Dent, and Nick Chater (2009)	Gain & Loss	Prospect Theory	Memory, experience, frequency, probability	Monetary Gamble Task
Kuhberger, Anton and Carmen Tanner (2010)	Gain & Loss	Prospect Theory, Fuzzy-Trace Theory	Framing effect and probability	Decision task
Dietrich, Cindy (2010)	Gain & Loss	-	Cognitive bias, framing effect, probability, memory, experience vs. information, emotion vs. reasons, hormone	Meta-Analysis
Vlaev, Ivo, Petko Kusev, Neil Stewart, Silvio Aldrovandi, and Nick Chater (2010)	Gain & Loss	-	Memory	Risky choice task
Kuhberger, Anton (2011)	Gain & Loss	Prospect Theory	Framing effect	Decision Task
Kusev, Petko and Paul van Schaik (2011)	-	-	Outcome and probability	Meta-Analysis
Harries, Tim (2012)	Loss	-	Emotion vs. Reasons, Experience	Risk protection measure

Kusev, Petko, Paul van Schaik, and Silvio Aldrovandi (2012)	Loss	Priming	Memory, experience	Semantic-priming paradigm
Mishra, Sandeep and Laurence Fiddick (2012)	Gain & Loss	Prospect theory, Risk-Sensitivity Theory	Framing effect	Decision Task
Kandasamy, Narayanan, Ben Hardy, Lionel Page, Markus Schaffner, Johann Graggaber, Andrew S. Powlson, Paul C. Fletcher, Mark Gurnell, and John Coates (2014)	Gain	-	Hormone	Cortisol measure, computerized risk task
Petrova, Dafina G., Joop van der Pligt, and Rocio Garcia-Retamero (2014)	Gain & Loss	-	Emotions vs Reasons (Negative)	Reappraisal task
Tennyson, Sharon and Hae Kyung Yang (2014)	Loss	-	Emotions vs Reasons	Insurance demand task
Hsee, Christopher, Yang Yang, Xingshan Zheng, and Hanwai Wang (2015)	Gain	Lay Rationalism	Emotion vs. Reason	Decision Task
Kurnianingsih, Y. A. and Mullette-Gillman O. A. (2015)	Gain & Loss	Reflection Effect, Prospect Theory	Risk preference and choice strategies	Monetary Gamble Task
Newell, B. R. (2015)	Gain & Loss	Prospect Theory	probability	Monetary Gamble Task
Newall, Philip. W. S. (2015)	Loss	Support Theory	Advertising and choice	Gambling Task per Advertising type

Kusev, Petko, Paul van Schaik, Shrooq Alzahrani, Samantha Lonigro, and Harry Purser (2016)	Loss	Moral dual-process model	Memory, experience	Moral-dilemma scenario
Kusev, Petko, Harry Purser, Renata Heilman, Alex J. Cooke, Paul van Schaik, Victoria Baranova, Rose Martin, and Peter Ayton (2017)	Gain & Loss	-	Cognitive bias, framing effect, probability, memory, experience vs. information, emotion vs. reasons, hormone	Meta-Analysis
May, Frank (2017)	Gain	-	Emotion vs. Reason, time	Decision Task
Kusev, Petko, Paul van Schaik, Krasimira Tsaneva-Atanasova, Asgeir Juliusson, and Nick Chater (2018)	-	-	Experience vs. Information	-

2.2 Decision-Making under Risk

What is ‘decision-making under risk’? Rather than involving exposure to actual danger or harm, risk can be considered more generally as uncertainty about the monetary amount you might lose or gain from making a particular choice. A decision is made by an attempt to evaluate probabilities related to different alternatives and choose what is regarded as the best given the situation (Newell, 2015).

The ultimate purpose of decision-making is to choose the best result among alternatives. von Neumann and Morgenstern (1947) and Tversky and Kahneman (1992) have suggested that economic theories of decision-making can be constructed

computational combinations of two representative attributes; monetary amount and probability. In other words, Kahneman and Tversky (1979) and Tversky and Kahneman (1992) also have indicated that rational decision-making for such as protection or investment is affected by economic expectations (e.g., the highest utility) between alternatives. Essentially, the economic theory emphasizes that any variable not related to computing the expected highest outcomes among several options could not affect the choice problem (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992; von Neumann and Morgenstern, 1947).

Generally, decision-making's economic models (for example, *Expected-Utility Theory*) allude that a decision-maker should make a choice that achieves utility maximization (von Neumann and Morgenstern, 1947). According to *Expected-Utility Theory*, the nature of diminishing marginal utility means that people avoid risk (Loewenstein et al., 2001; von Neumann and Morgenstern, 1947). That risk-averse attitude creates the demand for insurance for peace of mind (O' Donoghue and Somerville, 2018). However, this assumption in which the decision-maker might show rational economic behavior has been occasionally confuted in the literature. Indeed, as pointed out by *Bounded Rationality Theory*, individuals do not always rationally analyze decision-making problems. Instead, they sometimes depend on intuitions and heuristics when making decisions (Raue et al., 2015). Rather than showing utility maximization, their behaviors will be distorted by information type (different descriptions from the perspectives of context or content such as *Framing Effect*), probability level, cognitive biases, memory, experience, emotions versus reasons, hormonal correlates, etc. in the

process of decision (Hertwig et al., 2004; Kahneman and Tversky, 1979; Kusev et al., 2009; Tversky and Kahneman, 1974; 1981; 1992).

2.2.1 Cognitive Biases in Decision-Making

Cognitive biases may affect decision-making. Cognitive biases are defined as thinking patterns from observation and their generalizations that may generate memory errors, inaccurate judgments, and faulty logic (Dietrich, 2010; Evans, Barston, and Pollard, 1983; West, Toplak, and Stanovich, 2008).

In decision-making, cognitive biases impact that individuals can have more credence to expected outcomes and previous experience/knowledge while expelling uncertain information or outcomes. Therefore, it may occasionally lead to a poor decision without looking at the bigger picture (Dietrich, 2010; Kusev et al., 2017; Shah and Oppenheimer, 2008).

2.2.2 *Framing Effect* and Probability Levels in Decision-Making

Framing effect was defined by Kahneman and Tversky (1979, *Prospect Theory*). *The framing effect* is an example of cognitive bias and indicates irrationality in decision- making. People show inconsistent choices even though they have been exposed to equivalent options depending on how the options are linguistically different described; for example, gain or loss are defined in the scenario as descriptions of outcomes (Kahneman and Tversky, 1979; Kuhberger and Tanner, 2010; Tversky and Kahneman, 1974; 1981; 1992).

In *framing effect* and *Prospect Theory*, people show risk-averse attitude under a positive frame (gain domain), whereas they show risk-taking attitude under a negative frame (loss domain) with different levels of probability, respectively (Kahneman and Tversky, 1979; Tversky and Kahneman, 1974; 1981; 1986; 1992). Namely, the *framing effect* leads to different risk attitudes (Kuhberger, 2011; Levin et al., 1998; Mishra and Fiddick, 2012).

Besides, researchers (Kusev and van Schaik, 2011) pointed out that the specific combination of context, content, and task type in the studies would lead to either rational or irrational choice. In conclusion, many studies have necessarily employed a factor, a difference of probability-level, to recall respondents' memory and active their emotions toward the perceived risk in the context and the content.

2.2.3 Memory in Decision-Making

Recently, scholars have studied memory and decision-making under risk. Different context of risk probability levels, domain (gains or losses) effects, monetary amount, and retrospection such as vividness of events in memory and activated feelings/emotions can distort people's risk attitudes and decision-making (e.g., Kusev et al., 2009; 2012; 2017; Slovic, 1987; Tversky and Wakker, 1995; Vlaev et al., 2010).

2.2.4 Experience vs. Information in Decision-Making

One crucial factor that may influence future decision-making is past experiences (Juliusson, Karlsson, and Garling, 2005). Some studies (Hertwig et al., 2004; Kusev et al., 2018; Steward et al., 2006) have well-argued that decision-making depends on the

experience itself rather than descriptions of information regarding risky events. Specifically, individuals' experiences of past events will have a more substantial effect than when they have economics information (Kusev et al., 2009).

However, future decisions made by past experiences would not necessarily produce the best results. For example, in financial decision-making, highly successful investors make their investment decisions based on precise examination rather than past experiences. This approach is at odds with what one may predict (Dietrich, 2010, p.2; Juliusson et al., 2005)

Kusev et al. (2009), a study about insurance choice, proved that past experience and descriptions, respectively, affect risky choice. Still, there is a continuous argument to the effect between experience and information on decision-making under risk.

2.2.5 Emotions vs. Reasons in Decision-Making

Sometimes consumer decision-making depends on rational thinking through cost-benefit analysis, whereas it relies on emotions (Hsee and Rottenstreich, 2004; Hsee et al., 2004; May, 2017; Pham, 1998; Schwarz and Clore, 2007; Shive and Fedorikhin, 1999). This research posits that this difference can also apply to consumer decision-making under risk.

Recently, researchers try to dynamically explain the role of affective factors in decision-making and predict consumers' choices with some models and theories. For example, Tennyson and Yang (2014) revealed that respondents with high life satisfaction show higher insurance purchasing intentions. The researchers concluded that strong (positive) emotional ties within a family might result in a stronger desire to take

prevention actions against risky events. Therefore, respondents' willingness to purchase insurance is affected by an economic factor and an emotional one.

However, Petrova et al. (2014) have a conflicting opinion on the subject that respondents would like to purchase when having affective descriptions like fear of losing. Additionally, flood insurance data of UK households shows that policyholders' protective behaviors were affected more by affective reactions (anxiety or insecurity; anticipated negative emotions) and experience (either already had experienced flooding or at risk of flooding) than by material and financial considerations (Harries, 2012; Kusev et al., 2018).

Additionally, the existing literatures allude that decision-making under risk may be influenced by a composite image of positive and negative emotion. Accordingly, there has been much controversy about which emotion has more influence on decision-making under risk. Therefore, it is necessary to continually study which emotions (positive versus negative) are more active and intervene in the decision-making process under risk.

2.2.6 Hormonal Correlates in Decision-Making

Some researchers have recently investigated a few essential hormones (e.g., cortisol, testosterone, and oxytocin) that correlate and determine decision-making. Chronic continued elevation of cortisol makes people more risk-averse (Kandasamy et al., 2014), whereas naturally high testosterone increases risky behavior-men tend to make riskier decisions in situations (Byrnes et al., 1999; Croson and Gneezy, 2009). According to the experiment by Zak et al. (2007), oxytocin would increase in generosity resembled a

risk-aversion attitude. However, more research is required to increase confidence in these interpretations (Kusev et al., 2017, p.10).

CHAPTER 3 THEORETICAL BACKGROUND AND HYPOTHESES

3.1 Historical Theory Development of Decision-Making under Risk

3.1.1 *Expected Utility* (*EU*) *Theory*

Expected-Utility Theory implies that individuals should make decisions that accomplish utility maximization (von Neumann and Morgenstern, 1947). This was because researchers believed that maximizing expected utility was rationality with two justifications. One is maximizing expected utility is a profitable long-term policy. The other one is representation theorems in which all rational agents maximize the expected utility when there are certain rational restrictions on preferences (Briggs, 2014). *Expected-Utility Theory* became the dominant theory of rational choice in the analysis of decision-making under risk since the 1950s (Newell, 2015; Robert, 2018).

However, decision-makers do not always opt for higher expected value investment options in situations with risky consequences. *St. Petersburg paradox* of Nicolas 1 Bernoulli showed how the concept of expected value as an indicator of decision-making has failed to capture the way people actually choose (Newell, 2015; Newell, Lagnado, and Shanks., 2007). Besides, some violations have been systematically shown in subsequent empirical applications (Ellsberg, 1961; Markowitz, 1952), and these falsifications have raised the need for a deep understanding of how people actually make decisions. In 1979, Kahneman and Tversky showed the gap between choice based on *Expected-Utility Theory* and people's real choice and proposed *Prospect Theory* as an alternative (descriptive) decision theory (Kahneman and Tversky, 1979; Robert 2018).

3.1.2 *Prospect Theory* (*PT*)

Prospect Theory is still based on the *Expected-Utility Theory* but suggests significant modifications; the '*value function*' and the '*weighting function.'* In other words, the '*value function*' and '*weighting function*' of *Prospect Theory* maximize the expectation by converting the 'objective monetary utility' into 'subjective values' and the 'objective probabilities of outcomes' into 'subjective decision-weights,' respectively (Newell, 2015). Adding a *nonlinear probability weight function* to the existing Markowitz's model (1952) was developed into *Prospect Theory*.

In particular, *Prospect Theory* over-weighted the low (or small) probability on both gain and loss domains (Loewenstein et al., 2001). That is, *Prospect Theory* of Kahneman and Tversky (1979) has shown that people are more sensitive to losses than equal gains when making decisions in hypothetical monetary gambling experiments. *Prospect Theory* can explain why people want to purchase insurance to avoid risk through overweight, even though they are aware of the low-probability in the area of loss (Kahneman and Tversky, 1979; Loewenstein et al., 2001; Tversky and Kahneman, 1974, 1981).

However, decision-makers should be aware that despite objectively equivalent decision-making problems, the inconsistent choice is made in terms of gain or loss frame (Tversky and Kahneman,1974; 1981). It has become known as the *framing effect*

Thus, in order to choose the best decision from a variety of alternatives, individuals must consider two factors together in consumer decision-making under risk: different levels of risk probability and framing effects (Gains vs. Losses framing and two probability risk levels employed in the monetary gambles experiments: see Table 2).

Table 2_The Fourfold Pattern of Choice that Prospect Theory can explain

Risk Probability Level	Gain Domain	Loss Domain
Small-Probabilities	Risk-seeking	Risk-aversion
Medium/Large-Probabilities	Risk-aversion	Risk-seeking

Source: Newell, Ben R. (2015), "Decision making under risk: Beyond Kahneman and Tversky's Prospect Theory," in *Cognitive Psychology: Revisiting The Classic Studies*, eds. Michael W. Eysenck and David Groome, CA: SAGE, p. 169.

3.1.3 *Construal Level Theory* (*CLT*)

Construal Level Theory indicates that objects, events, or individuals are expressed as proximal or distant. Thus, the reference point is now and here, and how far away the object is temporally, spatially, socially, or probabilistically from it. In CLT, high versus low levels are expressed as psychological distance-near (proximal) versus far (distant). A high-level of CLT is a broad concept of an object and has an abstract perspective, whereas a low-level of CLT, which means close psychologically, is interpreted as a concrete point of an object (Trope and Liberman, 2010). In other words, these two construal levels of CLT proposed by Trope and Liberman (2010) can be explained as follows. One is low-level construal, which focuses on the feasibility of an action (e.g., probability of a positive outcome) based on a concrete mindset. The other is high-level construal, focusing on action's desirability (e.g., attractive of the outcome) based on an abstract mindset.

Many empirical studies prove the notion that psychological distance by activated a certain level of construal interpretation is related to decision-making (Raue et al., 2015; Trope and Liberman, 2010; Trope, Liberman, and Wakslak, 2007). When people make important decisions, they always keep the consequences in mind and are influenced by

the construal level that was active in the process. This is why CLT has received attention (Kim, Schnall, and White, 2013).

For example, in gambling experiment tasks at a temporal distance, respondents prefer gambling with a high-probability of winning (risk-averse) in the near future while preferring gambling with high-returns (risk-seeking) from a long-term perspective (high-level construal). That is, from this long-term perspective, it can be interpreted as showing an attitude that favors risk as people focus on the desirability of outcomes (Sagristano, Trope, and Liberman, 2002). This can be linked to the *framing effect* discussed earlier. In other words, individuals intuitively prospect the outcomes of decision-making under risk as either desirable or feasible (Trautmann and van de Kuilen, 2012) about the objectively equivalent choice problem.

Many researchers have examined the interaction of construal level manipulated by priming at various levels and risk attitudes (Lermer, Streicher, Sachs, Raue, and Frey, 2014; Raue et al., 2015; Streicher, Lermer, Sachs, and Frey, 2012). For instance, in the scenario framed with a high-level construal, participants judged the possibility of risk occurrence as low and showed an attitude to seek more risk. This is also consistent with the results of Wakslak and Trope (2009). In the neurological experiment setting, respondents judged that exposure to a high-level construal would be less likely to be at risk than exposed to a low-level construal (Raul et al., 2015; Wakslak and Trope, 2009). The results of the studies are summarized in the following table (see Table 3).

Table 3_*Construal Level Theory* under Risk

Construal Level	Psychological (Hypothetical) Distance	Risk Probability Level (Wakslak and Trope (2009))	Gain Domain	Loss Domain
Low-Construal Level (Proximal)	Probable (likely event)	High-Probability Risk	Risk-Averse	Risk-Taking
High-Construal Level (Distant)	Improbable (unlikely event)	Low-Probability Risk	Risk-Taking	Risk-Averse

Source: a. Armor, David A. and Aaron M. Sackett (2006), "Accuracy, Error, and Bias in Predictions for Real versus Hypothetical Events," *Journal of Personality and Social Psychology*, 91, 583-600.

b. Wakslak, Cheryl and Yaacov Trope (2009), "The Effect of Construal Level on Subjective Probability Estimates," *Psychological Science*, 20 (1), 52-58.

c. Raue, Martina, Bernhard Streicher, Eva Lermer, and Dieter Frey (2015), "How far does if feel? Construal level and decisions under risk," *Journal of Applied Research in Memory and Cognition*, 4, 256-264.

Construal Level Theory and *Prospect Theory* predict the same outcome in the loss domain, as shown in the following table (see Table 4).

Table 4_Expected Risk Attitudes under Risk in Loss Domain (Combination Table 2 and 3)

Theory	The Level of Risk Probability	
	Low-Probability Risk	High-Probability Risk
Construal Level Theory	Risk-Averse	Risk-Taking
Prospect Theory	Risk-Averse	Risk-Taking

3.1.4 *Risk-as-Feelings Hypothesis*

Existing economic models or cognitive assessment models only rely on more objective features of risky situations, such as assessing outcome probability and outcome

severity for risk. However, people do not make decisions only by these economic models, and this logic is insufficient to explain irrational behavior. As an alternative to explain this, some researchers (Loewenstein et al., 2001) have proposed the '*Risk-as-Feelings Hypothesis*.'

Emotional responses toward perceived risky situations sometimes would separate cognitive assessments from those risks. When such isolation happens, emotional responses can be a driving force to make a choice under risk (Damasio, 1994; Loewenstein et al., 2001). Loewenstein et al. (2001)'s study stressed the relation between probability and emotion as a basis of explaining the main paradox that arises from decision-making under risk.

The '*Risk-as-Feelings Hypothesis*' assumes that the direct emotional influences dominate decisions under risky situations felt in those situations (Damasio, 1994; Lerner and Keltner, 1999, 2000; Loewenstein et al., 2001; Raghunathan and Pham, 1999). What drives these emotions include the vividness of the resulting image, personal exposure or experience of the result, and a past history of conditioning (Loewenstein et al., 2001).

Therefore, it has been demonstrated that risk as either emotional assessment or cognitively evaluation sometimes drive different attitudes. For example, when people cognitively assess risk, they pay much attention to the probability of the occurrence, but the emotionally perceived risk does not depend much on the probability of occurrence (Loewenstein et al., 2001; Rottenstreich and Hsee, 2001). Thus, some people are actively preparing for and avoiding risks even with low-probability happening (e.g., purchasing insurance or warranty).

3.2 *System 1* (*Heart*) *versus System 2* (*Head*), *Dual-System Theory*

Psychologist, neuroscientist, behavioral economist, etc. have developed the concept of '*Dual-System Theory*' or so-called the '*Two Minds Hypothesis*' by explaining that human being's (sometimes irrational) behavior is structurally and conceptually driven by two different system sets (Kahneman, 2011; Turel and Qahri-Saremi, 2016).

These studies come to two consensus points. The first point highlights the unique properties of each of the two systems. One is called '*System 1*', and the decision of *System 1* is made based on the heart because it has characteristics such as intuitive and fast dependence on the sound from the heart. The other is named '*System 2*', and the choice of *System 2* is based on the head. *System 2*'s choice is defined as being slow, precise, and focusing on the head's sound. The second point is how the two systems interact and play different roles in decision-making (Kahneman, 2011; Turel and Qahri-Saremi, 2016).

In particular, studies in recently published papers have shown that the dual-system theory has been distinctly helpful in describing the causes of problematic behaviors such as problem gambling, overacting, drinking problems, smoking, etc. (Turel and Qahri-Saremi, 2016).

Therefore, this research will examine how *System 1* and *System 2* work in the decision-making process in the area of loss and what system it is useful to rely on to make the best choice under risk.

3.3 Utilitarian vs. Hedonic Attributes

A critical variable in the marketing field is the study of utilitarian versus hedonic benefits. Chitturi et al. (2008) well summarized the 'utilitarian' versus 'hedonic' concepts by synthesizing several works of literature as follows (see Table 5) (Batra and Ahtola 1990; Chitturi, Raghunathan, and Mahajan 2007; Chitturi et al., 2008; Dhar and Wertenbroch 2000; Strahilevitz and Myers 1998).

The Chitturi et al. (2008)' study also shows that focusing on the hedonic attributes evokes greater promoted feelings like excitement and cheerfulness, while consuming utilitarian benefits increase the preventive feelings such as confidence and security (Chitturi et al., 2008, p. 50).

Table 5_Utilitarian vs. Hedonic Benefits and Derived Emotion

Type of Benefits		Attributes	Emotion
Utilitarian Benefits	necessities-needs-utilitarian	Functional, Instrumental, Practical, etc.	Avoid Pain, Confidence, Security
Hedonic Benefits	luxuries-wants-hedonic	Aesthetic, Experiential, and Enjoyment, etc.	Cheerfulness, Excitement

Source: Chitturi, Ravindra, Rajagopal Raghunathan, and Vijay Mahajan (2008), "Delight by Design: The Role of Hedonic Versus Utilitarian Benefits," *Journal of Marketing*, 72 (3), 48-63.

From the above study, I can predict consumers' attitudes as follows (see Table 6). A utilitarian event will arouse risk-averse, whereas a hedonic event will stir up a risk-taking attitude. Furthermore, this expectation can also be linked to decision-making under risk by borrowing the 'Prevention' and 'Promotion' conditions of the 'Regulatory Focus Theory' used in the work of Chitturi et al. (2008) (see Table 7).

Table 6_Expected Risk Attitudes based on Chitturi et al. (2008)'s Research

Event Types	Emotion	Expected Risk Attitudes
Utilitarian Event	Confidence, Security	Risk-Averse
Hedonic Event	Cheerfulness, Excitement	Risk-Taking

Source: Chitturi, Ravindra, Rajagopal Raghunathan, and Vijay Mahajan (2008), "Delight by Design: The Role of Hedonic Versus Utilitarian Benefits," *Journal of Marketing*, 72 (3), 48-63.

Therefore, this research can organize the first independent variable by arranging several papers' results and theories as follows.

Table 7_Expected Risk Attitudes under Risk in Loss Domain

Consumption Purpose	Related-Emotions	Focus of Self-Regulation	Expected Risk Attitudes
Utilitarian Benefits	Confidence, Security	Prevention (avoiding loss)	Risk-Averse
Hedonic Benefits	Cheerfulness, Excitement	Promotion (attaining gains)	Risk-Taking

Source: a. Chitturi, Ravindra, Rajagopal Raghunathan, and Vijay Mahajan (2008), "Delight by Design: The Role of Hedonic Versus Utilitarian Benefits," *Journal of Marketing*, 72 (3), 48-63.
b. Bryant, Peter and Richard Dunford (2008), "The Influence of Regulatory Focus on Risky Decision-Making," *Applied Psychology*, 57 (2), 335-359.

As explained earlier, decision-making is not driven by a single factor. To achieve better results, this research would like to add one more important factor, utilitarian versus hedonic benefits, to framing effect and probability, which were the main variables of decision-making under risk. That is to say, this research strives to establish a better matrix, as shown below the table. This study wants to fill out the below matrix (see Table 8).

Table 8_Expected Risk Attitudes Matrix by Interaction between Type of Event and Two Levels of Risk Probability (2 Independent Variables)

Event Type	The Level of Risk Probability					
	Low-Probability Risk			High-Probability Risk		
	CLT & PT	HED/UTI	Interplay	CLT & PT	HED/UTI	Interplay
Utilitarian	Risk-Aversion	Risk-Aversion	?	Risk-Taking	Risk-Averse	?
Hedonic	Risk-Aversion	Risk-Taking	?	Risk-Taking	Risk-Taking	?

CLT: Construal Level Theory, PT: Prospect Theory, HED/UTI: Hedonic/Utilitarian

3.4 Lay Rationalism (LR)

As discussed in the literature review in 2.2.6 and the theoretical background in 3.2, there is an ongoing discussion about whether it should be based on emotion or reason when making a decision. One of the concepts that suggest another theoretical background is *Lay Rationalism*-the concept that uses reason rather than emotions to draw final choices (Hsee et al., 2015).

Lay rationalism can be used a little differently from the concept of the rationality of existing decision-making theories or dominant behavior economics. Lay rationalism does not counter emotions but treats them as part of a person's rational utility function (Hsee et al., 2015). This point is interpreted differently for rationalities in the existing dominant economic theory or decision-making theories. This aspect, like the Dual-System Theory, discussed earlier in 3.2, leads people into the dilemma of whether to follow the 'head (reasons)' or 'mind (emotion)' in the choice (Hsee et al., 2015).

Therefore, this study will examine how laypeople can make decisions under risk by operating this factor (decision-making reliance between heart vs. head) as an essential variable and how to derive effective risk communication.

3.5 Positive and Negative Affect Schedule (PANAS) Scale

As a result of the previous literature review (see 2.2.5), it continues to be controversial as to which emotions (positive versus negative) were more effective in making a decision under risk. To test this dispute, this study examines the decision-making process using the PANAS scale (Watson et al., 1998) as a moderated variable.

Watson, Clark, and Tellegen (1998) proposed the Positive and Negative Affect Schedule (PANAS), which consists of two mood scale rating positive and negative feelings with personality status and traits. Twenty (20) descriptors are used to measure respondents' Positive Affect (PA) and Negative Affect (NA).

Respondents will respond to each of the ten (10) positive and the ten (10) negative words using a 5-point scale that is close to the emotions they had at the time of the experiment or over the past few weeks (see 4.4)

3.6 Hypotheses

From the literature review and theory background, this research can expand the research questions (Chapter 1) to the following hypotheses.

Hypothesis 1. The interaction effect of risk probability level (low vs. medium) and event type (utilitarian vs. hedonic) on the perceived risk in the loss domain will induce

people to engage in risk-averse behavior. Significantly if the risk-taking hedonic-benefits interact with the perception of low-probability risk level, the opposite risk attitude (risk-averse) can occur.

Hypothesis 2: There will be an interaction effect of risk probability level (low vs. medium), event type (utilitarian vs. hedonic), and the amount of loss on the perceived risk in the loss domain. Significantly, unlike traditional economic models, people having hedonic-event with low-probability risk in small-loss conditions can exhibit a strong risk-averse attitude.

Hypothesis 3. The decision-making attitude under risk depends on the person's usual personality and traits, either emotional or rational.

Hypothesis 4. When making decisions based on emotion, people tend to avoid risk more than those made by logical thinking.

Hypothesis 5: Risk attitudes in dealing with big-loss versus small-loss are based on different emotions (positive vs. negative).

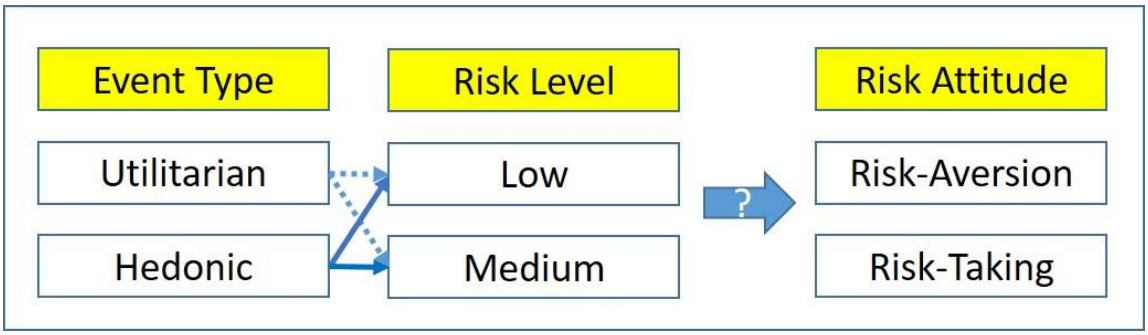
Hypothesis 6. People tend to be more risk-averse when making a decision that relies on negative emotions rather than positive emotions under risk in the loss domain. Even if they show the same risk attitudes, the decisions relied on different emotions per the amount of loss.

CHAPTER 4 METHODOLOGY AND MEASUREMENT

4.1 Study 1: Perceived Risk Attitudes and Decisions under Risk

Even though the level of risk probability (Low-Probability Risk vs. Medium-Probability Risk; IV 1) and the type of risky event (Utilitarian-Purpose Event vs. Hedonic-Purpose Event; IV 2) are two critical factors affecting decision-making, there is no research exploring the interplay between these two variables on consumer decision-making under risk. This study applies to these two independent variables to investigate how people perceive risky situations and make decisions under risk in the loss domain.

Figure 1_(Study 1) Research Model



4.1.1 Method and Procedure

This study employed a 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose Event vs. Hedonic-Purpose Event) between-subjects design. Participants (n = 252) were recruited from Amazon Mechanical Turk (MTurk). I removed participants who failed to answer the

attention check question correctly ("Please select strongly disagree."). The final sample had 234 participants. 65.8% (154 participants) were male.

First, participants were randomly assigned and asked to read one of four (4) scenario conditions (LRUE: Low-Probability Risk with Utilitarian-Purpose Event, LRHE: Low-Probability Risk with Hedonic-Purpose Event, MRUE: Medium-Probability Risk with Utilitarian-Purpose Event, and MRHE: Medium-Probability Risk with Hedonic-Purpose Event) of travel insurance choice. In the conditions of low (vs. medium) probability of trip cancellation risk and utilitarian-purpose (vs. hedonic-purpose) event, participants read the following:

> Imagine. You will go to the *City M* three (3) weeks later in order to attend a nationwide job fair (vs. for a sightseeing); event type. You will stay there for one (1) week. The round-trip flight costs from New York, USA to *City M*, USA $450 for non-stop service. Then, you would have a 5% (vs. 45%) chance of needing to cancel your trip; risk probability level. If you inevitably cancel the flight without travel insurance, you will lose $450 plane ticket costs. However, with this insurance, you will get 100% of the ticket price returned to you. Right after purchasing the ticket, the website asks whether you want to buy travel insurance or not. You will be charged an additional $30 per ticket. Would you want to buy travel insurance?

Table 9_(Study 1) Event Type and Risky Probability Level

Event Type		Risk Probability Level	
Utilitarian-Purpose Event	Hedonic-Purpose Event	Low-Probability Risk	Medium-Probability Risk
A trip to attend a nationwide job fair	A trip for a sightseeing	5% chance of trip cancellation	45% chance of trip cancellation

After reading one of four (4) scenarios, as a manipulation check for event type and risk level, I asked participants to rate their perception of event type (utilitarian-purpose event vs. hedonic-purpose event) and risk probability level (low-probability risk vs. medium-probability risk) and use on a 7-point scale: "The scenario's event is close to the attributes of" (1 = '*Practical/ Productive Event*' to 7 = '*Enjoyable/Fun Event*'; HED/UTI scale (Voss et al., 2003)) and "From the scenario, what do you think the probability of risk?" (1 = '*Low-Probability Risk*', 4 = '*Medium-Probability Risk*', 7 = '*High-Probability Risk*'), respectively.

Next, I asked participants to mark their relative willingness to purchase insurance by answering the question: "Please rate your willingness to purchase Travel Insurance." on a 7-point scale (1 = '*Definitely Won't Buy* (*No*)', 4 = '*Neutral*', 7 = '*Definitely Will Buy* (*Yes*)'). In addition, I measured participants' binary choice: "Do you want to buy Travel Insurance?" (1 = '*No*', 2 = '*Yes*').

On the next page of the survey, to gain insight about participants' decision-making reliance on between *System 1* (*Heart*) versus *System 2* (*Head*), participants were asked to indicate how they made their choices on seven (7) items (Levine et al., 2018) which were assessed on a 7-point scale (1 = '*Strongly Disagree*' to 7 = '*Strongly Agree'*): "You made your decision *intuitively*," "You made your decision *deliberately*," "You made your decision *quickly*," "You made your decision *slowly*," "You made your decision *by relying*

on your heart," and "You made your decision *by relying on your brain*". Moreover, comprehensively, I asked this additional question: "Overall, how did you make your decision?" (1 = '*Using only Emotion*' to 7 = '*Using only Reason*'). For each item, they indicated the degree to which they agree or disagree with the statement. Responses to these seven (7) items formed an index of participants' relative reliance on *System 1* (*Heart*) versus *System 2* (*Head*).

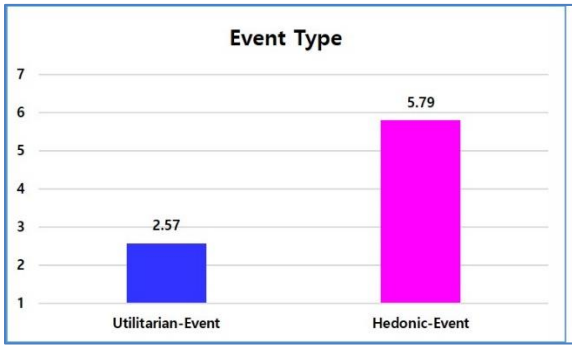
Finally, participants answered standard demographic questions. Participants received $0.50 for their participation.

4.1.2 Results and Discussion

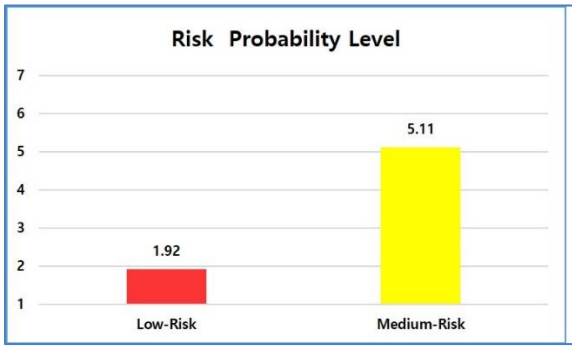
4.1.2.1 Manipulation Check.

The manipulation of event types was successful in showing that participants perceived 'a trip to attend a nationwide job fair' (M = 2.57) as significantly utilitarian-purpose event than that in the hedonic condition 'a trip for a sightseeing' (M = 5.79; F (1, 233) = 277.549, p < .000). And, the manipulation of risk probability levels was also successful in showing that participants perceived two distinct probability of trip cancellation risk; low-probability risk (M = 1.92) verse medium-probability risk (M = 5.11; F = (1, 233) = 380.744, p < .000).

Figure 2_(Study 1) Manipulation Check of Event Type and Risk Probability Level



Factor	Mean	S.E	F-value/Sig.
Utilitarian-Event	2.57	1.802	277.549/ .000
Hedonic-Event	5.79	1.063	



Factor	Mean	S.E	F-value/Sig.
Low-Risk	1.92	1.291	380.744/ .000
Medium-Risk	5.11	1.208	

Event Type: 1 = '*Practical/Productive Event*' to 7 = '*Enjoyable/Fun Event*'.
Risk Probability Level: 1 = '*Low-Probability Risk*' to 7 = '*High-Probability Risk*'.

4.1.2.2 Willingness to Purchase Travel Insurance

Main and Interaction Effects

A two-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) ANOVA conducted on participants' willingness to purchase travel insurance yielded the expected interaction (F (1, 233) = 14.610, $p < .000$, $\eta^2 = .060$). The main effect for event type (F (1, 233) = 21.133, $p < .000$, $\eta^2 = .084$) was significant, whereas the main effect for risk level (F (1, 233) = .427, $p < .514$, $\eta^2 = .002$) was not significant.

Table 10_(Study 1) Test of Between-Subjects Effects

Dependent Variable: Willingness to Purchase Travel Insurance
Design: Intercept + Risk Level + Event Type + Risk Level * Event Type

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	74.602[a]	3	24.867	11.731	.000	.133
Intercept	5530.774	1	5530.774	2609.115	.000	.919
RiskLevel	.906	1	.906	.427	.514	.002
EventType	44.797	1	44.797	21.133	.000	.084
RiskLevel * EventType	30.971	1	30.971	14.610	.000	.060
Error	487.551	230	2.120			
Total	6116.000	234				
Corrected Total	562.154	233				

a. R Squared = .133 (Adjusted R Squared = .121).

Two-way ANOVA

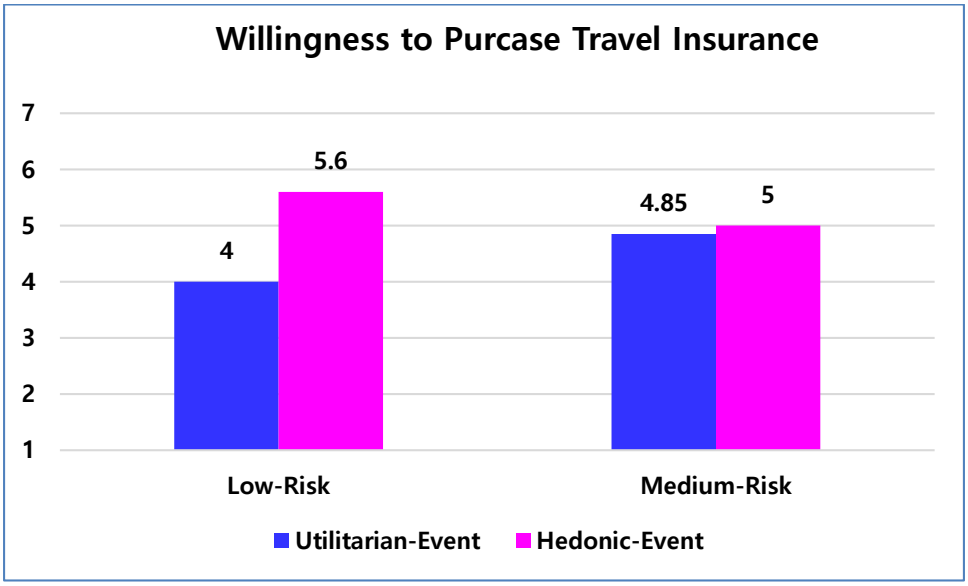
In low-probability risk condition, participants with hedonic-purpose event (M = 5.60, SD = 1.521) showed statistically greater willingness to purchase travel insurance than those with utilitarian-purpose event (M = 4.00, SD = .915). In medium-probability risk condition, participants with hedonic-purpose event (M = 5.00, SD = 1.781) also statistically showed a little greater willingness to purchase travel insurance than those with utilitarian-purpose event (M = 4.85, SD = 1.447; F (3, 230) = 11.731, p < .000)

Table 11_(Study 1) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	74.602	3	24.867	11.731	.000
Within Groups	487.551	230	2.120		
Total	562.154	233			

Overall, it indicated that they showed relatively strong risk-averse attitudes, excluding the LRUE (risk-neutral) condition. Significantly, participants with a hedonic-purpose event presented a higher willingness to purchase travel insurance attitudes than those with a utilitarian-purpose event regardless of the risk level. In detail, the condition of LRHE showed the highest mean to buy travel insurance (see Figure 3 and Table 12).

Figure 3_(Study 1) Willingness to Purchase Travel Insurance



Willingness: 1 = '*Definitely Won't Buy* (*No*)' to 7 = '*Definitely Will Buy* (*Yes*)'.

Table 12_(Study 1) Risk Attitude per condition interpreted through Willingness to Purchase Insurance of Figure 3

Conditions	Risk Attitude
LRUE (Low Risk + Utilitarian Event)	Risk Neutral
LRHE (Low Risk + Hedonic Event)	(the strongest) Risk-Averse
MRUE (Medium Risk + Utilitarian Event)	Risk Averse
MRHE (Medium Risk + Hedonic Event)	Risk-Averse

Post Hoc Analysis

According to the Post Hoc results, the significance value was .000, so the hypothesis was accepted. It was found that there was a significant difference in willingness to purchase depending on the groups/conditions.

Since equal variances were not assumed, the Dunnett T3 test was applied instead of Scheffe. As a result of Dunnett T3 analysis, there was a significant difference among groups in LRHE, LURE, and MRUE in willingness to purchase travel insurance.

Table 13_(Study 1) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Dunnett T3
Willingness to Purchase Travel Insurance	LRUE (a)	4.00	.915	11.731/ .000	b > a, c
	LRHE (b)	5.60	1.521		
	MRUE (c)	4.85	1.447		
	MRHE (d)	5.00	1.781		

Table 14_(Study 1) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Willingness to Purchase Travel Insurance
Dunnett T3

(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
LRUE	LRHE	-1.603*	.234	.000	-2.23	-.97
	MRUE	-.852*	.222	.001	-1.45	-.26
	MRHE	-1.000*	.262	.002	-1.70	-.30
LRHE	LRUE	1.603*	.234	.000	.97	2.23
	MRUE	.751*	.272	.040	.02	1.48
	MRHE	.603	.306	.267	-.22	1.42
MRUE	LRUE	.852*	.222	.001	.26	1.45
	LRHE	-.751*	.272	.040	-1.48	-.02
	MRHE	-.148	.297	.997	-.94	.65
MRHE	LRUE	1.000*	.262	.002	.30	1.70

	LRHE	-.603	.306	.267	-1.42	.22
	MRUE	.148	.297	.997	-.65	.94

* The mean difference is significant at the 0.05 level.

4.1.2.3 Binary Choice

A logistic regression was performed to ascertain binary choice whether respondents wanted to buy travel insurance or not. The logistic regression model was statistically significant, $x^2(3) = 19.377$, $p < .000$. The model explained 13.4% (Nagelkerke R^2) of the variance in binary choice and correctly classified 83.3% of cases.

Especially, I found significant effects on LRUE (*B* = -1.173, *S.E* = .526, *OR* = .309, $p < .026$) and MRUE (*B* = -1.144, *S.E* = .520, *OR* = .318, $p < .028$).

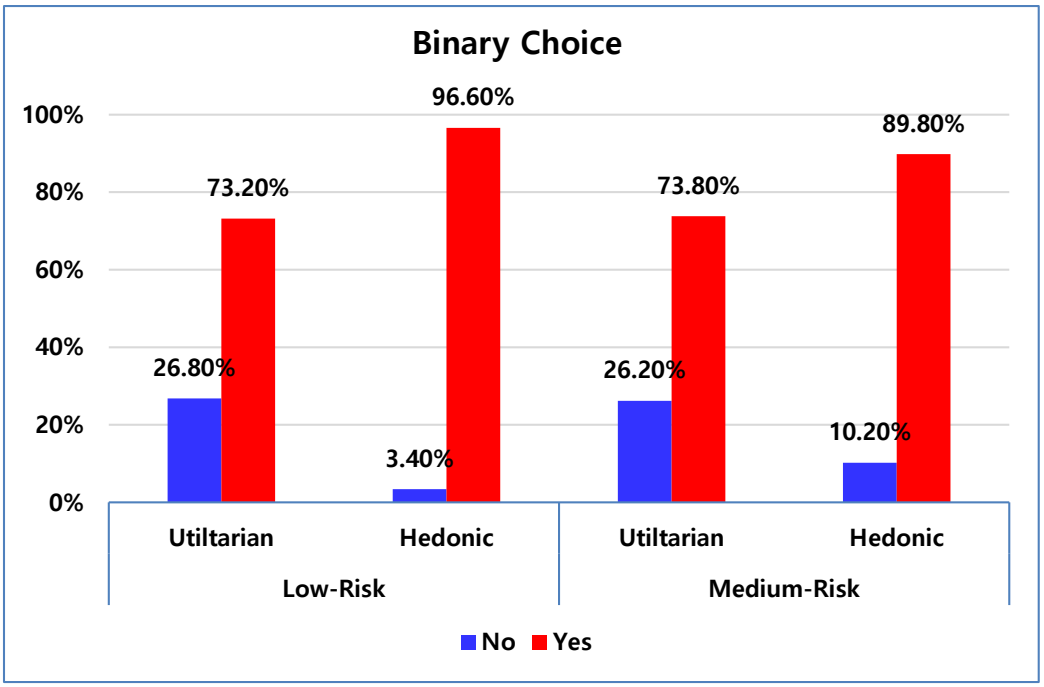
Table 15_(Study 1) Binary Choice

log (Binary Choice) = 2.179 – 1.173 * (LRUE) – 1.144 * (MRUE)

Variable	B	S.E	Wald	Exp(B)	95% CI		Sig.
					Lower	Upper	
MRHE	-	-	13.748	1.000	-	-	.003
LRUE	-1.173	.526	4.975	.309*	.110	.867	.026
LRHE	1.154	.839	1.892	3.170	.613	16.403	.169
MRUE	-1.144	.520	4.846	.318*	.115	.882	.028
Constant	2.179	.431	25.580	8.833	-	-	.000
Chi-square (df), Sig.					19.377 (3), .000		
Chi-square (df) of Hosmer-Lemeshow Test, Sig.					0.000 (2), 1.000		

* $p < .05$.

Figure 4_(Study 1) Binary Choice



Overall, participants showed that they wanted to buy travel insurance to avoid risk (risk-averse attitudes) across conditions. More specifically, those having hedonic-purpose events presented a higher willingness to purchase travel insurance attitudes than utilitarian-purpose events regardless of the risk level. Like the above two-way ANOVA results of willingness to purchase travel insurance, the strongest risk-aversion attitude was found in the condition of LRHE.

4.1.2.4 Decision-Making Reliance on *System 1* (*Heart*) vs. *System 2* (*Head*)

Factor Analysis, Reliability Analysis, and Correlations per Condition

Below, I examine how an individual's relative reliance on decision-making (*System 1* (Heart) vs. *System 2* (Head)) has a decisive effect on the risk attitudes per condition.

When extracting six (6) questions (Intuitively, Deliberately, Quickly, Slowly, Heart, and Head) into two (2) fixed numbers of factors, it was clearly divided into *System 1* (Heart, Intuitively, Quickly) or *System 2* (Head, Deliberately, Slowly) as follows.

In factor analysis, KMO > .5 and Bartlett $p < .05$ are considered appropriate. The Eigen-value must be greater than 1.0, and the factor load value should be greater than 0.4. If the Cronbach α value was too low, the factor was removed, and reliability analysis was conducted again to derive the results.

Table 16_(Study 1) Factor Analysis and Reliability Analysis

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
LRUE	System 2	Deliberately	.868	.757	1.465	36.633	α = .612
		Head	.820	.711			
	System 1	Intuitively	.858	.738	1.426	35.652	α = .574
		Heart	.806	.686			
	KMO (Kaiser-Meyer-Olkin)						.535
	Bartlett' Test of Sphericity				Chi-Square		24.864
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
LRHE	System 2	Slowly	.847	.720	1.447	36.186	α = .595
		Deliberately	.836	.714			
	System 1	Intuitively	.845	.719	1.410	35.258	α = .573
		Heart	.825	.704			
	KMO (Kaiser-Meyer-Olkin)						.510
	Bartlett' Test of Sphericity				Chi-Square		22.789
					df (*p*)		6 (.001)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
MRUE	System 1	Heart	.882	.779	1.798	35.966	α = .738
		Intuitively	.853	.756			
	System 2	Head	.828	.707	1.709	34.178	α = .645
		Slowly	.825	.683			
		Deliberately	.558	.583			
	KMO (Kaiser-Meyer-Olkin)						.577
	Bartlett' Test of Sphericity				Chi-Square		68.962
					df (*p*)		10 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
MRHE	System 1	Intuitively	.924	.853	1.672	41.788	α = .794
		Heart	.888	.831			
	System 2	Deliberately	.909	.827	1.644	41.100	α = .757
		Head	.881	.805			
	KMO (Kaiser-Meyer-Olkin)						.533
	Bartlett' Test of Sphericity				Chi-Square		65.864
					df (*p*)		6 (.000)

The below plots (Figure 5) show the items/variables of *System 1* versus *System 2* in the rotated factor space. It helps us to understand how the items are organized in the common factor space. As shown in Figure 5, it can be seen that the variables of *System 1* versus *System 2* are distantly divided into two areas. It can be explained that respondents clearly understood and answered each question about decision-making reliance on *System 1* versus *System 2*. Table 17 depicts the correlation between all measures.

Figure 5_(Study 1) Component Plot in Rotated Space

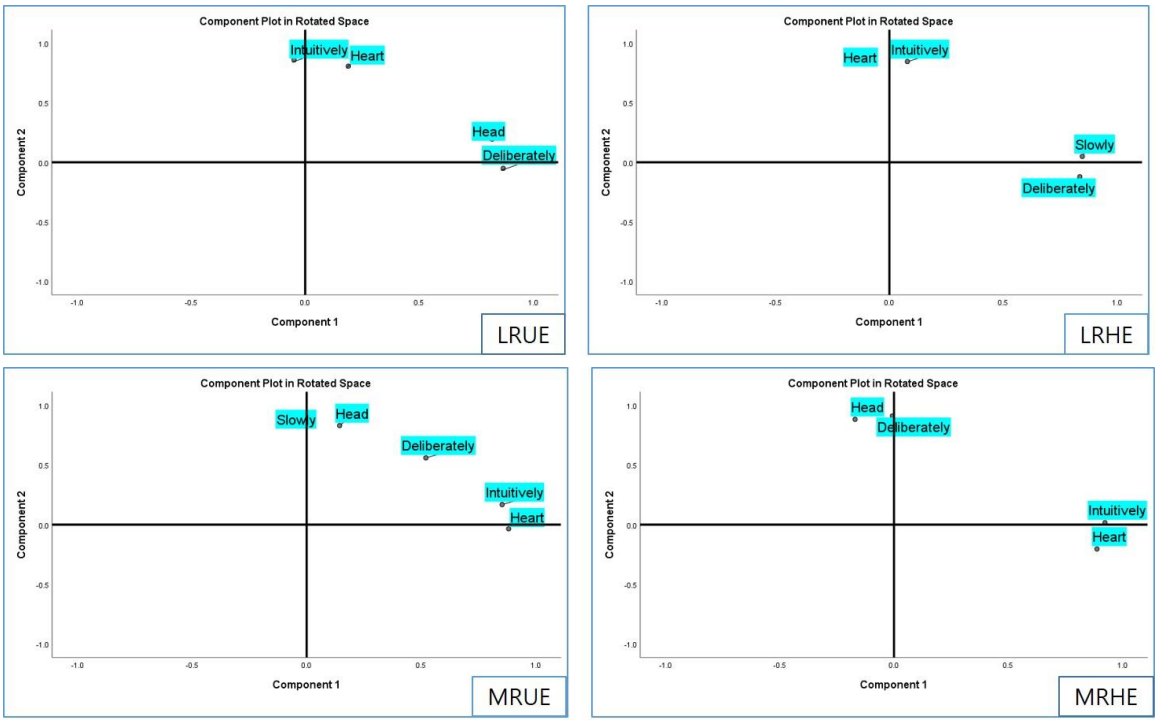


Table 17_(Study 1) Correlation Table

	Variable	Correlation			
L		1. Intuitively	2. Deliberately	3. Heart	4. Head
R	1. Intuitively	1	-.015	.407**	.131
U	2. Deliberately		1	.125	.449**
E	3. Heart			1	.222
	4. Heart				1

	Variable	Correlation			
L		1. Intuitively	2. Deliberately	3. Slowly	4. Heart
R	1. Intuitively	1	-.035	.030	.402**
H	2. Deliberately		1	.431**	-.172
E	3. Slowly			1	-.066
	4. Heart				1

	Variable	Correlation			
M		1. Intuitively	2. Deliberately	3. Slowly	4. Heart
R	1. Intuitively	1	.389**	.079	.585**
U	2. Deliberately		1	.318*	.353**
E	3. Slowly			1	.506
	4. Heart				1

	Variable	Correlation			
M		1. Intuitively	2. Deliberately	3. Slowly	4. Heart
R	1. Intuitively	1	.663**	-.020	-.152
H	2. Deliberately		1	-.195	-.286*
E	3. Slowly			1	.623**
	4. Heart				1

Note: Cells display Pearson's Correlation.

** $p < .01$. Correlation is significant at the 0.01 level (2-tailed).

* $p < .05$. Correlation is significant at the 0.05 level (2-tailed).

Main and Interaction Effects

A two-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) ANOVA conducted on individual's relative reliance on decision-making between *System 1* (Heart, Emotion) versus *System 2* (Head, Reason). This test yielded the expected interaction (F (1, 233) = 4.797, $p < .030$, $\eta^2 = .020$). The main effects for risk level (F (1, 233) = 20.483, $p < .000$, $\eta^2 = .082$) and even type (F (1, 233) = 8.217, $p < .005$, $\eta^2 = .034$) were significant.

Table 18_(Study 1) Tests of Between-Subjects Effects

Dependent Variable: Decision-Making Reliance
Design: Intercept + Risk Level + Event Type + Risk Level * Event Type

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	41.356[a]	3	13.785	11.215	.000	.128
Intercept	6392.889	1	6392.889	5200.847	.000	.958
RiskLevel	25.177	1	25.177	20.483	.000	.082
EventType	10.101	1	10.101	8.217	.005	.034
RiskLevel * EventType	5.897	1	5.897	4.797	.030	.020
Error	282.716	230	1.229			
Total	6737.000	234				
Corrected Total	324.073	233				

a. R Squared = .128 (Adjusted R Squared = .116).

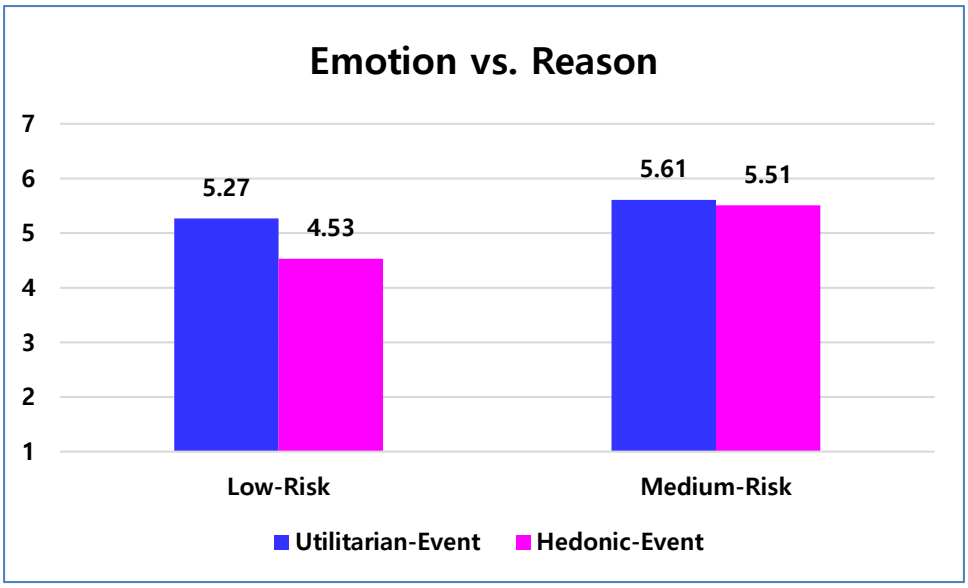
Two-way ANOVA

In the case of LRHE (M = 4.53, SD = .959; F (3, 230) = 11.215, p < .000), it was notable that the decision-making was statistically most emotionally dependent (emotion-based decision-making) than other conditions appear (see Figure 6 and Table 12). Regardless of the level of risk, individuals with hedonic events showed relative emotional reliance when making decisions than those with utilitarian events.

Table 19_(Study 1) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	41.356	3	13.785	11.215	.000
Within Groups	282.716	230	1.229		
Total	324.073	233			

Figure 6_(Study 1) Decision-Making Reliance Between Emotion vs. Reason



Decision-Making Reliance: 1 = '*Using only Emotion*' to 7 = '*Using only Reason*'.

Table 20_(Study 1) Decision-Making Reliance

Conditions	Decision-Making Reliance
LRUE (Low Risk + Utilitarian Event)	Reason
LRHE (Low Risk + Hedonic Event)	Emotion
MRUE (Medium Risk + Utilitarian Event)	Reason
MRHE (Medium Risk + Hedonic Event)	Reason

Post Hoc Analysis

According to the Post Hoc results, the significance value was .000, so the hypothesis was accepted. It presented that there was a significant difference in relative decision-making reliance depending on the groups/conditions. As a result of Scheffe analysis (equal variances assumed), there was a significant difference in all groups.

Also, the condition of LRHE showed the lowest mean on individuals' relative choice reliance (the most emotional decision-making). Furthermore, it can be interpreted that such decision-making led to the most risk-averse attitudes.

Table 21_(Study 1) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Scheffe
Decision-Making Reliance	LRUE (a)	5.27	1.036	11.215/ .000	b > a, d, c
	LRHE (b)	4.53	.959		
	MRUE (c)	5.61	1.159		
	MRHE (d)	5.51	1.251		

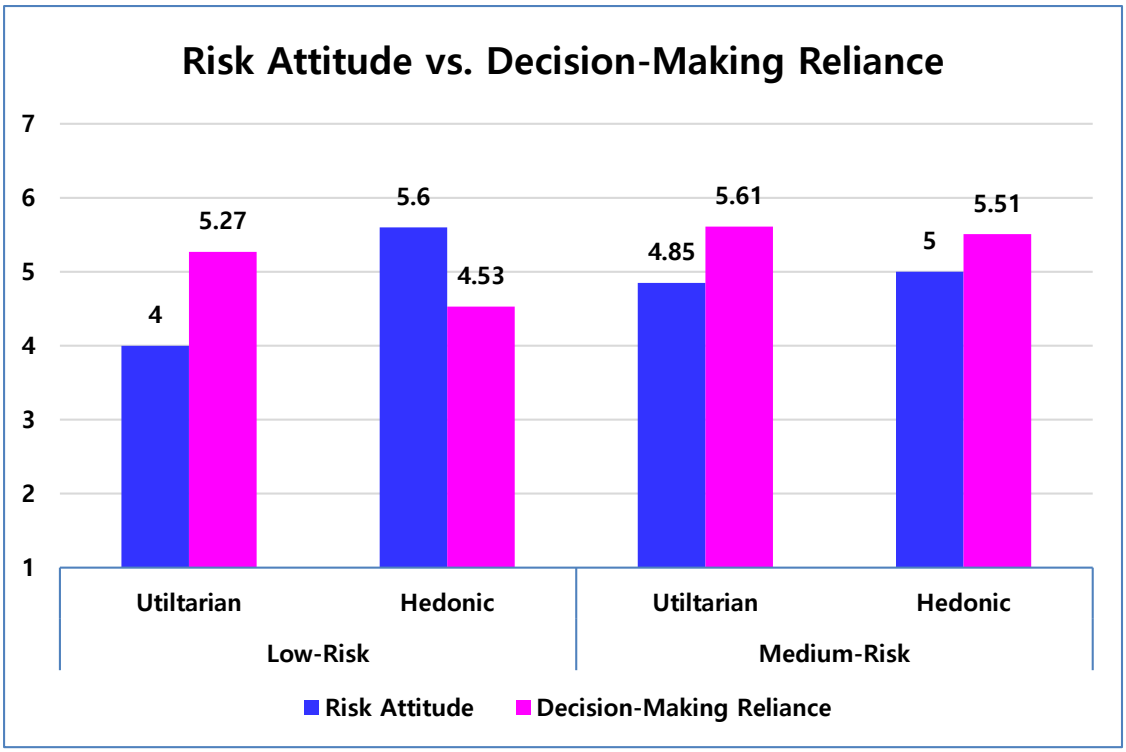
Table 22_(Study 1) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Decision-Making Relative Reliance between Emotion vs. Reason
Scheffe

(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
LRUE	LRHE	.733*	.208	.007	.15	1.32
	MRUE	-.339	.205	.438	-.92	.24
	MRHE	-.241	.207	.717	-.82	.34
LRHE	LRUE	-.733*	.208	.007	-1.32	-.15
	MRUE	-1.072*	.203	.000	-1.64	-.50
	MRHE	-.974*	.205	.000	-1.55	-.40
MRUE	LRUE	.339	.205	.438	-.24	.92
	LRHE	1.072*	.203	.000	.50	1.64
	MRHE	.098	.202	.972	-.47	.67
MRHE	LRUE	.241	.207	.717	-.34	.82
	LRHE	.974*	.205	.000	.40	1.55
	MRUE	-.098	.202	.972	-.67	.47

* The mean difference is significant at the 0.05 level.

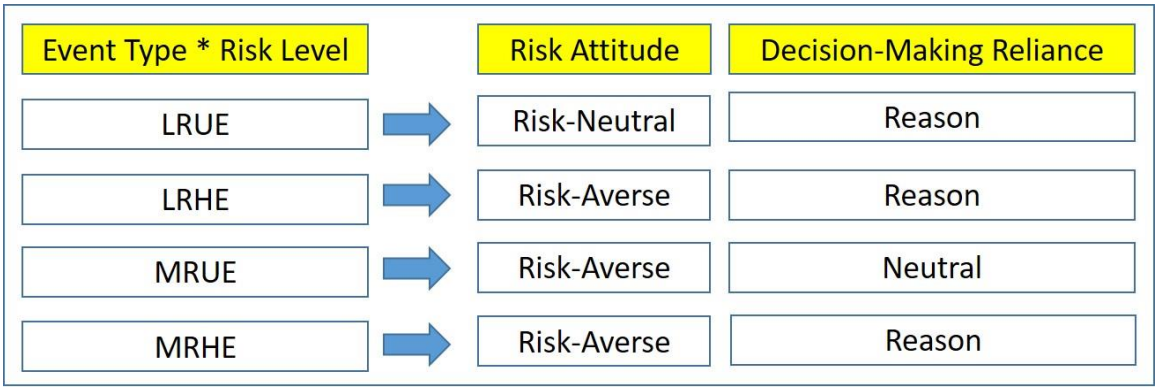
Figure 7_(Study 1) Risk Attitude vs. Decision-Making Reliance



Risk Attitude: 1 = '*Risk-Taking*' to 7 = '*Risk-Averse*'
Decision-Making Reliance: 1 = '*Using only Emotion (System 1)*' to 7 = '*Using only Reason (System 2)*'.

In conclusion, while the LRHE condition showed the strongest willingness to purchase travel insurance in order to avoid risk, the reliance on the choice turned out to be more dependent on emotion than other conditions. Strikingly, under low-risk probability level, when comparing utilitarian-purpose event and hedonic-purpose event, the decision was made based on relative emotions in the case of a hedonic-purpose event reliance (*System 1*). On the other hand, under the medium-risk probability level, the decision-making base was similar (*System 2*).

Table 23_(Study 1) Research Model and Results



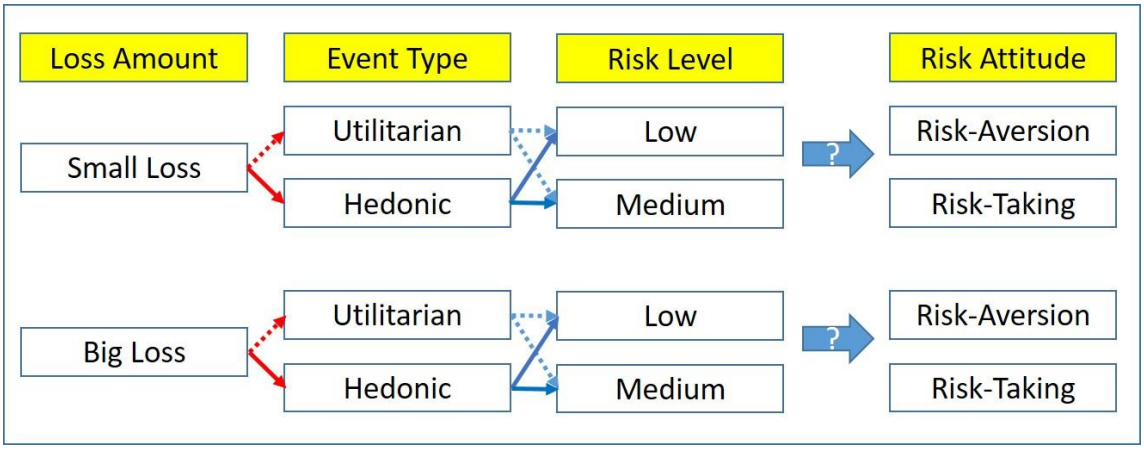
In conclusion, as shown in the above table, how people perceive risks and show their attitudes in different situations. Above all, LRHE shows that highest willingness to purchase insurance and risk-averse attitude, which is particularly remarkable (the core of this study, LOW RISK + HEDONIC EVENT), can be explained through *Construal Level Theory* and *Prospect Theory* in the background theory of this study (see Table 4). It is noteworthy that even at a low-probability risk level, people tend to avoid it, especially in HEDONIC events than in UTILITARIAN events. Moreover, these results also strongly support *Risk-as-Feeling Hypothesis.* This hypothesis is that if people perceive a risk emotionally, it becomes insensitive to the level of risk probability. Therefore, individuals show strong risk-averse attitudes even at a low-level of risk probability. This will be discussed more in the following study.

4.2 Study 2: Small-Loss versus Big-Loss, Consumer Decision-Making under Risk

In general, decisions are not decided by a single trait. However, they vary as a function of which the decision domain (gain domain versus loss domain), what the decision is about, who is a subject facing a risky event, the situational difference (for example, the level of risk probability or risky event type, respectively, or their interaction), the extent of loss/damage, the decision is emotionally applied or not, etc. In particular, each of these factors is a very import area, and each research has been conducted, but not all of them have been actively studied organically. No existing research dealt with the interaction among risk probability level, risky event type, and the extent of loss to consumer decision-making under risk in the loss domain.

In Study 1, the interaction between risk probability level and risky event type for decision-making under risk in the loss domain was investigated. We have successfully observed that the combination of these two variables yields different results than conventional economic theory.

Figure 8_(Study 2) Research Model



In Study 2, this research adds one more crucial independent variable (the amount of loss-big loss versus small loss; IV 3) to explore how people make decisions under risk.

4.2.1 Method and Procedure

This study employed a 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose Event vs. Hedonic-Purpose Event) X 2 (Loss Amount: Small-Loss vs. Big-Loss) between-subjects design. Participants (n = 480) were recruited from Amazon Mechanical Turk (MTurk). I removed participants who failed to answer the attention check question correctly ("Please select strongly disagree."). The final sample had 395 participants. 65.8% (260 participants) were male.

First, participants were randomly assigned and asked to read one of eight (8) scenario conditions (SLRUE: Small Loss + Low-Probability Risk + Utilitarian-Purpose Event, SLRHE: Small Loss + Low-Probability Risk + Hedonic-Purpose Event, SMRUE: Small Loss + Medium-Probability Risk + Utilitarian-Purpose Event, SMRHE: Small Loss + Medium-Probability Risk + Hedonic-Purpose Event, BLRUE: Big Loss + Low-Probability Risk + Utilitarian-Purpose Event, BLRHE: Big Loss + Low-Probability Risk + Hedonic-Purpose Event, BMRUE: Big Loss + Medium-Probability Risk + Utilitarian-Purpose Event, and BMRHE: Big Loss + Medium-Probability Risk + Hedonic-Purpose Event) of flood insurance choice. In the condition of small-loss (vs. big-loss), low (vs. medium) probability of flood risk, and utilitarian-purpose (vs. hedonic-purpose) event, participants read the following:

Imagine. You will buy a duplex ($300,000) in *City Y* as your everyday house (vs. as your vacation house; event type). For this reason, you have a concern about flood insurance. According to FEMA (Federal Emergency Management Agency), *City Y* has a low-risk flood area (vs. a medium-risk flood area; risk probability level) compared to most other states in the US. However, national statistics show that if a flood occurs in a certain area, an average flood claim was $3,000 (vs. you will lose all of your property ($300,000); loss amount). You have a chance of whether to buy flood insurance or not. With flood insurance, your property damage can be recovered. The average cost of a flood insurance policy is $12.5 per month ($150 per year). Would you want to buy flood insurance?

Table 24_(Study 2) Event Type, Risk Probability Level, and The Amount of Loss

Event Type		Risk Probability Level		The Amount of Loss	
Utilitarian-Purpose Event	Hedonic-Purpose Event	Low-Probability Risk	Medium-Probability Risk	Small-Loss	Big-Loss
Everyday House	Vacation House	Low-Probability Flood Risk Area	Medium-Probability Flood Risk Area	Small/Limited Loss ($3,000)	Whole Property Loss ($300,000)

After reading one of eight (8) scenarios, as a manipulation check for event type, risk probability level, and loss amount, I asked participants to rate their perception of event type (utilitarian-purpose event vs. hedonic-purpose event), risk probability level (low-probability risk vs. medium-probability risk), and the amount of loss (small-loss vs. big-loss) and use on a 7-point scale: “The scenario's event is close to the attributes of” (1 = ‘*Practical/Productive Event*’ to 7 = ‘*Enjoyable/Fun Event’*), “From the scenario, what

do you think the probability of risk?" (1 = '*Low-Probability Risk*', 4 = '*Medium-Probability Risk*', 7 = '*High-Probability Risk*'), and "From the scenario, if the flood risk happens, what do you think the amount of the loss?" (1= '*Small-Loss'* to 7 = '*Big-Loss'*), respectively.

Next, I asked participants to mark their relative willingness to purchase insurance by answering the question: "Please rate your willingness to purchase Flood Insurance." on a 7-point scale (1 = '*Definitely Won't Buy* (*No*)', 4 = '*Neutral'*, 7 = '*Definitely Will Buy* (*Yes*)'). In addition, I measured participants' binary choice: "Do you want to buy Flood Insurance?" (1 = '*No*', 2 = '*Yes*').

On the next page of the survey, subsequent questions about decision-making reliance and demographic questions used the same method as Study 1.

Finally, participants answered standard demographic questions. Participants received $0.50 for their participation.

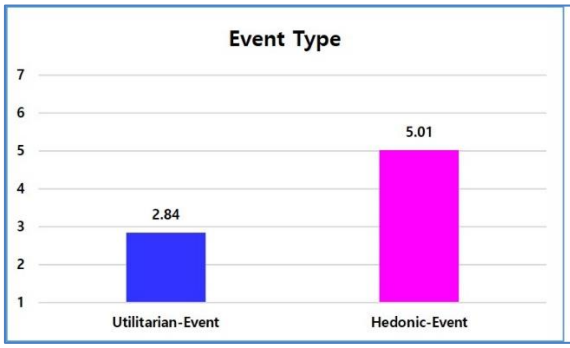
4.2.2 Results and Discussion

4.2.2.1 Manipulation Check.

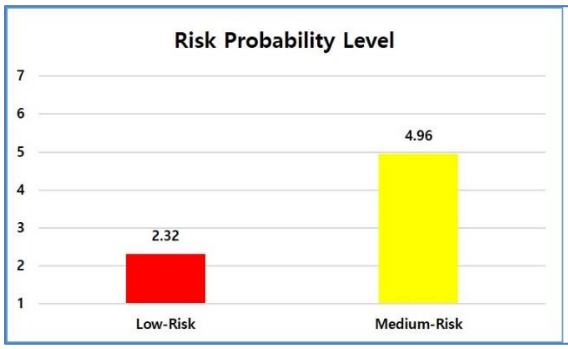
The manipulation of event types was successful in showing that participants perceived 'everyday house' (M = 2.84) as significantly utilitarian-purpose event than that in the hedonic condition 'vacation house' (M = 5.01; F (1, 393) = 180.840, p < .000). And, the manipulation of risk probability levels was also successful in showing that participants perceived two distinct probability of flood risk; low-probability risk (M = 2.32) verse medium-probability risk (M = 4.96; F = (1, 393) = 551.518, p < .000).

Finally, the manipulation of loss amount was also successful in showing that participants perceived two distinct amount of loss; small-loss (M = 2.46) verse big-loss (M = 5.34; F = (1, 393) = 546.882, p < .000).

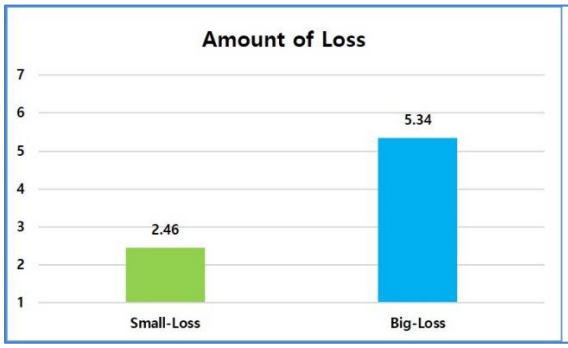
Figure 9_(Study 2) Manipulation Check of Event Type, Risk Probability Level, and Loss Amount



Factor	Mean	S.E	F-value/Sig.
Utilitarian-Event	2.84	1.526	180.840/ .000
Hedonic-Event	5.01	1.674	



Factor	Mean	S.E	F-value/Sig.
Low-Risk	2.32	1.057	551.518/ .000
Medium-Risk	4.96	1.175	



Factor	Mean	S.E	F-value/Sig.
Small-Loss	2.46	.914	546.882/ .000
Big-Loss	5.34	1.465	

Event Type: 1 = '*Practical/Productive Event*' to 7 = '*Enjoyable/Fun Event*'.
Risk Probability Level: 1 = '*Low-Probability Risk*' to 7 = '*High-Probability Risk*'.
The Amount of Loss: 1 = '*Small-Loss*' to 7 = '*Big-Loss*'.

4.2.2.2 Willingness to Purchase Flood Insurance

Main and Interaction Effects

A multi-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) X 2 (Amount of Loss: Small-Loss vs. Big-Loss) ANOVA conducted on participants' willingness to purchase flood insurance yielded the expected interaction (F (1, 394) = 9.324, $p < .002$, $\eta^2 = .024$).

Table 25_(Study 2) Tests of Between-Subjects Effects

Dependent Variable: Willingness to Purchase Flood Insurance
Design: Intercept + Risk Level + Event Type + Loss Amount + Risk Level * Event Type + Risk Level * Loss Amount + Event Type * Loss Amount + Risk Level * Event Type * Loss Amount

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	146.270[a]	7	20.896	12.563	.000	.185
Intercept	10997.136	1	10997.136	6611.972	.000	.945
RiskLevel	4.028	1	4.028	2.422	.120	.006
EventType	108.021	1	108.021	64.947	.000	.144
LossAmount	19.647	1	19.647	11.812	.001	.030
RiskLevel * EventType	.001	1	.001	.001	.977	.000
RiskLevel * LossAmount	.001	1	.001	.001	.977	.000
EventType * LossAmount	.485	1	.485	.292	.589	.001
RiskLevel * EventType * LossAmount	15.508	1	15.508	9.324	.002	.024
Error	643.665	387	1.663			
Total	11859.000	395				
Corrected Total	789.934	394				

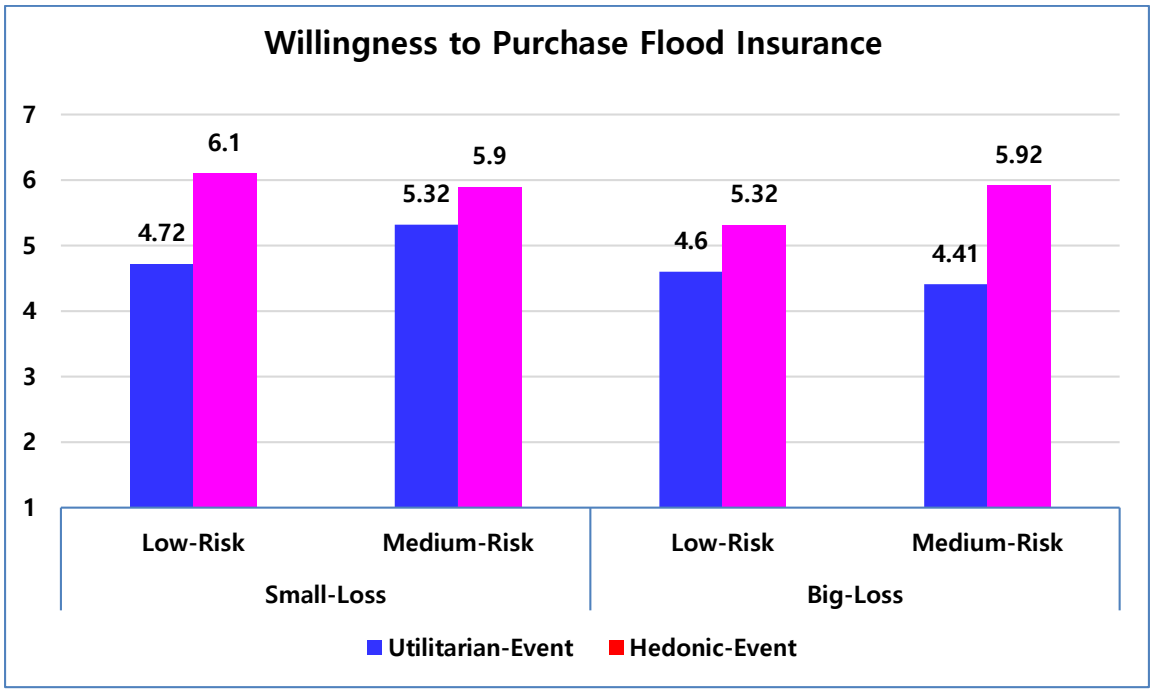
a. R Squared = .185 (Adjusted R Squared = .170).

The main effects for event type (F (1, 394) = 64.947, p < .000, η^2 = .144) and loss amount (F (1, 394) = 11.812, p < .001, η^2 = .030) were significant, whereas the main effect for risk level (F (1, 394) = 2.422, p < .120, η^2 = .006) was not significant.

Multi-Way ANOVA

Overall, the results of multi-way ANOVA indicated that participants showed relatively strong risk-averse attitudes across all conditions. When comparing small-loss and big-loss, individuals were more willing to purchase insurance to protect against risks in the case of small-loss.

Figure 10_(Study 2) Willingness to Purchase Flood Insurance



Willingness: 1 = '*Definitely Won't Buy* (*No*)' to 7 = '*Definitely Will Buy* (*Yes*)'.

Table 26_(Study 2) Risk Attitude per condition interpreted through Willingness to Purchase Insurance of Figure 10

Conditions		Risk Attitude
Small-Loss	LRUE	(weak) Risk-Averse
	LRHE	(the strongest) Risk-Averse
	MRUE	Risk-Averse
	MRHE	Risk-Averse
Big-Loss	LRUE	(weak) Risk-Averse
	LRHE	Risk-Averse
	MRUE	(the weakest) Risk-Averse
	MRHE	Risk-Averse

In particular, participants with SLRHE presented statistically the greatest willingness to purchase flood insurance than those with other conditions ($F(7, 387) = 12.563$, $p < .000$). Inversely, unlike the existing economic theory, those with BMRUE ($M = 4.41$, $SD = 1.148$) showed the lowest intention to buy flood insurance compared to other conditions.

Table 27_(Study 2) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	146.270	7	20.896	12.563	.000
Within Groups	643.665	387	1.663		
Total	789.934	394			

Post Hoc Analysis

According to the Post Hoc results, the significance value was .000, so the hypothesis was accepted. It was found that there was a significant difference in willingness to purchase insurance per condition.

Table 28_(Study 2) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Scheffe
Willingness to Purchase Flood Insurance	SLRUE (a)	4.72	1.591	12.563/ .000	b > g, e, a
	SLRHE (b)	6.10	1.375		
	SMRUE (c)	5.32	1.235		
	SMRHE (d)	5.90	1.372		
	BLRUE (e)	4.60	1.272		
	BLRHE (f)	5.32	.872		
	BMRUE (g)	4.41	1.148		
	BMRHE (h)	5.92	1.338		

Since equal variances assumed, Scheffe was applied for Post Hoc analysis. In detail, as the result of Scheffe analysis, there was a significant difference among groups in SLRHE, SLRUE, BLRUE, and BMRUE in willingness to purchase flood insurance against risks.

Table 29_(Study 2) Post Hoc Analysis: Multiple Comparison

Dependent variable: Willingness to Purchase Flood Insurance
Scheffe

(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SLRUE	SLRHE	-1.378*	.257	.000	-2.35	-.41
	SMRUE	-.599	.262	.632	-1.59	.39
	SMRHE	-1.176*	.261	.006	-2.16	-.19
	BLRUE	.124	.255	1.000	-.84	1.09
	BLRHE	-.601	.254	.590	-1.56	.36
	BMRUE	.311	.267	.987	-.69	1.32
	BMRHE	-1.200*	.258	.003	-2.17	-.23
SLRHE	SLRUE	1.378*	.257	.000	.41	2.35
	SMRUE	.779	.261	.262	-.20	1.76
	SMRHE	.202	.259	.999	-.78	1.18
	BLRUE	1.502*	.254	.000	.54	2.46

	BLRHE	.777	.253	.226	-.18	1.73
	BMRUE	1.689*	.265	.000	.69	2.69
	BMRHE	.178	.257	1.000	-.79	1.15
SMRUE	SLRUE	.599	.262	.632	-.39	1.59
	SLRHE	-.779	.261	.262	-1.76	.20
	SMRHE	-.577	.265	.690	-1.58	.42
	BLRUE	.723	.260	.357	-.26	1.70
	BLRHE	-.002	.258	1.000	-.98	.97
	BMRUE	.910	.271	.129	-.11	1.93
	BMRHE	-.601	.262	.629	-1.59	.39
SMRHE	SLRUE	1.176*	.261	.006	.19	2.16
	SLRHE	-.202	.259	.999	-1.18	.78
	SMRUE	.577	.265	.690	-.42	1.58
	BLRUE	1.300*	.258	.001	.33	2.27
	BLRHE	.575	.257	.659	-.39	1.54
	BMRUE	1.487*	.269	.000	.47	2.50
	BMRHE	-.024	.261	1.000	-1.01	.96
BLRUE	SLRUE	-.124	.255	1.000	-1.09	.84
	SLRHE	-1.502*	.254	.000	-2.46	-.54
	SMRUE	-.723	.260	.357	-1.70	.26
	SMRHE	-1.300*	.258	.001	-2.27	-.33
	BLRHE	-.725	.252	.311	-1.67	.23
	BMRUE	.187	.264	.999	-.81	1.18
	BMRHE	-1.324*	.255	.000	-2.29	-.36
BLRHE	SLRUE	.601	.254	.590	-.36	1.56
	SLRHE	-.777	.253	.226	-1.73	.18
	SMRUE	.002	.258	1.000	-.97	.98
	SMRHE	-.575	.257	.659	-1.54	.39
	BLRUE	.725	.252	.311	-.23	1.67
	BMRUE	.912	.263	.104	-.08	1.90
	BMRHE	-.599	.254	.593	-1.56	.36
BMRUE	SLRUE	-.311	.267	.987	-1.32	.69
	SLRHE	-1.689*	.265	.000	-2.69	-.69
	SMRUE	-.910	.271	.129	-1.93	.11
	SMRHE	-1.487*	.269	.000	-2.50	-.47
	BLRUE	-.187	.264	.999	-1.18	.81
	BLRHE	-.912	.263	.104	-1.90	.08
	BMRHE	-1.511*	.267	.000	-2.52	-.51
BMRHE	SLRUE	1.200*	.258	.003	.23	2.17

	SLRHE	-.178	.257	1.000	-1.15	.79
	SMRUE	.601	.262	.629	-.39	1.59
	SMRHE	.024	.261	1.000	-.96	1.01
	BLRUE	1.324*	.255	.000	.36	2.29
	BLRHE	.599	.254	.593	-.36	1.56
	BMRUE	1.511*	.267	.000	.51	2.52

* The mean difference is significant at the 0.05 level.

4.2.2.3 Binary Choice

A logistic regression was performed to confirm binary choice whether individuals wanted to buy insurance or not. The logistic regression model was statistically significant, $x^2(7) = 21.155$, $p < .000$. The model explained 10% (Nagelkerke R^2) of the variance in binary choice and correctly classified 87.6% of cases.

Table 30_(Study 2) Binary Choice

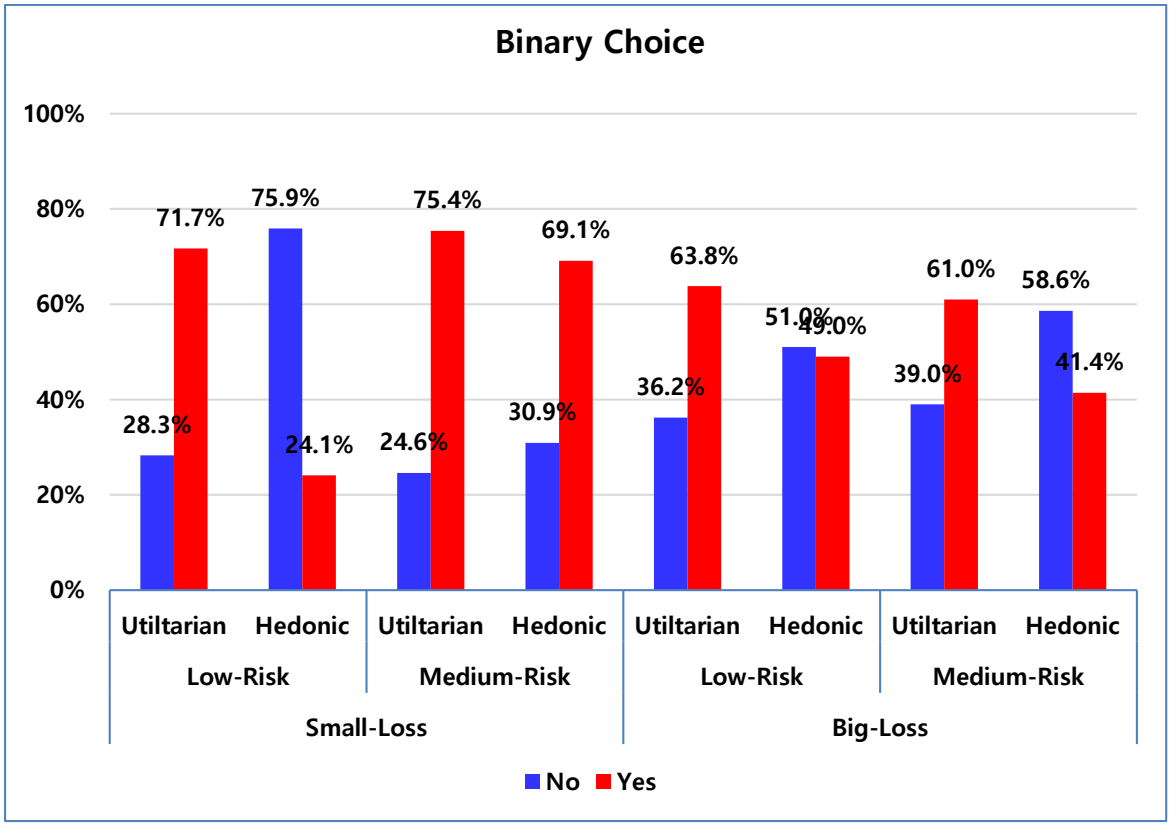
log (Binary Choice) = 3.892 – 2.739 * (SLRUE) - 2.308 * (SMRUE) - 2.187 * (BLRUE) -2.433 (BLRHE)

Variable	B	S.E	Wald	Exp(B)	95% CI		Sig.
					Lower	Upper	
BMRHE			15.398				.031
SLRUE	-2.739	1.063	6.639	.065*	.008	.519	.010
SLRHE	-1.673	1.115	2.252	.188	.021	1.668	.133
SMRUE	-2.308	1.082	4.548	.099*	.012	.830	.033
SMRHE	-.756	1.242	.371	.469	.041	5.353	.542
BLRUE	-2.187	1.081	4.095	.112*	.013	.934	.043
BLRHE	-2.433	1.069	5.177	.088*	.011	.714	.023
BMRUE	-1.277	1.174	1.183	.279	.028	2.784	.277
Constant	3.892	1.010	14.843	49.000			.000
Chi-square (df), Sig.					21.155 (7), .000		
Chi-square (df) of Hosmer-Lemeshow Test, Sig.					0.000 (6), 1.000		

* $p < .05$.

Especially, I found significant effects on SLRUE (B = -2.739, $S.E$ = 1.063, OR = .065, $p < .010$), SMRUE (B = -2.308, $S.E$ = 1.082, OR = .099, $p < .033$), BLRUE (B = -2.187, $S.E$ = 1.081, OR = .112, $p < .043$), and BLRHE (B = -2.433, $S.E$ = 1.069, OR = .088, $p < .023$).

Figure 11_(Study 2) Binary Choice



Binary Choice: 1 = '*No*', 2 = '*Yes*'.

In all scenarios, participants responded that they would insure insurance. These results showed much stronger risk-aversion attitudes in binary choice than in the willingness to purchase questions (see 4.2.2.2). Interestingly, it turned out that

respondents with hedonic-event showed a stronger buying intention compared to utilitarian-event across all conditions, excluding Big-Loss with Low-Risk condition.

4.2.2.4 Decision-Making Reliance on System 1 (Heart) vs. System 2 (Head)

Factor Analysis, Reliability Analysis, and Correlations per Condition

As in Study 1, the same analysis was conducted. In factor analysis, KMO (> .5), Bartlett (p < .05), Eigen-value (> 1.0), and the factor load value (> .4) were considered appropriate.

Table 31_(Study 2) Factor Analysis and Reliability Analysis

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SLRUE	System 1	Heart	.937	.883	1.764	44.108	α = .853
		Intuitively	.936	.878			
	System 2	Head	.911	.837	1.667	41.670	α = .790
		Deliberately	.911	.834			
	KMO (Kaiser-Meyer-Olkin)						.489
	Bartlett' Test of Sphericity				Chi-Square		69.115
					df (p)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SLRHE	System 1	Heart	.912	.833	1.625	40.634	α = .754
		Intuitively	.876	.810			
	System 2	Head	.887	.800	1.611	40.275	α = .743
		Deliberately	.883	.793			
	KMO (Kaiser-Meyer-Olkin)						.560
	Bartlett' Test of Sphericity				Chi-Square		49.719
					df (p)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SMRUE	System 1	Heart	.846	.738	2.140	35.660	α = .800
		Intuitively	.839	.715			
		Quickly	.819	.692			
	System 2	Slowly	.841	.724	1.938	32.300	α = .720
		Head	.792	.649			
		Deliberately	.740	.559			
	KMO (Kaiser-Meyer-Olkin)						.704
	Bartlett' Test of Sphericity				Chi-Square		75.850
					df (*p*)		15 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SMRHE	System 1	Intuitively	.819	.691	1.775	35.492	α = .628
		Heart	.728	.661			
		Quickly	.721	.559			
	System 2	Head	.871	.765	1.640	32.809	α = .691
		Deliberately	.832	.739			
	KMO (Kaiser-Meyer-Olkin)						.504
	Bartlett' Test of Sphericity				Chi-Square		43.815
					df (*p*)		10 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BLRUE	System 1	Heart	.904	.818	1.629	40.737	α = .758
		Intuitively	.895	.811			
	System 2	Deliberately	.859	.738	1.461	36.522	α = .627
		Head	.844	.724			
	KMO (Kaiser-Meyer-Olkin)						.520
	Bartlett' Test of Sphericity				Chi-Square		37.198
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BLRH							

E	System 1	Heart	.892	.693	1.809	36.171	α = .692
		Intuitively	.792	.662			
		Quickly	.663	.625			
	System 2	Head	.896	.816	1.795	35.899	α = .790
		Deliberately	.880	.808			
	KMO (Kaiser-Meyer-Olkin)						.711
	Bartlett' Test of Sphericity				Chi-Square		66.911
					df (*p*)		10 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BMRUE	System 2	Deliberately	.858	.737	1.542	38.551	α = .648
		Head	.844	.728			
	System 1	Heart	.883	.800	1.488	37.196	α = .637
		Intuitively	.832	.765			
	KMO (Kaiser-Meyer-Olkin)						.516
	Bartlett' Test of Sphericity				Chi-Square		25.887
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BMRHE	System 2	Head	.931	.876	1.794	44.850	α = .871
		Deliberately	.911	.890			
	System 1	Intuitively	.909	.771	1.577	39.418	α = .733
		Quickly	.825	.833			
	KMO (Kaiser-Meyer-Olkin)						.617
	Bartlett' Test of Sphericity				Chi-Square		71.558
					df (*p*)		6 (.000)

As shown in Figure 12, it presented that the variables between *System 1* versus *System 2* are clearly divided into two areas. Like Study 1, respondents distantly understood and answered each question about decision-making reliance on *System 1* versus *System 2*.

Figure 12_(Study 2) Component Plot in Rotated Space

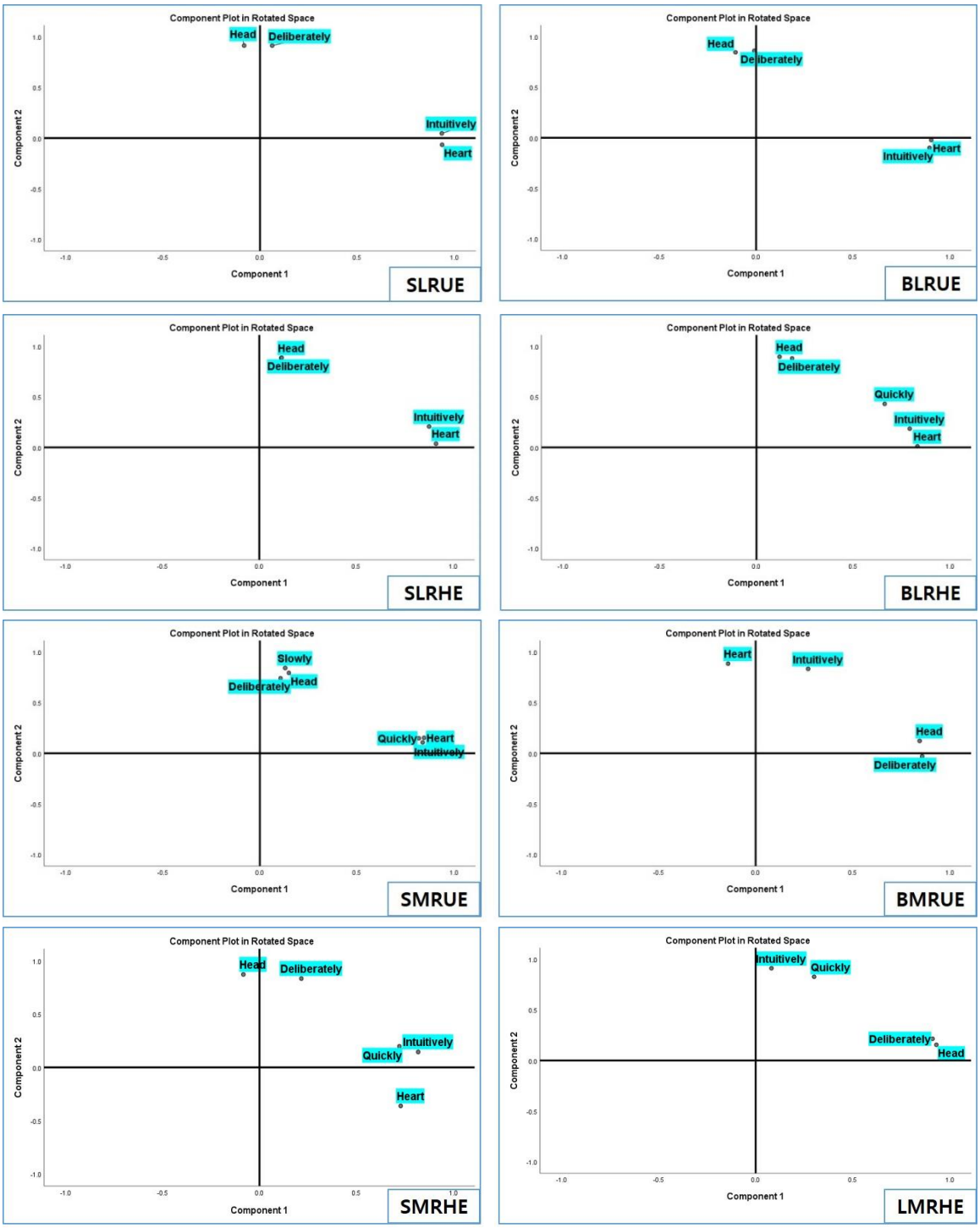


Table 32_(Study 2) SLRUE Correlation Table

	Variable	Correlations			
		1. Intuitively	2. Heart	3. Head	4. Deliberately
S L R U E	1. Intuitively	1	.756**	-.013	.064
	2. Heart		1	-.133	.009
	3. Head			1	.661**
	4. Deliberately				1

	Variable	Correlations			
		1. Heart	2. Intuitively	3. Head	4. Deliberately
S L R H E	1. Heart	1	.629**	.142	.166
	2. Intuitively		1	.279*	.249
	3. Head			1	.597**
	4. Deliberately				1

	Variable	Correlations					
		1. Intuitively	2. Deliberately	3. Quickly	4. Slowly	5. Heart	6. Head
S M R U E	1. Intuitively	1	.143	.540**	.234	.597**	.214
	2. Deliberately		1	.240	.459**	.197	.373**
	3. Quickly			1	.156	.579**	.268
	4. Slowly				1	.279	.559**
	5. Heart					1	.202
	6. Head						1

	Variable	Correlations				
		1. Head	2. Deliberately	3. Quickly	4. Intuitively	5. Heart
S M R H E	1. Head	1	.528**	-.001	.120	-.255
	2. Deliberately		1	.268	.171	.-049
	3. Quickly			1	.432**	.231
	4. Intuitively				1	.427**
	5. Heart					1

	Variable	Correlations			
		1. Head	2. Deliberately	3. Heart	4. Intuitively
B L R U E	1. Head	1	.458**	-.113	-.151
	2. Deliberately		1	-.047	-.104
	3. Heart			1	.627**
	4. Intuitively				1

	Variable	Correlations				
		1. Head	2. Deliberately	3. Quickly	4. Intuitively	5. Heart
BLRHE	1. Head	1	.659**	.383**	.272*	.169
	2. Deliberately		1	.428**	.290*	.217
	3. Quickly			1	.478**	.406**
	4. Intuitively				1	.443**
	5. Heart					1

	Variable	Correlations			
		1. Intuitively	2. Heart	3. Deliberately	4. Head
BMRUE	1. Intuitively	1	.484**	.168	.258
	2. Heart		1	-.070	.009
	3. Deliberately			1	.479**
	4. Head				1

	Variable	Correlations			
		1. Intuitively	2. Quickly	3. Deliberately	4. Head
BMRHE	1. Intuitively	1	.579**	.299*	.235
	2. Quickly		1	.406**	.395**
	3. Deliberately			1	.772**
	4. Head				1

Note: Cells display Pearson's Correlation.

** $p < .01$. Correlation is significant at the 0.01 level (2-tailed).

* $p < .05$. Correlation is significant at the 0.05 level (2-tailed).

Main and Interaction Effects

A multi-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) X 2 (Amount of Loss: Small-Loss vs. Big-Loss) ANOVA conducted on individuals' relative reliance on decision-making between emotion vs. reason. This test yielded the expected interaction (F (1, 394) = 4.351, $p < .038$, $\eta^2 = .011$). The main effects for event type (F (1, 394) = 3.979, $p < .047$, $\eta^2 = .010$) and loss amount (F (1, 394) = 37.617, $p < .000$,

η^2 = .089) were significant, whereas the main effect for risk level (F (1, 394) = 1.168, p < .280, $\eta^2 = .003$) was not significant.

Table 33_(Study 2) Tests of Between-Subjects Effects

Dependent Variable: Decision-Making Reliance

Design: Intercept + Risk Level + Event Type + Loss Amount + Risk Level * Event Type + Risk Level * Loss Amount + Event Type * Loss Amount + Risk Level * Event Type * Loss Amount

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	84.003[a]	7	12.000	10.801	.000	.163
Intercept	6311.664	1	6311.664	5680.666	.000	.936
RiskLevel	1.298	1	1.298	1.168	.280	.003
EventType	4.421	1	4.421	3.979	.047	.010
LossAmount	41.796	1	41.796	37.617	.000	.089
RiskLevel * EventType	3.312	1	3.312	2.981	.085	.008
RiskLevel * LossAmount	29.694	1	29.694	26.726	.000	.065
EventType * LossAmount	.604	1	.604	.543	.462	.001
RiskLevel * EventType * LossAmount	4.835	1	4.835	4.351	.038	.011
Error	429.987	387	1.111			
Total	6850.000	395				
Corrected Total	513.990	394				

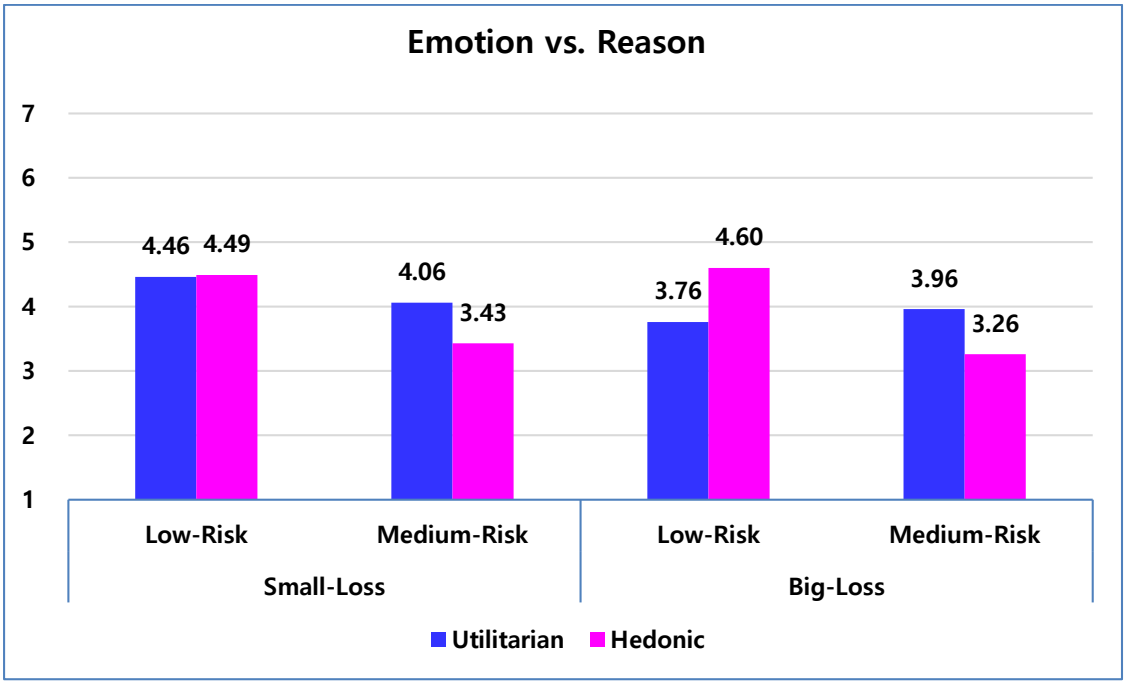
a. R Squared = .163 (Adjusted R Squared = .148).

Multi-way ANOVA

The most striking result is that when comparing the small-loss and the big-loss, in the case of the big-loss, decisions were made based on emotions relatively more than the small-loss conditions. Excluding only the case for SLRHE condition, big-loss conditions tended to make decisions based on emotions relatively more than small-loss ones. In

particular, BMRHE (M = 3.26, SD = 0.723; F (7, 387) = 10.801, p < .000) seems to have made the most emotional decision.

Figure 13_(Study 2) Decision-Making Reliance between Emotion vs. Reason



Decision-Making Reliance: 1 = '*Using only Emotion*' to 7 = '*Using only Reason*'.

Table 34_(Study 2) Decision-Making Reliance

Conditions		Decision-Making Reliance
Small-Loss	LRUE	Reason
	LRHE	Reason
	MRUE	Neutral
	MRHE	Emotion
Big-Loss	LRUE	Emotion
	LRHE	Reason
	MRUE	Emotion
	MRHE	Emotion

Table 35_(Study 2) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	84.003	7	12.000	10.801	.000
Within Groups	429.987	387	1.111		
Total	513.990	394			

Post Hoc Analysis

It was found that there was a significant difference in the decision-making base, depending on the groups/conditions ($p < .000$). In detail, the condition of BMRHE showed the lowest mean on the participant's relative emotional choice reliance. As a result of Dunnett T3 (equal variances not assumed), there was a significant difference among SLRUE, BMRHE, BMRUE, and SLRHE conditions.

Table 36_(Study 2) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Dunnett T3
Decision-Making Reliance	SLRUE (a)	4.46	1.232	10.801/ .000	a > h, g, b
	SLRHE (b)	3.76	.681		
	SMRUE (c)	4.49	1.214		
	SMRHE (d)	4.60	1.364		
	BLRUE (e)	4.06	1.110		
	BLRHE (f)	3.96	1.109		
	BMRUE (g)	3.43	.759		
	BMRHE (h)	3.26	.723		

Table 37_(Study 2) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Decision-Making Relative Reliance between Emotion vs. Reason
Dunnett T3

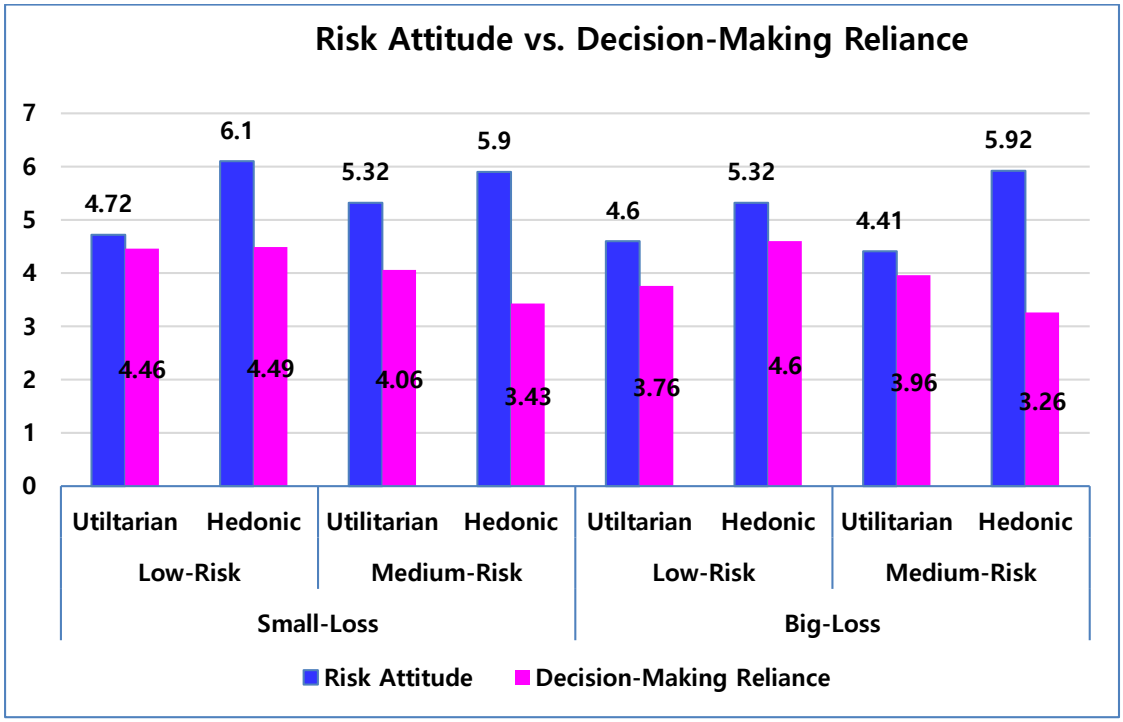
(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SLRUE	SLRHE	.695*	.199	.021	.06	1.34

	SMRUE	-.029	.248	1.000	-.82	.77
	SMRHE	-.144	.263	1.000	-.99	.70
	BLRUE	.402	.233	.903	-.34	1.15
	BLRHE	.498	.231	.596	-.24	1.24
	BMRUE	1.028*	.209	.000	.36	1.70
	BMRHE	1.200*	.202	.000	.55	1.85
SLRHE	SLRUE	-.695*	.199	.021	-1.34	-.06
	SMRUE	-.725*	.201	.016	-1.37	-.08
	SMRHE	-.839*	.219	.008	-1.55	-.13
	BLRUE	-.293	.181	.947	-.87	.29
	BLRHE	-.198	.180	1.000	-.77	.38
	BMRUE	.333	.149	.524	-.15	.81
	BMRHE	.505*	.140	.013	.06	.95
SMRUE	SLRUE	.029	.248	1.000	-.77	.82
	SLRHE	.725*	.201	.016	.08	1.37
	SMRHE	-.115	.265	1.000	-.96	.73
	BLRUE	.432	.235	.841	-.32	1.18
	BLRHE	.527	.234	.504	-.22	1.27
	BMRUE	1.058*	.211	.000	.38	1.74
	BMRHE	1.229*	.204	.000	.57	1.89
SMRHE	SLRUE	.144	.263	1.000	-.70	.99
	SLRHE	.839*	.219	.008	.13	1.55
	SMRUE	.115	.265	1.000	-.73	.96
	BLRUE	.546	.250	.565	-.25	1.35
	BLRHE	.642	.249	.267	-.16	1.44
	BMRUE	1.172*	.228	.000	.44	1.91
	BMRHE	1.344*	.222	.000	.63	2.06
BLRUE	SLRUE	-.402	.233	.903	-1.15	.34
	SLRHE	.293	.181	.947	-.29	.87
	SMRUE	-.432	.235	.841	-1.18	.32
	SMRHE	-.546	.250	.565	-1.35	.25
	BLRHE	.095	.217	1.000	-.60	.79
	BMRUE	.626*	.192	.042	.01	1.24
	BMRHE	.798*	.185	.001	.20	1.39
BLRHE	SLRUE	-.498	.231	.596	-1.24	.24
	SLRHE	.198	.180	1.000	-.38	.77
	SMRUE	-.527	.234	.504	-1.27	.22
	SMRHE	-.642	.249	.267	-1.44	.16
	BLRUE	-.095	.217	1.000	-.79	.60

	BMRUE	.530	.191	.162	-.08	1.14
	BMRHE	.702*	.183	.007	.11	1.29
BMRUE	SLRUE	-1.028*	.209	.000	-1.70	-.36
	SLRHE	-.333	.149	.524	-.81	.15
	SMRUE	-1.058*	.211	.000	-1.74	-.38
	SMRHE	-1.172*	.228	.000	-1.91	-.44
	BLRUE	-.626*	.192	.042	-1.24	-.01
	BLRHE	-.530	.191	.162	-1.14	.08
	BMRHE	.172	.154	1.000	-.32	.66
BMRHE	SLRUE	-1.200*	.202	.000	-1.85	-.55
	SLRHE	-.505*	.140	.013	-.95	-.06
	SMRUE	-1.229*	.204	.000	-1.89	-.57
	SMRHE	-1.344*	.222	.000	-2.06	-.63
	BLRUE	-.798*	.185	.001	-1.39	-.20
	BLRHE	-.702*	.183	.007	-1.29	-.11
	BMRUE	-.172	.154	1.000	-.66	.32

* The mean difference is significant at the 0.05 level.

Figure 14_(Study 2) Risk Attitude vs. Decision-Making Reliance

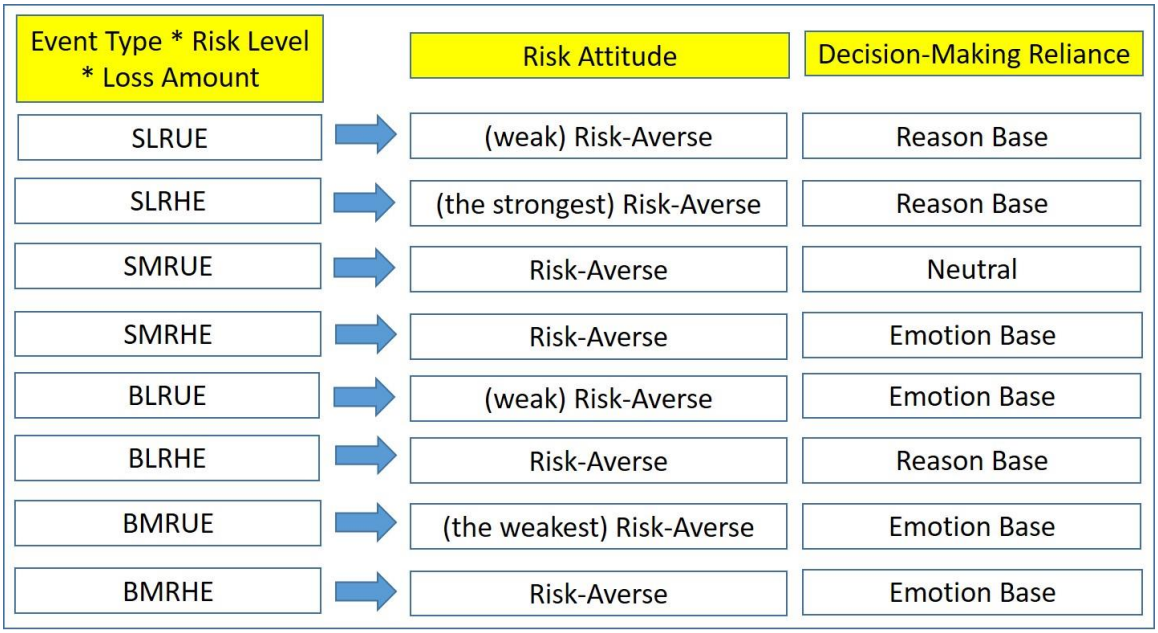


Risk Attitude: 1 = '*Risk-Taking*' to 7 = '*Risk-Averse*'

Decision-Making Reliance: 1 = '*Using only Emotion (System 1)*' to 7 = '*Using only Reason (System 2)*'.

In the case of small-loss versus big-loss, which was the core of Study 2, it was to determine whether the reliance on consumer decisions under risk was emotion (*System 1;* Heart) or reason (*System 2*; Head). As shown in the above results, it was revealed that the decision-making base in big-loss was much more dependent on emotion (*System 1*) than that of small-loss.

Figure 15_(Study 2) Research model and Results



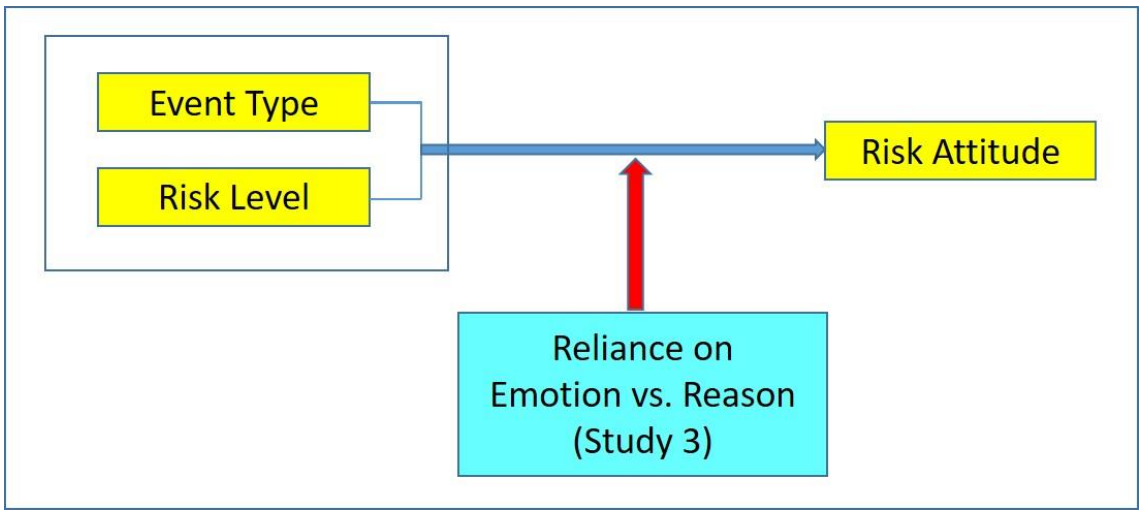
This repeatedly shows that people tend to strongly avoid risk in the hedonic event with low-probability risk level like the previous study. However, the decision-making reliance showed a slightly different pattern between the utilitarian-event and hedonic-event, which seems to be evidence of whether decision-making depends on the size of the loss, which was the purpose of the second study. It is explained that the amount of loss acts as an essential variable in risk perception, and it can be explained that people's reliance on decision-making has changed after recognizing the extent of the loss.

Therefore, in the following study 3, I examine whether the reliance on decision-making triggered when people perceive a risk depends on the situation at the time of the risk perception or not the usual tendency.

4.3 Study 3: Emotional versus Rational Decision-Making under Risk

In study 2, I investigated whether consumer choice based on emotion or reason according to the amount of loss under risk in loss domain. In Study 3, to examine this in more detail, I first measure whether an individual's decision-making reliance is based on emotion or reason using a Lay Rationalism (LR) Scale (moderating variable) that measures in general situations. Although some researchers have done this study, they still research the gain area. And I try to identify individual differences in using emotions versus reasons to make decisions under risk in loss domain. For example, would a logical person avoid risk? Or emotional person?

Figure 16_(Study 3) Research Model



4.3.1 Method and Procedure

This study employed a 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose Event vs. Hedonic-

Purpose Event) X 2 (Loss Amount: Small-Loss vs. Big-Loss) between-subjects design. Participants (n = 480) were recruited from Amazon Mechanical Turk (MTurk). I removed participants who failed to answer the attention check question correctly ("Please select strongly disagree."). The final sample had 454 participants. 68.3% (310 participants) were male.

First, to gain insight into participants' decision-making process, participants were asked to indicate how they made their choices on six (6) items of the Lay Rationalism Scale (LR Scale, Hsee et al., 2014), which was assessed on a 6-point scale (1 = '*Strongly Disagree*' to 6 = '*Strongly Agree*'). For each item, they indicated the degree to which they agree or disagree with the statement. Responses to these six (6) items formed an index of participants' relative reliance on feelings versus reasons.

Table 38_(Study 3) Lay Rationalism (LR) Scale

No	Item
1	When making decisions, I like to analyze financial costs and benefits and resist the influence of my feelings.
2	When choosing between two options, one of which makes me feel better and the other better serves the goal I want to achieve, I choose the one that makes me feel better. (R)
3	When making decision, I think about what I want to achieve rather than how I feel.
4	When choosing between two options, one of which is financially superior and other "feels" better to me, I choose the one that is financially better.
5	When choosing between products, I rely on my gut feelings rather than on product specifications (numbers and objective descriptions). (R)
6	When making decisions, I focus on objective facts rather than subjective feelings.

Notes: (R) denotes a reverse-coded item.

Source: Christopher K. Hsee, Yang Yang, Xingshan Zheng, and Hanwei Wang (2014), "Lay Rationalism: Individual Differences in Using Reason Versus Feelings to Guide Decisions," *Journal of Marketing Research*, 52 (1), 134-146.

Second, participants were randomly assigned and asked to read one of eight (8) scenario conditions (SLRUE: Small Loss + Low-Probability Risk + Utilitarian-Purpose Event, SLRHE: Small Loss + Low-Probability Risk + Hedonic-Purpose Event, SMRUE: Small Loss + Medium-Probability Risk + Utilitarian-Purpose Event, SMRHE: Small Loss + Medium-Probability Risk + Hedonic-Purpose Event, BLRUE: Big Loss + Low-Probability Risk + Utilitarian-Purpose Event, BLRHE: Big Loss + Low-Probability Risk + Hedonic-Purpose Event, BMRUE: Big Loss + Medium-Probability Risk + Utilitarian-Purpose Event, and BMRHE: Big Loss + Medium-Probability Risk + Hedonic-Purpose Event) whether the participants would want to go to a risky place or not. In the condition of small-loss (vs. big-loss), low (vs. medium) probability of new virus infection, and utilitarian-purpose (vs. hedonic-purpose) event, participants read the following:

> Imagine. You will go to *City K* in the coming months in order to attend a nationwide job fair (vs. for sightseeing); event type. You will stay there for 5 days. Then, you have realized that currently the city is being threatened by a new virus. The new virus shows a low-infection rate (vs. a medium-infection rate); risk probability level. However, if you get infected with the virus, you may sick, and hospitalization is required (vs. you may die because still there is no vaccine and exact treatment of it); the amount of loss. Are you willing to go to the place or cancel your trip?

Table 39_(Study 3) Event Type, Risk Probability Level, and The Amount of Loss

Event Type		Risk Probability Level		The Amount of Loss	
Utilitarian-Purpose Event	Hedonic-Purpose Event	Low-Probability Risk	Medium-Probability Risk	Small-Loss	Big-Loss
A trip to attend a nationwide job fair	A trip for a sightseeing	Low-Infection Area	Medium-Infection Area	Sick	Death

After reading one of eight (8) scenarios, as a manipulation check for event type, risk probability level, and loss amount, I asked participants to rate their perception of event type (utilitarian-purpose event vs. hedonic-purpose event), risk level (low-probability risk vs. medium-probability risk), and the amount of loss (small-loss vs. big-loss) and use on a 7-point scale: "The scenario's event is close to the attributes of" (1 = '*Practical/ Productive Event*' to 7 = '*Enjoyable/Fun Event'*), "From the scenario, what do you think the probability of risk?" (1 = '*Low-Probability Risk*', 4 = '*Medium-Probability Risk*', 7 = '*High-Probability Risk*'), and "From the scenario, if the risk happens, what do you think the amount of the loss?" (1= '*Small-Loss'* to 7 = '*Big-Loss'*), respectively.

Next, I asked participants to mark their relative willingness to purchase insurance by answering the question: "Please rate your willingness to go to the risky place, *City K*." on a 7-point scale (1 = '*Definitely Won't Go* (*No*)', 4 = '*Neutral'*, 7 = '*Definitely Will Go* (*Yes*)'). In addition, I measured participants' binary choice: "Are you willing to go to the risky place, *City K*?" (1 = '*No*', 2 = '*Yes*').

On the next page of the survey, subsequent questions about decision-making reliance and demographic questions used the same method as previous studies.

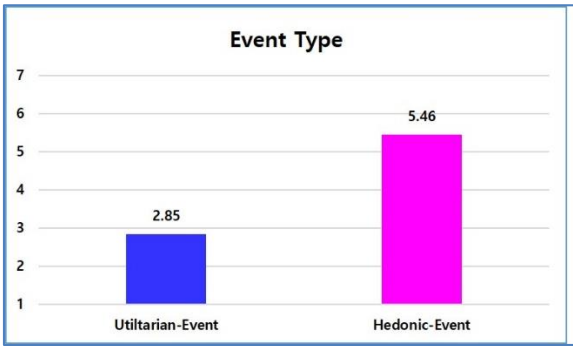
Finally, participants answered standard demographic questions. Participants received $0.50 for their participation.

4.3.2 Results and Discussion

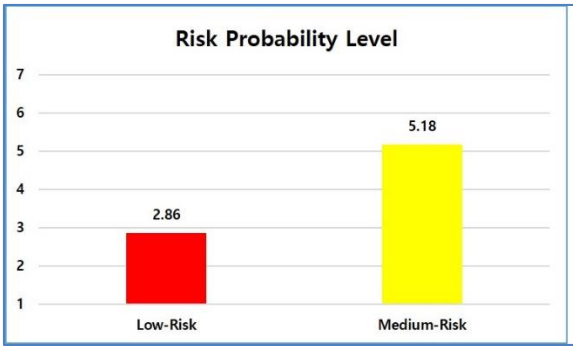
4.3.2.1 Manipulation Check.

The manipulation of event types was successful in showing that participants perceived ‘a trip to attend a nationwide job fair’ (M = 2.85) as significantly utilitarian-purpose event than that in the hedonic condition ‘a trip for a sightseeing’ (M = 5.46; F (1, 452) = 371.043, p < .000). And, the manipulation of risk levels was also successful in showing that participants perceived two distinct probability of infection rate; low-probability risk (M = 2.86) verse medium-probability risk (M = 5.18; F = (1, 452) = 428.328, p < .000). Finally, the manipulation of loss amount was also successful in showing that participants perceived two distinct amount of loss; small-loss (M = 2.52) verse big-loss (M = 5.63; F = (1, 452) = 975.336, p < .000).

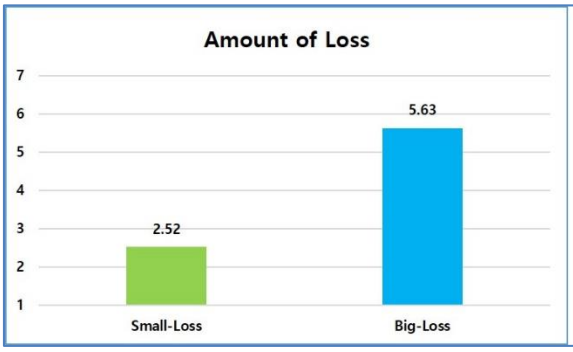
Figure 17_(Study 3) Manipulation Check of Event Type, Risk Probability Level, and Loss Amount



Factor	Mean	S.E	F-value/Sig.
Utilitarian-Event	2.85	1.375	371.043/ .000
Hedonic-Event	5.46	1.515	



Factor	Mean	S.E	F-value/Sig.
Low-Risk	2.86	1.198	428.328/ .000
Medium-Risk	5.18	1.196	



Factor	Mean	S.E	F-value/Sig.
Small-Loss	2.52	.933	975.336/ .000
Big-Loss	5.63	1.179	

Event Type: 1 = '*Practical/Productive Event*' to 7 = '*Enjoyable/Fun Event*'.
Risk Probability Level: 1 = '*Low-Probability Risk*' to 7 = '*High-Probability Risk*'.
The Amount of Loss: 1 = '*Small-Loss*' to 7 = '*Big-Loss*'.

4.3.2.2 Willingness Not to Go to Risky Place

Main and Interaction Effects

A multi-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) X 2 (Amount of Loss: Small-Loss vs. Big-Loss) ANOVA conducted on participants' willingness not to go to risky place yielded the expected interaction (F (1, 453) = 4.800, p < .029, η^2 .011). The main effect for event type (F (1, 453) = 4.172, p < .042, η^2 = .009 was significant.

Table 40_(Study 3) Tests of Between-Subjects Effects

Dependent Variable: Willingness Not to Go to Risky Place
Design: Intercept + Risk Level + Event Type + Loss Amount + Risk Level * Event Type + Risk Level * Loss Amount + Event Type * Loss Amount + Risk Level * Event Type * Loss Amount

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	33.748[a]	7	4.821	3.433	.001	.051
Intercept	4332.381	1	4332.381	3084.745	.000	.874
RiskLevel	2.230	1	2.230	1.588	.208	.004
EventType	5.860	1	5.860	4.172*	.042	.009
LossAmount	.299	1	.299	.213	.645	.000
RiskLevel * EventType	.895	1	.895	.637	.425	.001
RiskLevel * LossAmount	12.216	1	12.216	8.698*	.003	.019
EventType * LossAmount	5.934	1	5.934	4.225*	.040	.009
RiskLevel * EventType * LossAmount	6.742	1	6.742	4.800*	.029	.011
Error	626.386	446	1.404			
Total	5033.000	454				
Corrected Total	660.134	453				

a. R Squared = .051 (Adjusted R Squared = .036).

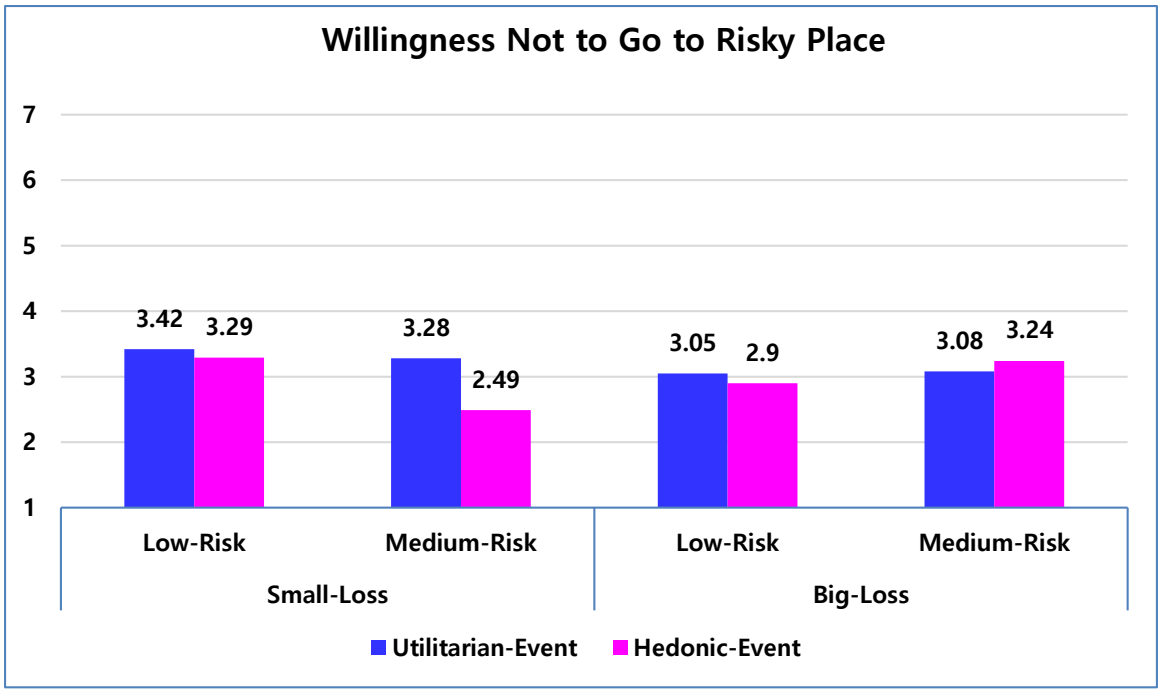
Multi-Way ANOVA

Overall, the results of the multi-way ANOVA indicated that participants showed relatively strong risk-averse attitudes across all conditions (see Figure 18 and Table 42). In particular, individuals with SMRHE presented statistically the greatest willingness not to go to a risky place than those with other conditions ($F(7, 446) = 3.433$, $p < .001$). Here, the answers were reversely transformed.

Table 41_(Study 3) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.748	7	4.821	3.433	.001
Within Groups	626.386	446	1.404		
Total	660.134	453			

Figure 18_(Study 3) Willingness Not to Go to Risky Place



Willingness: 1 = '*Definitely Won't Go* (*No*)' to 7 = '*Definitely Will Go* (*Yes*)'.

Table 42_(Study 3) Risk Attitude per condition interpreted through Willingness to not take risky action of Figure 18

Conditions		Risk Attitude
Small-Loss	LRUE	Risk-Averse
	LRHE	Risk-Averse
	MRUE	Risk-Averse
	MRHE	(the strongest) Risk-Averse
Big-Loss	LRUE	Risk-Averse
	LRHE	Risk-Averse
	MRUE	Risk-Averse
	MRHE	Risk-Averse

Post Hoc Analysis

According to the below results, the significance value was 0.000, so the hypothesis was accepted. Since equal variances assumed, Scheffe was applied for Post Hoc analysis.

In detail, as the result of Scheffe analysis, there was a significant difference between groups in SLRUE and SMRHE in willingness not to go to a risky place.

Table 43_(Study 3) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Scheffe
Willingness Not to Go to Risky Place	SLRUE (a)	3.42	1.062	3.433/ .001	a > d
	SLRHE (b)	3.29	1.108		
	SMRUE (c)	3.28	1.161		
	SMRHE (d)	2.49	1.069		
	BLRUE (e)	3.05	1.369		
	BLRHE (f)	2.90	1.195		
	BMRUE (g)	3.08	1.250		
	BMRHE (h)	3.24	1.233		

Table 44_(Study 3) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Willingness Not to Go to Risky Place
Scheffe

(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SLRUE	SLRHE	.124	.218	1.000	-.70	.95
	SMRUE	.136	.219	1.000	-.69	.96
	SMRHE	.926*	.221	.016	.09	1.76
	BLRUE	.365	.218	.903	-.46	1.19
	BLRHE	.519	.228	.640	-.34	1.38
	BMRUE	.332	.217	.939	-.49	1.15
	BMRHE	.175	.218	.999	-.65	1.00
SLRHE	SLRUE	-.124	.218	1.000	-.95	.70
	SMRUE	.012	.221	1.000	-.82	.85
	SMRHE	.802	.223	.077	-.04	1.64
	BLRUE	.241	.220	.991	-.59	1.07
	BLRHE	.395	.230	.889	-.47	1.26
	BMRUE	.208	.219	.996	-.62	1.03
	BMRHE	.052	.220	1.000	-.78	.88
SMRUE	SLRUE	-.136	.219	1.000	-.96	.69

	SLRHE	-.012	.221	1.000	-.85	.82
	SMRHE	.790	.224	.090	-.05	1.63
	BLRUE	.229	.221	.993	-.60	1.06
	BLRHE	.383	.231	.907	-.49	1.25
	BMRUE	.196	.220	.997	-.63	1.03
	BMRHE	.039	.221	1.000	-.79	.87
SMRHE	SLRUE	-.926*	.221	.016	-.176	-.09
	SLRHE	-.082	.223	.077	-1.64	.04
	SMRUE	-.790	.224	.090	-1.63	.05
	BLRUE	-.561	.223	.504	-1.40	.28
	BLRHE	-.407	.233	.879	-1.28	.47
	BMRUE	-.594	.222	.415	-1.43	.24
	BMRHE	-.750	.223	.128	-1.59	.09
BLRUE	SLRUE	-.365	.218	.903	-1.19	.46
	SLRHE	-.241	.220	.991	-1.07	.59
	SMRUE	-.229	.221	.993	-1.06	.60
	SMRHE	.561	.223	.504	-.28	1.40
	BLRHE	.154	.230	1.000	-.71	1.02
	BMRUE	-.033	.219	1.000	-.86	.79
	BMRHE	-.190	.220	.998	-1.02	.64
BLRHE	SLRUE	-.519	.228	.640	-1.38	.34
	SLRHE	-.395	.230	.889	-1.26	.47
	SMRUE	-.383	.231	.907	-1.25	.49
	SMRHE	.407	.233	.879	-.47	1.28
	BLRUE	-.154	.230	1.000	-1.02	.71
	BMRUE	-.187	.229	.999	-1.05	.68
	BMRHE	-.343	.230	.946	-1.21	.52
BMRUE	SLRUE	-.332	.217	.939	-1.15	.49
	SLRHE	-.208	.219	.996	-1.03	.62
	SMRUE	-.196	.220	.997	-1.03	.63
	SMRHE	.594	.222	.415	-.24	1.43
	BLRUE	.033	.219	1.000	-.79	.86
	BLRHE	.187	.229	.999	-.68	1.05
	BMRHE	-.157	.219	.999	-.98	.67
BMRHE	SLRUE	-.175	.218	.999	-1.00	.65
	SLRHE	-.052	.220	1.000	-.88	.78
	SMRUE	-.039	.221	1.000	-.87	.79
	SMRHE	.750	.223	.128	-.09	1.59
	BLRUE	.190	.220	.998	-.64	1.02

	BLRHE	.343	.230	.946	-.52	1.21
	BMRUE	.157	.219	.999	-.67	.98

* The mean difference is significant at the 0.05 level.

4.3.2.3 Binary Choice

A logistic regression was performed to ascertain binary choice whether participants would go to risky place or not. The logistic regression model was statistically significant, $x^2(7) = 51.698$, $p < .000$. The model explained 14% (Nagelkerke R^2) of the variance in binary choice and correctly classified 66.1% of cases.

Table 45_(Study 3) Binary Choice

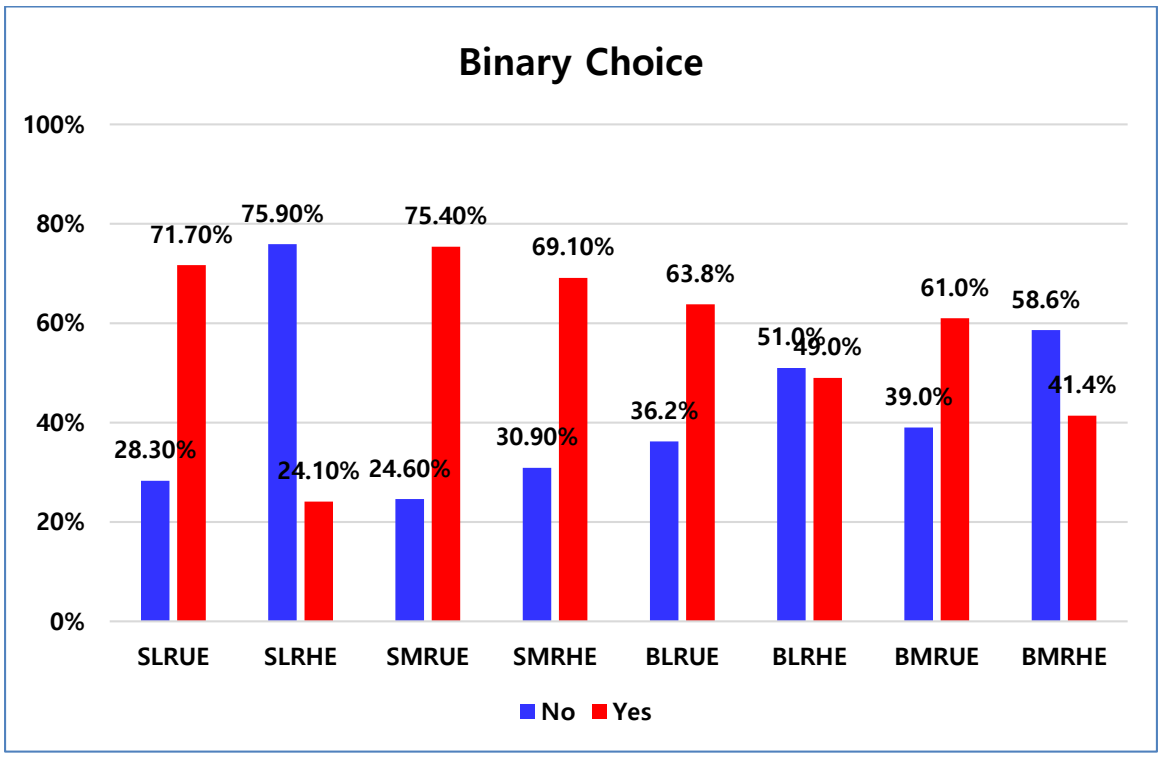
log (Binary Choice) = -0.348 +1.276 * (SLRUE) – 0.797 * (SLRHE) + 1.470 * (SMRUE) + 1.153 * (SMRHE) + 0.915 * (BLRUE) + 0.796 * (BMRUE)

Variable	B	S.E	Wald	Exp(B)	95% CI		Sig.
					Lower	Upper	
BMRHE			45.700				.000
SLRUE	1.276	.391	10.636	3.583*	1.664	7.716	.001
SLRHE	-.797	.406	3.843	.451*	.203	1.000	.050
SMRUE	1.470	.407	13.044	4.351*	1.959	9.664	.000
SMRHE	1.153	.395	8.505	3.167*	1.459	6.871	.004
BLRUE	.915	.382	5.742	2.496*	1.181	5.275	.017
BLRHE	.307	.391	.619	1.360	.632	2.926	.431
BMRUE	.796	.377	4.455	2.217*	1.059	4.645	.035
Constant	-.348	.267	1.707	.706			.191
Chi-square (df), Sig.					51.698 (7), .000		
Chi-square (df) of Hosmer-Lemeshow Test, Sig.					0.000 (6), 1.000		

* $p < .05$.

Especially, I found significant effects on SLRUE (*B* = 1.276, *S.E* = .391, *OR* = 3.583, $p < .001$), SLRHE (*B* = -.797, *S.E* = .406, *OR* = .451, $p < .050$), SMRUE (*B* = 1.470, *S.E* = .407, *OR* = 4.351, $p < .000$), SMRHE (*B* = 1.153, *S.E* = .395, *OR* = 3.167, $p < .004$), BLRUE (*B* = .915, *S.E* = .382, *OR* = 2.496, $p < .017$), and BMRUE (*B* = .796, *S.E* = .377, *OR* = 2.217, $p < .035$).

Figure 19_(Study 3) Binary Choice



From this study's scenario, 'No' means a risk-averse attitude, whereas 'Yes' indicates a risk-taking attitude. Hedonic-events tend to be more risk-averse than utilitarian-event on SLRHE, BLRH, and BMRHE. Especially in the case of SLRHE, respondents showed the strongest risk-averse attitude. Surprisingly, in SLRHE condition

(small-loss, low-probability risk level, and hedonic event), people have been shown to avoid risk like the previous studies.

4.3.2.4 Decision-Making Reliance on *System 1* (*Heart*) vs. *System 2* (*Head*)

Factor Analysis, Reliability Analysis, and Correlations per Condition

As in Study 1 and 2, the same analysis was conducted.

Table 46_(Study 3) Factor and Reliability Analysis

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SLRUE	System 1	Intuitively	.894	.805	1.596	39.902	α = .853
		Heart	.882	.779			
	System 2	Head	.852	.729	1.452	36.303	α = .790
		Deliberately	.848	.735			
	KMO (Kaiser-Meyer-Olkin)						.446
	Bartlett' Test of Sphericity				Chi-Square		41.322
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SLRHE	System 1	Heart	.870	.767	1.535	38.376	α = .668
		Intuitively	.855	.732			
	System 2	Head	.881	.786	1.531	38.278	α = .690
		Deliberately	.863	.782			
	KMO (Kaiser-Meyer-Olkin)						.470
	Bartlett' Test of Sphericity				Chi-Square		39.476
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SMRUE	System 1	Intuitively	.890	.793	2.257	45.148	α = .833
		Heart	.863	.761			
		Quickly	.848	.769			
	System 2	Deliberately	.870	.757	1.446	28.929	α = .570
		Head	.789	.623			
	KMO (Kaiser-Meyer-Olkin)						.575
	Bartlett' Test of Sphericity				Chi-Square		86.981
					df (*p*)		10 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SMRHE	System 1	Intuitively	.963	.937	1.872	46.812	α = .933
		Heart	.962	.938			
	System 2	Deliberately	.907	.831	1.664	41.608	α = .788
		Head	.905	.830			
	KMO (Kaiser-Meyer-Olkin)						.506
	Bartlett' Test of Sphericity				Chi-Square		109.873
					df (*p*)		6 (.000)

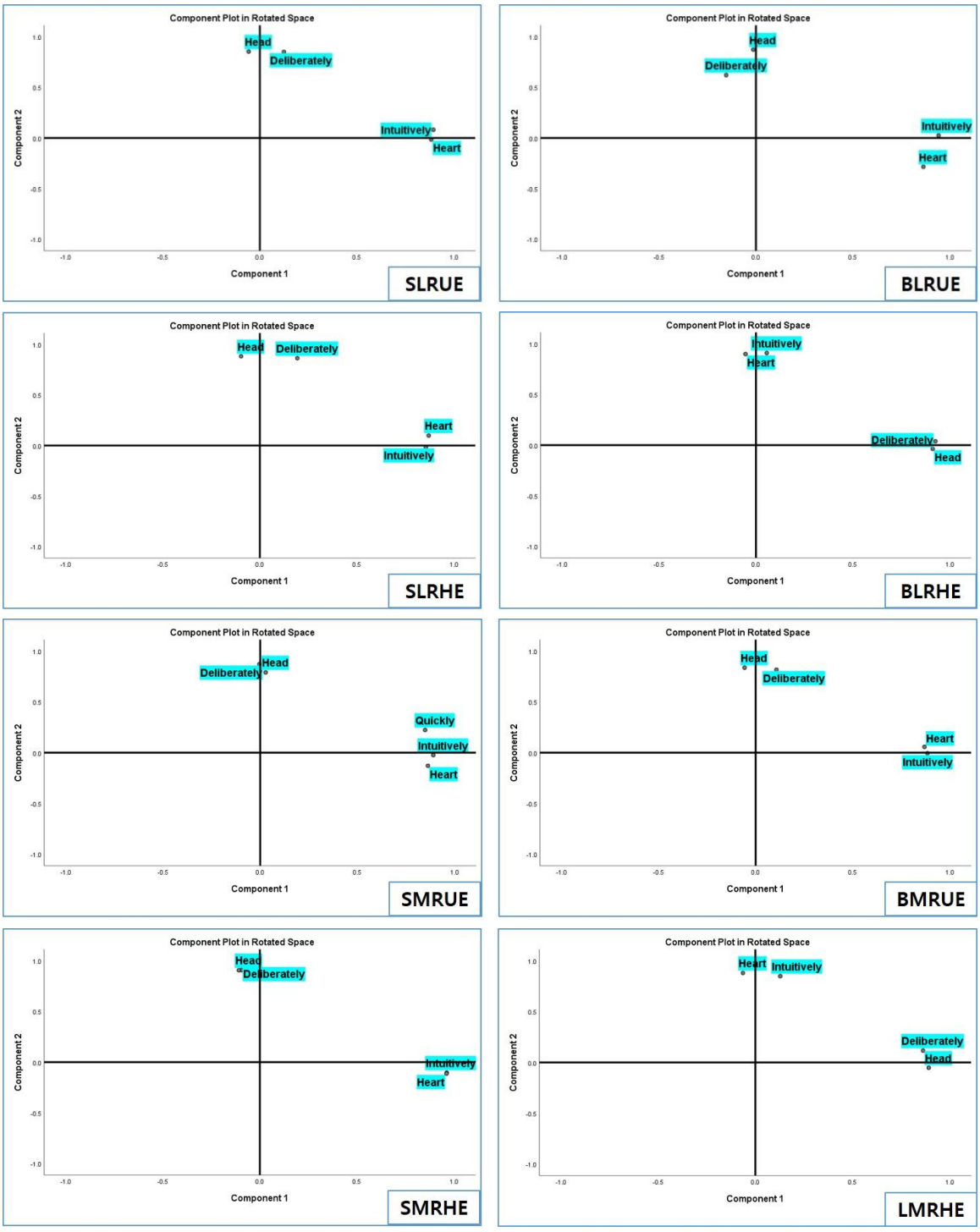
	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BLRUE	System 1	Intuitively	.942	.888	1.657	41.423	α = .804
		Heart	.864	.826			
	System 2	Head	.871	.758	1.223	30.572	α = .298
		Deliberately	.619	.407			
	KMO (Kaiser-Meyer-Olkin)						.421
	Bartlett' Test of Sphericity				Chi-Square		48.556
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BLRHE	System 2	Deliberately	.925	.858	1.694	42.347	α = .812
		Head	.912	.833			
	System 1	Intuitively	.908	.828	1.634	40.851	α = .771
		Heart	.898	.810			
	KMO (Kaiser-Meyer-Olkin)						.323
	Bartlett' Test of Sphericity				Chi-Square		68.052
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BMRUE	System 1	Intuitively	.885	.783	1.554	38.843	α = .702
		Heart	.869	.759			
	System 2	Head	.836	.701	1.367	34.166	α = .523
		Deliberately	.816	.677			
	KMO (Kaiser-Meyer-Olkin)						.475
	Bartlett' Test of Sphericity				29.747		68.052
					6 (.000)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BMRHE	System 2	Head	.892	.798	1.560	38.992	α = .678
		Deliberately	.863	.758			
	System 1	Heart	.879	.776	1.507	37.670	α = .664
		Intuitively	.847	.735			
	KMO (Kaiser-Meyer-Olkin)						.448
	Bartlett' Test of Sphericity				Chi-Square		40.031
					df (*p*)		6 (.000)

Figure 20_(Study 3) Component Plot in Rotated Space



As shown in Figure 20, it presented that the variables between *System 1* versus *System 2* are clearly divided into two areas. Like Study 1 and 2, respondents distantly

understood and answered each question about decision-making reliance on *System 1* versus *System 2*.

Table 47_(Study 3) SLRUE Correlation Table

SLRUE	Variable	Correlations			
		1. Intuitively	2. Heart	3. Head	4. Deliberately
	1. Intuitively	1	.585**	-.022	.196
	2. Heart		1	.031	.024
	3. Head			1	.449**
	4. Deliberately				1

SLRHE	Variable	Correlations			
		1. Intuitively	2. Heart	3. Head	4. Deliberately
	1. Intuitively	1	.504**	.000	.086
	2. Heart		1	-.020	.246
	3. Head			1	.528**
	4. Deliberately				1

SMRUE	Variable	Correlations				
		1. Deliberately	2. Head	3. Quickly	4. Intuitively	5. Heart
	1. Deliberately	1	.398**	.250	-.058	-.130
	2. Head		1	.046	.056	.008
	3. Quickly			1	.652**	.582**
	4. Intuitively				1	.652**
	5. Heart					1

SMRHE	Variable	Correlations			
		1. Head	2. Deliberately	3. Intuitively	4. Heart
	1. Head	1	.662**	-.177	-.226
	2. Deliberately		1	-.208	-.175
	3. Intuitively			1	.875**
	4. Heart				1

BLRUE	Variable	Correlations			
		1. Head	2. Heart	3. Deliberately	4. Intuitively
	1. Head	1	-.317*	.175	.005
	2. Heart		1	-.143	.673**
	3. Deliberately			1	.154

	4. Intuitively				1

	Variable	Correlations			
		1. Intuitively	2. Heart	3. Deliberately	4. Head
BLRHE	1. Intuitively	1	.632**	.155	-.073
	2. Heart		1	-.098	.023
	3. Deliberately			1	.689**
	4. Head				1

	Variable	Correlations			
		1. Intuitively	2. Heart	3. Head	4. Deliberately
BMRUE	1. Intuitively	1	.546**	-.057	.109
	2. Heart		1	.057	.060
	3. Head			1	.365**
	4. Deliberately				1

	Variable	Correlations			
		1. Heart	2. Intuitively	3. Deliberately	4. Head
BMRHE	1. Heart	1	.497**	.102	-.106
	2. Intuitively		1	.105	.115
	3. Deliberately			1	.547**
	4. Head				1

Note: Cells display Pearson's Correlation.

** $p < .01$. Correlation is significant at the 0.01 level (2-tailed).

* $p < .05$. Correlation is significant at the 0.05 level (2-tailed).

Main and Interaction Effects

A multi-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) X 2 (Amount of Loss: Small-Loss vs. Big-Loss) ANOVA conducted on participants' relative reliance on decision-making between emotion versus reason yielded the expected interaction (F (1, 453) = 7.349, $p < .007$, $\eta^2 = .016$). The main effects for risk level (F (1,

453) = 84.277, $p < .000$, $\eta^2 = .159$), event type (F (1, 453) = 7.411, $p < .007$, $\eta^2 = .016$), and loss amount (F (1, 453) = 5.143, $p < .024$, $\eta^2 = .011$) were significant.

Table 48_(Study 3) Tests of Between-Subjects Effects

Dependent Variable: Decision-Making Reliance

Design: Intercept + Risk Level + Event Type + Loss Amount + Risk Level * Event Type + Risk Level * Loss Amount + Event Type * Loss Amount + Risk Level * Event Type * Loss Amount

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	112.667[a]	7	16.095	20.917	.000	.247
Intercept	10256.465	1	10256.465	13328.850	.000	.968
RiskLevel	64.859	1	64.859	84.277	.000	.159
EventType	5.703	1	5.703	7.411	.007	.016
LossAmount	3.958	1	3.958	5.143	.024	.011
RiskLevel * EventType	31.312	1	31.312	40.691	.000	.084
RiskLevel * LossAmount	.635	1	.635	.825	.364	.002
EventType * LossAmount	.745	1	.745	.969	.326	.002
RiskLevel * EventType * LossAmount	5.655	1	5.655	7.349	.007	.016
Error	343.194	446	.769			
Total	10723.000	454				
Corrected Total	455.861	453				

a. R Squared = .247 (Adjusted R Squared = .235).

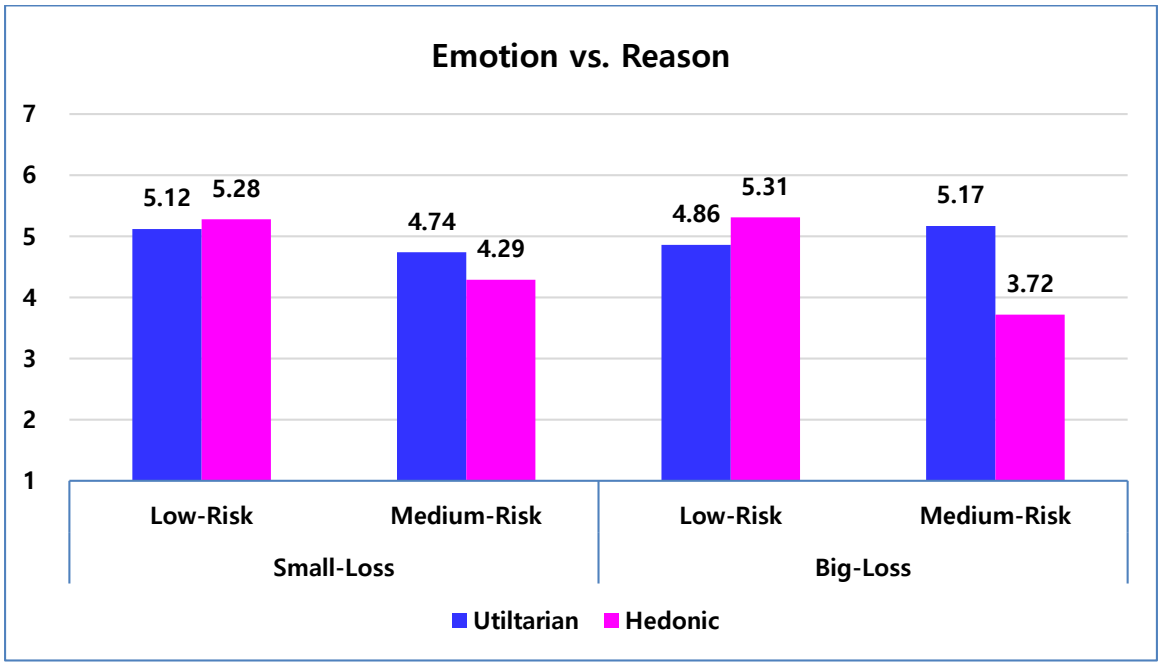
Multi-way ANOVA

Under medium-probability risk level, participants having hedonic-event showed relatively emotional decision-making based compared to utilitarian-event. In particular, BMRHE (M = 3.72, SD = .894; F (7, 446) = 20.917, $p < .000$) seems to have made the most emotional decision.

Table 49_(Study 3) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	112.667	7	16.095	20.917	.000
Within Groups	343.194	446	.769		
Total	455.861	453			

Figure 21_(Study 3) Decision-Making Reliance between Emotion vs. Reason



Decision-Making Reliance: 1 = '*Using only Emotion*' to 7 = '*Using only Reason*'.

Table 50_(Study 3) Decision-Making Reliance

Conditions		Decision-Making Reliance
Small-Loss	LRUE	Reason
	LRHE	Reason
	MRUE	Reason
	MRHE	Neutral
Big-Loss	LRUE	Reason
	LRHE	Reason
	MRUE	Reason
	MRHE	Emotion

Post Hoc Analysis

It was found that there was a significant difference in the decision-making base, depending on the conditions/groups ($p < .000$). In particular, as the result of Dunnett TE (equal variances not assumed), there was a significant difference among groups. In detail, the condition of BMRHE showed the lowest mean on the participant's relative emotional choice reliance.

Table 51_(Study 3) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Dunnett T3
Decision-Making Reliance	SLRUE (a)	5.12	.904	20.917/ .000	b > h, d, c, g
	SLRHE (b)	5.28	.874		
	SMRUE (c)	4.74	.813		
	SMRHE (d)	4.29	.712		
	BLRUE (e)	4.86	.511		
	BLRHE (f)	5.31	1.432		
	BMRUE (g)	4.78	.696		
	BMRHE (h)	3.72	.894		

Table 52_(Study 3) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Decision-Making Relative Reliance between Emotion vs. Reason
Dunnett T3

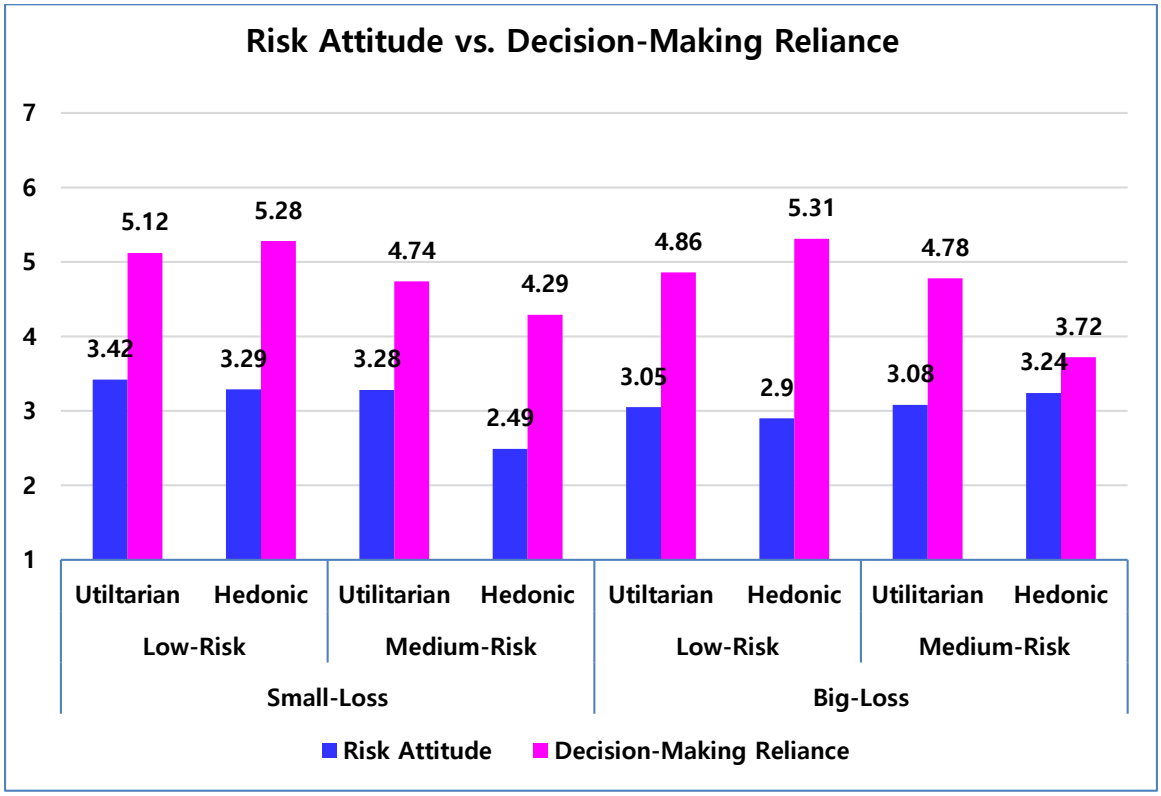
(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SLRUE	SLRHE	-.159	.164	1.000	-.68	.36
	SMRUE	.380	.159	.392	-.13	.89
	SMRHE	.826*	.151	.000	.34	1.31
	BLRUE	.255	.135	.806	-.18	.69
	BLRHE	-.189	.235	1.000	-.95	.57
	BMRUE	.337	.148	.483	-.13	.81
	BMRHE	1.393*	.166	.000	.87	1.92
SLRHE	SLRUE	.159	.164	1.000	-.36	.68

	SMRUE	.539*	.157	.024	.04	1.04
	SMRHE	.985*	.150	.000	.51	1.46
	BLRUE	.414	.133	.066	-.01	.84
	BLRHE	-.030	.235	1.000	-.79	.73
	BMRUE	.496*	.146	.027	.03	.96
	BMRHE	1.552*	.164	.000	1.03	2.08
SMRUE	SLRUE	-.380	.159	.392	-.89	.13
	SLRHE	-.539*	.157	.024	-1.04	-.04
	SMRHE	.446	.144	.067	-.01	.91
	BLRUE	-.125	.127	1.000	-.53	.28
	BLRHE	-.569	.231	.347	-1.32	.18
	BMRUE	-.043	.141	1.000	-.49	.41
	BMRHE	1.013*	.159	.000	.50	1.52
SMRHE	SLRUE	-.826*	.151	.000	-1.31	-.34
	SLRHE	-.985*	.150	.000	-1.46	-.51
	SMRUE	-.446	.144	.067	-.91	.01
	BLRUE	-.571*	.117	.000	-.95	-.20
	BLRHE	-1.015*	.226	.001	-1.75	-.28
	BMRUE	-.489*	.132	.009	-.91	-.07
	BMRHE	.567*	.152	.008	.08	1.05
BLRUE	SLRUE	-.255	.135	.806	-.69	.18
	SLRHE	-.414	.133	.066	-.84	.01
	SMRUE	.125	.127	1.000	-.28	.53
	SMRHE	.571*	.117	.000	.20	.95
	BLRHE	-.444	.215	.671	-1.14	.26
	BMRUE	.082	.113	1.000	-.28	.44
	BMRHE	1.138*	.135	.000	.70	1.57
BLRHE	SLRUE	.189	.235	1.000	-.57	.95
	SLRHE	.030	.235	1.000	-.73	.79
	SMRUE	.569	.231	.347	-.18	1.32
	SMRHE	1.015*	.226	.001	.28	1.75
	BLRUE	.444	.215	.671	-.26	1.14
	BMRUE	.526	.224	.431	-.20	1.25
	BMRHE	1.582*	.236	.000	.82	2.34
BMRUE	SLRUE	-.337	.148	.483	-.81	.13
	SLRHE	-.496*	.146	.027	-.96	-.03
	SMRUE	.043	.141	1.000	-.41	.49
	SMRHE	.489*	.132	.009	.07	.91
	BLRUE	-.082	.113	1.000	-.44	.28

	BLRHE	-.526	.224	.431	-1.25	.20
	BMRHE	1.056*	.148	.000	.58	1.53
BMRHE	SLRUE	-1.393*	.166	.000	-1.92	-.87
	SLRHE	-1.552*	.164	.000	-2.08	-1.03
	SMRUE	-1.013*	.159	.000	-1.52	-.50
	SMRHE	-.567*	.152	.008	-1.05	-.08
	BLRUE	-1.138*	.135	.000	-1.57	-.70
	BLRHE	-1.582*	.236	.000	-2.34	-.82
	BMRUE	-1.056*	.148	.000	-1.53	-.58

* The mean difference is significant at the 0.05 level.

Figure 22_(Study 3) Risk Attitude vs. Decision-Making Reliance

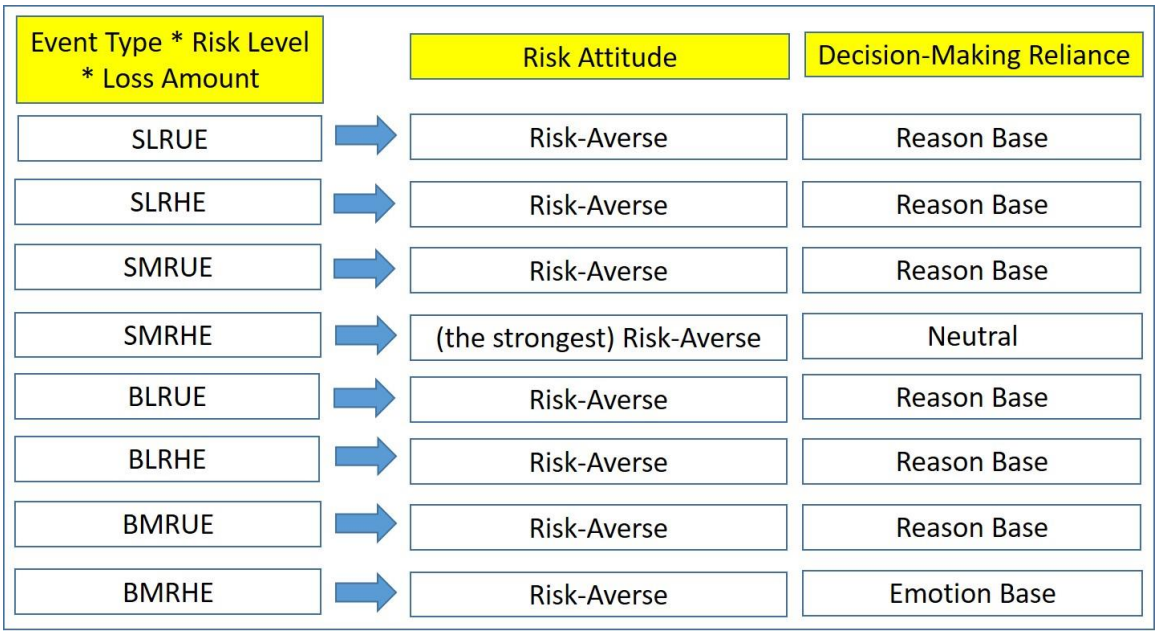


Risk Attitude: 1 = '*Risk-Taking*' to 7 = '*Risk-Averse*'

Decision-Making Reliance: 1 = '*Using only Emotion (System 1)*' to 7 = '*Using only Reason (System 2)*'.

Across the conditions, participants responded that they would not go to a risky place (risk-averse attitude). When reviewed the decision-making reliance, they said that they made a choice under relatively reasonably thinking.

Figure 23_(Study 3) Research Model and Results



4.3.2.5 Decision-Making Reliance with LR Scale

Moderated Regression Analysis

When the regression analysis was completed by intervening LR Scale as a moderated variable, it was found that the LR Scale showed a significant difference in seven (7) conditions/groups except for BLRUE.

As for the moderated regression analysis results, it is necessary to check whether the R^2 value increases as the model proceeds from step 1 to step 3, and check whether the significant F change is less than .05. Thus, excluding BLRUE, in other conditions/groups,

it was found that the LR Scale, which is a moderated variable, has a positive (+) moderated effect.

Table 53_(Study 3) Moderated Regression Analysis Results

Condition	Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics				
						R^2 Change	F Change	df 1	df 2	Sig F. Change
SLRUE	1	$.377^a$	.142	.127	.992	.142	9.618	1	58	.003
	2	$.403^b$	.162	.133	.989	.020	1.369	1	57	.242
	3	$.468^c$	.219	.177	.964	.057	4.067	1	56	.049
SLRHE	1	$.343^a$	.117	.102	.941	.117	7.452	1	56	.008
	2	$.366^b$	.134	.103	.941	.017	1.061	1	55	.307
	3	$.489^c$	.239	.196	.890	.105	7.421	1	54	.009
SMRUE	1	$.403^a$	.162	.147	1.072	.162	10.672	1	55	.002
	2	$.430^b$	.185	.155	1.068	.022	1.487	1	54	.228
	3	$.495^c$	.245	.202	1.037	.060	4.187	1	53	.046
SMRHE	1	$.159^a$	.025	.008	11.294	.025	1.423	1	55	.238
	2	$.181^b$	.033	-.003	11.353	.088	.427	1	54	.516
	3	$.960^c$	.921	.917	3.269	.888	598.436	1	53	.000
BLRUE	1	$.557^a$	.310	.298	1.147	.310	25.155	1	56	.000
	2	$.595^b$	.354	.331	1.120	.044	3.762	1	55	.058
	3	$.601^c$	.361	.325	1.125	.007	.563	1	54	.456
BLRHE	1	$.247^a$	.061	.041	6.97834	.061	3.055	1	47	.087
	2	$.386^b$	.149	.112	6.71522	.088	4.755	1	46	.034
	3	$.982^c$	.965	.963	1.37171	.816	1057.428	1	45	.000
BMRUE	1	$.097^a$	.009	-.008	8.148	.009	.544	1	57	.464
	2	$.667^b$	.444	.425	6.157	.435	43.834	1	56	.000
	3	$.992^c$	.983	.982	1.075	.539	1781.835	1	55	.000
BMRHE	1	$.050^a$	.003	-.015	10.984	.003	.142	1	56	.707
	2	$.390^b$	.152	.121	10.218	.150	9.707	1	55	.003
	3	$.988^c$	.976	.975	1.721	.824	1885.940	1	54	.000

a: Predictors: (Constant), each condition

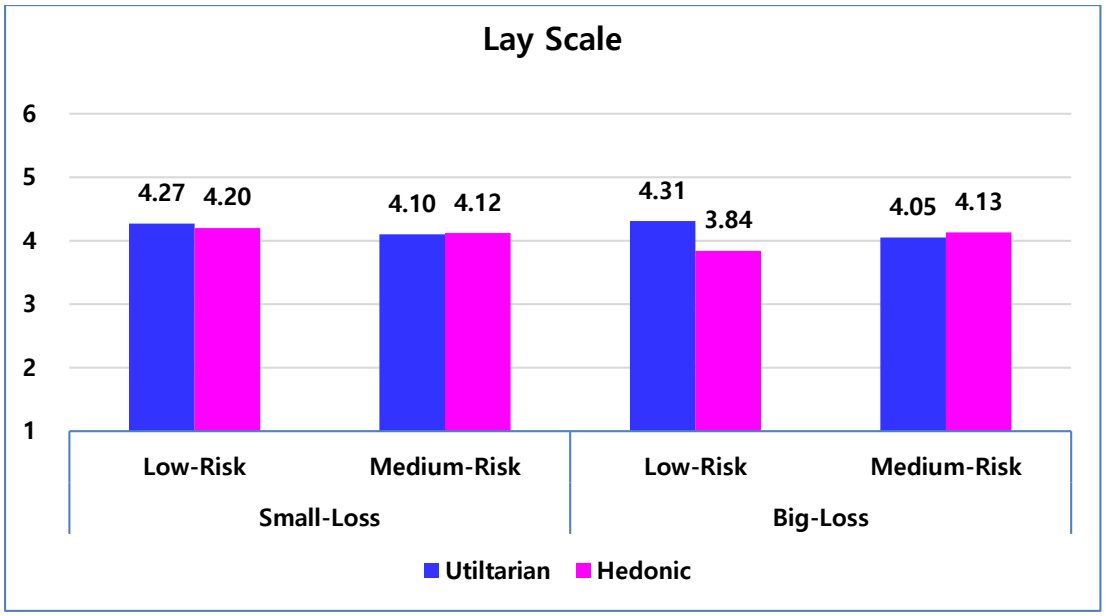
b: Predictors: (Constant), each condition, LR Scale per each condition

c: Predictors: (Constant), each condition, LR Scale per each condition, Moderated LR Scale per each condition

Table 54_(Study 4) Lay Rationalism Means

	Conditions	Mean	Std. Deviation	F-vale/Sig.
LR Scale	SLRUE (a)	4.27	.732	2.482/ .017
	SLRHE (b)	4.20	.731	
	SMRUE (c)	4.10	.581	
	SMRHE (d)	4.12	.751	
	BLRUE (e)	4.31	.672	
	BLRHE (f)	3.84	.705	
	BMRUE (g)	4.05	.551	
	BMRHE (h)	4.13	.663	

Figure 24_(Study 4) Lay Rationalism (LR) Scale



LR Scale: 1 = '*Close to Emotion*' to 6 = '*Close to Reason*'.

Like the above figure, participants answered they were relatively rational thinking bases in a general setting. This result conflicts with the answer to what your decision base (Figure 21) was like in experiments. That is to say, rather than being an extremely rational person or an emotional person with a particular condition prominently, it is

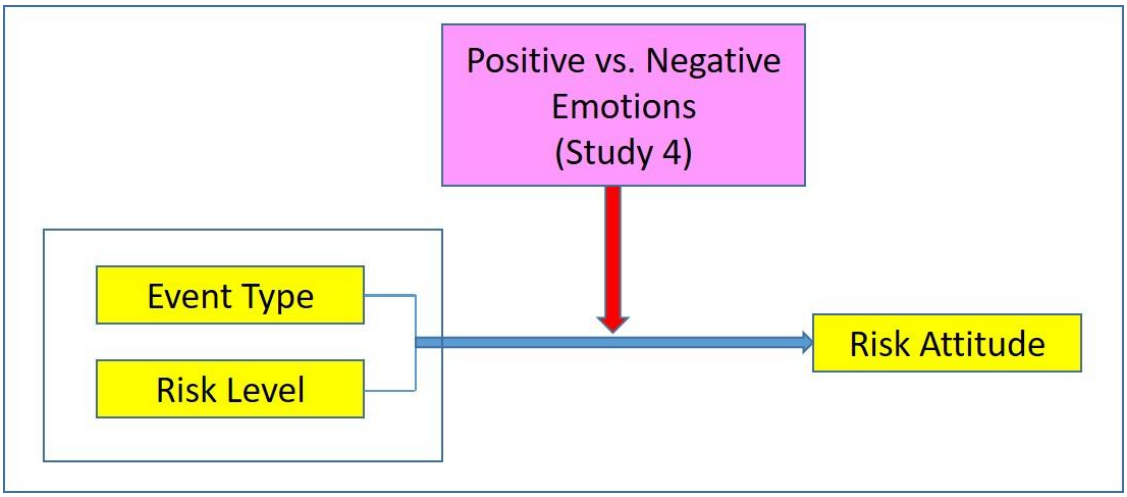
defined as a somewhat neutral and slightly rational person. Therefore, this study summarized that LR Scale would work as a moderated variable rather than an independent variable.

In conclusion, whether an individual depends on the heart's sound or the logic in the head when making a decision is more dependent on the variable context of each experimental condition.

4.4 Study 4: Positive versus Negative Emotions in Decision-Making under Risk

In Study 4, this research delves deeper into the emotions. There has been much controversy about which emotion (positive versus negative; moderating variable) influences decision-making under risk. Therefore, it is judged that it is necessary to continually study which emotion (positive versus negative) is more active and intervene in the decision-making process under risk. That is, which emotion, positive or negative, helps explicitly people make the best decision under risk in the loss domain.

Figure 25_(Study 4) Research Model



4.4.1 Method and Procedure

This study employed a 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose Event vs. Hedonic-Purpose Event) X 2 (Loss Amount: Small-Loss vs. Big-Loss) between-subjects design. Participants (n = 480) were recruited from Amazon Mechanical Turk (MTurk). I removed

participants who failed to answer the attention check question correctly ("Please select strongly disagree."). The final sample had 420 participants. 66.7% (280 participants) were male.

First of all, in order to know which emotions (positive vs. negative) work in the process of making decisions under risk, I first measured emotions of participants on twenty (20) items of Positive and Negative Affect Schedule (PANAS-SF, Watson, Clark, and Tellegen, 1998) which were assessed on a 5-point scale (1 = '*Very Slightly or Not At All*' to 6 = '*Extremely*'). For each item, the intent is to indicate to what extent they feel these emotions at the moment or how they felt over the past week. Response to these twenty (20) items formed an index of individuals' emotional type between positive versus negative. The term used in the scale are as follows (underlined items are emotions that display positive affect).

Table 55_(Study 4) Positive and Negative Affect Schedule (PANAS-SF)

Indicate the extent you have felt this way over the past week.	
PANAS 1	Interested
PANAS 2	Distressed
PANAS 3	Excited
PANAS 4	Upset
PANAS 5	Strong
PANAS 6	Guilty
PANAS 7	Scared
PANAS 8	Hostile
PANAS 9	Enthusiastic
PANAS 10	Proud
PANAS 11	Irritable
PANAS 12	Alert
PANAS 13	Ashamed
PANAS 14	Inspired
PANAS 15	Nervous

PANAS 16	Determined
PANAS 17	Attentive
PANAS 18	Jittery
PANAS 19	Active
PANAS 20	Afraid

Source: Watson, D., Clark, L. A., and Tellegen, A. (1998). "Development and Validation of Brief Measure of Positive and Negative Affect: the PANAS scale," *Journal of Personality and Social Psychology*, 54 (6), 1063.

Second, participants were randomly assigned and asked to read one of eight (8) scenario conditions (SLRUE: Small Loss + Low-Probability Risk + Utilitarian-Purpose Event, SLRHE: Small Loss + Low-Probability Risk + Hedonic-Purpose Event, SMRUE: Small Loss + Medium-Probability Risk + Utilitarian-Purpose Event, SMRHE: Small Loss + Medium-Probability Risk + Hedonic-Purpose Event, BLRUE: Big Loss + Low-Probability Risk + Utilitarian-Purpose Event, BLRHE: Big Loss + Low-Probability Risk + Hedonic-Purpose Event, BMRUE: Big Loss + Medium-Probability Risk + Utilitarian-Purpose Event, and BMRHE: Big Loss + Medium-Probability Risk + Hedonic-Purpose Event) whether the participants would want to buy used car warranty. In the condition of small-loss (vs. big-loss), low (vs. medium) breakdown risk probability, and utilitarian-purpose (vs. hedonic-purpose) event, participants read the following:

> Imagine. You will buy a second car to travel to and from your work (vs. to drive for your pleasure); event type. The vehicle will be a used car. Therefore, the dealer recommends you purchase the used extended warranty together. Buying a used car involves a low-level (vs. medium-level) breakdown risk probability; risk probability level. According to RepairPal.com, the average annual cost for

unexpected repairs on used cars runs about $418 (vs. $1,018): the amount of loss.

By purchasing an extended warranty, you can avoid expensive repair bills down the road. The warranty is approximately $350. Would you want to buy a used extended warranty?

Table 56_(Study 4) Event Type, Risk Probability Level, and The Amount of Loss

Event Type		Risk Probability Level		The Amount of Loss	
Utilitarian-Purpose Event	Hedonic-Purpose Event	Low-Probability Risk	Medium-Probability Risk	Small-Loss	Big-Loss
To travel to and from your work	To drive for your pleasure	Low-level of breakdown risk	Medium-level of breakdown risk	$418	$1,018

After reading one of eight (8) scenarios, as a manipulation check for event type, risk probability level, and loss amount, I asked participants to rate their perception of event type (utilitarian-purpose event vs. hedonic-purpose event), risk level (low-probability risk vs. medium-probabili3ty risk), and the amount of loss (small-loss vs. big-loss) and use on a 7-point scale: "The scenario's event is close to the attributes of" (1 = '*Practical/ Productive Event*' to 7 = '*Enjoyable/Fun Event'*), "From the scenario, what do you think the probability of risk?" (1 = '*Low-Probability Risk*', 4 = '*Medium-Probability Risk*', 7 = '*High-Probability Risk*'), and "From the scenario, if the risk happens, what do you think the amount of the loss?" (1= '*Small-Loss'* to 7 = '*Big-Loss'*), respectively.

Next, I asked participants to mark their relative willingness to purchase insurance by answering the question: "Please rate your willingness to purchase extended used-car warranty." on a 7-point scale (1 = '*Definitely Won't Buy* (*No*)', 4 = '*Neutral'*, 7 =

‘*Definitely Will Buy* (*Yes*)’). In addition, I measured participants’ binary choice: “Do you want to buy an extended used-car warranty?” (1 = ‘*No*’, 2 = ‘*Yes*’).

On the next page of the survey, subsequent questions about decision-making reliance and demographic questions used the same method as previous studies.

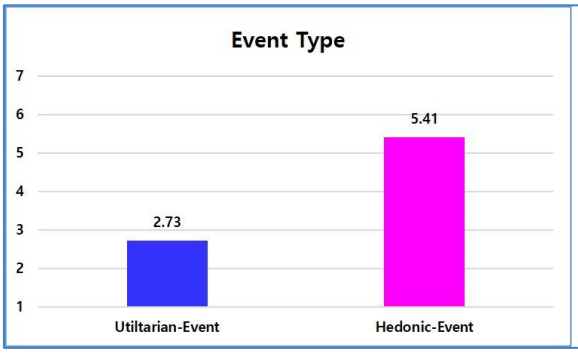
Finally, participants answered standard demographic questions. Participants received $0.50 for their participation.

4.4.2 Results and Discussion

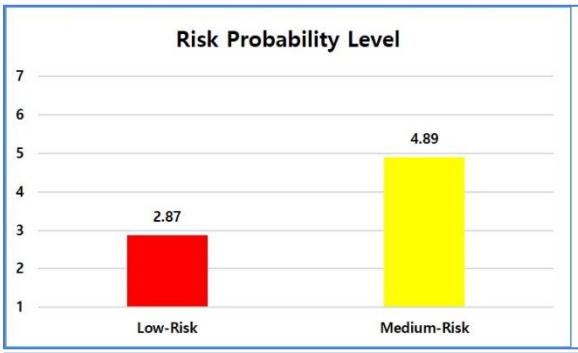
4.4.2.1 Manipulation Check.

The manipulation of event types was successful in showing that participants perceived ‘to travel to and from your work’ (M = 2.73) as significantly utilitarian-purpose event than that in the hedonic condition ‘To drive for your pleasure’ (M = 5.41; F (1, 418) = 391.120, p < .000). And, the manipulation of risk levels was also successful in showing that participants perceived two distinct probability of breakdown risk; low-probability risk (M = 2.87) verse medium-probability risk (M = 4.89; F = (1, 418) = 295.480, p < .000). Finally, the manipulation of loss amount was also successful in showing that participants perceived two distinct amount of loss; small-loss (M = 2.28) verse big-loss (M = 5.11; F = (1, 418) = 701.824, p < .000).

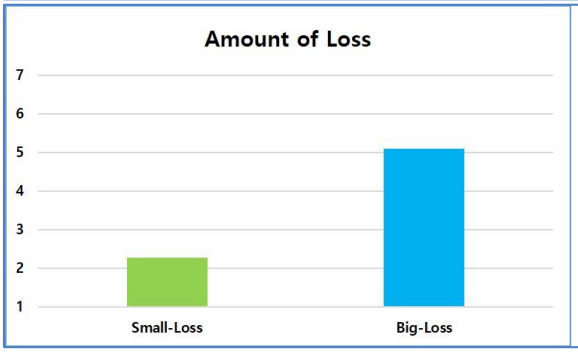
Figure 26_(Study 4) Manipulation Check of Event Type, Risk Probability Level, and Loss Amount



Factor	Mean	S.E	F-value/Sig.
Utilitarian-Event	2.73	1.364	391.120/ .000
Hedonic-Event	5.41	1.413	



Factor	Mean	S.E	F-value/Sig.
Low-Risk	2.87	1.107	295.480/ .000
Medium-Risk	4.89	1.293	



Factor	Mean	S.E	F-value/Sig.
Small-Loss	2.28	.950	701.824/ .000
Big-Loss	5.11	1.230	

Event Type: 1 = '*Practical/Productive Event*' to 7 = '*Enjoyable/Fun Event*'.
Risk Probability Level: 1 = '*Low-Probability Risk*' to 7 = '*High-Probability Risk*'.
The Amount of Loss: 1 = '*Small-Loss*' to 7 = '*Big-Loss*'.

4.4.2.2 Willingness Not to Go to Risky Place

Main and Interaction Effects

A multi-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) X 2 (Amount of Loss: Small-Loss vs. Big-Loss) ANOVA conducted on individuals' willingness to purchase used-car warranty yielded the expected interaction (F (1, 419) = 5.556, $p < .019$, $\eta^2 = .013$).

Table 57_(Study 4) Tests of Between-Subjects Effects

Dependent Variable: Willingness to Purchase Warranty
Design: Intercept + Risk Level + Event Type + Loss Amount + Risk Level * Event Type + Risk Level * Loss Amount + Event Type * Loss Amount + Risk Level * Event Type * Loss Amount

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	48.811[a]	7	6.973	2.367	.022	.039
Intercept	11630.354	1	11630.254	3947.701	.000	.905
RiskLevel	.619	1	.619	.210	.647	.001
EventType	21.894	1	21.894	7.431	.007	.018
LossAmount	.288	1	.288	.098	.755	.000
RiskLevel * EventType	1.550	1	1.550	.526	.469	.001
RiskLevel * LossAmount	4.685	1	4.685	1.590	.208	.004
EventType * LossAmount	2.540	1	2.540	.862	.354	.002
RiskLevel * EventType * LossAmount	16.369	1	16.369	5.556	.019	.013
Error	1213.786	412	2.946			
Total	12923.000	420				
Corrected Total	1262.598	419				

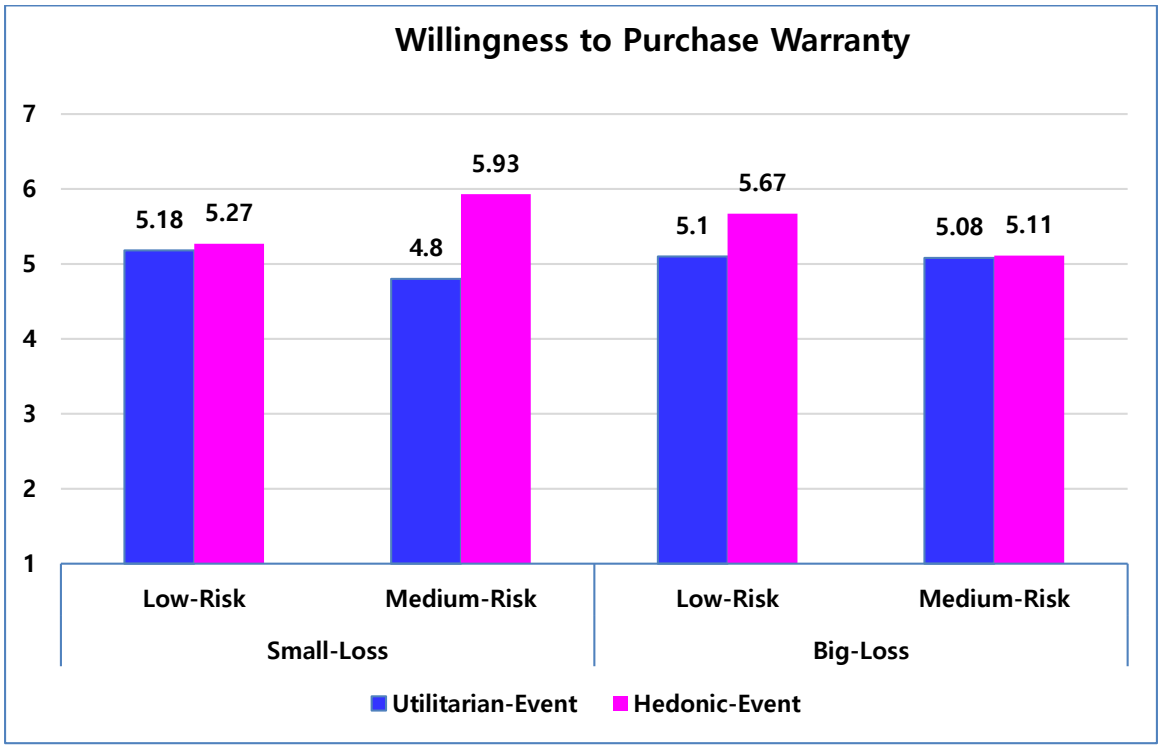
a. R Squared = .039 (Adjusted R Squared = .022).

The main effect for event type (F (1, 419) = 7.431, p < .007, η^2 = .018) was significant, whereas the main effects for risk level (F (1, 419) = .210, p < .647, η^2 = .001) and loss amount (F (1, 419) = .098, p < .775, η^2 = .000) were not significant.

Multi-Way ANOVA

Overall, the results of multi-way ANOVA indicated that participants showed relatively strong risk-averse attitudes across all conditions. In particular, individuals with SMRHE presented statistically the greatest willingness to purchase extended used-car warranty than those with other conditions (F (7, 412) = 2.367, p < .022).

Figure 27_(Study 4) Willingness to Purchase Warranty



Willingness: 1 = '*Definitely Won't Buy* (*No*)' to 7 = '*Definitely Will Buy* (*Yes*)'.

Table 58_(Study 4) Risk Attitude per condition interpreted through Willingness to not take risky action of Figure 18

Conditions		Risk Attitude
Small-Loss	LRUE	Risk-Averse
	LRHE	Risk-Averse
	MRUE	Risk-Averse
	MRHE	(the strongest) Risk-Averse
Big-Loss	LRUE	Risk-Averse
	LRHE	Risk-Averse
	MRUE	Risk-Averse
	MRHE	Risk-Averse

Table 59_(Study 4) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	48.811	7	6.793	2.367	.022
Within Groups	1213.786	412	2.946		
Total	1262.598	419			

Post Hoc Analysis

It was found that there was a significant difference in willingness to purchase extended used-car warranty depending on the conditions/groups ($p < .000$). In particular, as the result of Dunnett T3 (equal variances not assumed), there was a significant difference between groups in SMRUE and SMRHE.

Table 60_(Study 4) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Dunnett T3
Willingness to Purchase Warranty	SLRUE (a)	5.18	1.964	2.367/ .022	c > d
	SLRHE (b)	5.27	1.868		
	SMRUE (c)	4.80	1.571		
	SMRHE (d)	5.93	1.912		
	BLRUE (e)	5.10	1.652		
	BLRHE (f)	5.67	1.665		

	BMRUE (g)	5.08	1.456		
	BMRHE (h)	5.11	1.513		

Table 61_(Study 4) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Willingness to Purchase Warranty
Dunnett T3

(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SLRUE	SLRHE	-.096	.373	1.000	-1.29	1.09
	SMRUE	.382	.339	1.000	-.70	1.46
	SMRHE	-.747	.370	.706	-1.93	.43
	BLRUE	.081	.350	1.000	-1.04	1.20
	BLRHE	-.495	.350	.989	-1.61	.62
	BMRUE	.095	.336	1.000	-.98	1.17
	BMRHE	.067	.334	1.000	-1.00	1.13
SLRHE	SLRUE	.096	.373	1.000	-1.09	1.29
	SMRUE	.478	.340	.989	-.61	1.57
	SMRHE	-.651	.371	.891	-1.84	.53
	BLRUE	.176	.351	1.000	-.95	1.30
	BLRHE	-.399	.351	1.000	-1.52	.72
	BMRUE	.191	.338	1.000	-.89	1.27
	BMRHE	.163	.335	1.000	-.91	1.24
SMRUE	SLRUE	-.382	.339	1.000	-1.46	.70
	SLRHE	-.478	.340	.989	-.157	.61
	SMRHE	-1.130*	.337	.030	-2.21	-.05
	BLRUE	-.302	.315	1.000	-1.31	.70
	BLRHE	-.877	.315	.159	-1.88	.13
	BMRUE	-.287	.300	1.000	-1.25	.67
	BMRHE	-.315	.297	1.000	-1.26	.63
SMRHE	SLRUE	.747	.370	.706	-.43	1.93
	SLRHE	.651	.371	.891	-.53	1.84
	SMRUE	1.130*	.337	.030	.05	2.21
	BLRUE	.828	.348	.404	-.28	1.94
	BLRHE	.253	.348	1.000	-.86	1.36
	BMRUE	.843	.334	.303	-.23	1.91
	BMRHE	.815	.332	.346	-.25	1.88

BLRUE	SLRUE	-.081	.350	1.000	-1.20	1.04
	SLRHE	-.176	.351	1.000	-1.3	.95
	SMRUE	.302	.315	1.000	-.70	1.31
	SMRHE	-.828	.348	.404	-1.94	.28
	BLRHE	-.575	.327	.889	-1.62	.47
	BMRUE	.015	.313	1.000	-.99	1.01
	BMRHE	-.013	.310	1.000	-1.00	.98
BLRHE	SLRUE	.495	.350	.989	-.62	1.61
	SLRHE	.399	.351	1.000	-.72	1.52
	SMRUE	.877	.315	.159	-.13	1.88
	SMRHE	-.253	.348	1.000	-1.36	.86
	BLRUE	.575	.327	.889	-.47	1.62
	BMRUE	.590	.312	.809	-.41	1.59
	BMRHE	.562	.309	.857	-.43	1.55
BMRUE	SLRUE	-.095	.336	1.000	-1.17	.98
	SLRHE	-.191	.338	1.000	-1.27	.89
	SMRUE	.287	.300	1.000	-.67	1.25
	SMRHE	-.843	.334	.303	-1.91	.23
	BLRUE	-.015	.313	1.000	-1.01	.99
	BLRHE	-.590	.312	.809	-1.59	.41
	BMRHE	-.028	.294	1.000	-.97	.91
BMRHE	SLRUE	-.067	.334	1.000	-1.13	1.00
	SLRHE	-.163	.335	1.000	-1.24	.91
	SMRUE	.315	.297	1.000	-.63	1.26
	SMRHE	-.815	.332	.346	-1.88	.25
	BLRUE	.013	.310	1.000	-.98	1.00
	BLRHE	-.562	.309	.857	-1.55	.43
	BMRUE	.028	.294	1.000	-.91	.97

* The mean difference is significant at the 0.05 level.

4.4.2.3 Binary Choice

A logistic regression was performed to test binary choice whether participants would want to bur used-car extended warranty or not. The logistic regression model was

statistically significant, $x^2(7) = 17.312$, $p < .015$. The model explained 6% (Nagelkerke R^2) of the variance in binary choice and correctly classified 69.8% of cases.

Especially, I found significant effects on SLRUE (*B* = -.1.194, *S.E* = .442, *OR* = .303, $p < .030$), SLRHE (*B* = -.960, *S.E* = .455, *OR* = .383, $p < .035$), SMRUE (*B* = -.951, *S.E* = .450, *OR* = .386, $p < .034$), and SMRHE (*B* = -.951, *S.E* = .450, *OR* = .386, $p < .034$) in all small-loss conditions.

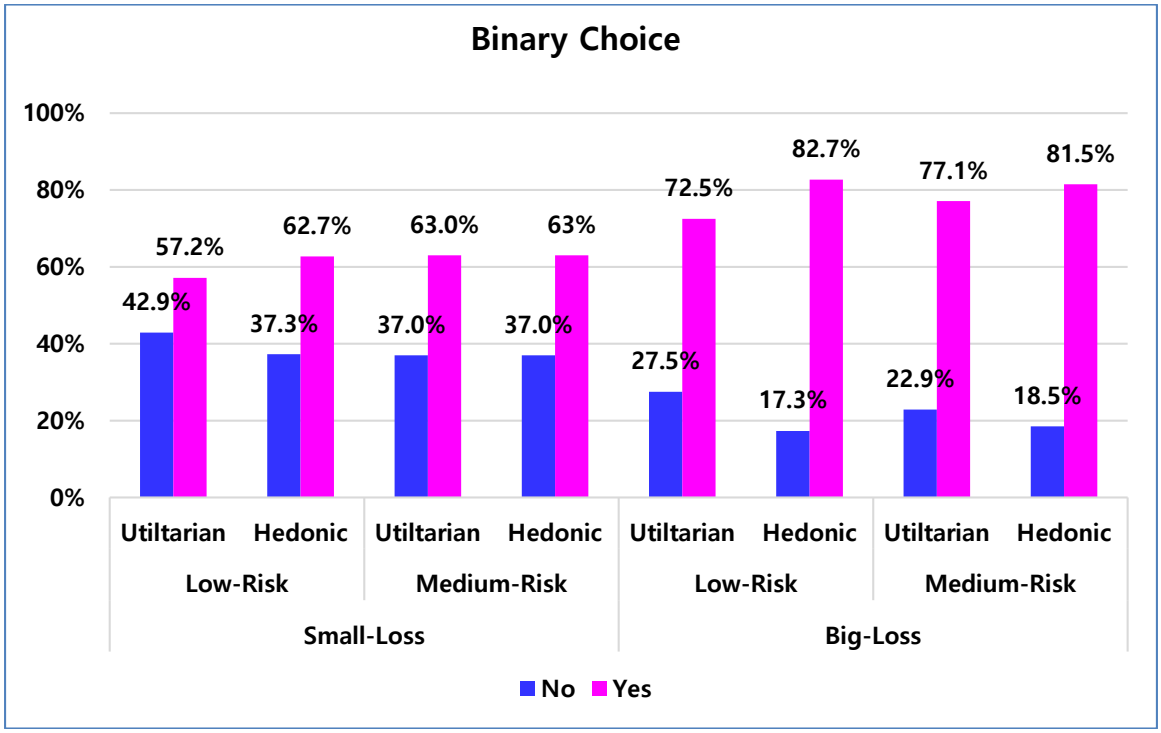
Table 62_(Study 4) Binary Choice

log (Binary Choice) = 1.482 -.971 * (SLRUE) -.960 * (SLRHE) -.951 * (SMRUE) -.951 * (SMRHE)

Variable	B	S.E	Wald	Exp(B)	95% CI		Sig.
					Lower	Upper	
BMRHE			16.224				.058
SLRUE	-1.194	.442	7.286	.303*	.127	.721	.030
SLRHE	-.960	.455	4.463	.383*	.157	.933	.035
SMRUE	-.951	.450	4.474	.386*	.160	.933	.034
SMRHE	-.951	.450	4.474	.386*	.160	.933	.034
BLRUE	-.510	.470	1.175	.601	.239	1.510	.278
BLRHE	.082	.507	.026	1.086	.402	2.933	.871
BMRUE	-.269	.491	.300	.764	.292	2.000	.584
Constant	1.482	.350	17.886	4.400			.000
Chi-square (df), Sig.					17.312 (7), .015		
Chi-square (df) of Hosmer-Lemeshow Test, Sig.					0.000 (5), 1.000		

* $p < .05$.

Figure 28_(Study 4) Binary Choice



As a result of binary choice logistics regression analysis, it reveals that people tend to avoid risk more strongly in the scenario of all big-loss conditions. Also, hedonic-events tend to be more risk-averse than utilitarian-event. Especially in the case of SLRHE, both showed strong risk-averse attitudes regardless of the amount of the loss.

4.4.2.4 Decision-Making Reliance on *System 1* (*Heart*) vs. *System 2* (*Head*)

Factor Analysis, Reliability Analysis, and Correlations per Condition

Like previous studies, the same analysis was conducted.

Table 63_(Study 4) Factor and Reliability Analysis

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SLRUE	System 1	Intuitively	.917	.845	1.653	41.334	α = .787
		Heart	.887	.803			
	System 2	Deliberately	.868	.754	1.453	36.327	α = .621
		Head	.824	.704			
	KMO (Kaiser-Meyer-Olkin)						.370
	Bartlett' Test of Sphericity				Chi-Square		56.655
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SLRHE	System 1	Heart	.922	.853	1.696	42.410	α = .818
		Intuitively	.919	.852			
	System 2	Head	.857	.735	1.477	36.923	α = .636
		Deliberately	.856	.733			
	KMO (Kaiser-Meyer-Olkin)						.498
	Bartlett' Test of Sphericity				Chi-Square		44.577
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SMRUE	System 1	Heart	.892	.798	1.618	40.444	α = .721
		Intuitively	.861	.749			
	System 2	Deliberately	.896	.809	1.494	37.349	α = .661
		Head	.825	.754			
	KMO (Kaiser-Meyer-Olkin)						.505
	Bartlett' Test of Sphericity				Chi-Square		40.988
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
SMRHE	System 1	Heart	.905	.828	1.641	41.027	α = .765
		Intuitively	.903	.819			
	System 2	Head	.862	.748	1.484	37.102	α = .646
		Deliberately	.854	.731			
	KMO (Kaiser-Meyer-Olkin)						.463
	Bartlett' Test of Sphericity				Chi-Square		42.616
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BLRUE	System 1	Heart	.940	.884	1.837	36.736	α = .831
		Intuitively	.872	.760			
	System 2	Deliberately	.729	.532	1.489	29.787	α = .480
		Head	.703	.542			
		Slowly	.680	.607			
	KMO (Kaiser-Meyer-Olkin)						.401
	Bartlett' Test of Sphericity				Chi-Square		59.589
					df (*p*)		10 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BLRHE	System 2	Deliberately	.921	.849	1.812	45.310	α = .829
		Head	.897	.851			
	System 1	Heart	.929	.864	1.547	38.667	α = .709
		Quickly	.797	.795			
	KMO (Kaiser-Meyer-Olkin)						.587
	Bartlett' Test of Sphericity				Chi-Square		67.116
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BMRUE	System 1	Heart	.844	.801	1.664	41.067	α = .757
		Intuitively	.770	.813			
	System 2	Deliberately	.830	.775	1.467	36.680	α = .617
		Head	.624	.742			
	KMO (Kaiser-Meyer-Olkin)						.514
	Bartlett' Test of Sphericity				Chi-Square		36.178
					df (*p*)		6 (.000)

	Factor	Variable	Factor Analysis				Reliability Analysis
			Factor Load	Communality	Eigen-value	% of Variance	Cronbach α
BMRHE	System 1	Heart	.922	.852	1.670	41.745	α = .763
		Intuitively	.871	.771			
	System 2	Deliberately	.895	.807	1.505	37.619	α = .670
		Head	.831	.745			
	KMO (Kaiser-Meyer-Olkin)						.386
	Bartlett' Test of Sphericity				Chi-Square		54.738
					df (*p*)		6 (.000)

As shown in Figure 26, it presented that the variables between *System 1* versus *System 2* are clearly divided into two areas. As in previous studies, respondents distantly understood and answered each question about decision-making reliance on *System 1* versus *System 2*.

Figure 29_(Study 4) Component Plot in Rotated Space

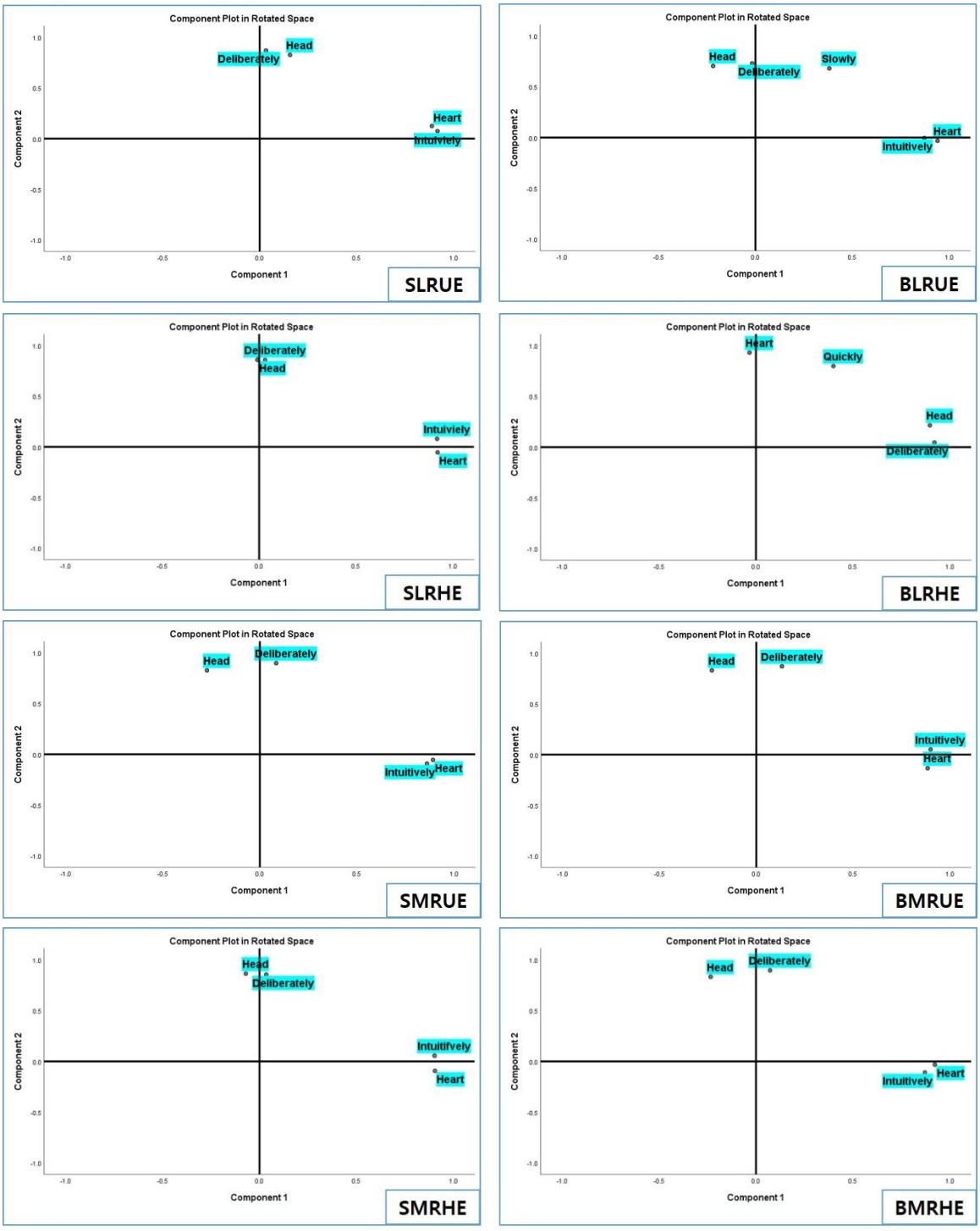


Table 64_(Study 4) Correlation Table

	Variable	Correlations			
		1. Intuitively	2. Deliberately	3. Heart	4. Head
SLRUE	1. Intuitively	1	.023	.650**	.290*
	2. Deliberately		1	.248	.451**
	3. Heart			1	.420
	4. Head				1

	Variable	Correlations			
		1. Intuitively	2. Deliberately	3. Heart	4. Head
SLRHE	1. Intuitively	1	.077	.696**	.056
	2. Deliberately		1	-.010	.470**
	3. Heart			1	-.040
	4. Head				1

	Variable	Correlations			
		1. Intuitively	2. Deliberately	3. Heart	4. Head
SMRUE	1. Intuitively	1	-.084	.567**	-.217
	2. Deliberately		1	.013	.500**
	3. Heart			1	-.284*
	4. Head				1

	Variable	Correlations			
		1. Intuitively	2. Deliberately	3. Heart	4. Head
SMRHE	1. Intuitively	1	.008	.637**	.024
	2. Deliberately		1	-.008	.476**
	3. Heart			1	-.154
	4. Head				1

	Variable	Correlations				
		1. Intuitively	2. Deliberately	3. Heart	4. Head	5. Slowly
BLRUE	1. Intuitively	1	-.077	.712**	.020	.166
	2. Deliberately		1	.041	.233	.283*
	3. Heart			1	-.257	.284*
	4. Head				1	.225
	5. Slowly					1

		Correlations			
BLRHE		1. Deliberately	2. Quickly	3. Heart	4. Head
	1. Deliberately	1	.349*	.080	.708**
	2. Quickly		1	.563**	.488**
	3. Heart			1	.176
	4. Head				1

	Variable	Correlations			
BMRUE		1. Intuitively	2. Heart	3. Head	4. Deliberately
	1. Intuitively	1	.617**	-.135	.099
	2. Heart		1	-.241	-.028
	3. Head			1	.456**
	4. Deliberately				1

	Variable	Correlations			
BMRHE		1. Intuitively	2. Heart	3. Deliberately	4. Head
	1. Intuitively	1	.634**	-.142	-.155
	2. Heart		1	.069	-.291*
	3. Deliberately			1	.506**
	4. Head				1

Note: Cells display Pearson's Correlation.

** $p < .01$. Correlation is significant at the 0.01 level (2-tailed).

* $p < .05$. Correlation is significant at the 0.05 level (2-tailed).

Main and Interaction Effects

A multi-way 2 (Risk Probability Level: Low-Probability Risk vs. Medium-Probability Risk) X 2 (Event Type: Utilitarian-Purpose vs. Hedonic-Purpose) X 2 (Amount of Loss: Small-Loss vs. Big-Loss) ANOVA conducted on participants' relative reliance on decision-making between emotion versus reason yielded the expected interaction (F (1, 419) = 4.231, $p < .040$, $\eta^2 = .010$). The main effects for risk level (F (1, 419) = 7.246, $p < .007$, $\eta^2 = .017$) and amount loss (F (1, 419) = 13.652, $p < .000$, $\eta^2 = .032$) were significant.

Table 65_(Study 4) Tests of Between-Subjects Effects

Dependent Variable: Decision-Making Reliance

Design: Intercept + Risk Level + Event Type + Loss Amount + Risk Level * Event Type + Risk Level * Loss Amount + Event Type * Loss Amount + Risk Level * Event Type * Loss Amount

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	35.985[a]	7	5.141	3.864	.000	.062
Intercept	10278.036	1	10278.036	7725.085	.000	.949
RiskLevel	9.641	1	9.641	7.246	.007	.017
EventType	.061	1	.061	.046	.831	.000
LossAmount	18.163	1	18.163	13.652	.000	.032
RiskLevel * EventType	1.082	1	1.082	.814	.368	.002
RiskLevel * LossAmount	1.155	1	1.155	.868	.352	.002
EventType * LossAmount	.263	1	.263	.197	.657	.000
RiskLevel * EventType * LossAmount	5.629	1	5.629	4.231	.040	.010
Error	548.156	412	1.330			
Total	10895.000	420				
Corrected Total	584.140	419				

a. R Squared = .062 (Adjusted R Squared = .046).

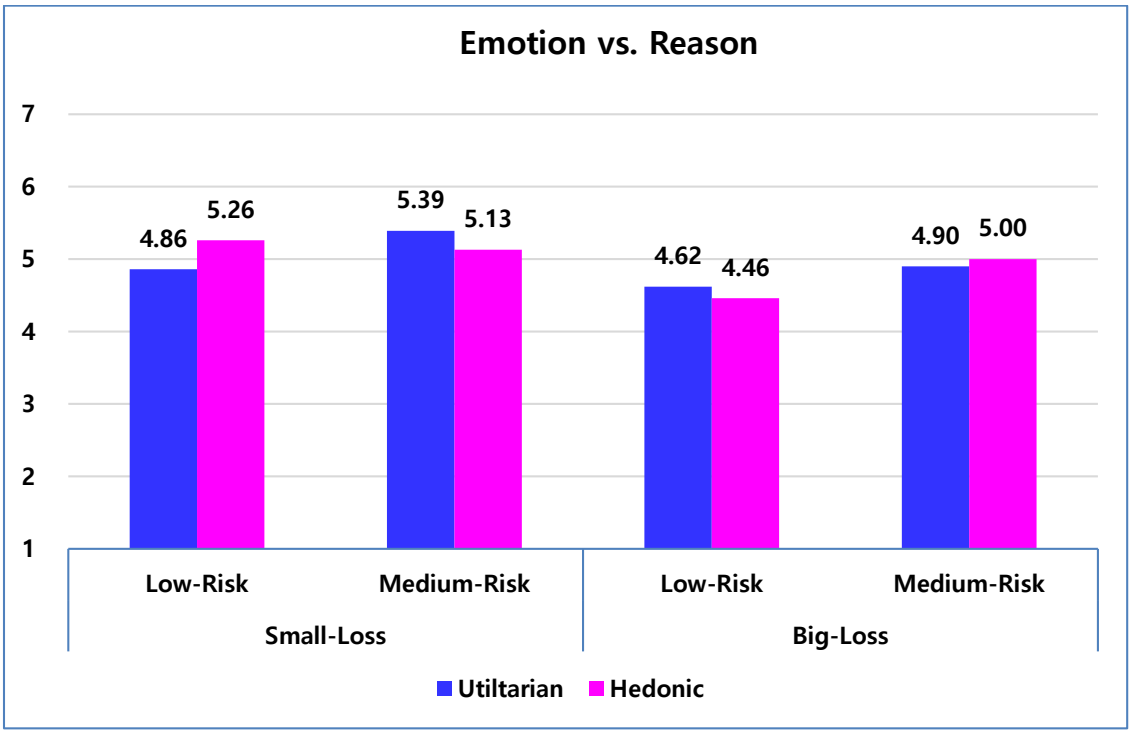
Multi-way ANOVA

Like Study 2, excluding only the case for SLRHE condition, big-loss conditions showed a tendency to make decisions based on emotions relatively more than small-loss ones. In particular, BLRHE (M = 4.46, SD = 1.188; F (7, 412) = 3.864, p < .000) seems to have made the most emotional decision.

Table 66_(Study 4) ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	35.985	7	5.141	3.864	.000
Within Groups	548.156	412	1.330		
Total	584.140	419			

Figure 30_(Study 4) Decision-Making Reliance between Emotion vs. Reason



Decision-Making Reliance: 1 = '*Using only Emotion*' to 7 = '*Using only Reason*'.

Table 67_(Study 4) Decision-Making Reliance

Conditions		Decision-Making Reliance
Small-Loss	LRUE	Reason
	LRHE	Reason
	MRUE	Reason
	MRHE	Reason
Big-Loss	LRUE	Neutral
	LRHE	Neutral
	MRUE	Reason
	MRHE	Reason

Post Hoc Analysis

It was found that there was a significant difference in the decision-making base, depending on the conditions ($p < .000$). In particular, as the result of Dunnett T3 (equal variances not assumed), there was a significant difference among groups in SMRUE, BLRHE, and BLRUE. In detail, the condition of BLRHE showed the lowest mean on the participant's relative emotional choice reliance.

Table 68_(Study 4) Post Hoc Analysis

DV	Conditions	Mean	Std. Deviation	F-vale/Sig.	Dunnett T3
Decision-Making Reliance	SLRUE (a)	4.86	1.313	3.864/ .000	c > f, e
	SLRHE (b)	5.26	.839		
	SMRUE (c)	5.39	1.369		
	SMRHE (d)	5.13	1.087		
	BLRUE (e)	4.62	.887		
	BLRHE (f)	4.46	1.188		
	BMRUE (g)	4.90	1.180		
	BMRHE (h)	5.00	1.125		

Table 69_(Study 4) Post Hoc Analysis: Multiple Comparisons

Dependent variable: Decision-Making Relative Reliance between Emotion vs. Reason
Dunnett T3

(I) Conditions	(J) Conditions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SLRUE	SLRHE	-.408	.211	.779	-1.08	.27
	SMRUE	-.532	.256	.659	-1.35	.29
	SMRHE	-.272	.229	.999	-1.01	.46
	BLRUE	.239	.215	1.000	-.45	.93
	BLRHE	.396	.241	.940	-.37	1.16
	BMRUE	-.039	.245	1.000	-.82	.74
	BMRHE	-.143	.242	1.000	-.92	.63
SLRHE	SLRUE	.408	.211	.779	-.27	1.08

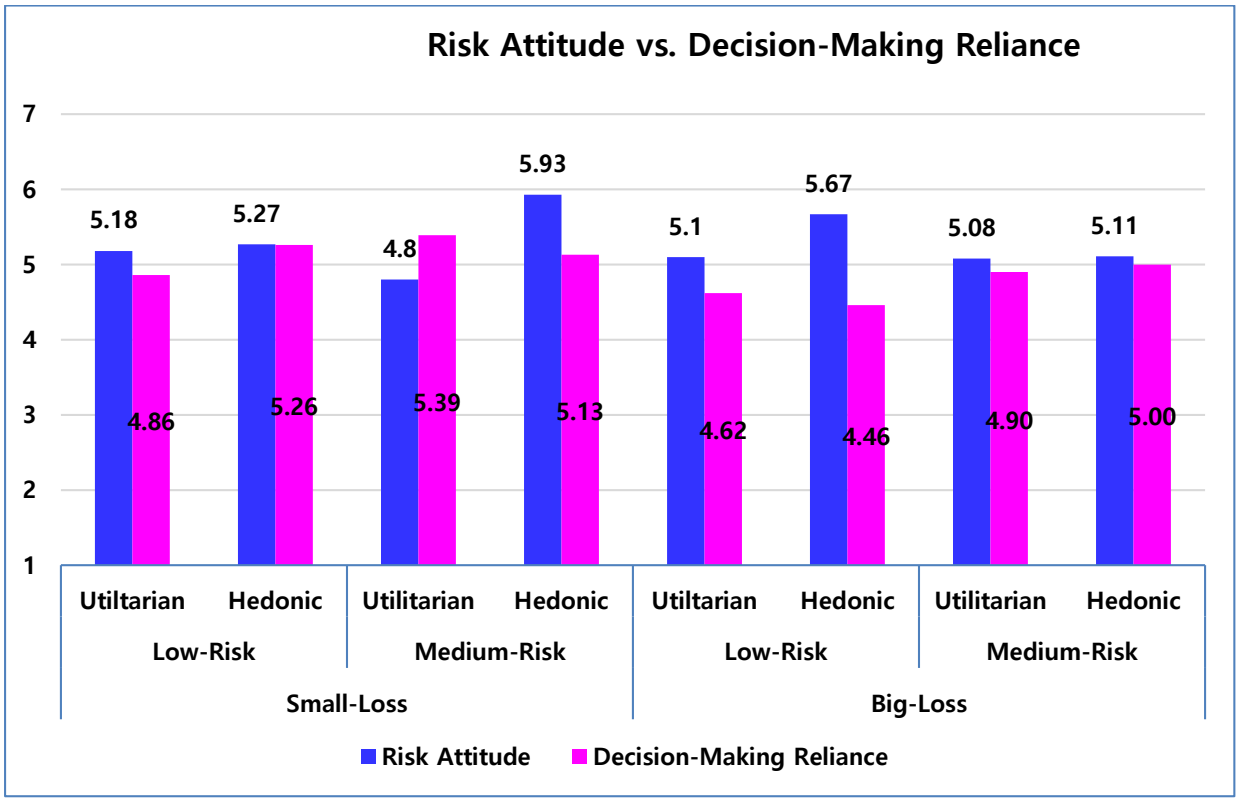
	SMRUE	-.124	.220	1.000	-.83	.58
	SMRHE	.135	.189	1.000	-.47	.74
	BLRUE	.647*	.171	.007	.10	1.19
	BLRHE	.803*	.202	.004	.16	1.45
	BMRUE	.369	.207	.874	-.30	1.03
	BMRHE	.532	.204	.996	-.39	.92
SMRUE	SLRUE	.532	.256	.659	-.29	1.35
	SLRHE	.124	.220	1.000	-.58	.83
	SMRHE	.259	.238	1.000	-.50	1.02
	BLRUE	.771*	.224	.024	.05	1.49
	BLRHE	.927*	.249	.009	.13	1.72
	BMRUE	.493	.252	.761	-.31	1.30
	BMRHE	.389	.250	.966	-.41	1.19
SMRHE	SLRUE	.272	.229	.999	-.46	1.01
	SLRHE	-.135	.189	1.000	-.74	.47
	SMRUE	-.259	.238	1.000	-1.02	.50
	BLRUE	.512	.193	.223	-.11	1.13
	BLRHE	.668	.221	.084	-.04	1.38
	BMRUE	.234	.226	1.000	-.49	.96
	BMRHE	.130	.223	1.000	-.58	.84
BLRUE	SLRUE	-.239	.215	1.000	-.93	.45
	SLRHE	-.647*	.171	.007	-1.19	-.10
	SMRUE	-.771*	.224	.024	-1.49	-.05
	SMRHE	-.512	.193	.223	-1.13	.11
	BLRHE	.156	.206	1.000	-.50	.82
	BMRUE	-.278	.211	.995	-.95	.40
	BMRHE	-.382	.208	.841	-1.05	.28
BLRHE	SLRUE	-.396	.241	.940	-1.16	.37
	SLRHE	-.803*	.202	.004	-1.45	-.16
	SMRUE	-.927*	.249	.009	-1.72	-.13
	SMRHE	-.668	.221	.084	-1.38	.04
	BLRUE	-.156	.206	1.000	-.82	.50
	BMRUE	-.434	.237	.846	-1.19	.32
	BMRHE	-.538	.234	.469	-1.29	.21
BMRUE	SLRUE	.039	.245	1.000	-.74	.82
	SLRHE	-.369	.207	.874	-1.03	.30
	SMRUE	-.493	.252	.761	-1.30	.31
	SMRHE	-.234	.226	1.00	-.96	.49
	BLRUE	.278	.211	.995	-.40	.95

	BLRHE	.434	.237	.846	-.32	1.19
	BMRHE	-.104	.238	1.000	-.87	.66
BMRHE	SLRUE	.143	.242	1.000	-.63	.92
	SLRHE	-.265	.204	.996	-.92	.39
	SMRUE	-.389	.250	.996	-1.19	.41
	SMRHE	-.130	.223	1.000	-.84	.58
	BLRUE	.382	.208	.841	-.28	1.05
	BLRHE	.538	.234	.469	-.21	1.29
	BMRUE	.104	.238	1.000	-.66	.87

* The mean difference is significant at the 0.05 level.

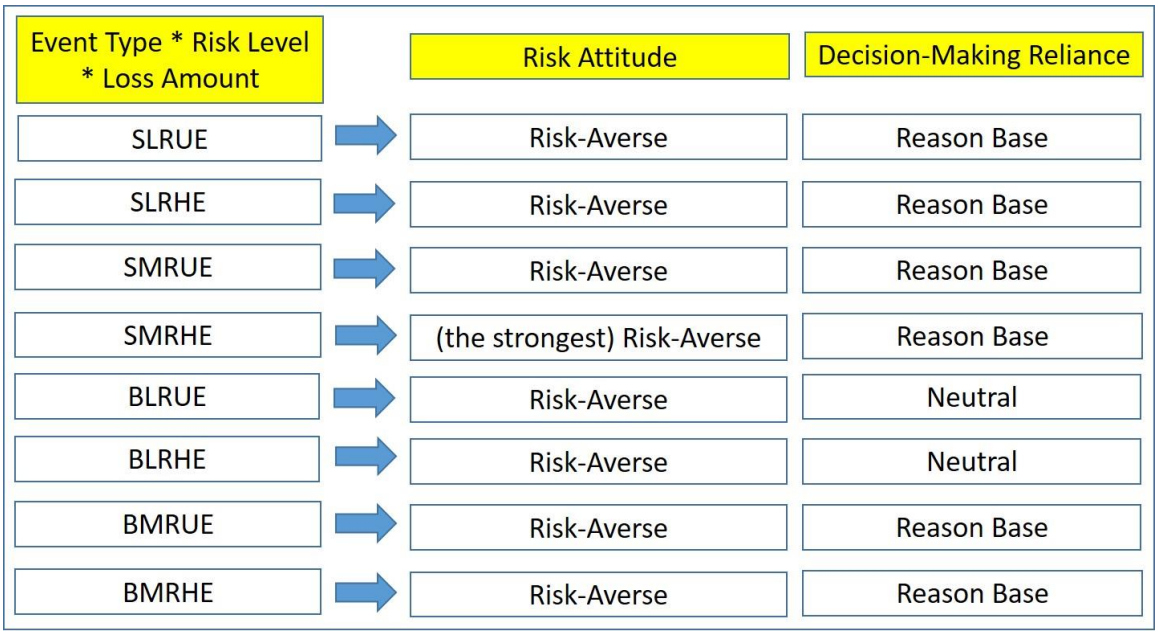
In the big-loss condition, the participant made their decisions relatively emotion-based compared to the small-loss condition.

Figure 31_(Study 4) Risk Attitude vs. Decision-Making Reliance



Risk Attitude: 1 = '*Risk-Taking*' to 7 = '*Risk-Averse*'
Decision-Making Reliance: 1 = '*Using only Emotion (System 1)*' to 7 = '*Using only Reason (System 2)*'.

Figure 32_Research Model and Results



4.4.2.5 Decision-Making Reliance with LR Scale

Moderated Regression Analysis

When the regression analysis was completed by intervening PANAS-SF scale as a moderated variable, it was found that the PANAS scale showed a significant difference in seven (8) conditions; SLRHE (PA, NA), SMRUE (PA, NA), BLRUE (PA, NA), BLRHE (PA, NA) (see Table 70). As in Study 4 (4.3.2.5), the same analysis was conducted.

Table 70_(Study 4) Moderated Regression Analysis Results

Condition	Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics				
						R^2 Change	F Change	df 1	df 2	Sig F. Change
SLRUE (PA)	1	$.315^a$	.099	.082	1.88154	.099	5.944	1	54	.018
	2	$.360^b$	.130	.097	1.86693	.030	1.848	1	53	.180
	3	$.368^c$	.135	.085	1.87854	.006	.347	1	52	.558
SLRUE	1	$.315^a$	.099	.082	1.88154	.099	5.944	1	54	.018

(NA)	2	$.315^{b}$	.099	.065	1.89910	.000	.066	1	53	.939
	3	$.330^{c}$	.109	.057	1.90711	.010	.556	1	52	.459
SLRHE (PA)	1	$.512^{a}$	.262	.247	1.75520	.262	17.422	1	49	.000
	2	$.529^{b}$	.280	.250	1.75157	.018	1.203	1	48	.278
	3	$.591^{c}$	.349	.308	1.68322	.069	4.978	1	47	.030
SLRHE (NA)	1	$.512^{a}$	.262	.247	1.755	.262	17.422	1	49	.000
	2	$.606^{b}$	.367	.341	1.642	.105	7.980	1	48	.007
	3	$.649^{c}$	.421	.384	1.588	.053	4.308	1	47	.043
SMRUE (PA)	1	$.521^{a}$	.271	.257	1.35374	.271	19.351	1	52	.000
	2	$.599^{b}$	.359	.334	1.28198	.088	6.984	1	51	.011
	3	$.641^{c}$	.411	.376	1.24.97	.052	4.426	1	50	.040
SMRUE (NA)	1	$.521^{a}$	.271	.257	1.35374	.271	19.351	1	52	.000
	2	$.521^{b}$	.272	.243	1.36667	.000	8.021	1	51	.006
	3	$.525^{c}$	.276	.233	1.37006	.004	5.307	1	50	.038
SMRHE (PA)	1	$.301^{a}$	.090	.073	1.84079	.090	5.165	1	52	.027
	2	$.309^{b}$	.095	.060	1.85337	.005	.274	1	51	.603
	3	$.315^{c}$	.099	.045	1.86802	.004	.255	1	50	.637
SMRHE (NA)	1	$.301^{a}$	.090	.073	1.84079	.090	5.165	1	52	.027
	2	$.369^{b}$	.136	.102	1.81168	.045	2.685	1	51	.107
	3	$.374^{c}$	.140	.088	1.82526	.004	.244	1	50	.624
BLRUE (PA)	1	$.460^{a}$	.211	.195	1.48231	.211	13.128	1	49	.001
	2	$.542^{b}$	.294	.264	1.41731	.082	5.597	1	48	.022
	3	$.598^{c}$	.358	.317	1.36537	.064	4.721	1	47	.035
BLRUE (NA)	1	$.460^{a}$	.211	.195	1.48231	.211	13.128	1	49	.001
	2	$.466^{b}$	.217	.184	1.49252	.005	.332	1	48	.567
	3	$.558^{c}$	.311	.267	1.41448	.094	6.441	1	47	.015
BLRHE (PA)	1	$.257^{a}$	.066	.047	1.626	.066	13.524	1	50	.066
	2	$.257^{b}$	.066	.028	1.642	.000	7.004	1	49	.652
	3	$.258^{c}$	.067	.008	1.658	.001	1.033	1	48	.040
BLRHE (NA)	1	$.257^{a}$	.066	.047	1.626	.066	3.524	1	50	.066
	2	$.257^{b}$	.066	.028	1.642	.000	.001	1	49	.979
	3	$.295^{c}$	.087	.030	1.640	.021	1.099	1	48	.030
BMRUE (PA)	1	$.548^{a}$	.300	.285	1.23118	.300	19.751	1	46	.000
	2	$.552^{b}$	.304	.274	1.24114	.004	.265	1	45	.609
	3	$.553^{c}$	.306	.258	1.25399	.001	.082	1	44	.775
BMRUE (NA)	1	$.548^{a}$	.300	.285	1.23118	.300	19.751	1	46	.000
	2	$.556^{b}$	.309	.278	1.23715	.009	.557	1	45	.459
	3	$.588^{c}$	.345	.301	1.21770	.036	2.449	1	44	.125
BMRHE (PA)	1	$.505^{a}$	.255	.241	1.31829	.255	17.816	1	52	.000
	2	$.613^{b}$	.376	.352	1.21818	.121	9.898	1	51	.003
	3	$.616^{c}$	.379	.342	1.22728	.003	.246	1	50	.622
BMRHE (NA)	1	$.505^{a}$	.255	.241	1.31829	.255	17.816	1	52	.000
	2	$.544^{b}$	.296	.269	1.29403	.041	2.968	1	51	.091
	3	$.556^{c}$	.310	.268	1.29438	.013	.972	1	50	.329

Table 71_(Study 4) PANAS-SF Means

Conditions	PA	NA
SLRHE	4.13	2.91
SMRUE	3.7	2.66
BLRUE	2.79	3.87
BLRHE	3.8	4.43

LR Scale: 1 = ‘Strongly Disagree’ to 6 = ‘Strongly Agree’.

The table above shows the comparison of the mean of the PANAS-SF scale between groups showing the significant differences in moderated regression analysis. These results derive the following results. When comparing the loss size, the tendency to avoid risk in the case of big-loss appears to be a negative emotion, whereas, in small-loss, the tendency to avoid risk is based on positive emotions.

CHAPTER 5 GENERAL DISCUSSION

This research studies how individuals perceive risky situations, and after that, how they make choices.

Many studies have been conducted to understand, interpret, and predict human behavior, but errors that deviate from predictions have always appeared. People do not always rationally make optimal choices. Sometimes their decision based on intuitions or heuristics leads to better outcomes. Thus, what factors influence human decision-making, especially under risk?

Although many researchers have made great efforts to find variables that influence decision-making, errors still occur, and situational variables hinder prediction optimization. My dissertation also started to solve these problems. Notably, under risk, how people's decisions are made, what variables are affected, and how to increase an individual's attention to (even low-probability) risky situation and draw their choice to actively engage in precautionary behavior before misfortune arise. I believe that this preventive behavior can reduce the burden of cost to society. Furthermore, based on the results of this research, effective risk communication can be proposed.

To this purpose, this research has been examined decision-making under risk such as travel insurance (study 1), flood insurance (study 2), will you go to a risky place? (study 3), and used-car extended warranty choice (study 4) through Amazon Mechanical Turk (Survey-based experiments).

In Study 1, I tested hypothesis 1. Even though the level of risk probability and the type of risky event are two essential factors affecting decision-making, respectively, there is no research exploring the interplay between these two variables on consumer decision-

making under risk. I have successfully observed that the interaction of two variables yields different results, unlike conventional economy theory (e.g., *Expected Utility Theory*). LRHE (low-risk with hedonic-event) showed the highest willingness to purchase insurance to avoid risk (risk-averse attitude). *Construal Level Theory* and *Prospect Theory* has introduced this explanation before; however, in reality, people might disregard a low-probability risk event and tend to take the low-probability risk.

Moreover, people showed risk-taking behavior with hedonic-benefits because they seek cheerfulness and excitement (Chitturi, 2008). However, in Study 1, we should note that people want to avoid it even at low-probability risk levels, especially in HEDONIC events rather than utilitarian events. Moreover, these results also strongly support *Risk-as-Feeling Hypothesis.* This hypothesis is that if people perceive a risk emotionally, it becomes insensitive to the level of risk probability. Therefore, individuals show strong risk-averse attitudes even at a low-level of risk probability. As the last part of Study 1, when asking the basis for the decision-making reliance, it was found that the most emotional judgment made LRHE (the strongest risk-averse attitude)'s decision. Therefore, hypothesis 1 was accepted.

In Study 2, I tested hypothesis 2. Study 2 also reputedly proved that people having hedonic-event with low-probability risk tend to avoid risk strongly. After applying one more variable, the amount of loss, people show a slightly different attitude. When comparing big-loss versus small-loss, people tend to be more risk-averse when they perceived small-loss. Furthermore, it turns out that this judgment is based on more rational thinking than on a big-loss condition. It is explained that the amount of loss acts

as an essential variable in risk perception, and it can be linked to the explanation that people's reliance on decision-making has changed after recognizing the extent of the outcome loss. Therefore, hypothesis 2 was accepted.

In Study 3, I examined the hypothesis; the decision-making under risk depends on the person's usual personality and traits, either emotional or rational. When analyzing attitudes under risk through Study 1 and Study 2, it was confirmed that the choice was made by emotion or reason-based. However, in order to test whether such rational or emotional judgment is determined by what people feel at the moment of the experiment or is due to the usual individual's personality, the experiment was conducted by introducing a Lay Rationalism (LR) Scale representing the degree of rationalization of an individual as a moderated variable. The test results revealed that human beings depend on the sound of the heart (*System 1*) or the logic from the head (*System 2*) at the moment of exposure to risk rather than their usual personality or propensity.

In conclusion, whether an individual depends on the heart's sound or the logic in the head when making a decision is more dependent on the variable context of each experimental condition. Therefore, this result presents an essential message on risk communication. No matter how reasonable or emotional you are usually, you can make different choices when making choices under risk, depending on the variable of information you have. Thus, hypothesis 3 was rejected.

For hypothesis 4, all studies (studies 1 to 4 tested decision-making reliance between emotion vs. reason, but the result was partly accepted across the studies. Under small-loss, people follow rational judgment (*System 2*) to avoid risk, whereas, under big-loss,

they listen to emotional judgment (*System 1*) to avoid risk. There is a need to continue research in this area.

In the previous studies, the effect of interaction between various variables was confirmed, and it was proved that the final choice was changeable in reliance (emotion vs. reason) generated while decision-making. Here, more specifically, I have a desire to study which emotion is most effective and most influential in making optimal choices under risk. For this purpose, Study 5 was tested. This study makes impressive results that people activate negative emotions to avoid risk under the big-loss area, whereas they activate positive emotions to avoid risk under small-loss.

When comparing the loss size, the tendency to avoid risk in the case of big-loss appears to be a negative emotion, whereas, in small-loss, the tendency to avoid risk is based on positive emotions. The result of this study also presents necessary signals for risk communication. To prepare for the risk under big-loss, it is possible to show a risk-averse attitude by conveying negative emotions to people. On the other hand, in a small loss scenario, raising positive emotions can lead to a risk-averse attitude.

Hedonic benefit seeks to maintain positive emotions. Thus, even though people have a low-probability risky event, but the event has hedonic benefit, people would try to avoid risk not to lose positive emotions. Besides, as in *Risk-as-Feelings*, if individuals perceive risk as an emotion, it is interpreted that people feel it strongly and take action regardless of the probability level of occurrence. Therefore, hypotheses 5 and 6 were accepted.

The contributions of this research are six fold.

First of all, most research papers about consumer decision-making under risk have been studied in the gain domain, whereas this study has examined it in the field of loss domain.

Secondly, even though considering utilitarian or hedonic attributes as one variable is a prevalent and useful concept from marketing, it hardly has been used in the research about consumer decision-making under risk. Therefore, I have employed it as an independent variable.

Thirdly, the amount of loss could affect consumers' risk perception and attitudes.

Fourthly, one suggestion for effective risk communication is that people are more dependent on their condition when decision-making than their usual personality or propensity (either emotion person or rational person). According to the results of this study, it was confirmed that people are strongly trying to avoid the risk in a design in which all of these variables (even a hedonic consumption, a low-probability risk occurrence, and small-loss risk) have interacted.

Next, this research suggests a salient, fresh, and new approach (Listen to your Head or Heart?) to interpret people's risk perception and to predict precautionary behavior under risk. The results show that even though people have a low-probability risk and hedonic event, their decision-making about big-loss risk depends on emotional factors (*System 1*, from Heart), whereas the choice about small-loss risk relies on rational thoughts (*System 2*, from Head).

Finally, the experiment gives an exciting result: to avoid risk in big-loss (negative emotion) and small-losses (positive emotions), people trigger different emotions.

As a limitation of this paper, it is necessary to further analyze consumers' risk perceptions and attitudes by diversifying loss areas. Each variable (e.g., event type, risk probability level, loss amount, decision-making reliance) was continuously measured through four studies, but further research is needed to determine what emotion (positive versus negative) is more active and intervene in the final decision-making under risk.

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