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**Self-Regulation and Emotion: Predicting  
Risky Choice**

Ph.D. Dissertation

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**Rome  
2013**

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## CHAPTER 1

### Introduction and Overview

The goal of the present chapter is to introduce and provide the reader with key concepts to go through the present work. All of the researches presented in the dissertation focus on people's risky behaviors. In order to shed light on mechanisms underlying this phenomenon, I point out how people's emotions (i.e., *anticipated emotions, integral emotions, anticipated regret, and emotion regulation strategies*) and individuals' goal-oriented self-regulation (i.e., *regulatory mode*; see chapter 2, for more explanations) affect risky behaviors. For this purpose: first, I briefly introduce the phenomenon studied (i.e., risk taking) as well as some advanced behavioral measures designed to assess real-world risk taking in controlled laboratory environments. Second, I present how researchers have started to take into the account emotions in order to better investigate and comprehend people's risky behaviors; and I also introduce different types of emotions which are thought to affect individual differences in risky choices. Third, I highlight some features of the regret feeling since it is considered as the emotion most studied in behavioral decision-making, experimental economics and related research fields (Roese & Summerville, 2005; Shimanoff, 1984). Finally, I point out the relevant role of emotion regulation strategies (Gross & John, 2003) in increasing the explanatory power of current models of decision-making under risk (see chapters 3 and 4, for more explanations).

#### **Risk taking processes**

Most decisions in everyday activities include risk taking, because the consequences of alternative courses of action are rarely known with certainty. Indeed, one rarely knows the outcomes with certainty when making daily decisions in domains such as health, economic, social and so forth. Broadly speaking, risky behavior is defined as a type of behavior that can have negative consequences for

the self or for others. Risky choices are a central topic in judgment and decision-making (J/DM) research and related field (e.g., economics, psychology, health psychology and medicine). Since first proposed by Swiss mathematician Daniel Bernoulli (1700/1782), the “expected utility” (EU) framework served as the normative benchmark for researchers in behavioral decision making to show how actual human decisions are made differently from mathematical reasoning and computations. Model based on EU assumes that people choose between alternative courses of action by assessing the desirability (i.e., utility) of each action’s potential outcomes and linearly weighting those utilities by their probability of occurring. The normative status of the EU model was enhanced by von Neumann and Morgenstern’s (1944) theoretical developments that it could be derived from a primitive, intuitively appealing set of axioms, such as the transitivity of preferences axiom, by which if option A is preferred over option B, and B is preferred to C, then A should be preferred to C. In addition, the model's assumption that decisions are based on EU rather than on expected value gives it a descriptive appeal as well. For instance, it assumes that the difference in displeasure (i.e., utility) between losing \$11 and losing \$12 is not necessarily equal to the difference in displeasure between losing \$111 and losing \$112 (i.e., though the difference in value is \$1 in both cases). Nevertheless, empirical evidence (e.g., Mellers, Schwartz, Ho, & Ritov, 1997; Mellers & MacGraw, 2001) has documented many behavioral phenomena that are inconsistent with both predictions of the EU model and basic axioms. Many of these “inconsistencies” can be attributed to unrealistic assumptions about the determinants of anticipated emotions and the influence of incidental and/or integral emotions on risky choices. Thus, several models have accounted for some of these “inconsistencies” by making more realistic assumptions about the determinants of the emotions occurring in making risky decisions (Lerner & Keltner, 2000; Loewenstein, Weber, Hsee, & Welch, 2001; Mellers, Schwartz, Ho, & Ritov, 1997; Mellers & MacGraw, 2001; Tversky & Kahneman, 1991). Furthermore, some

authors (Weber & Johnson, 2009) suggested that economics paradigms (i.e., risk tasks) adopted to study human behavior under risk fail in predicting risk taking behavior in naturalistic risk taking; because they often do not elicit participants' emotionally engaging and they also lack a good external validity. A recent review (Weber & Johnson, 2009) pointed out that an important feature of tasks, which are meant to assess risk taking in laboratory settings, consists of capturing not only static and cognitive dimensions of risk taking processes but also engage dynamic and affective dimensions (e.g., exhilaration and specific emotions, such as hope or fear which accompany naturalistic risk taking). In addition, tasks designed to assess people's risk taking demonstrated reliable empirical associations with naturalistic risk taking behaviors in healthy and clinical samples as well as they allow us to distinguish between them in order to show a good external validity. These features are really relevant to bridge the gap between laboratory settings and real-world risk taking because participants faced with the risk task may vary systematically their risky behavior as a function of a number of state variables, such as negative and positive affect or their motivation, just as naturalistic context. Luckily, some recent works in clinical psychology and neuroscience (e.g., Lejuez et al. 2002; Brand et al., 2005; Figner, Mackinlay, Wilkening, & Weber, 2009) provide us new advanced behavioral paradigms (i.e., Balloon Analogue Risk Task, BART; Lejuez et al. 2002; and Columbia Card Task, CCT; Figner et al. 2009) that better enhance the prediction of real-world risk taking behaviors, because these tasks not only show good external validity, but they also are emotionally engaging (Aklin, et al., 2005; Hunt et al., 2005; Lejuez et al., 2002, 2003; Lejuez et al., 2007; Skeel, Neudecker, Pilarski, & Pytlak, 2008; Bornovalova et al., 2009; Weber & Johnson, 2009; Mishra, Lalumière, & Williams, 2010; Swogger, Walsh, Lejuez, & Kosson, 2010; MacPherson, Reynolds, Daughters, Wang, Cassidy, Mayes, & Lejuez, 2010; Schonberg, Fox, & Poldrack, 2010). Keeping in mind these evidences, in the present work, I chose three advanced behavioral measures of risk: First (i.e., chapter

2), I adopted the BART that involves immediate feedback about outcomes of participants' decisions because choices' feedback has been considered crucial to study the role of regret in J/DM research (see the next chapter for more details about this risk task). Second (i.e., chapter 3), I was interested in assessing people's risk taking under deliberative processes. I then adopted the cold version of Columbia Card Task (Figner et al. 2009; see chapter 3, for more details) that was specifically developed to estimate risk taking when occurring decisions made with the involvement of mainly "cold" cognitive processes. Finally (i.e., chapter 4), I focus on risky choices under high emotional arousal processes. I then adopted the hot version of CCT (Figner et al. 2009; see chapter 4, for more details) that was specifically designed to trigger substantial involvement of affective decision-making processes.

An important feature of these tasks consists in triggering different types of emotions (e.g., anticipated, integral emotions). For example, the hot version of CCT predominantly triggers integral emotions (see also Figner et al. 2009; Panno, Lauriola, & Figner, 2012). I then suggest that - based on specific task features - we may adopt one which most reflects the peculiarities of our study. Next, I introduce how different emotions' types (i.e., integral, anticipated and incidental), affect risky choices. Finally, I also consider crucial to take into the account motivational and emotion regulation factors to shed light on mechanisms underlying decision-making processes under risk.

### **Emotions meet decision-making processes.**

As a reaction to the dominance of behaviorism in the middle of the past century, the *cognitive revolution* arises within psychology (e.g., see Miller, 2003). The cognitive revolution emphasized a view of human cognition as information processing (Neisser, 1976). As a result, a primary goal of cognitive psychology was to explore “the way man collects, stores, modifies, and interprets environmental

information or information already stored internally” (Lachman et al., 1979, p. 7). This approach generally excluded emotions as it was partially inspired by the computer metaphor. Although there has been significant debate over the past 30 years about the appropriate role for emotion in the study of cognition (Lazarus, 1984; Neisser, 1976; Zajonc, 1984), until recently these different approaches to the study of human decision and behavior rarely overlapped. Nevertheless, based on previous studies (e.g., see Le Doux, 1996) it has become increasingly apparent that emotions and cognition interact in making decisions and shaping the human behavior. Indeed, for a long time, emotions were thought of having a detrimental influence on decisions, leading the decision maker away from normative predictions. But it is worth noting that, the detrimental emotions' influence on decisions occur, in some cases, where emotional states are strong enough to completely overcome cognitive processes, such as in the cases of phobias or addictions (Baron, 1992; Loewenstein, 1996). Luckily, in the previous decade, an influential research focus has been the study of emotions in decision making, as part of what has been called the *emotions revolution*. The emotions revolution of the past decade or so has tried to correct cognitive research overemphasis by documenting the prevalence of affective processes, depicting them as automatic and essentially effort-free inputs that orient and motivate adaptive behavior (Weber & Johnson, 2009).

Based on emotion revolution's findings, I consider three types of emotions which are thought affect risky decision making (see also next chapters for more details):

- a) *Integral emotions*. This type occurs when the emotional state is induced by the situation itself, for example by the stimuli presented in a task or by positive or negative feedback experienced during a risk task. In those cases of integral emotion, there is an emotional state that results from the contents presented in the cognitive task (Blanchette & Richards, 2010). For instance, in the process of deciding whether to purchase a stock, the



potential investor may experience immediate fear if s/he see that the stock is losing value.

- b) *Incidental emotions*. These are emotions that are present at the time of a decision but are unrelated to the decisional process itself (Lerner & Keltner, 2000). Incidental affect may be induced affective states (moods) that are transient in nature or more stable personality differences in affective traits (e.g., anxiety) that are not evoked by the target materials. For instance, a radio program playing in the background may trigger positive or negative emotions when the investor is purchasing a stock.
- c) *Anticipated emotions*. These are emotions which the decision-maker believes that will be occurring after the selection of one of the alternatives. “Anticipated emotions are a component of the expected consequences of the decision. They are ‘cognitive’ emotions that are expected to occur when outcomes are experienced” (Loewenstein et al., 2001, p. 269). For instance, if Anna is a potential investor, who have decide whether to purchase a stock, she might imagine some potential emotions such as regret and relief that she might experience if she did not purchase the stock and its price either rose or fell. A lot attention has been paid to this type of emotions occurring in decision-making processes (Loewenstein & Lerner, 2003; Lerner & Keltner, 2000; Schwarz, 2000).

*Specific emotion in decision-making processes: Regret feeling.*

Several works (e.g., Mellers, et al, 1997; Nordgren, van der Pligt, & van Harreveld, 2007; Richard, van der Pligt, & de Vries, 1996; Richard, de Vries, & van der Pligt, 1998) focused on regret to increase the predictive power the decision-making models. Let me introduce the regret emotion (see chapter 2, for more

details). Broadly speaking, every day people make thousands of decisions which include several activities ranging from which products to buy for dinner to whether to purchase a stock. Each of these activities engenders a potential regret, therefore this emotion is widely considered in decision-making research. Although the study of regret originated from economics (e.g., Bell, 1982; Loomes & Sugden, 1982), and psychology (Gilovich & Medvec, 1995; Kahneman & Tversky, 1982; Connolly & Zeelenberg, 2002; Zeelenberg, & Beattie, 1997; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996; Zeelenberg & Pieters, 2004; Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen, & Reinderman, 1998; Zeelenberg, 1999), one can find many examples of regret works in many different domains, such as marketing (Inman, Dyer, & Jia, 1997; Simonson, 1992), organizational behavior (Goerke, Moller, & Schulz-Hardt, 2004; Maitlis & Ozcelik, 2004), cross-cultural psychology (Gilovich, Wang, Regan, & Nishina, 2003), medicine (Brehaut et al., 2003; Djulbegovic, Hozo, Schwartz, & McMasters, 1999), law (Prentice & Koehler, 2003), health psychology (Chapman & Coups, 2006; Connolly, & Reb, 2005; Richard, Van der Pligt, & De Vries, 1996), and neuroscience (e.g., Camille et al., 2004).

Zeelenberg and Pieters (2007) claim that regret is an unpleasant feeling triggered when people is realizing or imagining (i.e., anticipated regret) that their current situation would have been better, if only they had decided differently. It is worth nothing that, regret is a backward looking emotion signaling an unfavorable evaluation of a decision. Kahneman claims that regret can also be considered an emotion where cognitive processes meet affective processes, because it is the emotion triggered by counterfactual thinking. Indeed, it has been considered as an emotion strongly marked cognitively which is omnipresent in the people's life (Kahneman & Miller, 1986). The anticipated regret's key feature consists of experiencing the outcome of a decision when is materialized, but not at the moment of choice, at the moment of choice it is only cognitions about future emotions.

Based on these features, it is easy to imagine how regret shapes and leads the behavior. Moreover, these features are particularly emphasized when people are faced with risky decisions. Therefore, the anticipated regret is also considered crucial in understanding the people's risk taking. Keeping in mind these features, I consider regret as a key variable between decision maker's self-regulation and human risky behavior. In the chapter 2, I focus on regret since I attempt to show his trajectory (i.e., how regret forms from regulatory mode; and in turn, affects the risky behavior).

Considering previous studies' findings which focus on the role of the emotions in making risky decision, we have both empirical and theoretical motives to consider that emotions should be included among the scientific interests of those investigating risky behaviors (Lopes, 1987; Lopes & Oden, 1999; Mellers et al., 1997; Loewenstein & Lerner, 2003). I am strongly confident that by including emotions in decision-making models their explanation power is increased.

### **Taking into the account the people's emotion regulation to explain their risk taking.**

Although it has been showed how emotions affect risky behaviors. It is worth nothing that, people are not at the whim of their emotions. Emotion regulation strategies may affect (i.e., upregulating or downregulating) the experienced emotions (e.g., anticipated emotions triggered before to take a risky choice), which in turn, affect risky decision making. Thus, people can use a number of emotion regulation strategies designed to alter their emotional reactions, which in turn, affect risky behaviors. Emotion regulation is widespread in our daily lives, it is possible that it might actually mediate the involvement of emotion in risky decision making. Most of the previous studies, which investigated the relationship between emotions and risky decision making, have not controlled for people's emotion regulation

strategies (see also Loewenstein et al., 2001; Loewenstein & Lerner, 2003; Lopes, 1987; Lopes & Oden, 1999; Mellers et al., 1997). Therefore, the emotions effect on risky decision making, ranging from affecting human choices by several types of bias to interfering with information processing, may actually be mediated by emotion regulation strategies, such as cognitive reappraisal, expressive suppression and many others (Gross & John, 2003). Based on this issue have been devised some hypotheses of the present work (see chapters 3 and 4, for more details).

## **Overview**

Based on these premises – in the present dissertation – First, I introduce a comprehensive series of three studies (i.e., chapter 2) demonstrating whether and how individuals' regulatory modes affect individual differences in taking risky choices. I further focus on the role of anticipated regret to explain how it arises from regulatory mode, and in turn, affects risk taking. In keeping with this view, the present work sheds light on mechanisms underlying the relationships among decision-maker's regulatory mode, anticipated emotions and risky behaviors. Second (i.e., chapter 3), I introduce a relatively new theory studied in decision-making research (Emotion Regulation theory; ER, Gross & John, 2003), demonstrating how ER strategies adopted from people predict risky choices occurring in deliberative processes (i.e., processes which predominantly involve anticipated emotions). But the present work does more than this. Indeed, the chapter 4 shows how situationally induced ER strategies affect risky choices occurring in decision processes related to high emotional arousal level (i.e., processes which predominantly involve integral emotion) as well as demonstrating how a personality variable (i.e., negative focus on potential outcome; see chapter 4, for more details) moderates the relationship between ER strategy and risky choices.

The experiments presented in the following chapters offer solid evidence of the

mediating role of anticipated regret between decision-maker's regulatory modes and risky behavior. Moreover, robust evidence is showed on mechanisms underlying the relationship between ER strategies and risky decision making. Thus, we can claim that the quality of a decisional output is not only influenced by integral or anticipated emotions, but also by the effectiveness the regulatory strategies employed to control the affective states.



## CHAPTER 2

### **Between self-regulation and risk Taking: The mediating role of anticipated regret**

Although there is literature showing that regret influence risk taking behavior and that regulatory modes affect the regret experience, no studies so far investigated the interplay of regulatory modes and anticipated regret in risky decision making. In Study 1, anticipated regret was induced to test the causal effect on performance level (i.e., risky choices) in the Balloon Analogue Risk Task (BART). In Study 2 and 3, to test the regulatory modes' effect on BART's performance level, assessment and locomotion modes were both experimentally induced and measured as chronic individual differences, respectively. One's degree of anticipated regret was measured in both studies 2 and 3 to test the mediating role of anticipated regret. Study 1 showed that people in the anticipated regret condition exhibited a lesser BART's performance level than control participants. Study 2 demonstrated that regulatory modes affected anticipated regret, which in turn, had an effect on BART's performance level. Study 3 replicated study 2's findings providing evidence that anticipated regret also mediated the effect of chronic individual differences in regulatory modes. I concluded that the interplay of regulatory modes and anticipated regret influenced the amount of risky choices in a dynamic risk task and disclosed mechanisms underlying this relation. Implications for behavioral decision making and emotion research are discussed.

This chapter is based on Panno, A., Lauriola, M., & Pierro, A. Between self-regulation and risk taking: The mediating role of anticipated regret. *Manuscript in preparation.*

Although some are much more risky than others almost any human endeavor carries some risk. Broadly speaking, people take different types of risk in making daily decisions. The risk occurs in people's decisions when there is the potential that a taken choice will lead to a loss (i.e., an undesirable outcome). Some authors (Schonberg, Fox, & Poldrack, 2010) suggested that people tend to see risk in terms of possible negative outcomes, rather than conceiving it in terms of chance probabilities. In keeping with this view, other works (Loewenstein et al., 2001; Schwarz, 2000; Slovic, 1987) showed that the risk's dimension encompasses a 'strong fear' in having losses characterizing by lack of control. Based on these studies, decision maker's self-regulatory orientation plays a relevant role in explaining individual differences in taking risk. Indeed, it has been suggested that a specific self-regulatory competence influences the degree of risk-taking propensity (Steinberg, 2005). Since self-regulation can generally be defined as the ability to control, modify, and adapt one's behavior considering people's emotions (Murtagh & Todd, 2004); a relevant role then is attributed to emotions in taking risky behaviors. Indeed, several authors (Loewenstein et al., 2001; Mellers, Schwartz, Ho, & Ritov, 1997; Mellers, 2000; Mellers & McGraw, 2001; Panno, Lauriola, & Figner, 2012; Weber & Johnson, 2009) showed that people often take risk based on anticipated emotions triggered during decision making processes. Anticipated emotions are typically expected to be experienced in the future as the outcome of choice done; for example, decision maker is assumed to anticipate how they will feel about obtaining different outcomes as the result of various counterfactual comparisons. "Anticipated emotions are emotions that are expected to occur when outcomes are experienced" (Loewenstein et al., 2001, p. 269). Several Decision Making theories of risk taking provide a prominent role for such emotions, which include the anticipated regret that might arise from prefactual comparisons before in making a decision (Bell, 1985; Loomes & Sugden, 1982, 1986; Mellers & McGraw,



2001; Mellers, Schwartz, Ho, & Ritov, 1997). Less attention has been paid to the relationship between decision maker's self-regulatory orientation and anticipated emotion, such as the anticipated regret, in making risky decisions. The major purpose of the present study was to examine how decision maker's regulatory mode affects anticipated regret experience before of taking risky choices.

*Regulatory modes in making decisions.*

A number of researchers pointed out many factors which might improve or impair the effectiveness of self-regulation strategies itself during goal pursuit (e.g., Carver & Scheier, 1998; Higgins, Shah, & Friedman, 1997; Kruglanski et al., 2000). Mischel and colleagues showed compelling differences among people's self-regulatory strategies and emotional or cognitive sources for exerting self-regulation (Mischel, Cantor, & Feldman, 1996). Mischel's work attempted to shed light on these differences in terms of underlying mediating processes, such as self-regulatory strategies, emotions and goals. These authors also claimed that a challenge for future research consists of a better understanding how possible mediating individual or context variables interact and guide people's behavior (Mischel et al., 1996). In this framework, Kruglanski and colleagues have proposed regulatory mode theory, in which two independent goal-oriented motivational factors, like the so-called assessment and locomotion modes, are posited to influence people behavior, either as chronic personality dispositions or as momentarily as situationally induced states. More specifically, the assessment mode “constitutes the comparative aspect of self-regulation concerned with critically evaluating entities or states, such as goals or means in relation to alternatives in order to judge relative quality” (Kruglanski et al., 2000, p. 794). By contrast, the locomotion mode “is the self-regulatory aspect concerned with movement from state to state and with committing the psychological resources that will initiate and maintain goal-directed progress in a straightforward manner, without undue distractions or delays” (Kruglanski et al.,

2000, p. 794). In the assessment mode individuals emphasize critical evaluations (e.g., Which alternative is best?; What are my options?) rather than need in moving from state to state, such as in the locomotion mode (e.g., people's doing or in making something happen; see Higgins, Kruglanski, & Pierro, 2003, for more details). In other words, assessors are concerned with determining the rate, amount, size, or value of something, with critical evaluation to guide action. By contrast, locomotors are concerned with initiating and maintaining movement in strongly leading it to goal.

Regulatory modes have been included among the most prominent individual difference variables, which may potentially account for choice behavior in decision making (Appelt, et al. 2011); but surprisingly, there are no empirical evidences of their relations with risk taking. People who are in locomotion mode are supposed to be dynamic and active decision-makers, while people who are in assessment mode are supposed to be concerned with the evaluative aspects of choice options, which may complicate decision making in terms of amount of information processed and may extend the deliberation time needed to get to the final decision (Kruglanski, et al. 2000). Camerer, Lowenstein, and Prelec (2005) have assimilated the distinction between assessment and locomotion orientation to the distinction between controlled and automatic processes. Consistent with this view, Mannetti and colleagues pointed out that if the locomotion mode overrides the assessment mode, more impulsive choices and decisions would be made. By contrast, if the assessment mode overrides the locomotion, less impulsive, systematic and more far-sighted choices would result (Mannetti, Leder, Insalata, Pierro, Higgins, & Kruglanski, 2009). For example, locomotion is related to willingness to take prompt decisions, to quickly initiate actions and then maintaining them without disruption. By contrast, assessment is related to taking time before making decisions in order to deeply investigate and appraise the alternatives (see Higgins et al., 2003; Kruglanski et al., 2000).

Avnet and Higgins (2003) demonstrated that a direct and causal link exists between regulatory modes and decision-making processes by inducing situationally assessment and locomotion modes and then assessing how these experimental conditions influenced people's purchasing behavior. In particular, the assessment mode was emphasized by asking research's participants to give examples from their personal lives, related to situations in which they behaved in an assessment-like way (e.g., *Think of some occasion in which you thought about your positive and negative characteristics*). Likewise, for locomotion, participants were asked to give examples related to situations in which they behaved in a locomotion-like way (e.g., *Think of a time when you decided to do something and you could not wait to get started*). Next, participants were presented with a real decision situation in which they had choose among different reading lights' brands. Furthermore, two decision strategies were combined with the experimental manipulation of regulatory modes in a 2 x 2 design. The “*full comparison*” strategy, which is meant to fit well with the assessment mode, required research participants to compare each option with all of the other options in the decision set along all attributes. By contrast, the “*progressive elimination*” strategy, which is presumed to fit well with the locomotion mode, was based on sequentially eliminating those options having the worst value on a given attribute (or attributes), until only one option remains. The results of the study showed that locomotors and assessors offered more money to purchase their preferred book-light when the decision strategy fitted with the induced mode; and more relevant, that assessment and locomotion modes can be reliably induced situationally. In the present study, Avnet and Higgins's (2003) manipulations to induce situationally regulatory modes were adopted.

More recently, Pierro et al. (2008) provided empirical evidence that regulatory modes, both situationally induced or personality dispositions, affected the experience of post-decisional regret. The theoretical account for these findings is related to greater amount of counterfactual thinking, which in turn, is related to

more regret's experience. This latter is supposed to be stronger for people in assessment mode, based on their aptitude to make effortful and full comparisons in decision making, while people in locomotion mode are supposed to experience less post-decisional regret, based on their tendency to move suddenly from state to state, thereby leaving lesser room for counterfactual thinking (Pierro, Leder, Mannetti, Higgins, Kruglanski, & Aiello, 2008).

A recent review (Molden, 2012) highlighted that regulatory modes affect basic process of judgment, including the evaluation of alternative hypotheses or counterfactuals, thus underpinning the relationship between regulatory modes and decision-making processes. As above showed, previous works (Avnet & Higgins, 2003; Kruglanski et al., 2000; Molden, 2012; Pierro et al. 2008) related regulatory modes to processes underlying the people's decision making. Nevertheless, this literature considered consumer behavior and decision-making situations in which elements of risk were not directly involved. In addition, although post-decisional regret has been thought as a consequence of regulatory modes, less is known about anticipated regret as a mediator of the relation between regulatory modes and risky decision making. Hoch and Loewenstein (1991) pointed out that anticipated emotions related to desired and undesired future outcomes are crucial in making decisions; one may then consider anticipated emotions among the most prominent mediators of the self-regulation's effect on risk taking. Keeping in mind this, I believe that a relationship between regulatory modes and decision making not only may be detected in the context of risky decisions, but that anticipated regret also is a key element mediating this relation. On the one hand, these hypotheses are based on Pierro et al.'s (2008) study which showed that regulatory modes affected the experience of post-decisional regret. On the another hand, they are based on J/DM research's findings, which also showed how anticipation of negative emotional reactions, such as regret, affect risky choice (see Mellers, Schwartz, Ho, & Ritov, 1997, for more details). Thus, combining regulatory modes theory (i.e., Kruglanski

et al., 2000) with decision research (e.g., Mellers et al., 1997; Nordgren, van der Pligt, & van Harreveld, 2007; Richard, van der Pligt, & de Vries, 1996; Richard, de Vries, & van der Pligt, 1998), I endeavored to shed light on how anticipated regret stems from decision maker's self-regulatory orientation; and accordingly affects the risky decision making.

*Anticipated regret and risky choice*

Before presenting the specific goals of this study, let me now provide a more detailed description of anticipated regret. Regret's research (Connolly & Zeelenberg, 2002; Zeelenberg, & Beattie, 1997; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996; Zeelenberg & Pieters, 2004; Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen, & Reinderman, 1998; Zeelenberg, 1999) covers a wide range of life domains (e.g., mental health outcomes, risky decision making, interpersonal relationship and so forth); and it is one of the most common emotions studied (Shimanoff, 1984). Understanding the trajectory of regret—how regret forms and affects the behavior—is indeed crucial across different fields (i.e., psychology, economics, medicine, marketing, neuroscience and so forth).

Anticipated regret can be defined as a cognitively based anticipated emotion that people trigger when figuring out that future outcomes would be better, if a different decision would be made. The idea is that this emotion is anticipated and taken into account when people are evaluating different options (Mellers et al., 1997; Mellers & MacGraw, 2001; Zeelenberg & Beattie, 1997; Zeelenberg & Pieters, 2004; Zeelenberg, 1999). For example, before in making a decision, one can anticipate future regret whether he/she thinks that the decision go awry. The expected feedback on decision's potential outcome then triggers prefactual thinking protecting against the possibility of experiencing severe regret in missing the good decision. The rationale behind anticipated regret's works is that when future regret is brought to the attention of the decision maker (i.e., just before the decision is made),

this feeling will be receive a weight in the decisional process (Connolly & Zeelenberg, 2002; Zeelenberg, & Beattie, 1997; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996; Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen, & Reinderman, 1998; Zeelenberg, 1999). In other words, people consider the possibility of future regret before making their decisions (Zeelenberg & Pieters, 2007; Zeelenberg, 1999). It is worth nothing, this idea not only applies to consumer or purchasing behavior, but also to risky decision making in which elements of uncertainty and potential for losses are supposed to make more salient one's anticipated regret feelings (Mellers et al., 1997; Mellers & MacGraw, 2001; Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen, & Reinderman, 1998; Zeelenberg & Pieters, 2004; Zeelenberg, 1999).

Relevant to this study, Zeelenberg (1999) showed that anticipated regret can be induced by providing the decision makers with the possibility of being disclosed about the outcomes of both chosen and unchosen options, before making a choice. This aspect also characterizes real life situations, in which people often receive information about forgone outcomes. For example, people choosing to invest in a stock is also likely to learn about future stock prices for the chosen stock as well as also for the non-chosen stocks. Unlike post decisional regret situations, in which experience of regret is determined by counterfactual thinking after the decision is made, anticipated regret is triggered by the expected feedback, which is stimulated by the possibility of making prefactual thinking before the decision is made (see Zeelenberg, 1999, for more details).

Classical regret studies showed that anticipated regret is related to decision making under risk (e.g., Bakker, Buunk, & Manstead, 1997; Conner, Sandberg, McMillan, & Higgins, 2006; Cooke, Sniehotta, & Schuz, 2007; Li, Zhou, Sun, Rao, Zheng, & Liang, 2010; Nordgren, van der Pligt, & van Harreveld, 2007; Richard, van der Pligt, & de Vries, 1996; Richard, de Vries, & van der Pligt, 1998; Sheeran &

Orbell, 1999; Tochkov, 2009; Zeelenberg & Pieters, 2007; Zeelenberg & Pieters, 2004; Zeelenberg, 1999; Zeelenberg & Beattie, 1997). It has been shown that anticipated regret leads to riskier choices in the lottery context (e.g., Sheeran & Orbell, 1999; Zeelenberg & Pieters, 2004) as well as in investment decisions and negotiations (e.g., Zeelenberg & Beattie, 1997). A number of studies also demonstrated that anticipated regret increases a greater one's perception of risk (e.g., Nordgren, van der Pligt, & van Harreveld, 2007); and that, it is also strongly related to risk aversion in some risk domains, such as taking unprotected sexual behaviors (e.g., Richard, van der Pligt, & de Vries, 1996; Richard, de Vries, & van der Pligt, 1998), binge-drinking behaviors (e.g., Cooke, Sniehotta, & Schuz, 2007), gambling (e.g., Li, Zhou, Sun, Rao, Zheng, & Liang, 2010; Tochkov, 2009), adolescent smoking (e.g., Conner, Sandberg, McMillan, & Higgins, 2006). Zeelenberg and Pieters (2007) suggested that based on expected feedback (i.e., framed as positive or negative) the anticipated regret can promote both risk-avoiding and risk-seeking tendencies. Importantly, two recent studies (Li, Zhou, Sun, Rao, Zheng, & Liang, 2010; Tochkov, 2009) addressed this issue, pointing out that the relationship between anticipated regret and risky choices may also switch from risk-avoiding to risk-seeking based on the features of the risk task which is presented to the decision maker.

Relevant to my goals, it is worth noting that—during the past decade or so—behavioral decision scientists moved from static lotteries and decision scenarios (e.g., Zeelenberg, 1999) to dynamic risk measures (e.g., Lejuez et al., 2002), which engender a naturalistic metaphor triggering a relatively strong affective response (i.e., a sense of escalating tension) that mimics in a controlled environment the affective phenomenological experience of risk taking typical of naturalistic environments (see Schonberg, Fox, & Poldrack, 2010, for more details). In addition, such modern dynamic risk tasks involve feedback-related emotional processes triggered by the processing of outcomes following from participants' decisions. This

feature reinforced my decision to study the mediating role of anticipated regret by one of the most popular behavioral measures in this specific class of tasks - i.e., the Balloon Analogue Risk Task (BART, Lejuez et al., 2002, explanations see below). To the best my knowledge—none of the reviewed studies have investigated the effect of regulatory modes and anticipated regret on risky choices in dynamic tasks, in which participants can receive (positive or negative) feedback about the outcomes of their decisions (i.e., win or loss).

### *Present Research*

On the one hand, we know that regulatory modes affect post-decisional regret (Pierro et al., 2008). On the another hand, decision research's empirical evidence has strongly showed a relationship between anticipated regret and risk attitude (e.g., Li et al., 2010; Mellers et al., 1997; Nordgren, van der Pligt, & van Harreveld, 2007; Richard, van der Pligt, & de Vries, 1996; Richard, de Vries, & van der Pligt, 1998; Zeelenberg, 1999). Thus, relating the regulatory mode theory to J/DM research, I hypothesized that regulatory modes also affect anticipated regret experience, which in turn, affects risky behavior. More specifically, I hypothesized that decision maker's assessment orientation led to greater anticipated regret experience, which in turn, decreased the amount of risky choices taken in the BART. By contrast, decision maker's locomotion orientation led to lesser anticipated regret experience, which in turn, increased the amount of risky choices taken in the BART.

I carried out a comprehensive series of three studies in order to investigate the expected relationships. In the first study, I tested the effect of situationally induced anticipated regret in making risky choices in BART. Once underpinned this relationship, I devised the second study to demonstrate a causal link between situationally induced regulatory modes and risk taking mediated by anticipated regret experience. Finally, in the third study, I replicated and extended the findings



of the earlier study by investigating the relationship between chronic regulatory modes—rather than situationally induce—and anticipated regret in making risky decisions.

### **Study 1**

Consistent with the theoretical framework presented in the introduction, I designed this experiment to show that a causal relation exists between situationally induced anticipated regret and risky choices. As a reminder, a novel and distinctive feature of this study is the assessment of risk preferences in dynamic task, while other similar studies relied more on static gambles or scenarios (e.g., Camille et al., 2004; Zeelenberg & Beattie, 1997). I expect that participants in the anticipated regret condition (see procedures) take less risky choices than participants in the control condition. Positive findings supporting this causal relation are also a prerequisite for testing the mediating role of anticipated regret between regulatory modes and risk taking (i.e., Studies 2 and 3).

### **Methods**

#### *Participants*

Seventy-seven undergraduate students at the University of Rome “Sapienza” participated in this study ( $M_{age} = 21$ ,  $SD = 1.25$ ; range 19 to 25 years; 70% females).

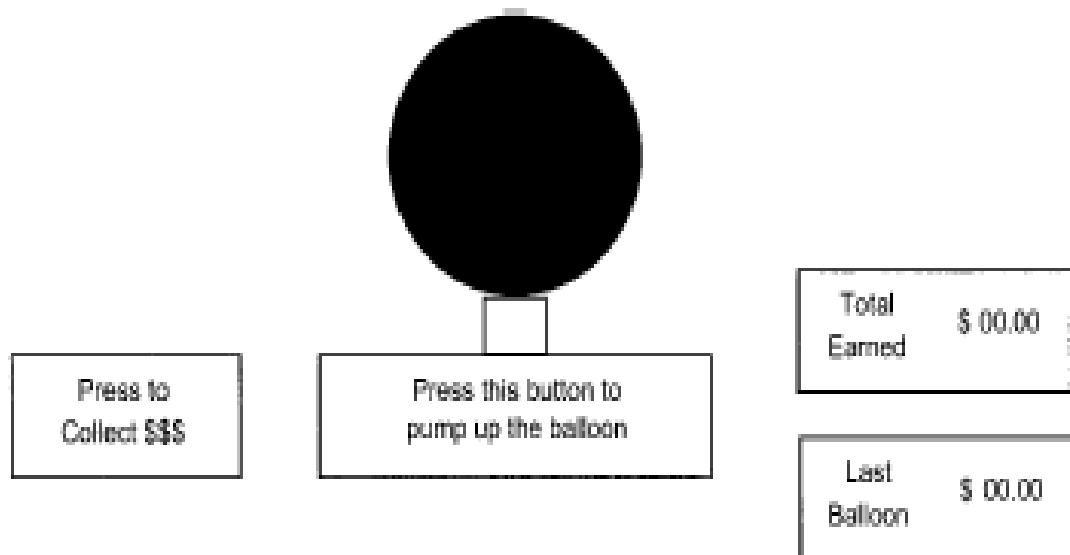
#### *Materials*

BART. The Balloon Analogue Risk Task (Lejuez et al., 2002), hereafter referred to as BART (see Figure 1), is a computerized task modeling real-world risk behavior through the conceptual frame of balancing the potential for reward and harm (Leigh 1999; Lejuez et al. 2002). In the task, the participant is presented with 30 trials in which they are asked to inflate a balloon by clicking a specific button on the screen. On each pump the balloon inflates and \$.05 is accrued in a temporary bank. However, balloons can explode anytime during the task, with an explosion probability of 1/128 on the first pump. The participant can decide whether

collecting the money in the temporary bank by transferring it to a permanent bank. If the balloon pops before the participant collects the money, all earnings for that balloon are lost, and the next balloon is presented. Thus, each pump confers greater risk, but also greater potential reward. It is worth noting that the participant was not informed about the expected balloon breakpoint. However, the average number of pumps across trials that would maximize one's earnings should be equal to 64 pumps, with lower and higher numbers describing risk-advantageous and risk-disadvantageous strategies, respectively (Lejuez et al., 2002). A recent meta-analysis showed that research participants, on average make 33 pumps per balloon, thereby showing a largely sub-optimal number of risky choices (Lauriola, Panno, Levin, & Lejuez, in press).

The primary BART score is the average number of pumps on unexploded balloons, also referred to as average adjusted pumps, with higher scores indicating greater risky choices taken. A number of studies used the average adjusted pump as behavioral criteria. These studies, which compared experimental groups versus control groups, provided evidence that the average adjusted pumps was sensitive to a variety of experimental manipulations (e.g., sleep deprivation, medical therapies, or craving; Reynolds et al. 2006; Acheson et al. 2007; Acheson & de Wit 2008; White, Lejuez, de Wit 2007; Killgore, 2007; Killgore, Grugle, Killgore, Leavitt, Watlington, McNair, Balkin, 2008; Lighthall, Mather, Gorlick, 2009; Reed, Levin, Evans, 2010). Many studies also showed that the average adjusted pumps was associated with real-world risky behaviors occurring outside the laboratory, thereby legitimating the BART as a measure of risk attitude (Aklin, et al., 2005; Hunt et al., 2005; Lejuez et al., 2002, 2003; Lejuez et al. 2007; Skeel, Neudecker, Pilarski & Pytlak, 2008; Bornovalova et al. 2009; Mishra, Lalumière & Williams, R. J. 2010; Swogger, Walsh, Lejuez, & Kosson, 2010; MacPherson, Reynolds, Daughters, Wang, Cassidy, Mayes, & Lejuez, 2010). In the present study, all research

participants were informed that top 10 participants sorted in descending orders by their total earnings on BART were rewarded by a prepaid mobile phone cards.



*Figure 1. Diagram of the Balloon Analogue Risk Task.*

### *Procedure and manipulation*

The experimental manipulation of anticipated regret was in keeping with previous studies, in which anticipated regret was induced by providing research participants with information that they will receive feedback about the outcomes of both chosen and unchosen options (Connolly & Zeelenberg, 2002; Zeelenberg, & Beattie, 1997; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996; Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen, & Reinderman, 1998; Zeelenberg, 1999; Camille et al., 2004). For instance, Camille et al. (2004) induced anticipated regret in a two-outcome risky decision task depending on whether participants were given the opportunity to compare the outcome of the chosen option with the outcome of the rejected option. As a reminder, in the BART balloons can explode

anytime during the task, with an explosion probability of 1/128 on the first pump. The participant can then decide whether transferring the money from temporary bank to the permanent bank or to inflate the balloon presented. If the balloon pops before the participant collects the money, all earnings for that balloon are lost, and the next balloon is presented. Research participants in the anticipated regret condition ( $N = 39$ ) were informed – before taking the task – that they will be disclosed at the end the task about their *actual total earnings* as well as about the *potential earnings* attainable in balancing to best pumping with collecting money. By contrast, research participants in the control condition ( $N = 38$ ) were only informed about the *actual total earnings* resulting from their choices and no reference to the *potential earnings* was made. Importantly, – before taking the task – participants in both groups were asked: “How much regret would you feel, if you will miss the game's prize?”. Regret ratings were collected on a seven point rating scale where 1 = “No regret at all” and 7 = “Full of regret”.

## Results

*Manipulation check.* Results of a one-way analysis of variance (ANOVA) performed on participants’ anticipated regret ratings yielded a significant effect of experimental condition—in comparison to control condition:  $F(1,75) = 7,90$   $p < .001$ ,  $d = .64$ . Participants reported lower anticipated regret in the control condition ( $M = 2.03$ ,  $SD = 1.19$ ) than in the experimental condition ( $M = 2.90$ ,  $SD = 1.50$ ). This result indicates that successfully anticipated regret was induced (see Figure 2).

*Risky choice.* A one way ANOVA was performed to test the effect of situationally induced anticipated regret on risky choices (see Figure 2). As predicted, there were lesser risky choices in the situationally induced anticipated regret condition ( $M = 27.57$ ,  $SD = 11.98$ ) than in the control condition ( $M = 33.90$ ,  $SD = 14.76$ ),  $F(1, 75) = 4.27$ ,  $p < .05$ ,  $d = .47$ .

Results of Study 1 provided support to the claim that situationally induced anticipated regret affected one’s choices in decision making under risk. Noteworthy,

this effect was detected in a dynamic behavioral measure of risk triggering emotional processes by providing immediate feedback to the decision maker.

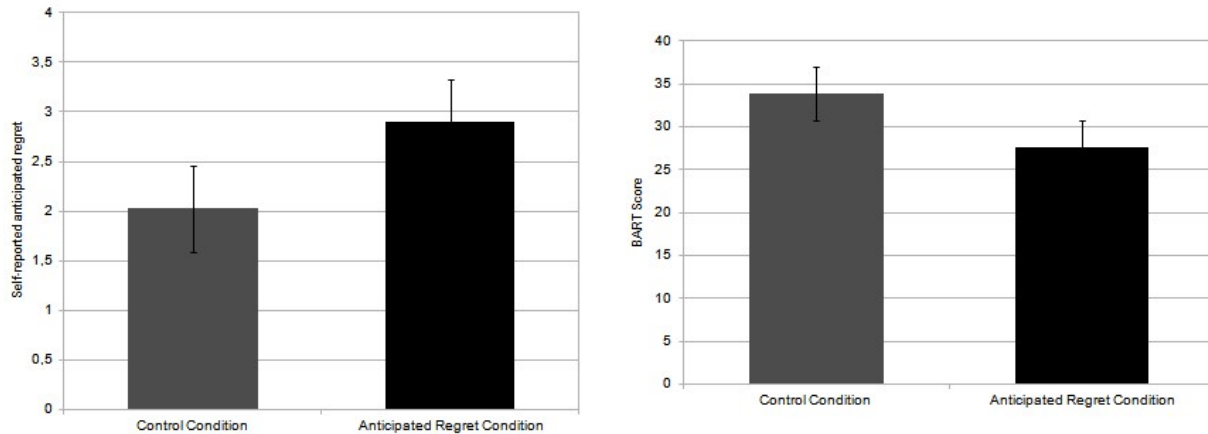


Figure 2. Manipulation-check scores for anticipated regret and control groups. Risk taking (average adjusted pumps) as a function of anticipated regret and control groups.

## Study 2

The goal of present study consists of showing that anticipated regret mediated the relation between situationally induced regulatory modes (i.e., assessment and locomotion) and risky behavior. I expected that assessors increased anticipated regret feelings, which in turn, reduced people's risky choices. By contrast, I expected that locomotors decreased anticipated regret feelings, which in turn, increased people's risky choices.

## Methods

### *Participants*

One hundred and ten undergraduate students participated in the study ( $M_{age} = 25,37$   $SD = 3.95$ ; range 23 to 45 years; 75% females).

### *Procedure and manipulation*

All research participants took the BART according to the procedures described in Study 1 for the control condition. Participants were randomly assigned to either

an assessment ( $N = 56$ ) or a locomotion ( $N = 54$ ) condition. To induce participants' locomotion and assessment orientations I asked them to think of three different situations in which they personally exemplified either high locomotion or high assessment behaviors and to write them down (see also Appendix B). For locomotion, they were asked to: “*Think of a day when you made many different things*”; “*Think of a time when you finished one project and did not wait long before you started a new one*”; “*Think of a time when you decided to do something and you could not wait to get started*”. For assessment, they were asked to: “*Think of some occasion in which you compared yourself with other people*”; “*Think of some occasion in which you thought about your positive and negative characteristics*”; “*Think of some occasion in which you critiqued work done by others or yourself*”. These were taken from items in the locomotion and assessment scales of the regulatory mode questionnaire (see Kruglanski et al., 2000, for more details). This experimental manipulation has been shown to be effective by Avnet and Higgins (2003). Afterwards locomotion and assessment manipulations participants were asked to rate their anticipated regret as in Study 1.

## **Results**

*Risky choice.* I tested my hypothesis that people's anticipated regret experience mediated the effect of situationally induced regulatory modes on risky behavior. According to the multistep procedure recommended by Baron and Kenny (1986), for mediation to occur, four conditions need to be met. First, variation in the independent variable (i.e., regulatory modes) should significantly account for variation in the mediator (i.e. anticipated regret). Second, variation in the mediator should significantly account for variation in the dependent variable (i.e. risky choices in the BART). Third, variation in the independent variable should significantly account for variation in the dependent variable. Fourth, the effect of the independent on the dependent variable should be substantially reduced once the mediator effect on the dependent variable is controlled for.

Results of multiple regression analyses (see Figure 3) showed that, consistent with my hypotheses, decision maker's regulatory mode (locomotion vs. assessment orientation) affected risk taking on BART ( $\beta = .23, p < .05$ ). More specifically, assessors — in comparison to locomotors — exhibited a lesser number of risky choices. Hence, the first condition of the Baron and Kenny's (1986) procedure was satisfied. Furthermore, I found that situationally induced regulatory modes also affected the participants' anticipated regret experience ( $\beta = -.21, p < .05$ ). In particular, assessors — in comparison to locomotors — experienced more anticipated regret. This finding satisfied the second condition of Baron and Kenny's (1986) procedure. Moreover, lower score of participants' anticipated regret significantly predicted a greater risk taking on the BART ( $\beta = -.26, p < .01$ ), thus satisfying the third condition. Finally, results showed that, once the mediator effect on the dependent variable was controlled for, the effect of regulatory modes on risky choice became non-significant ( $\beta = .17, p = .07$ ), thereby satisfying the fourth condition of Baron and Kenny's procedure, too.

As to this latter finding, I employed Preacher and Hayes's (2004) procedure to extrapolate estimates of indirect effects. Preacher and Hayes's strategy employs the use of bootstrapping, a non-parametric re-sampling procedure, to estimate the size of indirect effects using adjusted percentile (asymmetrical) confidence intervals. Ninety-five percent confidence intervals (C.I.) were employed and 5000 bootstrapping re-samples were run. Results showed that the bias corrected confidence intervals obtained not contained zero (C.I. = 0.17 to 3.79); showing that the participants' anticipated regret experience fully mediated the effect of situationally induced regulatory modes on risky behavior. In other words, these findings showed that situationally induced regulatory mode (i.e., assessors vs. locomotors) affected the participants' anticipated regret experience, which in turn, affected individual difference in taking risk (see Figure 3).

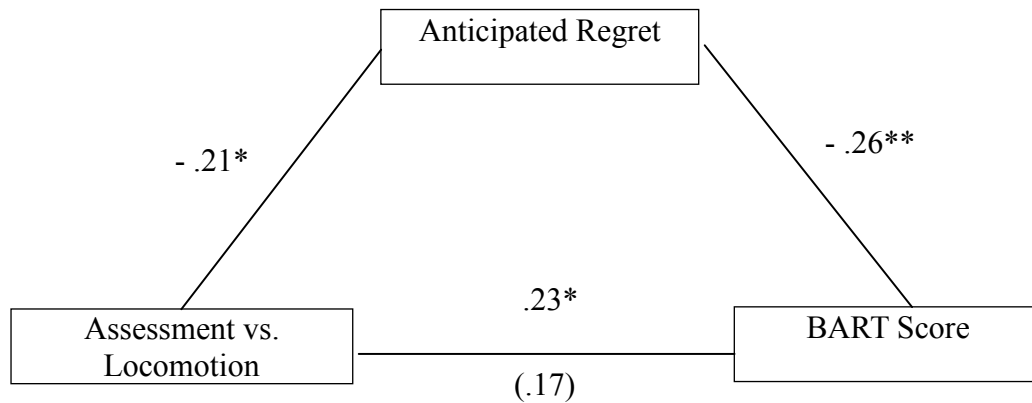


Figure 3. Path model depicting relations among manipulated regulatory mode condition (dummy coded: assessment = 0, locomotion = 1), anticipated regret, and BART score. Numbers represent regression equation  $\beta$  coefficients. \* $p < .05$ . \*\* $p < .01$ .

### Study 3

The goal of present study consists of showing that people's anticipated regret mediated the relation between predominant chronic regulatory mode (i.e., assessment vs. locomotion orientation) and risky behavior. I expected that chronic assessment orientation increased the anticipated regret's feelings, which in turn, decreased people's risky choices. By contrast, chronic locomotion orientation decreased anticipated regret's feelings, which in turn, increased people's risky choices. Importantly, in this study I assessed chronic regulatory modes one month before the experiment (see explanations below).

### Methods

#### Participants

One hundred and eleven undergraduate students participated in the study ( $M_{age} = 21.28$   $SD = 3.52$ ; range 19 to 44 years; 68% females).



*Measures*

*Regulatory Mode Questionnaire.*

Kruglanski et al. (2000) developed two separate scales which assessed chronic individual differences in assessment and locomotion. Empirical evidence showed the independence between these people's self-regulatory tendencies (Kruglanski et al., 2000). Accordingly, they found the unidimensionality, internal consistency, and temporal stability of locomotion and assessment conceived as two independent psychometric scale through a comprehensive series of studies (see Kruglanski et al., 2000, for more details). These researchers highlighted that locomotion and assessment orientations are essentially uncorrelated with each other, that each contributes to self-regulatory success, and that each relates to a distinct task orientation and motivational emphasis (Kruglanski et al., 2000; Higgins, Kruglanski, & Pierro, 2003). I measured participants' chronic regulatory mode with the Regulatory Mode Questionnaire (RMQ; Kruglanski et al., 2000), which consists of 24 items using six-point scales (see also Appendix A). Sample items include “*I often compare myself with other people*” (i.e., assessment mode) and “*When I finish one project, I often wait awhile before getting started on a new one*” (i.e., locomotion mode, reverse scored). There is literature showing that assessment and locomotion orientations are uncorrelated (see Higgins et al., 2003; Kruglanski et al., 2000). This was also the case in the current sample:  $r = -.14, p > .10$ . In this study, I calculated participants' predominant chronic regulatory mode; for this purpose, I subtracted the assessment score ( $M = 45.29, SD = 8.30, \text{Cronbach's } \alpha = .78$ ) from the locomotion score ( $M = 50.46, SD = 7.26, \text{Cronbach's } \alpha = .72$ ). Analyses are based on this difference score ( $M = 5.17, SD = 11.76$ ), for which a higher score indicated a greater relative chronic use of locomotion mode.

*Procedure*

Participants were tested on two separate occasions, four weeks apart, which were framed as two unrelated studies. I chose this procedure to more conservatively test

the predictive power of the regulatory mode variables. On the first session, participants filled in self-report battery, which included the Regulatory Mode Questionnaire (RMQ; Kruglanski et al, 2000). The questionnaires were administered in small-group sessions of about eight people. Four weeks later, on the second session, participants played the BART according to the procedure used in Study 2. Again, anticipated regret feeling was assessed as in Study 1 and 2.

## **Results**

*Risky choice.* I tested my hypothesis that people's anticipated regret experience mediated the effect of chronic regulatory modes to risky choice. I carried out analyses according to the multistep procedure recommended by Baron and Kenny (1986), as described above (see study 2, for more details). Consistent with my hypothesis, the chronic regulatory mode (assessment vs. locomotion orientation) affected risky choices ( $\beta = .21, p < .05$ ). More specifically, predominant chronic assessment decreased the number of risky choices. By contrast, predominant chronic locomotion increased risk taking on BART. Furthermore, I found that chronic regulatory modes affected participants' anticipated regret experience ( $\beta = -.33, p < .001$ ). In particular, predominant chronic assessment increased the anticipated regret feelings. By contrast, predominant chronic locomotion decreased the anticipated regret feelings. Furthermore, lower score of participants' anticipated regret significantly predicted a greater number of risky choices in the BART ( $\beta = -.25, p < .001$ ); thus, satisfying the third condition. Finally, once the mediator effect on the dependent variable was controlled for, the effect of chronic regulatory modes on risky choice became non-significant ( $\beta = .15, p > .10$ ).

Again, the Preacher and Hayes's (2004) procedure showed that the bias corrected confidence intervals obtained not contained zero (C.I. = .01 to .21); showing then, that the participants' anticipated regret experience fully mediated the effect of the chronic regulatory modes on risky behavior. In other words, these findings expanded Study 2's previous results, showing that chronic regulatory mode also

affected the people's anticipated regret experience, which in turn, affected individual difference in taking risky choices (see Figure 4).

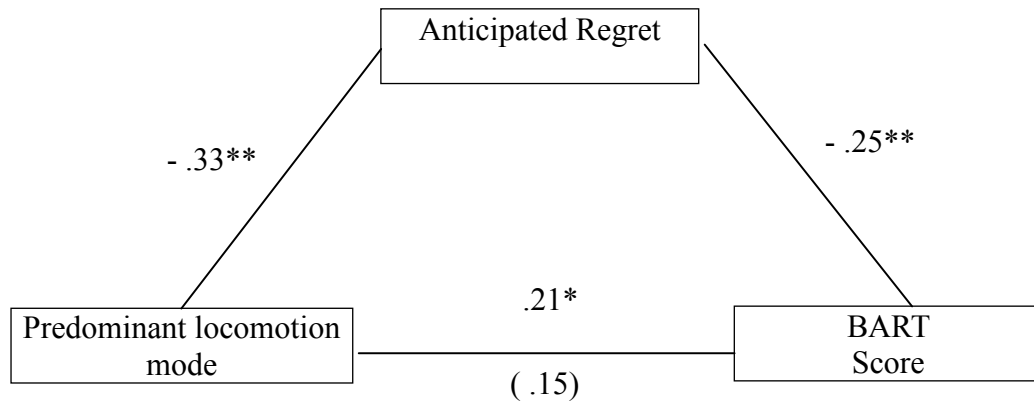


Figure 4. Path model depicting relations among predominant chronic regulatory mode (it was yielded subtracting the assessment score from the locomotion score), anticipated regret, and BART score. Numbers represent regression equation  $\beta$  coefficients. \* $p < .05$ . \*\* $p < .01$ .

### General Discussion

The results of three independent studies provided evidence that assessment and locomotion regulatory modes, both as chronic individual dispositions and as situationally induced states, influenced the amount of people's experienced regret as well as their risky behaviors. These findings contribute to our understanding of regulatory mode, regret's experience and human decisions under risk (e.g., Pierro et al. 2008; Mellers & McGraw, 2001). Let me begin with anticipated regret's experience. The idea behind the present work was that people faced with risky situations may engage in an anticipatory simulation of feelings, such as regret that these situations would engender. Indeed, the present findings shed light on the link between the people's anticipated regret experience and risky choices. Although this association is not novel, as there is some evidence for this relation in static gambles, lotteries or self-reported measures (e.g., Bakker et al., 1997; Conner et al., 2006; Cooke et al., 2007; Li et al., 2010; Nordgren, van der Pligt, & van Harreveld, 2007;

Richard, van der Pligt, & de Vries, 1996; Richard, de Vries, & van der Pligt, 1998; Sheeran & Orbell, 1999; Tochkov, 2009; Zeelenberg & Pieters, 2007; Zeelenberg & Pieters, 2004; Zeelenberg, 1999; Zeelenberg & Beattie, 1997); there is no empirical evidence in the literature that regret feeling have an influence on risk attitude in dynamic risk tasks, such as BART. Differently from previous literature, I chose the BART as it triggers a relatively strong affective response (i.e., a sense of escalating tension) that mimics the affective phenomenological experience of risk taking. It is worth nothing that this BART's feature bridges the gap between lab's setting and real-world risky choices (see Schonberg, Fox, & Poldrack, 2010, for more details). Thus, the choice to adopt the BART also underpins the ecological validity of the present work. Moreover, it also permits us to extend previous findings which show a link between anticipated regret and risk perception (e.g., Nordgren et al., 2007) to real risky behavior.

Relating the BART's properties (i.e., Schonberg, Fox, & Poldrack, 2010) to regret's works (e.g., Camille, 2004; Zeelenberg, 1999) it is not difficult to imagine how the decision's feedback occurring in the BART is crucial to engage prefactual thinking triggering anticipated regret. To the best my knowledge — the present research is the first attempt to underpin the relationship between anticipated regret (i.e., an emotion triggered when participants expect a feedback about the 'good or bad' outcomes that result from their decisions) and risky choices occurring in making repeated decisions which involve immediate outcome feedback. Based on these premises, let me now show how these findings relate to risk taking literature. Previous studies have shown that anticipated regret increases risk's perception (i.e., Nordgren et al., 2007), and also increases healthy self-reported behaviors (i.e., Richards et al., 1996, 1998). The Study 1's findings point out that situationally induced anticipated regret (vs. controls) affects risky behavior decreasing the number of risky choices taken in a task triggering decision making emotional-based processes (i.e., when occurring post-decisional feedback-based emotions). The

present work (i.e., Study 1) then extends previous findings (i.e., Nordgren et al., 2007; Richards et al., 1996, 1998) as it shows that situations which trigger the people's anticipated regret experience decreases the number of risky choices occurring when the sense of escalating tension related to risk escalates based on expected result of the decision.

Once underpinned the relationship between anticipated regret and risky choices in BART (see Study 1); I then move on how anticipated regret stems from decision maker's self-regulatory orientation (i.e., assessment and locomotion modes), and in turn, affects risky behaviors (see Studies 2, 3). Although regulatory modes have been related to decision making as well as to post-decisional regret in consumer behavior. No study so far tested the hypothesis that regulatory modes can influence risk taking by increasing or decreasing regret feelings.

First, let me point out the link between regulatory modes and risky choices. Indeed, in the—to the best of my knowledge—there is no evidence that regulatory modes affect risky choices, nor there is evidence on mechanisms underlying the relationship between decision maker's regulatory mode and making risky decisions. Taken together the present findings increase our understanding on these relationships. Broadly speaking, people's regulatory modes as chronic individual predispositions and as situationally induced states affect risky choices in making decision. More specifically, based on study 2's findings I demonstrated that situationally induced assessment—in comparison to situationally induced locomotion—mode decreases the number of risky choices taken in BART. It is worth noting that based on study 3's findings, individuals' chronic regulatory mode predicted risky choices; thus, expanding on study 2's findings (i.e., where it is showed how situationally induced regulatory modes affect people's risky choices). In Study 3 individuals' chronic regulatory mode were assessed one month before the experiment, thereby showing a long term stable effect of individual differences on risky decision making.

Getting into mechanisms relating decision maker's self-regulatory orientations to risky behavior, I think that an important role is assumed by anticipated emotions, such as regret (Mellers et al, 1997), which decision maker triggers before taking a risky decision. The present work then focus on regret emotion to highlight also mechanisms underlying the relationship between regulatory modes and risky choices. Indeed, describing the regret's trajectory in making risky choices, I also find that the anticipated regret mediates the relationship between decision maker's regulatory mode and risky behavior. More specifically, these findings show that people's assessment mode produces greater anticipated regret's experience, which in turn, decreases their risky choices during decisional processes. By contrast, people's locomotion mode produces lesser anticipated regret's experience, which in turn, increases their risky choices in making decisions.

Previous studies (Avnet & Higgins, 2003; Kruglanski et al, 2000; Molden, 2012; Pierro et al., 2008) showed that regulatory modes affect individual differences in making decision. Relevant to the present study, Pierro et al. (2008) focused on post-decisional regret showing that regulatory modes affect experienced regret after buying the laptop. Based on present work's results, I extend Pierro et al.'s (2008) findings in two ways: First, I show that people's regulatory modes affect regret's experience still before making a decision (i.e., decision maker's regulatory mode affects anticipated regret as well as post-decisional regret). Second, I show that regulatory modes not only affect consumer decision making (e.g., laptop's purchase as showed in Pierro et al., 2008), but they also affect risky choices occurring in making decisions. Based on previous studies (Avent & Higgins, 2003; Kruglansky et al., 2000; Pierro et al. 2008) which showed how regulatory modes are related to different strategies in making a decision. Thus, the findings of present study show that people with assessment concerns are strategically motivated to trigger anticipated regret because it permits making comparisons. By contrast, people with locomotion concerns are strategically motivated not to trigger anticipated regret

because it interferes with smooth and uniform movement to the next state. In this view, a major result of the present study consists of underpinning the relationship between people's regulatory modes and making decisions, showing how decision maker's self-regulatory orientation also affects risky choices occurring during decisional processes. These findings have also several implications for decision making research on individual differences (Appelt et al., 2011; Lauriola et al., in press). To begin with, the study 2 identifies a situational variable which influences the anticipated regret's amount triggered before of taking a risky decision. But it does more than this. As study 3, after all, shows the same effect assessing individuals' chronic assessment and locomotion orientation one month before the experiment. Thus supporting the ecological validity of the effects of regulatory modes on risk taking as well as experimentally induced temporary differences in regulatory modes orientation. Taken together these findings could help to explain why the literature yielded unstable and stable results investigating individual differences in taking risky choice (see Appelt et al., 2011, for more details). Indeed, based on these findings, the situationally induced assessment and locomotion could create the instability. By contrast, the chronic individual differences in assessment and locomotion could provide the stability.

These findings could also have important applied implications since it is not difficult to imagine how one of the regulatory orientations could be made more accessible in daily life by situational cues and/or training instructions. For instance, situationally induced assessment orientation triggering people's anticipated regret may increase safer choices in making decisions. Moreover, the assessment motive for triggering anticipated regret is of particular interest. In some ways, it relates to self-improvement (Kruglanski et al., 2000). Since, “it is about how to make the decision-making process itself better. It involves critical reflection on both what was good and what was bad about the process — the essence of evaluative criticism” (Pierro et al., 2008, p. 327). Future studies might then shed light on how this

particular 'critical reflection' affects anticipated emotions in making decisions under risk. Further studies are also needed in order to explore more fully whether and how the impact of regulatory mode on risky choices could itself be affected by other personal and situational variables. For instance, future works might then shed light on how personality individual differences may mediate or moderate the relationship between decision maker's regulatory mode and risky decisions. Although it was beyond the scope of the current study to investigate how personality dispositions (e.g., extraversion and neuroticism) may mediate the regulatory modes' effect on risky choices. Nevertheless, let me here consider some possible additional factors of interest — extroversion, neuroticism individual differences and fast versus accurate information processing. First, based on previous studies (e.g., Lauriola & Levin, 2001) we know that higher individuals' extroversion predict riskier choices. On the regulatory modes' side, we know that locomotion correlated positively with extroversion (see Kruglanski et al., 2000, for more details). Thus, extroversion may also mediate the relationship between locomotion orientation and risky behavior. Second, Lauriola and Levin (2001) found a tendency for neuroticism disposition to have the opposite effect on risk taking for loss and gain domains. They showed that higher neuroticism's scores were associated with lesser risk taking in gain domain. By contrast, higher neuroticism's score were also associated with greater risk taking in loss domain. Moreover, Kruglanski and colleagues (2000) have also shown that people's assessment orientation is related to neuroticism disposition. Interestingly, based on these findings (i.e., Lauriola & Levin, 2001; Kruglanski et al., 2000) we may then expect that risk domain (i.e., gain and loss) may moderate the relationship between decision maker's assessment orientation and risky behavior. Third, a recent review (i.e., Molden 2012) has shown a link between regulatory modes and the prioritization of fast versus accurate information processing in making judgments. Accordingly, it is easy to imagine how the prioritization of fast versus accurate information processing may affect risky choices occurring in decision-making



processes (see Weber & Johnson, 2009, for more details). The information processing may then moderate the relationship between regulatory modes and risky behavior. For instance, people's assessment orientation could pay greater attention in processing gain, loss and probability of loss values occurring in making risky decisions. By contrast, people's locomotion orientation may pay lesser attention to these information (i.e., gain, loss, probability of loss) in making risky decisions. Future studies may then shed light on these mechanisms investigating regulatory modes' effect on risky behaviors by adopting a task assessing individuals' gain, loss and probability sensitivity in making decisions (e.g., Columbia Card Task, CCT; see Figner, Mackinlay, Wilkening, & Weber, 2009, for more details). It is worth noting, devising investigations which relate decision maker's regulatory mode to emotions and decision making promise novel insights in our understanding of the human risk behaviors.



## CHAPTER 3

### **Emotion regulation and risk taking: Predicting risky choice in deliberative decision making**

Only very recently has research demonstrated that experimentally induced *emotion regulation* strategies (i.e., cognitive reappraisal and expressive suppression) affect risky choice (e.g., Heilman et al., 2010). However, it is unknown whether this effect also operates via *habitual* use of emotion regulation strategies in risky choice involving deliberative decision making. I investigated the role of habitual use of emotion regulation strategies in risky choice using the "cold" deliberative version of the Columbia Card Task (CCT; Figner et al. 2009). Fifty-three participants completed the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) and — one month later — the CCT and the PANAS. Greater habitual cognitive reappraisal use was related to increased risk taking. Greater habitual expressive suppression use was related to decreased risk taking. The results show that habitual use of reappraisal and suppression strategies predict risk taking when decisions involve predominantly cognitive-deliberative processes.

This chapter is based on Panno, A., Lauriola, M., & Figner, B. (*In press*). Emotion regulation and risk taking: Predicting risky choice in deliberative decision making. *Cognition & Emotion*. DOI: 10.1080/02699931.2012.707642

During the previous decade, a trend emerged in decision research highlighting the influence of emotion on decision making (e.g., Lauriola & Levin, 2001; Loewenstein, Weber, Hsee, & Welch, 2001; Weber & Johnson, 2009). One important line of such research has shown that decision makers often are influenced by *anticipated emotions*, which are generated by considering the potential choice outcomes (e.g., Mellers & McGraw, 2001). As a reminder: “Anticipated emotions are a component of the expected consequences of the decision. They are '*cognitive*' emotions that are expected to occur when outcomes are experienced” (Loewenstein et al., 2001, p. 269). For instance, people who overestimate positive emotions related to favorable outcomes would tend to be overly risk seeking. By contrast, people who overestimate negative emotions related to unfavorable outcomes would tend to be overly risk averse (Mellers & McGraw, 2001).

From a different line of research, pioneered by Gross and colleagues (Gross & John, 2003), we know that people feeling an emotion often use specific emotion regulation strategies (ER) to downregulate emotions in a wide range of life domains (e.g., interpersonal relationships, problem solving, etc.). Gross and John's (2003) two-factor model provides an emotion regulation theory: The model distinguishes between antecedent-focused strategies versus response-focused strategies. Antecedent-focused strategies are based on cognitive reappraisal, which represents one's ability to reframe a situation in order to change its emotional impact (Gross, 2002). For instance, before making a risky decision, decision makers can change the way they view the potential outcomes of their choice in order to minimize or modify their emotional impact on decision making. In contrast, response-focused strategies (i.e., expressive suppression) are based on the ability to inhibit the current emotion-expressive behaviors (Gross, 2002). For instance, decision makers may maintain a "poker-face" while bluffing during a card game in order to inhibit their emotions. Gross and John (2003) suggested that these two types of ER strategies are

independent of each other and that they can be differentially employed by individuals, either habitually (i.e., in the form of a personality disposition) or momentarily (e.g., situationally induced).

Most recently, the two research lines, on emotions in decision making and on ER strategies, have converged in the investigation of whether decision makers use strategies of emotion regulation during decision making and whether differences in emotion regulation might explain differences in decision making. More generally, Westen and Blagov (2007) have argued that every decision can be viewed also as an act of emotion regulation, because the goal of any decision can be to minimize one's future negative affective states and/or to maximize one's future positive affective states. According to this view, it thus is possible that reappraisal and/or suppression may indeed substantially affect individuals' choices. More specifically, research has started to investigate the role of emotion regulation (not always constrained to both cognitive reappraisal and expressive suppression) in decision making: Several recent neuroscience studies (Martin & Delgado, 2011; Sokol-Hessner et al., 2009; Sokol-Hessner, Camerer, & Phelps 2012) investigated the role of cognitive reappraisal during financial decision making, its effect on loss aversion, and its neural correlates. To summarize briefly, these studies showed that cognitive reappraisal can affect risk-taking levels (Martin & Delgado, 2011), loss aversion, (Sokol-Hessner, Camerer, & Phelps 2012), and the arousal related to losses (Sokol-Hessner et al., 2009). In addition, two behavioral studies focused on the same two ER strategies that I did: Miu and Crisan (2011) have shown that situationally induced reappraisal — in comparison to suppression — reduced the susceptibility to framing effects in risky choice. Most relevant to current study, Heilman, Crişan, Houser, Miclea, and Miu (2010) have shown that experimentally induced ER strategies influenced performance on a risky choice task, the Balloon Analogue Risk Task (BART; Lejuez et al., 2002): Participants in the suppression condition took significantly less risk than participants in the reappraisal condition. Noteworthy, in

Heilman and colleagues' study, participants were randomly assigned to either a reappraisal, suppression, or control condition, receiving instructions how to regulate their emotions (in the control condition, no ER instructions were given). After these ER instructions, participants watched one of two video clips, chosen to elicit specific incidental emotions, fear or disgust. After the clips, participants played the Balloon Analogue Risk Task (Lejuez et al., 2002) to assess risk-taking levels. In this paradigm, the ER strategy manipulation was introduced to test the effect of ER strategies on risk taking when participants had to regulate incidental emotions (elicited via video clip before the risk task). It is unknown whether habitual use of ER strategies used to regulate anticipated emotions the risky decisions would equally affect risk-taking levels.

To summarize, previous research has shown not only that emotions themselves can affect risky choices, but that situationally induced ER strategies can also affect decision making. In contrast to the role of situationally induced ER strategies, in the current paper I was interested whether *naturally occurring* individual differences in the ER strategies people habitually adopt may affect their risky choices. A further goal of the current study was to extend the existing research with respect to the type of emotions likely to be involved, namely whether emotion regulation has an effect on risky decision making when anticipated emotions are involved.

Consistent with the latter goal, I chose a task that delays feedback about the outcomes of participants' decisions until all decisions have been made. Thus, on logical grounds, if we still observe effects of emotion regulation on risky choices, it is plausible that ER strategies operated via anticipated emotions.

In particular, I had two main hypotheses, based on prior research (regarding emotion regulation: Gross & John, 2003; Heilman et al., 2010; regarding decision making in the cold CCT: Figner et al., 2009; Figner & Weber, 2011): First, I predicted that individuals with a stronger tendency for habitual use of cognitive

reappraisal would show increased risk taking compared to individuals with a lower such tendency. Second, I predicted that individuals with a stronger tendency for habitual use of expressive suppression would show decreased risk taking compared to individuals with a lower such tendency. I expected that reappraisers would make relatively riskier choices because they are more likely to focus on positive emotions triggered by potential gains. By contrast, I expected that suppressors would make relatively less risky choices because they are more likely to focus on avoiding negative emotions triggered by negative potential outcomes (see chapter 4).

## **METHODS**

### *Participants*

Fifty-three undergraduate students at the University of Rome “Sapienza” participated in the study ( $M_{\text{age}} = 21.73$ ,  $SD = 4.05$ ; range 19 to 44 years; 66% females). As reimbursement, participants received course credit plus a variable payment in the form of a prepaid mobile phone card whose amount was determined by the outcome of one of the CCT game rounds (with 1 point = 1 cent), randomly selected at the end of the task.

### **Measures**

*Emotion Regulation Questionnaire.* The Emotion Regulation Questionnaire (ERQ: Gross & John, 2003) is a 10-item self-report scale assessing two individual strategies that people adopt in order to regulate their emotions: cognitive reappraisal and expressive suppression. Respondents rate the extent to which they agree with self-descriptive statements reflecting cognitive reappraisal (e.g., “*When I want to feel less negative emotion, I change the way I’m thinking about the situation*”) or expressive suppression (e.g., “*When I am feeling negative emotions, I make sure not to express them*”). Ratings are made on a 7-point Likert type scale with the response

anchored at the ends with 1 (*strongly disagree*) and 7 (*strongly agree*). The ERQ produces an overall score of "reappraisal" and an overall score of "suppression," quantifying the two independent ER strategies for each participant. Previous studies (Gross, 2002; Gross & John, 2003; John & Gross, 2004) found associations between cognitive reappraisal and positive mood and between expressive suppression and negative mood. Somewhat less strong effects were also found for the negative association between cognitive reappraisal and negative affect and the positive association between expressive suppression and negative affect (e.g., depression). These same studies also showed that ER strategies predict psychological well-being outcomes (e.g., life satisfaction, positive interpersonal relationships, personal growth, and environmental mastery). In the present study, I used the Italian ERQ version (Balzarotti, John, & Gross, 2010, see also Appendix A). The psychometric properties of the Italian ERQ version have been found to be reasonable with alpha reliabilities averaging .84 for reappraisal and .72 for suppression (Balzarotti, John, & Gross, 2010). Consistent with these findings, the internal consistencies in this sample were .81 for reappraisal and .74 for suppression.

*PANAS.* Because previous studies (Gross & John, 2003; John & Gross, 2004) have shown strong associations between ER strategies and mood, I assessed participants' mood states in order to be able to control for potentially confounding effects. Positive and negative mood states were operationalized by summing the 10 positive and 10 negative affect items in the Positive and Negative Affect Schedule, respectively (PANAS; Watson, Clark, & Tellegen, 1988). Participants were instructed to rate how they felt "right now" on a scale from 1 (= *very slightly or not at all*) to 5 (= *extremely*). Watson and colleagues reported alpha coefficients of .88 and .87 for positive and negative mood, respectively. I observed alpha coefficients of .79 for positive mood and .86 for negative mood.



*Columbia Card Task (CCT).* The "cold" CCT (Figner et al., 2009; Figner & Weber, 2011; Gladwin, Figner, Crone, & Wiers, 2011) was developed to assess risk taking under predominantly deliberative conditions, i.e., when decisions are made with the involvement of mainly "cold" cognitive processes. Several experiments using self-reports, skin conductance measurement, and convergent validity with other measures (Figner et al., 2009) established that the cold version involves mainly deliberative cognitive processes and triggers comparatively little emotional arousal. This contrasts with the "hot" affective version of the CCT (see also chapter 4) which was specifically designed to trigger substantial involvement of affective decision-making processes (the hot CCT achieves this by incorporating both immediate feedback about participants' choices and incremental stepwise risky decisions instead of the "overall" type of decisions in the cold CCT; details see below). For example, in the cold CCT participants report to more strongly rely on "mathematical decision strategies" compared to the hot CCT, while in the hot CCT, they report to rely more on their "gut feelings" and to experience greater emotional arousal when making their decisions, compared to the cold CCT (Figner et al., 2009; Figner & Weber, 2011).

In the current study, I used a shortened version that consisted of 24 game rounds (described in Figner & Weber, 2011; compared to the longer version consisting of 54 game rounds described in Figner et al., 2009). Thus, participants played a total of 24 game rounds. In each game round, 32 cards are presented face-down and the participant indicates how many cards he/she wants to turn over in the current round (see Figure 1). Participants indicate their choice by clicking on one of 33 buttons (ranging from 0 to 32 cards to be turned over). The main variable of interest is how many cards participants choose to turn over in each of the 24 game rounds. For each gain card that they turn over, they win the number of points the gain cards are worth in the current game round. However, if they encounter a loss card, the current game round is over (i.e., no more cards are turned over in that game round) and the loss

amount is subtracted from the points they had accrued in the current game round. Each new game round starts with a score of 0 points. Based on the main dependent variable (the number of cards chosen in each of the 24 game rounds) I derived my constructs of interest: The risk-taking level is the average number of cards chosen per game round.

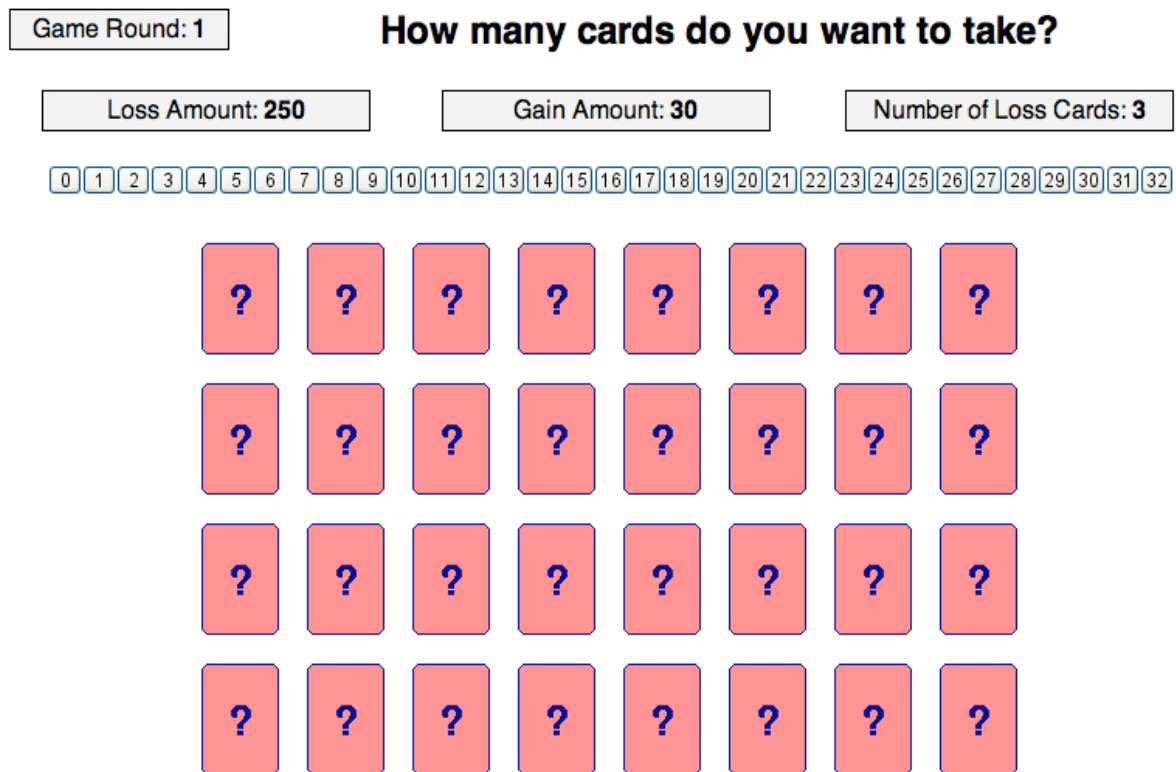


Figure 1 – Cold Version of Columbia Card Task, CCT. Adapted from Figner et al., (2009).

### Procedure

Participants were tested on two separate occasions, four weeks apart, which were framed as two unrelated studies. I chose this procedure to more conservatively test the predictive power of the emotion regulation variables: In the first session,

participants filled out a self-report battery, which included the Emotion Regulation Questionnaire (ERQ; Balzarotti, John, & Gross, 2010) and other scales unrelated to the goals of the current study. The questionnaires were administered in small-group sessions of about eight people. Gender and age information was also collected. Four weeks later, in the second session, participants played the cold CCT in an individual setting on a desktop computer, according to the procedure described by Figner et al. (2009). Mood state (i.e., PANAS) was assessed before participants played the CCT. The experimenter did not know the participants' scores on the self-report battery.

## **RESULTS**

To investigate my hypotheses of the relationship between risk taking (average number of cards chosen per game round) and habitual use of ER strategies, I computed correlations between habitual use of cognitive reappraisal, expressive suppression, risk taking, and as covariates, positive and negative mood states. As predicted and shown in Table 1, reappraisal and suppression were significantly correlated with risk taking, in opposite directions: Stronger habitual use of reappraisal was associated with increased risk taking while stronger habitual use of suppression was associated with decreased risk taking.

Table 1. Means, Standard Deviations, and Intercorrelations among Independent Variables and Risk Taking

	1	2	3	4	5
1 Cold CCT	1				
2 ERQ - Reappraisal	.30*	1			
3 ERQ - Suppression	-.31*	.07	1		
4 Positive Mood	.25 <sup>§</sup>	.12	-.36**	1	
5 Negative Mood	-.08	-.03	.25 <sup>§</sup>	-.01	1
M (SD)	12.43 (4.85)	25.7 (6.57)	11.5 (4.02)	31.22 (6.16)	18.05 (7.50)

\*\*  $p < .001$ ; \*  $p < .05$ ; <sup>§</sup>  $p < .10$

These results were confirmed by a single multiple regression model in which risk taking was simultaneously regressed on participants' reappraisal and suppression scores (reappraisal:  $\beta = .32, p < .05$ ; suppression:  $\beta = -.33, p < .05$ ).

To investigate whether these effects were affected by sex, age, or positive or negative mood states, risk taking was used in a hierarchical regression analysis in which these covariates (sex, age, mood scores) were entered as the first step in the analysis. Reappraisal and suppression were then entered as the second step. As can be seen in Table 2, controlling for these covariates effects did not substantially change the relationship between ER strategies and risk taking.

Table 2. Hierarchical Regression Analysis of Risky Behavior

Predictors		Measure of risky behavior				
		Number of cards chosen in cold CCT				
		$R^2$	Adj $R^2$	Model F	df	$\beta$
Step 1	Sex	.075	-.006	.928	(4, 46)	.04
	Age					.05
	Positive Mood					.24
	Negative Mood					-.08
Step 2	ERQ – Reappraisal	.220	.113	2.100	(6, 44)	.30*
	ERQ – Suppression					-.33*

\*  $p < .05$

## DISCUSSION

The results of the present study offer evidence that habitual use of different ER strategies (cognitive reappraisal and expressive suppression) are significant predictors of risk taking when predominantly deliberative "cold" cognitive processes are involved in the decisions. Importantly, in contrast to earlier work, the risky choice task I used triggers mainly deliberative "cold" cognitive decision-making processes (Figner et al., 2009).

To the best of my knowledge — there is only other study on the role of both cognitive reappraisal and expressive suppression in risk taking (Heilman et al., 2010); but this study investigated effects of ER strategies on incidental emotions before taking the risk task. Thus, the results of the present study not only support Heilman's (2010) findings (replicating their results of reappraisal and suppression on risk taking), but extend them in two ways: First, I show that *naturally occurring*

individual differences in the habitual use of ER strategies (in contrast to situationally induced ER strategies) are significant predictors of risk taking, thus supporting the ecological validity of the effects of emotion regulation on risk taking beyond experimentally induced temporary differences in ER strategies (which was the previous studies' approach, e.g., Heilman et al., 2010; Miu & Crisan, 2011). Second, I show that ER strategies are significant predictors of risky choice in a task that triggers mainly deliberative "cold" cognitive decision-making processes (Figner et al., 2009).

Some limitations of present study need to be acknowledged. First, the evidence on the relationship between emotion regulation and risky choice is only correlational; accordingly, I cannot rule out that these results have been caused by a third variable, related to both emotion regulation and risky choice. This was the price I paid for investigating naturally occurring individual differences in ER strategies, instead of experimentally manipulating them. Of course, further studies are needed in order to underpin causal effect of ER strategies on anticipated emotions occurring in making risky choices.

Second, previous studies (Gross & John, 2003; John & Gross, 2004) have shown several links between ER strategies on the one hand and various personality characteristics on the other hand, such as openness to experience, neuroticism and extraversion, self-esteem, negative affect (e.g. depression), dispositional coping, and optimism. It was beyond the scope of the current study to investigate all of these, but I cannot rule out that these or other personality dispositions may mediate or moderate the results of present study. Gross and John's (2003) study, considering a large pool of variables, reported substantial effect sizes for the relationship between ER strategies and mood. Therefore, I investigated at least one potential alternative explanation, namely that emotion regulation might have affected mood (e.g. Gross & John, 2003) and, in turn, mood might have affected risky choice (e.g., Yuen & Lee, 2003). To investigate that possibility, I assessed participants' mood before they

did the CCT. As I found that risk taking was not significantly associated with mood, I can rule out this one potential alternative explanation. Nevertheless, it would be interesting to investigate possible pathways by which personality characteristics might mediate or moderate the effect of emotion regulation on risky choice. For instance, greater reappraisal might increase people's optimism, leading to increased risk taking. By contrast, greater suppression might decrease people's optimism, leading to decreased risk taking.

To conclude, these results increase the knowledge about emotion regulation theory (Gross & John, 2003) and are also relevant for research lines that rely on affective forecasts in decision making processes (e.g., Mellers & McGraw, 2001). More broadly speaking, investigations using behavioral risky choice tasks (such as the Columbia Card Task; Figner et al., 2009; Figner & Weber, 2011) promise novel insights into the connections between emotion regulation and risky behaviors across various fields including psychology, economics, and neuroscience (e.g., Schonberg, Fox, & Poldrack, 2010). Thus, if during the past decade emotion itself has played an important role in decision research, perhaps emotion regulation is bound to play an increasingly prominent role in the current decade.





## CHAPTER 4

### **Emotion regulation and risk taking: What happens when people focus on negative outcomes?**

Every day, people make risky choices using emotion regulation strategies (ER; e.g., cognitive reappraisal and expressive suppression; Gross & John, 2003) to regulate their emotions, but little attention has been paid to the psychological mechanisms underlying the relationship between ER strategies and risky choices. Previous studies (e.g., John & Gross, 2004) showed that expressive suppression — in comparison to cognitive reappraisal — fails to downregulate the experience of negative emotions. Thus, the main objective of this experiment was to investigate whether and how individuals' *negative outcome focus* moderates the relation between ER strategy and risk taking. I situationally induced either expressive suppression or cognitive reappraisal (or, as control, no induction) as ER strategy, before participants completed a dynamic risky choice task that triggers *integral emotions* ("hot" Columbia Card Task, CCT; Figner et al., 2009); participants' negative outcome focus (EPO; Nenkov et al., 2008) was assessed as individual-differences measure. Suppressors — in comparison to reappraisors — with a strong negative outcome focus showed significantly decreased risk taking, suggesting that individuals' negative outcome focus moderates risk taking by exacerbating suppression effects in risky decision making.

This chapter is based on Panno, A., Lauriola, M., & Figner, B. (*Under Review*). Emotion regulation and risk taking: What happens when people focus on negative outcomes?

As a reminder, in the previous decade or so, an influential focus has been the study of emotions in decision making, as part of the *emotions revolution* (Weber & Johnson, 2009). As mentioned in the previous chapter, research pioneered by Gross and colleagues (e.g., Gross & John, 2003), has shown that generally people to regulate emotions use two common ER strategies: *cognitive reappraisal* and *expressive suppression*. Reappraisal is the ability to construe a potentially emotion-eliciting situation in a manner that changes its emotional impact (Lazarus & Alfert, 1964). E.g., during a card game a person may control her feelings by taking different points of view to reformulate the meaning of a situation. In contrast, suppression is the ability to inhibit emotion-expressive behavior (Gross, 1998); e.g., maintaining a poker-face while bluffing in a card game to inhibit one's own emotions. It has been highlighted that several studies investigated the role of ER strategies — predominantly cognitive reappraisal — in risky decision making, showing that ER strategies can affect risky decisions in various ways, including risk-taking levels (Heilman, Crişan, Houser, Miclea, & Miu, 2010; Martin & Delgado, 2011; Panno, Lauriola, & Figner, in press), loss aversion, (Sokol-Hessner, Camerer, & Phelps 2012), the arousal related to losses (Sokol-Hessner et al., 2009), and the susceptibility to framing effects (Miu & Crisan, 2011). The role of expressive suppression in risky decisions has been studied to a much lesser extent, despite its potentially great ecological relevance: Employing an ER strategy of expressive suppression, may often lead people to avoid risks and instead choose conservatively to reduce the probability of experiencing negative emotions that would be triggered by negative outcomes. It is important to note that particularly negative outcomes and negative emotions are relevant with respect to expressive suppression as it has been shown that expressive suppression specifically fails to reduce the experience of negative emotions (e.g., Gross, 1998; Gross & John, 2003;

Heilman, Crişan, Houser, Miclea, & Miu, 2010; John & Gross, 2004; Richards & Gross, 2000; Vanderhasselt, Baeken, Van Schuerbeek, Luybaert, & De Raedt, 2012). For example, a recent neuroscience study has shown that reappraisal, but not suppression, can successfully downregulate negative emotions (Vanderhasselt et al., 2012).

Given the relative lack of knowledge about the role of expressive suppression in risky choice and its inability to regulate negative emotions, the first goal of the present study was to investigate the relationship between expressive suppression and risky choice. To better understand particularly the role of negative emotions related to negative potential outcomes, I assessed the moderating role of individual differences in how strongly people focus on potential negative outcomes (Nenkov, Inman, & Hulland, 2008) as it has been suggested that personality dispositions in the "Elaboration on Potential Outcomes" (EPO: Nenkov et al., 2008) influence risky behaviors. Indeed, the EPO is considered an important predecision process that lies at the heart of self-regulation. Construct's authors (Nenkov et al, 2008) showed that decision makers differ in their tendencies to engage in predecision outcome elaboration. Thus, the EPO represents a decision maker's generalized predisposition toward thinking about actions' consequences and taking into the account these consequences at time of decision. Noteworthy, EPO provides information about the decisional context making people more conscious of the potential effect of their behaviors. Based on this view, it is easy to imagine how the EPO may lead people's behavior faced with risky choices. For instance, if decision makers are given a choice between different mutual funds, individuals with a relatively strong negative outcome focus will invest more in funds with a low risk level as these funds are most likely, even in a worst case, to result in only a small loss. This prediction is consistent with decision affect theory, which claims that decision makers faced with a risky decision are influenced by anticipated emotions triggered by the potential outcomes of their choices (Mellers, Schwartz, Ho, & Ritov, 1997): "People who

overestimate the displeasure of unfavorable outcomes would tend to be overly risk averse” (Mellers & McGraw, 2001, p. 213).

Combining that (a) suppression leaves intact (i.e., unregulated) the experience of negative emotions (John & Gross, 2004), (b) focusing more strongly on negative outcomes and emotions increases risk aversion (i.e., Mellers et al., 1997; Nenkov et al., 2008), I then predict that individual differences in how strongly they focus on negative outcomes will moderate the effect of expressive suppression on risky choices, such that inducing expressive suppression will increase risk aversion particularly in individuals who strongly focus on negative outcomes.

In the present study, I was also interested to investigate whether and how situationally induced ER strategies affect *integral emotions* which occur in taking risk. In the introduction (i.e., chapter 1) has been pointed out that research distinguishes between *incidental* and *integral* emotions (see Blanchette & Richards, 2010, for a review): Incidental emotions are emotions triggered by a source unrelated to the current situation, e.g., by inducing an emotional state by showing a video clip before the task of interest is administered (Rottenberg, Ray, & Gross, 2007). In contrast, integral emotions occur when the emotional state is induced by the situation of the task itself, e.g., by positive/negative feedback during the task. In the present study, I used a risky-choice task that triggers integral emotions: Participants playing the “hot” Columbia Card Task (CCT; Figner, Mackinlay, Wilkening, & Weber, 2009; Figner & Voelki, 2004; Figner & Weber, 2011; Gladwin, Figner, Crone, & Wiers, 2011) make risky decisions to turn over cards in a stepwise manner and receive immediate feedback about their wins or losses. Integral emotions are triggered when participants learn about the (good or bad) outcomes from their decisions. As a reminder, Heilman and colleagues (2010) investigated the effects of induced ER strategies (reappraisal and suppression) on risk taking when *incidental emotions* had to be regulated that were elicited by a

video clip. They found that reappraisers took significantly greater risks than suppressors and controls; no significant differences were found between suppressors and controls. To the best my knowledge, it is unknown whether induced ER strategies to regulate *emotions integral* to the risky decisions would equally affect risk-taking levels. Accordingly, the second goal of the current study is to investigate risky behavior when the situationally induced ER strategies are targeted towards emotions integral to the risky decision making task.

To summarize, the goals of the present study are, first, to investigate whether individuals' negative outcome focus moderates the effect of suppression on risky choice. The second goal is to investigate the effects of ER strategies on risky choices when integral emotions are occurring. These are topics of great relevance as it is currently virtually unknown which mechanisms are involved when individuals regulate integral emotions during risky decision making, despite the fact that in many everyday situations, we need to regulate emotions triggered by the decision-making process itself.

## **METHODS**

### *Participants*

Seventy-four undergraduate students participated in the study ( $M_{age} = 21.16$ ,  $SD = 1.86$ , range 19-28 years; 79% females). They were randomly assigned to emotion regulation conditions (reappraisal, suppression, control).

*HOT – Columbia Card Task (CCT)*. The hot CCT consisted of 24 game rounds (Figner & Weber, 2011); each game round starts with 32 cards shown face down and a score of 0 points (see Figure 1). Participants' task is to turn over cards sequentially by clicking on one card after the other, until they either decide to stop or they turn over a loss card. Participants receive immediate feedback whether the

chosen card was a gain card or a loss card with points accumulating with each turned-over gain card . If they turn over a loss card, the current game round stops and they lose the stated amount of points. Across the 24 game rounds, 3 factors are systematically varied, (i) probability (out of the 32 cards, 1 or 3 are loss cards), (ii) gain amount (each gain card leads to a gain of 10 or 30 points), (iii) loss amount (turning over a loss card leads to a loss of 250 or 750 points), leading to  $(2 \times 2 \times 2)$  8 different combinations, which are each presented 3 times, resulting in the total of 24 rounds. The indicator of risk taking used here is the *average number of cards chosen* per game round (see also Figner et al., 2009). Participants received a variable payment in the form of a prepaid mobile phone card whose amount was determined by the outcome of one randomly selected game round (with 1 point = 1 cent).

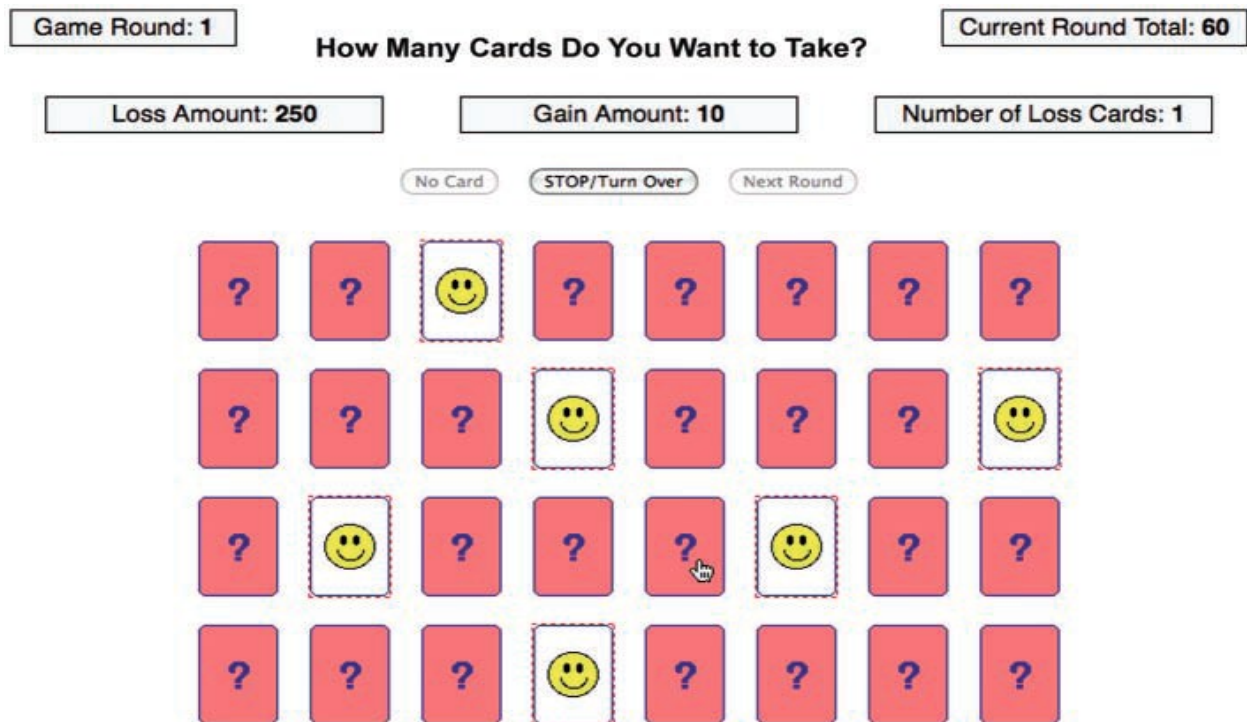


Figure 1 – Hot Version of Columbia Card Task, CCT. Adapted from Figner & Weber (2011).

*Manipulations and Measures*

*Emotion Regulation Manipulation.* To induce reappraisal versus suppression ER strategies, I adopted two brief instructions previously devised from Richards and Gross (2000). These instructions have been successfully used to induce reappraisal versus suppression across a wide variety of tasks and studies (e.g., Gross, 1998; Gross & John, 2003; Richards & Gross, 2000; Heilman et al. 2010). Participants in the control condition did not receive any ER strategy instructions. The reappraisal instruction was as follows:

*During the game, you may turn over win or loss cards, eliciting feelings. Please remember that during the game, it is important to take different points of view in order to control your feelings. You can do this by changing the way you look at the situation in which you are.*

The suppression instruction was as follows:

*During the game, you may turn over win or loss cards, eliciting feelings. We would like to see how well you can control your facial expressions. Therefore, it is very important to us that you try your best to adopt a neutral facial expression. To do this, we would like for you to keep your facial muscles from moving. So play, but please try to keep your facial muscles still so that you don't make any expressions at all.*

*Elaboration on potential outcomes.* The "Elaboration on Potential Outcomes" questionnaire (EPO: Nenkov et al., 2008) is a 13-item measure assessing negative focus, positive focus, and general focus on potential outcomes. The negative focus subscale measures the extent to which an individual focuses on the possible negative outcomes (e.g., "I often worry about what could go wrong as a result of my decisions"). Likewise, the positive focus subscale measures the extent to which an

individual focuses on the possible positive outcomes (e.g. “*When thinking over my decisions I focus more on their positive end results*”). The generation subscale measures the extent to which an individual generates different outcomes of their own choices (e.g., “*Before I make a decision I consider all possible outcomes*”). The psychometric properties of the EPO scale have been found to be satisfactory with alpha reliabilities averaging .87 for the negative focus subscale, .87 for the positive focus subscale, and .88 for the generation subscale (Nenkov et al., 2008). Consistent with these findings, internal consistency in this sample was .93, .85, and .92 for negative focus, positive focus and generation, respectively.

### *Procedure*

Participants first completed the EPO questionnaire, then were given the ER-strategy instructions, then played the hot CCT. Finally, participants answered four self-report items as ER manipulation-check, derived from Gross and John’s (2003) Emotion Regulation Questionnaire (e.g., for reappraisal: “*During the game, I controlled my emotions by changing the way I thought about the situation I was in;*” for suppression: “*During the game, I controlled my emotions by not expressing them*”).

## **RESULTS**

*Manipulation check.* Two one-way ANOVAs showed that participants used the strategy they were instructed to use: Reappraisal vs. suppression vs. control conditions differed significantly on the reappraisal and the suppression manipulation-check scores,  $F(2, 71) = 8.19, p < .001$ ;  $F(2, 71) = 7.36, p < .001$ , respectively (see Table 1).



Table 1. Self-Reported Use and Cronbach Alpha of Cognitive Reappraisal and Expressive Suppression in the hot CCT (manipulation-check scores).

Experimental Conditions	Reappraisal <i>M</i> ( <i>SD</i> )	Suppression <i>M</i> ( <i>SD</i> )
Reappraisors	4.60 ( $\pm$ 1.73)a	2.97 ( $\pm$ 1.26)a
Suppressors	2.93 ( $\pm$ 1.37)b	4.37 ( $\pm$ 1.38)b
Controls	3.46 ( $\pm$ 1.23)c	3.42 ( $\pm$ 1.21)c
Cronbach Alpha (Items)	$\alpha = .79$ (2)	$\alpha = .70$ (2)

Subscripts indicate mean differences tested with post-hoc comparisons: For reappraisal score, a vs. b –  $p < .001$ ; a vs. c –  $p < .01$ . For suppression score, b vs. a –  $p < .001$ ; b vs. c –  $p < .05$ . All other post-hoc comparisons were non-significant.

*Risk taking.* To investigate my hypotheses, a 3 (ER: reappraisal vs. suppression vs. control)  $\times$  2 (negative focus: high vs. low; using a median split) ANOVA with average number of card chosen was carried out. The results showed that there was a significant main effect of ER strategies on risk,  $F(2, 68) = 3.60, p < .05, \eta^2 = .09$ . Post-hoc analyses showed that suppressors chose significantly less cards than reappraisors (suppressors vs. reappraisors,  $p < .01$ ); while the other pairwise comparisons were not significant (reappraisors vs. controls,  $p = .30$ ; suppressors vs. controls,  $p = .12$ ). No significant main effect of negative outcome focus on risky choices was found ( $p = .12$ ). However, as expected, there was a significant interaction between ER strategy and negative outcome focus,  $F(2, 68) = 3.40, p < .05, \eta^2 = .09$ . As can be seen in Figure 2, suppressors took less risks than reappraisors only among participants with a strong negative outcome focus ( $p < .01$ ), the other pairwise comparisons were not significant (all  $p$ 's  $> .1$ ). The other EPO subscales showed no significant main effects or interaction on risky choices (all  $p$ 's  $> .1$ ). As the used median split on the negative outcome focus scale could lead to spurious results, I also conducted an ANCOVA with negative focus as

continuous covariate (DeCoster, Iselin, & Gallucci, 2009). As both analyses yielded the same results, I report only the ANOVA results.

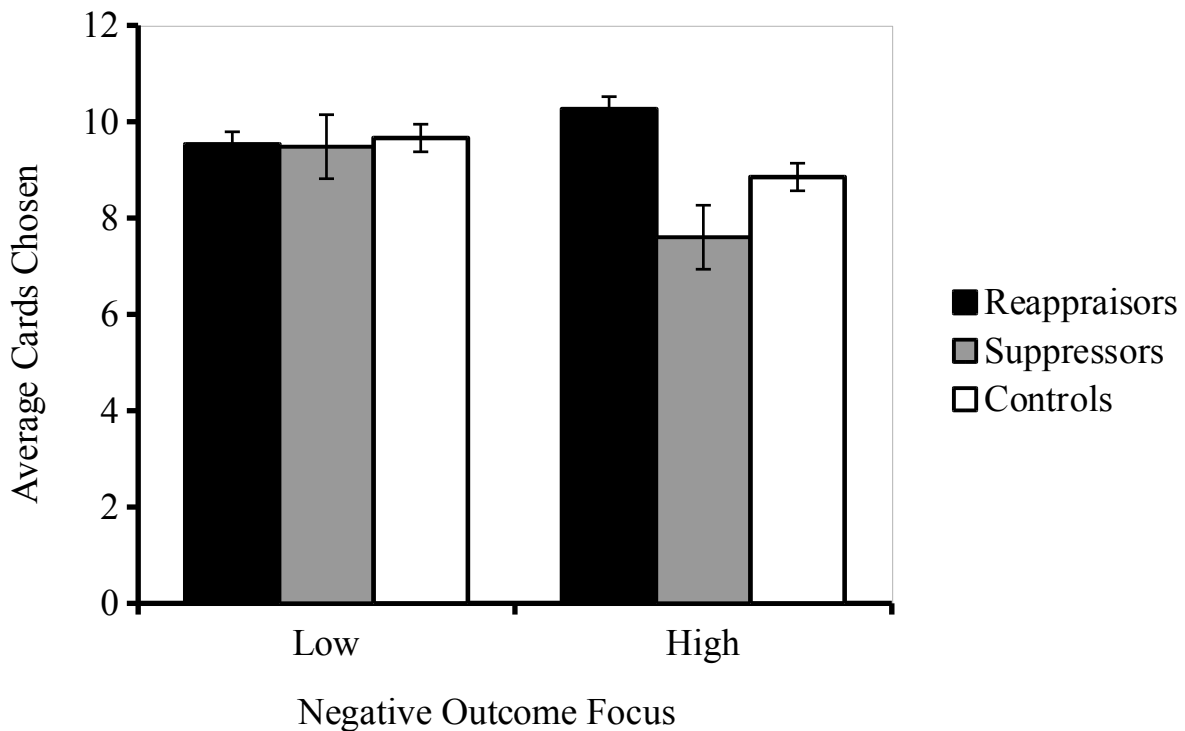


Figure 2. Risk taking (average number of cards chosen) as a function of ER-Strategy (reappraisers/suppressors/controls) and negative outcome focus (low/high).

## DISCUSSION

The findings of present study show that the strength of individuals' negative outcome focus in decision making is a significant moderator of the effect that ER strategy has on risky behavior. Consistent with — and extending — previous studies (e.g., Heilman et al., 2010; Panno et al., in press), we found that ER strategies also affect risky choices when integral emotions are involved. Decision research (e.g., Blanchette & Richards, 2010; Loewenstein, Weber, Hsee, & Welch, 2001; Mellers

& McGraw, 2001) highlighted the role of emotions in risky choices, but only recently has it started paying attention to their regulation. Most of these — still few — studies focused on reappraisal (e.g., Martin & Delgado, 2011; Sokol-Hessner et al., 2009; Sokol-Hessner, Camerer, & Phelps 2012).

The question of the current study, whether and how a habitual use of negative outcome focus may interact with a situationally induced ER strategy in risky decisions, has not been addressed in the literature and the present results clarify the role of ER strategies in risky choice in several ways. First, as a reminder, suppression is conceptualized as a behavioral ER strategy; i.e., it consists of “changing the way one responds behaviorally to an emotion-eliciting event” (John & Gross, 2004, p. 1301). In other words, suppressors attempt to downregulate negative emotions by adopting specific behavioral patterns (e.g., Gross, 1998; Gross & John, 2003), for example by avoiding situations that could potentially elicit negative emotions (see Gross & John, 2003, for more details). This fits very well with results of present study as I observed that suppressors made less risky choices than reappraisors, leading them to a reduced chance of encountering losses (which would trigger negative emotions). Thus, it is tempting to speculate that suppressors were risk averse because – by adopting a risk averse behavior – they attempt to avoid the experience of negative emotions which could be triggered by negative potential outcomes, (e.g., Gross, 1998; Gross & John, 2003; Heilman et al., 2010; John & Gross, 2004; Vanderhasselt et al., 2012). This mechanism would seem to be particularly relevant and powerful in individuals with a strong negative outcome focus, as this personality variable is presumed to exacerbate one’s attention to negative outcomes — an interaction effect that I indeed observed in the present data. In sum, this study shows evidence for such an exacerbation due to the co-occurrence of two specific circumstances, namely the first, the reliance on expressive suppression as ER strategy and, second, having a strong negative outcome focus. Vice versa, these results suggest that situationally induced

suppression does not always necessarily increase risk aversion, as I observed that reappraisers, suppressors, and controls exhibited identical levels of risk among participants with a low negative outcome focus.

Second, the present findings support and extend previous studies that investigated the role of ER strategies in incidental (Heilman et al., 2010) and anticipated (Panno et al., in press) emotions, as I here show that ER strategies also affect risky choices in a task that was specifically developed to elicit integral emotions.

To conclude, present study's findings shed light on decision research outcomes and are also relevant for emotion research. For instance, decision research has shown that the impact of negative outcomes on emotions is stronger than the impact of equally-sized positive outcomes (often discussed in terms of loss aversion; e.g., Tversky & Kahneman, 1991; see also Yechiam & Hochman, in press). Accordingly, negative emotions may be stronger and thus harder to control than positive emotions during decision making. These results are consistent with this idea, but further studies are needed to investigate these speculations, e.g., whether and how a powerful ER strategy, such as reappraisal may influence the effects of negative emotions on risky behaviors. The results of the present study are also relevant to and can extend predictions of decision affect theory (Mellers et al., 1997): This theory posits that the overestimation of displeasure leads individuals to be overly risk averse. Based on this study, there is evidence that expressive suppression may play a key role in the relation between negative outcome focus and risky choice, as I find a joint effect of suppression and strong negative focus. Thus, future theories that rely on affective forecasts in decision making (e.g., Mellers et al., 1997) may benefit from taking into account decision makers' ER strategies to better explain risky behaviors.

Finally, I would suggest that in general more attention should be paid to suppression as ER strategy. Often in our lives, we regulate decision-related emotions via suppression: For example, we may avoid to speak about our own idea in a work meeting because we are afraid of co-workers' potentially negative judgments. Thus, better understanding the role of suppression in decision making could have important applied implications in a wide range of situations. Further, using training to replace one ER strategy (e.g., suppression) by an alternative, better ER strategy (e.g., reappraisal) may benefit decisions across a broad range of domains and may have the effect that people can avoid disadvantageous choices by changing their decision processes and the regulation of the involved emotions.



## **CHAPTER 5**

### **General discussion and summary of findings**

“It is apparent that specific emotions are important, frequently occurring elements of everyday experience” (Brief & Weiss, 2002, p. 297). Broadly speaking, people daily make thousands of choices which include several activities ranging from whether taking a public transport or their own car to go to work to whether (or not) taking a flu shot. These choices involve greater or lesser risk-taking level. Accordingly, each of these choices also engenders several types of emotions which could be positive or negative, pre-decisional or post-decisional (Mellers & MacGraw, 2001). People decisions depend on previous experience (i.e., memories) and cognition but also on current emotional state (Phelps, 2006). It is also likely that post-decisional emotions may in turn affect the next choice; though it is unrelated to previous choice domain. What role do emotions have in risky decision-making processes? Where emotions arise? How do personality dispositions affect the experience of emotions in risk taking? How do situational cues affect decision makers' emotions faced with a risky choice?

Surely, emotions play a relevant functional role in decision-making processes, but in so doing, they also affect these processes (e.g., Loewenstein et al., 2001). In the present work, driven by interest in these issues, I attempt to shed light on mechanisms underlying the relationship between emotions and risky choices, but mainly I attempt to extend the knowledge on these processes taking into account some motivational and emotion-regulation factors which affect the experience of emotion when the decision maker is faced with risky choices. Furthermore, I was also motivated in underpinning the relationships between emotion and decision research.

In the chapter 2, I was stimulated by previous findings (Pierro et al., 2008) which showed how regulatory modes (i.e., in the form of a personality dispositions

or momentarily, i.e., situationally induced) affected the experience of post-decisional regret. Based on this evidence, I hypothesized that likewise regulatory modes affected the experience of anticipated regret. Combining this hypothesis with previous findings (see also Zeelenberg & Pieters, 2007), which showed a strong relationship between anticipated regret and risky choices, I then hypothesized that regulatory modes may affect the experience of anticipated regret, which in turn, affect human risky decision making. It is worth noting that, the series of three experiments presented in the chapter 2 pointed out two relevant novel findings: First, they show that decision maker's regulatory mode (as personality disposition and situationally induced) affect risk-taking level. Second, the present findings show that this relationship is mediated by the experience of anticipated regret. Based on this latter finding, we may highlight the trajectory of anticipated regret when a decision maker is faced with risky choices.

Recent evidence on emotion regulation (ER) have shown that humans typically make efforts to control emotion experiences (Gross & John, 2003). This issue opens the possibility that people's ER strategies modulate the effect of acute emotions in making risky decisions. Accordingly, this raises the additional possibility that different people's regulation strategies could have different implications for decisions. I want to emphasize this latter point, because it shifts the research focus from studying of the effects of emotions on decision-making to studying the strategies which people adopt to regulate the experience of these emotions, thereby marking – in my view – an important step forward in understanding the mechanisms underlying the human risky behaviors.

Based on a number of evidences (e.g., Heilman, Crişan, Houser, Miclea, & Miu, 2010; Martin & Delgado, 2011; Miu & Crisan, 2011; Sokol-Hessner et al., 2009; Sokol-Hessner, Camerer, & Phelps 2012) in the chapter 3, I hypothesized that ER strategies affect risky decision making not only in risk-taking processes which



involve high emotional arousal; but also – and perhaps more interestingly – they also affect human risky decision making under deliberative processes. In the present chapter is crucial to hypothesize that deliberative processes are not free from emotions, because emotions occur in a “cold” form, such as anticipated emotions (i.e., by lower emotional arousal level). Thus, findings of this experiment extend previous literature (e.g., Heilman, et al., 2010; Miu & Crisan, 2011) in two ways: First, I showed that people's ER strategies also affect risky behavior under deliberative processes. Second, I showed that not only situationally induced (i.e., Heilman et al., 2010) ER strategies affect human decision under risk but also naturally occurring (i.e., personality disposition) ER strategies affect people's risky choices.

In the chapter 4, I was particularly focused on the gap between emotion research and decision research. On the one hand, we have empirical evidence about how ER strategies affect risky choices (Heilman et al., 2010; Miu & Crisan, 2011). On the another hand, we know that choices' potential outcomes trigger positive or negative emotions which lead to the decision maker behavior (Mellers et al., 1997). Furthermore, Tversky and Kahneman (1991) showed that negative outcomes have a stronger impact on experience of emotions than equally-sized positive outcomes. Keeping in mind that suppression leaves intact (i.e., unregulated) the experience of negative emotions (John & Gross, 2004); and combining this latter finding with previous decision research's findings (i.e., Mellers et al., 1997; Nenkov et al., 2008; Tversky & Kahneman, 1991), I then hypothesized a moderator effect of the habitual use of negative outcome focus (see also Nenkov et al., 2008 and chapter 4, for more details) when suppression is induced. Findings of this chapter extend previous research on emotion and decision research in two ways: First, I showed that personality dispositions in negative outcome focus exacerbates the suppression's effect in taking risky choices. Second, I showed that ER strategies also affect integral emotions which occur in making risky decisions as well as incidental

emotions (Heilman et al., 2010) and anticipated emotions (Panno et al., in press).

### **Future Directions**

Based on the findings reported in chapter 2, we concluded that regulatory mode affects anticipated regret, which in turn, affects risk-taking level. In keeping with this view, further studies are needed to investigate whether and how different types of anticipated emotions may affect people's risky choices. For instance, researchers may extend the literature on this topic investigating whether specific emotions of the same valence but triggering different arousal level (i.e., anger and fear) may also mediate the relationship between regulatory modes and risky choices. For example, assessors faced with risky choices may engage negative emotions with a lower arousal level (i.e., fear). By contrast, locomotors may engage always negative emotions but triggering a higher arousal level (i.e., anger). Furthermore, future studies are needed to understand how regulatory modes affect human decisions under risk when these are positively or negatively framed. For example, the assessment mode may affect people's risky choices by opposite pathways whether risky choices are framed via gain or loss domain. More specifically, as stated by prospect theory (Kahneman & Tversky, 1979), people are more risk averse when a risky decision is framed in terms of potential gains; while, they are more risk seeking when the same decision is framed in terms of losses. In this framework, a specific regulatory mode, such as locomotion, may reduce the susceptibility to the framing effect in making risky decisions.

Furthermore, futures studies are needed to investigate the gain, loss, probability amount sensitivity of regulatory modes when risky choices occurring in decision-making processes. To address this issue, Schonberg and colleagues suggest to adopt paradigms, which allow for decomposition and analysis in terms of cognitive and economic primitives (e.g., magnitude of gains and losses, probabilities). This latter issue has a high potential explanatory to shed light on mechanisms underlying the

relationship between goal-oriented self-regulation and risk taking (Schonberg, Fox, & Poldrack, 2010, p. 6).

We could make several speculations by combining regulatory mode theory with emotion regulation theory. One may claim that assessors and locomotors adopt different emotion regulation strategies when they are faced with risky choices. For example, since assessors are afraid to fail a decision, they may adopt the suppression strategy because they need to exclude negative emotions from decisional processes (i.e., they need to make more “cold” these processes). By contrast, locomotors may adopt the reappraisal strategy because they generally focus on positive outcomes (Kruglansky et al., 2000); and accordingly, they are more suitable to take into account positive emotions in making risky decisions. Based on these speculations, on the one hand; we can hypothesize that different regulatory mode orientations are associated with different emotion regulation strategy. On the another hand, we know that different emotion regulation strategies affect risk taking by opposite directions (Panno et al., in press). Thus, we may hypothesize that assessors engage the suppression strategy, which in turn, decreases risk-taking level (i.e., these relationships may be explained by assessors' fear to make the wrong decision). By contrast, locomotors engage the reappraisal strategy, which in turn, increases risk-taking level (i.e., this relationship may be explained by locomotors' need to move from state to state searching positive outcomes).

In the next paragraph, I focus on some hypotheses which might increase the knowledge about mechanisms underlying the relationship between emotion regulation strategies and human risky behavior.

John and Gross (2004) also pointed out that suppression — in comparison to reappraisal — strategy fails to downregulate negative emotions but not positive emotions. Thus, we may hypothesize that integral emotions might mediate the relationship between ER strategies and risky choices. For example, situationally

induced suppression might do not be suitable to decrease people's negative integral emotions, which in turn, might affect their risk taking (see Blanchette & Richards, 2010, for a review). By contrast, situationally induced reappraisal might be suitable to decrease people's negative integral emotions withdrawing their effect on risky choices. Thus, future studies are needed to elaborate implications of this asymmetric process in human decisions under risk. Future researches are also needed to shed light on autonomic nervous system's mechanisms involved in making risky choices which trigger integral emotions; for example, assessing the participants' skin conductance during the risk task. Neuroscience studies may also show brain mechanisms involved in these decisional processes (e.g., Schonberg, Fox, & Poldrack, 2010; Vanderhasselt, Baeken, Van Schuerbeek, Luypaert, & De Raedt, 2012).

Combining some cognitive functions, such as working memory, which is related to emotion regulation (i.e., Richards & Gross, 2000) and decision research we may increase the understanding about mechanisms underlying these processes. For example, we know that suppression — but not reappraisal — impaired working memory during information processing (Richards & Gross, 2000). Accordingly, suppression, by impairing working memory during information processing, might affect decision making. Thus, future studies could investigate whether cognitive variables, such as memory function might moderate the effect of emotion regulation strategies on decision making.

Consistent with this theoretical framework, which points out the role of emotions in making risky decision (Loewenstein et al., 2001; Loewenstein & Lerner, 2003; Lopes, 1987; Lopes & Oden, 1999; Mellers et al., 1997); we have both empirical and theoretical motives to consider that future theories that rely on affective forecasts in decision making (e.g., Mellers et al., 1997) should include emotion regulation strategies and motivational variables to increase their explanatory power.

It is an intriguing challenge for future studies.

### **Summary of findings**

In the following paragraph, I summarize the most important contributions put forward in this work. For each chapter will be highlighted novel findings outlined.

On the one hand, the findings of the present studies shed light on emotional processes underlying human decisions under risk. On the another hand, they shed light on both regulatory mode theory and emotion regulation theory. In sum, these findings extend our knowledge in five ways:

First, they show how decision maker's self-regulatory mode (i.e., assessment and locomotion) affect people's risky choices (i.e., chapter 2). More specifically, I find that assessment mode – in comparison to locomotion mode – lead to decreased risk-taking level. It is worth nothing that, these tendencies have been shown in both habitual use and situationally induced of regulatory modes.

Second, they show the trajectory of anticipated regret in making decisions under risk (i.e., chapter 2). In particular, I show that assessment mode increases the regret emotion, which in turn, decreases risk-taking level. By contrast, locomotion mode decreases the regret emotion, which in turn, increases risk-taking level.

Third, they show that habitual use of emotion regulation strategies (i.e., cognitive reappraisal and expressive suppression) predict individual differences in taking risk under deliberative processes (i.e., chapter 3). More specifically, cognitive reappraisal and expressive suppression were significantly correlated with risk taking, in opposite directions: Stronger habitual use of reappraisal was associated with increased risk taking while stronger habitual use of suppression was associated with decreased risk taking.

Four, they show how situationally induced emotion regulation strategies affect people's risky choices which involve higher arousal levels (e.g., when occurring

integral emotions; i.e., chapter 4). In particular, situationally induced suppression ER strategy—compared to reappraisal—significantly decreases risk taking only among people with a higher negative outcome focus.

Five, based on chapter 4's findings it is showed that habitual use of negative outcome focus on risky choice moderates the expressive suppression's effect in human decisions under risk.



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**Appendix A**  
**Psychometric Measures**

**Emotion Regulation Questionnaire**  
**Regulatory Mode Questionnaire**  
**Elaboration on Potential Outcome Scale**

**Emotion Regulation Questionnaire: ERQ Italian version**

**Qui di seguito, ti chiediamo di rispondere ad alcune domande sulla tua esperienza emotiva, in particolare riguardo al modo in cui controlli (cioè regoli e gestisci) le tue emozioni. Le domande comprendono due diversi aspetti circa le tue emozioni. Il primo aspetto riguarda la tua *esperienza*, ovvero quello che provi, senti dentro. Il secondo riguarda invece l'*espressione*, cioè il modo in cui mostri le tue emozioni nel modo di parlare, esprimerti, comportarti.**

**Nonostante alcune domande ti sembreranno simili, in realtà esse differiscono per alcuni aspetti importanti. Ti chiediamo quindi di leggere con attenzione e di rispondere alla sinistra dell'affermazione utilizzando questa scala di valori:**

\_\_\_\_\_ 1 Per sentirmi meglio (ad esempio, felice/contento/sollevato/di buon umore), cerco di guardare le cose da una prospettiva diversa.

\_\_\_\_\_ 2 Tengo i miei sentimenti per me.

\_\_\_\_\_ 3 Per non starci male (ad esempio, essere triste/in collera/di cattivo umore), cerco di guardare le cose da una prospettiva diversa.

\_\_\_\_\_ 4 Quando sono contento/felice, cerco di non farlo notare.

\_\_\_\_\_ 5 Quando devo affrontare una situazione difficile, cerco di considerarla da una prospettiva che mi aiuti a stare calmo/a.

\_\_\_\_\_ 6 Controllo le mie emozioni non esprimendole.

\_\_\_\_\_ 7 Cambiare il modo di pensare ad una situazione, mi aiuta a sentirmi meglio.

\_\_\_\_\_ 8 Cerco di controllare i miei sentimenti provando a cambiare il modo di considerare la situazione in cui mi trovo.

\_\_\_\_\_ 9 Se provo sentimenti negativi, faccio attenzione a non esprimerli.

\_\_\_\_\_ 10 Cambiare il modo di pensare ad una situazione, mi aiuta a non starci male.

**Regulatory Mode Questionnaire: RMQ Italian version**

- \_\_\_ 1. Non mi dispiace fare qualcosa anche se richiede uno sforzo ulteriore.
- \_\_\_ 2. Sono uno stacanovista del lavoro.
- \_\_\_ 3. Mi sento eccitato quando sono in prossimità di raggiungere un obiettivo.
- \_\_\_ 4. Mi piace fare le cose attivamente piuttosto che stare semplicemente a guardare e fare da spettatore.
- \_\_\_ 5. Sono una persona fattiva (che agisce).
- \_\_\_ 6. Quando porto a termine un progetto spesso aspetto un po' prima di iniziarne un altro.
- \_\_\_ 7. Quando decido di fare qualcosa non vedo l'ora di cominciare.
- \_\_\_ 8. Nel momento in cui completo un compito ho già in mente il successivo.
- \_\_\_ 9. Sono una persona poco energica.
- \_\_\_ 10. Per la maggior parte del tempo i miei pensieri sono occupati dal compito che desidero realizzare.
- \_\_\_ 11. Quando comincio a fare qualcosa di solito persevero finché non la finisco.
- \_\_\_ 12. Sono una persona intraprendente.
- \_\_\_ 13. Non do mai una valutazione delle mie interazioni sociali con altri dopo che hanno avuto luogo.
- \_\_\_ 14. Passo molto tempo a fare una lista delle mie caratteristiche positive e negative.
- \_\_\_ 15. Mi piace valutare i progetti delle altre persone.
- \_\_\_ 16. Spesso mi paragono ad altre persone.
- \_\_\_ 17. Non passo molto tempo a pensare ai modi in cui gli altri potrebbero migliorare se stessi.
- \_\_\_ 18. Spesso critico sia i lavori che faccio io che quelli fatti dagli altri.
- \_\_\_ 19. Spesso sento che gli altri mi stanno giudicando.
- \_\_\_ 20. Sono una persona portata a rilevare errori ed imperfezioni.

- \_\_\_\_ 21. Quando parlo, sono molto critico rispetto a quello che dico.
- \_\_\_\_ 22. Spesso penso che le scelte e le decisioni degli altri sono sbagliate.
- \_\_\_\_ 23. Raramente analizzo le conversazioni che ho avuto con altri una volta che esse si sono concluse.
- \_\_\_\_ 24. Quando incontro una persona nuova di solito la valuto sotto diversi punti di vista (ad esempio l'aspetto estetico, il successo, il livello sociale, l'abbigliamento).



**Elaboration on Potential Outcomes: EPO Italian version**

- \_\_\_1. Prima di agire considero cosa guadagnerò o perderò in futuro come risultato delle mie azioni.
- \_\_\_2. Provo ad anticipare mentalmente il maggior numero di conseguenze possibili delle mie azioni.
- \_\_\_3. Prima di prendere una decisione considero tutti i possibili risultati.
- \_\_\_4. Provo sempre a valutare quanto potrebbero essere importanti le potenziali conseguenze delle mie azioni.
- \_\_\_5. Mi impegno molto nel predire quanto siano probabili le differenti conseguenze di una decisione.
- \_\_\_6. Di solito valuto con cura il rischio dei vari risultati che si presenteranno.
- \_\_\_7. Ho come una sensazione positiva che le cose andranno sempre per il meglio
- \_\_\_8. Preferisco pensare alle cose buone che possono succedere piuttosto che a quelle cattive
- \_\_\_9. Ripensando alle mie decisioni mi focalizzo di più sul lato positivo dei risultati ottenuti.
- \_\_\_10. Tendo a pensare molto sugli esiti negativi che potrebbero verificarsi come un risultato delle mie azioni.
- \_\_\_11. Spesso ho il timore che le cose potrebbero andare a finire male.
- \_\_\_12. Ripensando alle mie decisioni mi focalizzo di più sul lato negativo dei risultati ottenuti.
- \_\_\_13. Mi preoccupa spesso su cosa potrebbe andar male come un risultato delle mie decisioni.



# **Appendix B**

## **Experimental Manipulations**

### **Regulatory Modes: Assessment, Locomotion**

**Assessment Manipulation: Italian Version**

**Ricerca sui ricordi personali**

Ti chiediamo di ricordare tre diversi comportamenti che tu hai messo in atto con successo nel passato e di scrivere una breve descrizione di ciascun comportamento. Si tratta di comportamenti che tutte le persone adottano nella vita quotidiana. In particolare ti chiediamo di fornire un breve esempio di ciascuno dei seguenti tre tipi di comportamento.

Pensa alle occasioni nelle quali hai paragonato te stesso ad altre persone

Pensa alle occasioni nelle quali ti sei soffermato a riflettere sulle tue caratteristiche positive e negative

Pensa alle occasioni nelle quali hai criticato i lavori fatti da te stesso e quelli fatti dagli altri

**Locomotion Manipulation: Italian Version**

**Ricerca sui ricordi personali**

Ti chiediamo di ricordare tre diversi comportamenti che tu hai messo in atto con successo nel passato e di scrivere una breve descrizione di ciascun comportamento. Si tratta di comportamenti che tutte le persone adottano nella vita quotidiana. In particolare ti chiediamo di fornire un breve esempio di ciascuno dei seguenti tre tipi di comportamento.

Pensa alle occasioni nelle quali ti sei comportato come una persona attiva.

Pensa alle occasioni nelle quali avevi appena completato un progetto e ne hai iniziato subito un altro

Pensa alle occasioni nelle quali avevi deciso di fare qualcosa e non vedevi l'ora di cominciare

## **Ringraziamenti – Acknowledgments**

Gli ultimi tre anni appena trascorsi sono stati tra i più belli della mia vita... Ricordi fantastici, gioie, timori hanno contribuito a formare quella fantastica miscela di emozioni che mi ha accompagnato in questo percorso. Non posso fare a meno di ringraziare tutti coloro i quali ho incontrato lungo questo percorso.

Innanzitutto devo ringraziare i miei genitori che mi hanno sempre supportato ed invogliato a perseverare per raggiungere ciascun obiettivo. Senza il loro sostegno probabilmente alcune esperienze non sarebbero state possibili ed è per questo che dedico questo lavoro a loro. Non basterebbero parole per ringraziarli della pazienza con cui mi hanno sopportato ed accolto ogni volta che ne avevo bisogno. Grazie mamma e papà per ogni parola ed ogni gesto da voi ricevuto.

Un ringraziamento particolare va a Marco che mi ha sempre sostenuto e stimolato a cercare nuove conoscenze e nuovi stimoli. Alla sua pazienza, e dedizione con cui mi ha seguito nei vari progetti in cui ci cimentavamo. Un ricordo particolare che mi accompagnerà per sempre è legato alla sua tenacia con cui mi ha spronato a viaggiare e a confrontarmi con nuove realtà alle quali devo gran parte della mia crescita. Il lavoro fianco a fianco con lui ha sicuramente creato le basi sulle quali ancora oggi continuiamo a costruire insieme cose nuove. Grazie veramente di cuore!!!

Eine grosse grüße zu Bernd seine entgegen war für mir sehr wichtig. Seine ethisch wert und seine geistig Ehrlichkeit war für mich eine gut und wichtig eingebend. Ich sage ihr viele dank mit meine Hertz für seine gut aufnehmen wen ich war in Amsterdam. Ich behalte alle die schmieren Anmerkung auf dem Tisch von UvA betreffs unserem Idee. Ich nicht vergesse seine Lächeln wen er gesagt mir „wen du bist in U.S. bitte nicht aufwecken mir aus dem nacht für die Stundenplan!“.  
Vielen danken auch für seine Kuriosität aus Gebiet des Wissens. Eine aus meine Träume war die reise in New York und ich sage ihr viele danke.

Ich danke ihr für alles Sachen wir machen zusammen.

Entschuldigen mir für meine schlechte deutsche Sprache.

Eine grosse grüße.

A special thanks is for Tom Meyvis. I thank Tom, because he provided me different perspectives to understand chapter 2's results.

Grazie a Giacinto e Julie che mi hanno offerto una deliziosa ospitalità a NYC rendendo splendido il mio soggiorno negli Stati Uniti e dandomi la possibilità di visitare la Columbia University.

Grazie a Valentina, Giulia Propersi, Costanza, Giulia S., Giulia P. e Ylenia che mi hanno sopportato e seguito assiduamente nelle varie attività di laboratorio.

