# IN THE MOOD FOR RISK?
# A RANDOM-ASSIGNMENT EXPERIMENT ADDRESSING THE EFFECTS OF MOODS ON RISK PREFERENCES

**Theresa Treffers**[a*]

**Philipp D. Koellinger**[b]

**Arnold Picot**[c]

[a] School of Industrial Engineering & Innovation Sciences, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands, Phone: +31 40 247 5532, T.Treffers@tue.nl

[b] Department of Applied Economics, Erasmus School of Economics, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR, Rotterdam, The Netherlands, koellinger@ese.eur.nl

[c] Research Center for Information, Organisation and Management, Munich School of Management, Ludwig Maximilian University, Ludwigstreet 28, 80539 Munich, Germany, picot@lmu.de

[*]Corresponding Author

**ABSTRACT**

Recent discussions in decision sciences and behavioral economics stress the potential impact of affect on decision outcomes. In the present study, we conducted random-assignment experiments ($N$ = 253) to investigate whether affect can cause temporary fluctuations in risk preferences. In particular, we employed film clips to vary the valence (positive / negative) and arousal level (low / high) of the affective states of student participants; following this, we elicited and observed risk preferences by asking the participants to make choices among different lotteries. The financial consequences of the lottery choices varied randomly among the fixed-, low-, and high-stakes treatment groups. Our results suggest that the impact of affect on risk preferences depends on the magnitude of the financial stakes. Specifically, we find that sadness induces risk aversion but only if the financial stakes are fixed or low. We find no evidence that affect influences risk preferences under high-stakes treatments. The observed sensitivity to variations in the financial incentives in our study reinforces the value of incentive-compatible study designs.

*Keywords*: risk preferences; affect; mood; emotion; financial stakes; random-assignment experiment

*JEL Codes*: D03, D81

## 1. Introduction

The behavior of people in situations involving risk appears to be systematically influenced by factors that are not directly related to the expected payoffs. For instance, recent studies demonstrate that natural disasters (Cameron and Shah, 2012; Eckel et al., 2009), terrorist attacks (Viscusi, 2009), violent trauma (Callen et al., 2011; Voors et al., 2012), deadly disease (Sunstein, 2003), financial crises (Guiso et al., 2013), and asset-pricing bubbles (Odeon et al., 2012) can change individuals' risk preferences. However, even daily events, such as rainy or sunny weather (De Silva et al., 2012; Hirshleifer and Shumway, 2003; Kamstra et al., 2000, 2003; Kliger and Levy, 2003; Levy and Galili, 2008; Saunders, 1993), appear to affect the decision-making processes of individuals in situations that involve risk. These findings challenge the assumptions that individual risk preferences are stable over time and across events with similar prospective outcomes (Stiglitz and Becker, 1977). One possible explanation for these findings that has been suggested in the literature is that affective responses in individuals exert a temporary influence on their risk preferences. In an experiment with financial professionals, for example, Cohn et al. (2012) show that financial busts trigger negative emotions that diminish risk-taking behavior.

The hypothesis that affect impacts risk preferences has its roots in psychology, which has a long tradition of studying the influence of affect on decision making in situations that involve risk. Most of the studies in this field either experimentally induce general affective states or measure naturally occurring moods and emotions with self-reporting scales. However, many of these studies have reached conflicting conclusions (e.g., Cheung and Mikels, 2011; Demaree et al., 2011; Heilman et al., 2010; Hockey et al., 2000; Isen and Geva, 1987; Isen and Patrick, 1983; Lee and Andrade, 2011; Leith and Baumeister, 1996; Lerner and Keltner, 2001; Raghunathan and Pham, 1999; Wang, 2006; Yuen and Lee, 2003). Two opposing theories have emerged to explain the relationship between affect and risk preferences: the mood-maintenance hypothesis (MMH; Isen and Patrick, 1983) and the affect-infusion model (AIM; Forgas, 1995). The MMH suggests that a positive affect leads to risk-averse behavior and that a negative affect produces risk-seeking behavior (e.g., Hockey et al., 2000; Kim and Kanfer, 2009; Kliger and Levy, 2003; Wegener and Petty, 1994), whereas the AIM proposes that affect will influence risk preferences in exactly the opposite manner (e.g., Au et al., 2003; Finucane et al., 2000; Grable and Roszkowski, 2008; Hirshleifer and Shumway, 2003; Johnson and Tversky, 1983; Kamstra et al., 2003; Leith and Baumeister, 1996; Levy and Galili, 2008; Yuen and Lee, 2003).

There are several possible causes for the inconsistent results in the literature with respect to the influence of affect on risk preferences. First, most of the studies that have addressed this topic have only examined generally positive and negative affects and have therefore neglected the different impact that may be produced by distinct affective states of the same valence. In particular, different shades of negative affects (e.g., anger, fear, sadness) might have a greater variety of impact than positive affects (e.g., joy, excitement, trust). Furthermore, negative affects may not necessarily have the opposite impact of positive affects (Isen, 2000). To gain more insight into the specific influences that affective states of the same valence may have on decisions that involve risk, certain studies have examined different arousal levels of affective states (Leith and Baumeister, 1996; Lerner and Keltner, 2001). Whereas the valence dimension of affect describes the extent to which affective states involve pleasant or unpleasant experiences, the arousal dimension expresses the level of activation associated with the affective experience (Russell, 1980). Following the arousal description, joy is regarded to have a positive valence and can be either low arousal (relaxed) or high arousal (happy). Sadness, fear, and anger each has a negative valence, but sadness is described as a low arousal state whereas fear and anger are high arousal states (Russell, 1980; Watson and Tellegen, 1985). A few studies (Carver and Harmon-Jones, 2009; Lerner and Keltner, 2001) have argued that fear and anger could have opposite effects on risk perception, although both are affective states with a negative valence. Fear may cause pessimistic risk assessments and risk aversion; by contrast, angry individuals may evaluate risk more optimistically and therefore become more risk seeking. Furthermore, happy individuals may also express optimistic risk estimates and therefore may appear to resemble angry individuals with respect to their risk behavior (Lerner and Keltner, 2001). Investigating the influence of distinct affective states with different valence and arousal levels on risk preferences may help explain the inconsistencies in the findings of prior studies.

Second, the inconsistent empirical results associated with the opposing predictions of the AIM and the MMH may be caused by publication bias, i.e., the tendency of researchers and journals to report findings rather than non-findings (for a discussion of the problem of publication bias, please see Ashenfelter et al., 1999; Dickersen and Min, 1993; Ioannides, 2005).

A third possible reason for the inconsistent results is that the participants in most studies in the field of psychology make hypothetical decisions without personal consequences.[1] Economists have raised questions about the internal and external validity of such studies (Croson and Gneezy, 2009; Smith, 1982). If the results of decisions do not produce personal consequences, then decision makers will be less inclined to carefully consider their responses, and they may be more likely to attempt to please the experimenter with an anticipated response instead of seeking to maximize their own utility. In addition, other potential sources of utility that are irrelevant outside the laboratory context may influence the decisions that are observed. Furthermore, fixed participation fees instead of incentive-compatible designs may offset randomization across treatments and lead to biased samples (Harrison et al., 2009). To address these concerns, Smith (1982) suggested that experimental studies of decision making should fulfill the salience and dominance criteria. The salience criterion requires clearly understood rewards to be linked to an individual's behavior. The dominance criterion stipulates that monetary rewards or costs dominate all other potential sources of utility.

A number of recent economic studies have adopted a different methodological paradigm and investigated the role of affective states in decision making that considers risk by assessing observed financial investments in the field, i.e., by examining revealed preferences rather than hypothetical decisions (Hirshleifer and Shumway, 2003; Kamstra et al., 2000, 2003; Kliger and Levy, 2003; Levy and Galili, 2008; Saunders, 1993; Shu, 2010). Whereas most of these economic studies used naturally occurring mood proxies, such as the weather (De Silva et al., 2012; Hirshleifer and Shumway, 2003; Kliger and Levy, 2003; Levy and Galili, 2008; Saunders, 1993), biorhythms (Kamstra et al., 2000; Yuan et al., 2006), or seasonal affective disorder (Kamstra et al., 2003), other studies are based on survey measures of naturally occurring moods (Fehr-Duda et al., 2008) or on experimentally induced moods (Capra et al., 2004; Kirchsteiger et al., 2006).

[1] One noteworthy exception is the study by Lee and Andrade (2011), which examines the influence of fear in stock market simulations.

However, because these studies investigate generally positive or negative affects, the interpretations of their results remain vague with respect to which specific affective states are involved in the impact that is observed. For instance, it is unclear how weather will affect people's mood because rain might produce sadness in certain individuals and anger in others. Thus, for different individuals, the same external events can trigger various affective states of the same valence with different arousal levels. The differences in these negative affective states cannot be identified in laboratory experiments when inducing or measuring generally negative affects. An incentive-compatible laboratory experiment that induces and measures specific affective states that vary in valence and arousal levels may address these issues and examine whether distinct moods have a causal influence on risk preferences.

Our study reports the results from this type of experiment. Specifically, we investigate the influence of three distinct affective states (joy, fear, and sadness) on risk preferences in the gain domain in laboratory random-assignment experiments involving nonexistent, low, or high financial stakes. We chose to induce joy, fear, and sadness because of their different valence and arousal dimensions (Russell, 1980; Watson and Tellegen, 1985); moreover, these affective states are likely to be present among economic agents in a wide range of situations (Scherer, 2005) and can be triggered by everyday circumstances in most cultures (Ekman, 1992). We measured the specific affective states of participants before and after mood induction using subscales of the Positive and Negative Affect Schedule (PANAS-X; Watson and Clark, 1994), which is the most commonly used psychometric measurement of affect in the psychological literature (e.g., Harmon-Jones, 2003; Lee and Allen, 2002; Stanton et al., 2000).

Moods are generally described as low-intensity, diffuse, and relatively enduring affective states that often arise for no particularly salient reason. By contrast, compared with moods, emotions are considered to be more intense and short-lived affective states that generally have a definite cause and clear cognitive content. Affect is often used as an umbrella term that refers to the current moods and emotions of individuals (Davidson, 1994; Gray and Watson, 2001). It is important to note that the distinctions between moods and emotions are largely theoretical rather than empirical in nature. In research practice, identical methods are often used to induce both moods and emotions (Fredrickson, 2002). In this paper, we use the term mood because we believe that the definition of mood—low-intensity, diffuse, and not object-directed—better fits our induction procedure with film clips than the definition of emotion, which is intense, object-directed, and with clear cognitive content.

Following Holt and Laury (2002), we use lottery-choice menus in our study to elicit risk preferences. This is an established and frequently used approach (e.g., Blavatskyy, 2009; Colombier et al., 2008; Goeree et al., 2003; Johansson-Stenman, 2010). Furthermore, we differentiate between nonexistent, low, and high financial stakes in a random-assignment experimental design. This variance in the financial stakes is an important design element of our study for three reasons. First, risk preferences appear to be sensitive to the magnitude of the financial stakes that are involved in a decision (Camerer and Hogarth, 1999; Croson and Gneezy, 2009; Holt and Laury, 2002). Thus, it is not immediately obvious that the results from an experiment on risk preferences that involves small or nonexistent financial stakes would be replicable with high stakes or in the field. Second, in a study of the impact of a positive affect on risk preferences, Isen and Patrick (1983) found that subjects who were faced with hypothetical decisions demonstrated behavior that was diametrically opposed to that of individuals who (erroneously) believed that their decisions would affect their course grades. Thus, we vary the financial stakes in our random-assignment experiments to investigate if and how the financial stakes moderate the impact of moods on risk preferences. Third, varying both the financial stakes *and* differentiating between specific moods that differ in valence and arousal allows us to parse between two of the possible reasons for the inconsistent empirical results in the literature.

## 2. Data

### *2.1 Participants*

We conducted two studies in a large German university's laboratory for economic experiments. Study 1 included three decision tasks, and one of these tasks was the current study on risk preferences. The other two tasks were incentive-compatible measures of ambiguity preferences and overconfidence, the results of which are unpublished. The sequence of the three tasks was randomized to prevent fixed-choice ordering. In study 1, we recruited a total of 322 participants: 142 participants had no financial stakes, 144 participants had low financial stakes, and 36 participants had high financial stakes. However, we only use data from the participants who completed the risk preference task directly after the mood induction (108 participants in total, including 48 participants with no financial stakes, 48 participants with low financial stakes, and 12 participants with high financial stakes) because these data are most comparable with the data from study 2. We used the 214 observations on risk preferences from study 1 that could not be pooled with the data from study 2 for further robustness checks, as we discuss below.

Study 2 was identical to study 1 in terms of experimental procedures, except for two differences. First, study 2 included no other tasks than the measurement of risk preferences after mood induction. Second, we asked participants about their risk preferences in the loss domain before we asked them about their risk preferences in the gain domain in study 2. Because of the rules of the laboratory in which the experiment was conducted, we did not require participants to pay us in cases involving loss. Thus, there was no incentive-compatible measure of risk preferences in the loss domain, and we therefore only include risk preferences from the gain domain in the current article. We conducted a generalized Chow test to confirm that our main results are not driven by a potential confound (please see section 3.3 for methods and results). In study 2, 37 participants had no financial stakes, 41 participants had low financial stakes, and 67 participants had high financial stakes. Our main analyses below are based on the pooled sample from study 1 and 2 (total $N$ = 253), which included 85 participants with no financial stakes, 89 participants with low financial stakes, and 79 participants with high financial stakes.

The experiment was programmed in z-tree (Fischbacher, 2007) and we recruited participants using the Internet-based ORSEE system (Greiner, 2004), which allowed us to ensure that there was no overlap between the participants in studies 1 and 2. In each experimental session, all three of the mood treatments (i.e., the induction of a joyful, fearful, or sad mood) and a control treatment (i.e., no mood induction) were conducted on personal computers that were randomly matched with the participants. All of the computers looked identical, and only the experimenters knew the participants' treatment groups. During the entire experiment, study participants could not communicate with one another. Participants wore headphones and each participant's working station was concealed from the view of other participants by walls. The participants had no time restrictions for completing the experiment. On average, participants completed study 1 in 30 minutes and study 2 in 20 minutes.

The pooled sample of studies 1 and 2 consisted of 104 males and 149 females with an average age of 24 (SD = 3.41). The youngest and oldest participants were 18 and 43 years old, respectively. In total, 243 of the participants were students, and 10 of the participants were non-students. Of the 243 students, 2% were majoring in the fine arts, 18% in the humanities, 32% in the social sciences, 4% in the biological sciences, and 19% in the physical sciences. The remaining 25% were studying other subjects.

### *2.2 Procedures*

The pooled observations from studies 1 and 2 followed identical experimental procedures in the following aspects. Upon their arrival, the participants were introduced to the session and signed consent forms confirming that they had read and understood the terms and conditions of the experiment and that the experimenters had adequately answered all of their questions.

On the first screen of the experiment, the participants were informed that they were about to participate in an experiment on economic decision making that included real financial payoffs. The participants were then asked to complete questions about their socio-economic status, which included their age, gender, current occupation, level of education, academic major, personality traits (Gosling et al., 2003)[2], and individual risk attitude (Dohmen et al., 2011). After completing these measures, participants were asked to complete self-reported assessments of their pre-induction mood (please see section 2.4.1).

Subsequently, the participants in the three treatment groups watched a film clip that was intended to manipulate their mood (please see section 2.3). After watching this film clip, these participants again indicated their mood states (please see section 2.4.1). The participants in the control group did not watch a film clip (Verheyen and Göritz, 2009) and instead completed the mood scales only once at the beginning of the experiment with the same mood measurement instrument. All the participants then received separate instructions with respect to the magnitude of the financial stakes (please see Appendix A for detailed experimental instructions for both experimental sets) but solved the same risk-preference task (please see Appendix B for the lottery-choice task). Table 1 indicates the number of subjects across the treatment groups who had fixed, low, and high financial stakes.

---

[2] Overall, internal reliabilities for extraversion (Cronbach's $\alpha = 0.74$), agreeableness ($\alpha = 0.23$), conscientiousness ($\alpha = 0.71$), emotional stability ($\alpha = 0.69$), and openness ($\alpha = 0.52$) were not satisfactory. Therefore, we conducted a rotated factor analysis and extracted four components with eigenvalues that were greater than 1, that is, extraversion, emotional stability, conscientiousness, and openness. Agreeableness was not found to be a separate factor and was not included as a control variable in the analysis. The principal component analysis (PCA) considers all the available information, whereas sum scores of the items for one personality dimension would ignore the personality differences among participants. The factor scores and the sum scores were almost perfectly correlated for all four of the five personality dimensions examined ($r$s > 0.90, $p$s < 0.001).

**Table 1**
Number of subjects with consistent risk-preference measures across financial treatment groups in the pooled studies 1 and 2.

| | Fixed stakes | Low stakes | High stakes | ***Total*** |
|---|---|---|---|---|
| **No mood induction** | 20 | 18 | 18 | ***56*** |
| **Joy induction** | 18 | 19 | 17 | ***54*** |
| **Fear induction** | 20 | 21 | 17 | ***58*** |
| **Sadness induction** | 17 | 21 | 17 | ***55*** |
| ***Total*** | *75* | *79* | *69* | ***223*** |

Note: 30 of the original 253 subjects were excluded from the analyses and this table because they either had inconsistent risk preferences or did not understand the decision task (please see section 2.4.2 for further details).

The instructions for the condition that involved fixed financial stakes explained that the individuals who were participating under this condition would receive a fixed payoff of 9 EUR at the end of the experiment, regardless of their performance, which consisted of an attendance fee of 4 EUR and an additional 5 EUR to compensate them for their time. These participants were, however, urged to try their best to solve the subsequent tasks. The participants who experienced the low- and high-stakes treatments were instructed that their payoff at the end of the experiment would depend on their decisions in the subsequent task. These participants received an attendance fee of 4 EUR and the opportunity to earn an additional payoff of up to 15.40 EUR. The participants in the high-stakes treatment were told, in addition, that they had a 1:36 or 2.8% chance to centuplicate their payoff. The maximum amount that the high-stakes participants might win, therefore, was 1,540 EUR. Whether the payoff would be centuplicated depended on the outcome of a fair lottery draw that was explained to the participants in the high-stakes treatment. We chose 36 participants per high-stakes sessions because of the available seats in the laboratory and because of the reasonable probability to win the high-stakes payoff.

After receiving the financial instructions, all the participants completed the same risk-preference task. The completion of this task was the last stage of the study for the participants in the nonexistent-stakes treatment. For the participants in the incentive-compatible treatments, the payoffs were randomly determined by computer in accordance with the experimental instructions and observed behavior. Immediately after each session had concluded, all the session participants were thanked and separately received their payoffs. The participants in the high-stakes treatment also received a card that stated the time and location for the drawing of a lottery number (ranging from 1 to 36) that would determine whose payoff was centuplicated. At the specified times, the participants of the high-stakes sessions each drew one number in the presence of 35 other high-stakes participants who participated in the same lottery draw. The participants provided their names, addresses, and telephone numbers and signed forms that confirmed the lottery numbers they drew. Two hours later, for each of the three high-stakes lotteries, we randomly drew one of the 36 numbers. The participants with the winning numbers received one hundred times the standard conversion rate of the experimental currency in Euros. The high-stakes participants had all been invited to be present at these drawings, but only a fraction of these participants were actually in attendance for each drawing. The drawings of the numbers were video recorded and subsequently published on a publically accessible faculty website; the names of the winners were not announced, however. We chose this public procedure to increase participants' trust in our payoff method and simultaneously to ensure the winners' anonymity. The three winners were informed immediately and confidentially, and the money that they had won was transferred to their bank accounts.

The slightly different payoff mechanism in the high-stakes treatment introduces another layer of uncertainty and delay in payoffs into the experiment compared to the low-stakes treatment. We note, however, that our experimental design still allows us to compare the effects of moods on risk preferences within each of the three financial-stakes treatments. We discuss below (please see section 4) if and how the differences in payoff mechanisms might influence the comparability of our results between the different financial-stakes treatments.

### *2.3 The mood induction process*

We used three film clips that were each 7 minutes in length and that were extracted from Hollywood movies to induce a joyful, fearful, or sad mood in three quarters of the participants. The use of film clips to manipulate moods is standard methodology for studying affect in experimental settings (e.g., Bradley et al., 2009; Guiso et al., 2013; Heilmann et al., 2010; Ifcher and Zarghamee, 2011; Kirchsteiger et al., 2006; Lee and Andrade, 2011; Lerner et al., 2004; Odeon et al., 2012). Film clips have been shown to be one of the most effective mood manipulation mechanisms and have been utilized to induce either positive *or* negative affective states (Gerrards-Hesse et al., 1994; Westermann et al., 1996). In total, 193 participants were induced with joyful (64 participants), fearful (64 participants), or sad (65 participants) moods, using film clips from "When Harry met Sally" (1989), "Paranormal Activity" (2007), and "The Champ" (1979), respectively (Gross and Levenson, 1995; Hewig et al., 2005).

Prior to viewing the film clips, the participants were asked to become involved in the feelings that were suggested in the film clips and to clear their mind of all of their thoughts, feelings, and memories. The mood induction effects are assumed to be more intense if explicit instructions are provided to study participants (Westermann et al., 1996). After the film clip had concluded, the participants were required to indicate whether they had previously watched the movie that was the source of the clip in question. At the end of the experiment, the participants who received the negative mood inductions were shown the film clip of the joyful mood treatment as a counter induction (Göritz and Moser, 2006). We also showed the joyful film clip to the control group participants because this activity consumed a portion of the time that these participants had available while they waited for the other participants to complete the experiment and receive their payoff.

### *2.4 Measures*

#### *2.4.1 Mood measurement*

We used three subscales of the short version of the PANAS-X (Watson and Clark, 1994; Watson et al., 1988) to measure participants' specific moods at the beginning of the experiment (once in the control group and twice in the treatment groups). The PANAS-X is the most researched psychometric measure of affect; in fact, the original article by Watson et al. (1988) has been cited more than 7,873 times as of May 2013, according to the Thomson Reuters Web of Knowledge. We used the joviality subscale of this metric (e.g., happy, joyful, or delighted; *Cronbach's* $\alpha_{\text{before induction}} = 0.87$, $\alpha_{\text{after induction}} = 0.92$) to assess participants' levels of joy at the beginning of the experiment, the fear subscale (e.g., afraid, scared, or frightened,

$\alpha_b = 0.83$, $\alpha_a = 0.92$) to measure participants' levels of fear, and the sadness subscale (e.g., sad, blue, or downhearted, $\alpha_b = 0.88$, $\alpha_a = 0.90$) to measure participants' levels of sadness.

### *2.4.2 Risk preferences*

To measure risk preferences, we used an adaptation of the Holt and Laury (2002) method, which asks participants to make a series of choices between two lotteries with different payoffs (please see Appendix B for the lottery-choice task). The payoffs are structured such that one lottery (option *S*) is less risky than the other (option *R*). In addition, the series of payoffs is designed such that at the beginning of the experiment, the expected value of the safe choice (*S*) is higher than the expected value of the risky choice (*R*). During the course of the series of choices, the difference in expected values between the two choices becomes successively smaller until it reverses; thus, as the series of choices continues, the riskier choice (*R*) has an increasing advantage in the expected value that the participant will receive. The point at which the participants switch from the safe (*S*) to the risky (*R*) lottery reveals their risk preferences. Participants in the incentive-compatible treatments (the low- and high-financial-stakes treatments) knew that one of the decision options would be randomly chosen and that their decision performances would affect the quantity of real money that they received at the end of the experiment.

In total, 30 participants displayed choices that were not compatible with expected utility theory. These participants either preferred the safe option (*S*) in the last lottery choice (i.e., a sure win of 800 Experimental Dollars [ED])—despite the fact that this choice is strictly dominated by the "risky" (*R*) option (i.e., a sure win of 1,540 ED)—or switched between the lotteries more than once and thereby displayed inconsistent preferences. We excluded these 30 participants from further analyses to avoid inference problems (Andersen et al., 2006; Holt and Laury, 2002). In our sample, by the standard specified above, females ($Chi^2 = 6.26$, $p = 0.01$)[3] were more likely than males to exhibit inconsistent or unreasonable choices. Furthermore, there is no indication that the excluded subjects were non-randomly distributed across the financial-stakes treatments ($Chi^2 = 0.08$, $p = 0.96$)[4] or the mood treatments ($Chi^2 = 3.57$, $p = 0.31$)[5].

## 3. Results

### *3.1 Mood inductions*

According to the participants' self-evaluations, all of the mood inductions appear to have worked successfully.[6] In particular, the participants that viewed the joyful film clip reported that their joy after induction was significantly higher than their joy before induction

---

[3] We take a conservative approach and report two-sided p-values throughout the entire paper.
[4] From these 30 participants, 10 participants were excluded from each financial stake condition.
[5] From these 30 participants, 10 participants were excluded from the sadness and the joy treatment, 6 from the fear treatment, and 4 from the control treatment.
[6] We used factor scores for the analysis because factor scores consider all the available information, whereas sum scores of the items for one mood type would ignore the mood differences among participants that arose from changes in fear or sadness. The principal component analysis (PCA) factor scores are based on PANAS-X items. Varimax rotation is applied. The factor scores and sum scores were almost perfectly correlated for all three of the examined moods ($r > 0.95$, $p < 0.001$). The results are robust to using sum scores instead of factor scores.

($t[df = 63] = -6.19$, $p < 0.001$, $d$[7] $= 1.56$). Similarly, with respect to the fearful film clip, participants showed higher fear after induction than before induction ($t[df = 63] = -5{,}17$, $p < 0.001$, $d = 1.30$), and the sad film clip caused participants to report significantly higher sadness after induction than they had reported before induction ($t[df = 64] = -4.91$, $p < 0.001$, $d = 1.23$). Table 2 indicates the factor scores of the principal component analyses of the self-reported moods across treatments after mood induction. This table illustrates that study participants self-report the highest mean values for a particular mood after they have been exposed to the appropriate mood treatment.

**Table 2**
Self-reported moods across treatments after mood induction.

| | **Self-reported joy** | | **Self-reported fear** | | **Self-reported sadness** | |
|---|---|---|---|---|---|---|
| | *Mean* | *Std. Err.* | *Mean* | *Std. Err.* | *Mean* | *Std. Err.* |
| **No mood induction** | 0.50 | 0.72 | -0.30 | 0.46 | -0.07 | 0.69 |
| **Joy induction** | **0.72** | **1.04** | -0.38 | 0.40 | -0.33 | 0.40 |
| **Fear induction** | -0.44 | 0.77 | **1.01** | **1.28** | -0.42 | 0.98 |
| **Sadness induction** | -0.73 | 0.57 | -0.34 | 0.78 | **0.80** | **1.20** |

We assessed whether the participants' affective reactions to the film clips differed with respect to gender (Croson and Gneezy, 2009; Hagemann et al., 1999), personality traits (Gross et al., 1998) or prior exposure to the film (Gross and Levenson, 1995). Compared to men, women self-reported higher fear ($t[df = 62] = -3.15$, $p = 0.003$, $d = 0.80$) and sadness ($t[df = 63] = -2.25$, $p = 0.03$, $d = 0.57$) levels after induction. Previously published studies have shown that men intentionally report lower levels of negative moods than women (e.g., Blier and Blier-Wilson 1989; Sutton and Farrall 2005). In the fear treatment, participants high in emotional stability reported lower levels of fear after the induction ($r = -0.39$, $p = 0.001$). There were no significant personality effects on the strength of the mood inductions in the joy and in the sadness treatment (Pearson correlations, $p$s > 0.08). In addition, we find no evidence that prior exposure to the film ($t$-test, $p$s > 0.10)[8] produced any influence on the strength of the mood inductions that were observed. Using sum scores instead of factor scores for the mood and personality scales yields similar results.[9]

### *3.2 Descriptions and correlations*

Figure 1 illustrates the proportion of safe choices in each of the 10 lottery decisions. The horizontal axis indicates the number of safe choices and the vertical axis indicates the probability of safe choices. Participants in the sad mood treatment show the highest overall risk aversion. Participants in the joy and the fear treatments are also marginally more risk-averse than participants in the control group. A one-way analysis of variances (ANOVA, $F[3, 219] = 2.35$, $p = 0.07$) with least-significant differences (LSD) post-hoc test indicates that, in

---

[7] Cohen (1988) suggests that $d = 0.20$ denotes a small effect, $d = 0.50$ denotes a medium effect, and $d = 0.80$ denotes a large effect.

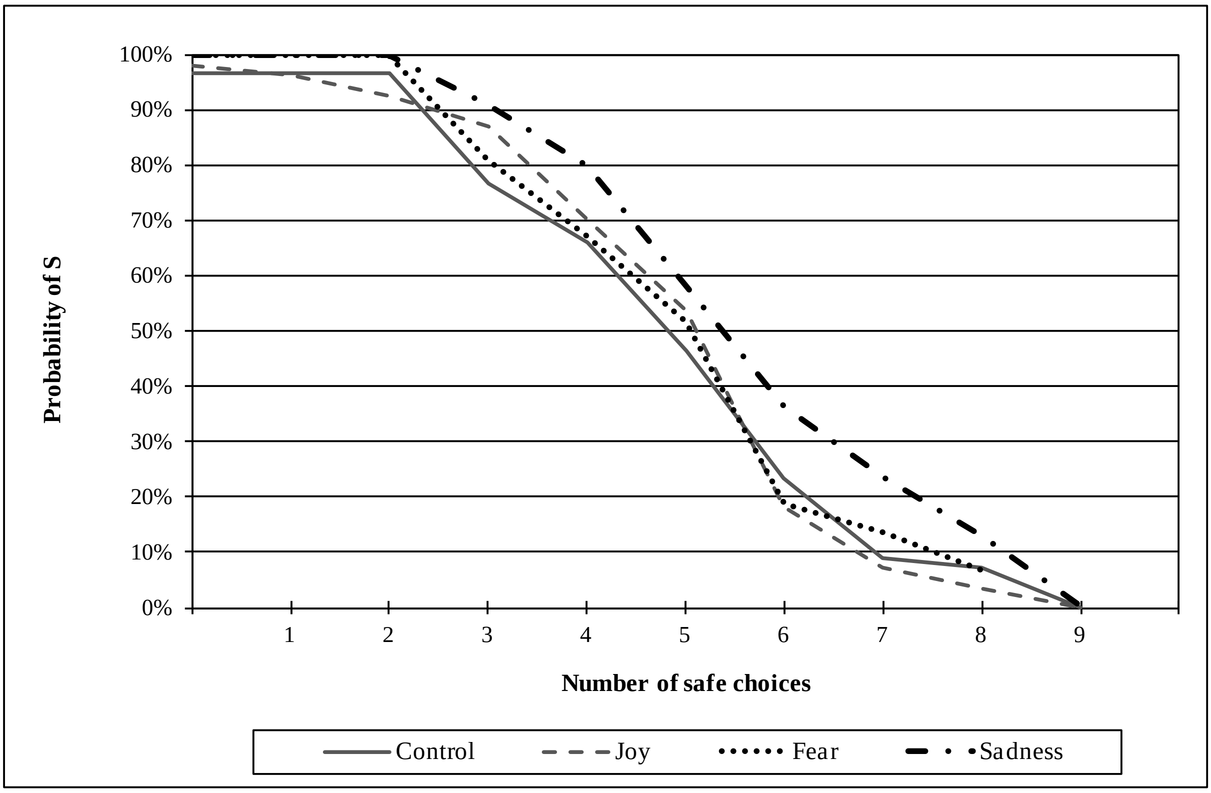
[8] 19 participants in the joy treatment and 8 participants in the fearful treatment had seen the respective movie before participating in the experiment. No participant had previously seen the sad movie.

[9] Detailed results available upon request.

general, risk aversion is significantly higher in the sadness ($M$ = 2.02, $SD$ = 1.80) group than in the joy ($M$ = 1.28, $SD$ = 1.78, $p$ = 0.04, $d$ = 0.41), fear ($M$ = 1.40, $SD$ = 1.75, $p$ = 0.07, $d$ = 0.35), and control groups ($M$ = 1.18, $SD$ = 1.98, $p$ = 0.02, $d$ = 0.44).

**Figure 1**

Proportion of safe choices – data averages across treatment groups ($N$ = 223).




Correlation results (please see Appendix C) show that our careful randomization procedures were not entirely successful in distributing personal characteristics equally across treatment groups ($p$s < 0.05). Therefore, we included personality characteristics in the following regressions as control variables. The risk attitudes that were self-reported before the mood induction using the general risk question of Dohmen et al. (2011) were weakly correlated with the elicited risk preferences ($r$ = 0.16, $p$ = 0.02), and they were randomly distributed across the treatment groups. Gender and age are not correlated with either our measure of risk preference or the treatment groups; thus, these factors do not influence the regression results.

*3.3 Regression results*

To analyze the relationship between moods and risk preference, we consider a model of the form

$$(1)\quad y_i = a + \overline{\beta}_1'\overline{M} + \overline{\beta}_2'\overline{F} + \beta_3'\overline{S} + \overline{\beta}_4'(\overline{MF}) + \overline{\beta}_5'(\overline{MS}) + \overline{\beta}_6'(\overline{FS}) + \overline{\beta}_7'(\overline{MFS}) + \overline{\beta}_8'\overline{C} + \varepsilon_i, \quad i = 1,\ldots,N$$

where $y_i$ is the observed risk preference of subject *i*, *M* is a set of dummy variables for the mood treatment (control, joy, fear, sadness), *F* is a set of dummy variables for the financial-stakes treatment (nonexistent, low, high), and *S* is a dummy for studies 1 and 2. *C* is a vector of control variables for personality scores and self-reported risk preferences before the experimental treatments. The $\beta$ coefficients are the differential intercepts for the experimental treatments, whereas *a* gives an estimate of the common intercept.

This model arrangement that includes dummy variables for the different experimental treatments both in additive and in multiplicative form may be used to test the assumptions that moods (*M*) influence risk preferences independent from the magnitude of the financial stakes (*F*) and the study design (*S*) (Chow, 1960; Gujarati, 1970). Our main interest lies in the effects of *M* and *F* and their interaction, which is reported in Table 3. We control for *S*, *MS*, and *FS* as potential confounds that may otherwise arise as the result of the slightly different experimental conditions in studies 1 and 2. Model 1 assumes that $\beta_4$ and $\beta_7$ are zero, reflecting the implicit assumption from previous studies that the magnitude of financial stakes does not moderate the effect of moods on risk preferences. Model 2 relaxes this assumption and explicitly estimates $\beta_4$. Model 3 estimates the full set of coefficients as a further robustness check.

In the following regressions, a positive coefficient denotes risk-averse preferences and a negative coefficient indicates risk-seeking preferences. In all three Models in Table 3, we find no evidence that the fear treatment influences risk preferences. Sadness, by contrast, is significantly associated with risk aversion in Model 1 ($p = 0.03$). Although the main effect is insignificant in Models 2 and 3, the effect size is similarly strong. In Model 2, we find evidence that the effects of moods are dependent on the magnitude of the financial stakes that are involved. Specifically, the participants in the joy group are more risk seeking under the low-stakes treatments ($\beta = -0.22$, $p = 0.09$) than under conditions involving either nonexistent or high stakes. These findings suggest that a pooled analysis of the three financial stake conditions is not appropriate. Model 3 gives no indication of an influence of moods on risk preferences when we control for the financial-stakes treatments and all other potential confounds.[10]

[10] No evidence against poolability was produced by a poolability analysis across the factor of gender. Detailed results are available upon request.

**Table 3**

OLS regressions on risk preferences.

| | *Model 1* | | *Model 2* | | *Model 3* | |
|---|---|---|---|---|---|---|
| | ***β*** | ***p*** | ***β*** | ***p*** | ***β*** | ***p*** |
| Intercept | *0.28* | *0.60* | *0.23* | *0.71* | *0.26* | *0.71* |
| Joy | 0.09 | 0.41 | 0.14 | 0.42 | 0.18 | 0.39 |
| Fear | 0.07 | 0.54 | -0.01 | 0.94 | -0.05 | 0.79 |
| Sadness | 0.22** | 0.03 | 0.27 | 0.11 | 0.25 | 0.21 |
| Low stakes | -0.04 | 0.72 | 0.06 | 0.75 | 0.01 | 0.97 |
| High stakes | -0.10 | 0.28 | -0.15 | 0.37 | -0.14 | 0.49 |
| Joy*Low stakes | | | -0.22* | 0.09 | -0.25 | 0.18 |
| Joy*High stakes | | | 0.05 | 0.67 | 0.02 | 0.90 |
| Fear*Low stakes | | | 0.02 | 0.89 | 0.12 | 0.53 |
| Fear*High stakes | | | 0.09 | 0.48 | 0.09 | 0.57 |
| Sadness*Low stakes | | | -0.04 | 0.79 | 0 | 1.00 |
| Sadness*High stakes | | | -0.05 | 0.71 | -0.05 | 0.76 |
| Joy*Low stakes*Study2 | | | | | 0.05 | 0.79 |
| Joy*High stakes*Study2 | | | | | 0.04 | 0.74 |
| Fear*Low stakes*Study2 | | | | | -0.15 | 0.46 |
| Fear*High stakes*Study2 | | | | | 0.05 | 0.64 |
| Sadness*Low stakes*Study2 | | | | | -0.05 | 0.81 |
| Sadness*High stakes*Study2 | | | | | 0.02 | 0.89 |
| **Model diagnostics** | | | | | | |
| *N* | 223 | | 223 | | 223 | |
| $R^2$ | 0.11 | | 0.14 | | 0.15 | |
| *Prob > F* | 0.07 | | 0.07 | | 0.20 | |

Note: *βs* are standardized for all variables except for the intercept.
Control variables are the experimental study design, experimental study design*mood treatments, experimental study design*financial stakes, personality factor scores, and self-reported risk attitudes.
The reference groups are the control treatment, nonexistent financial stakes, and study 1.
The results are robust for the exclusion of control variables, for the inclusion of additional control variables such as gender, age, and whether the movie was seen before, for including personality sum scores instead of factor scores, and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

Table 4 provides three separate OLS regressions for the financial stake conditions of the experiment. We find no significant effects of moods on risk preferences. This may be caused by the smaller sample sizes in each of the regressions, which reduce the statistical power to identify small effect sizes. Moreover, a regression analysis using the pooled sample of the incentive-compatible low- and high-stakes treatments (*N* = 148) does not indicate any significant effects of participants' moods on risk preferences either (please see Table D1 in Appendix D). However, the interaction effect of joy and low financial stakes is again significant in Model 2 in Table D1.

**Table 4**

OLS regressions on risk preferences – by stakes ($N$ = 223).

| | ***Model 1: Fixed stakes*** | | ***Model 2: Low stakes*** | | ***Model 3: High stakes*** | |
|---|---|---|---|---|---|---|
| | ***β*** | ***p*** | ***β*** | ***p*** | ***β*** | ***p*** |
| Intercept | *0.10* | *0.91* | *0.58* | *0.53* | *-0.75* | *0.43* |
| Joy | 0.25 | 0.22 | -0.26 | 0.21 | 0.19 | 0.23 |
| Fear | -0.01 | 0.96 | 0.11 | 0.61 | 0.09 | 0.56 |
| Sadness | 0.27 | 0.18 | 0.20 | 0.33 | 0.19 | 0.28 |
| **Model diagnostics** | | | | | | |
| *N* | 75 | | 79 | | 69 | |
| $R^2$ | 0.22 | | 0.19 | | 0.18 | |
| *Prob > F* | 0.18 | | 0.27 | | 0.47 | |

Note: *βs* are standardized for all variables except for the intercept.
Control variables are the experimental study design, experimental study design*mood treatments, personality factor scores, and self-reported risk attitudes.
The reference group is the control treatment.
The results are robust for the exclusion of control variables; for the inclusion of additional control variables, such as gender, age, and whether the movie was seen before; for including personality sum scores instead of factor scores; and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

We conducted robustness checks of our results with model specifications in Table 3 using the excluded observations from study 1 ($N$ = 214, please see Table D2 in Appendix D) and the pooled observations from study 1 ($N$ = 322, please see Table D3 in Appendix D). There is no evidence that mood has a direct effect on risk preferences. However, the results in Tables D2 and D3 indicate that the financial-stakes treatments have significant direct and indirect effects on risk preferences. These findings corroborate our previous results that the effects of moods on risk preferences depend on the magnitude of the financial stakes.

Furthermore, we calculated three separate OLS regressions for the financial stake conditions with the pooled observations from study 1 ($N$ = 322, please see Table D4 in Appendix D). The results show that sadness leads to risk aversion when the financial stakes are low, which speaks again to a moderating effect of financial stakes between moods and risk preferences. We find no indications that moods influence risk preferences when the financial stakes are high.

In addition, we performed statistical sensitivity analyses (Erdfelder et al., 1996) for Model 3 in Table 4 to estimate the maximum effect sizes that we could identify in the high-stakes data. For the 69 participants in this Model and at a significance threshold of $p = 0.1$, we had 50% power to detect the effects of variables that explain at least 9.7% of the variance in risk preferences, i.e., the increase in overall $R^2$ that is caused by the predictor. In a pooled model that uses all of the high-stakes data from experimental sets 1 and 2 ($N$ = 92, please see Table D5 in Appendix D), we had 50% power to identify even smaller effects ($R^2$ > 7%). Because we do not find coefficients with $p$-values that are close to 0.1 in these models in Tables 4 and D5, we conclude that the influence of the induced moods on risk preferences in our sample is likely to be small or nonexistent under conditions in which the decisions of participants have serious monetary consequences.

## 4. Discussion

To study the effects of moods on risk preferences, our random-assignment experiments used standard techniques from psychology to manipulate and measure moods and a standard incentive compatible technique from economics to elicit risk preferences. In addition to a control group that did not receive mood manipulation, we varied both the valence and the arousal level of the affective states of participants by inducing three distinct moods, i.e., joy (positive, high arousal), fear (negative, high arousal), and sadness (negative, low arousal). In addition, we also varied the financial-stakes treatments across participants (i.e., fixed-, low-, and high-stakes treatments). These two dimensions of random between-subject variation in our experiment allow us to parse between two possible explanations for the inconsistent empirical results found in the previous literature on this topic—biases that may be introduced by non-incentive-compatible experimental designs, and biases introduced by unobserved variation in the induced moods. Considered in their entirety, our results underscore the possible relevance of both types of biases in the literature on affect and risk preferences.

Our result for the influence of sadness on risk preferences when the financial stakes are fixed or low is most comparable with earlier studies in psychology that are almost exclusively based on experiments employing hypothetical decisions. In particular, the result that sadness causes risk aversion is consistent with the predictions of the AIM (Forgas, 1995). The AIM relies on the valence perspective and hypothesizes that affect has a congruent effect if a substantive processing strategy is used for the given information. Because we assume that our risk preferences measure required considerable cognitive processing effort, negatively valenced moods such as sadness led to mood-congruent decision outcomes, i.e., risk aversion. However, neither the AIM nor the competing MMH (Isen and Patrick, 1983) can explain our null results for joy and fear.

Instead, our result for sadness and risk aversion in the fixed- and low-stakes treatments may be explained by the valence-arousal framework (Russell, 1980; Watson and Tellegen, 1985). Studies consistent with this framework suggest that affective states may not only influence decision making through their valence but also through their arousal level. Whereas low-arousal affective states (e.g., sadness) are supposed to promote structured information processing, high arousal affective states (e.g., fear, happy) are assumed to lead to less structured information processing (e.g., Sanbonmatsu and Kardes, 1998). Although certain recent studies have questioned the inhibiting influence of fear as a high arousal state on information processing and argue that fear can also promote structured and systematic thinking (Lerner and Keltner, 2000, 2001; Tiedens and Linton, 2001), our findings seem to support the common view that fear may rather resemble joy instead of sadness because fear and joy show no effects on risk preferences. Hence, although fear and sadness share the same valence level, it is reasonable to argue that joy and fear share the same arousal level and lead to identical non-existent effects on risk preferences. Consequently, from an arousal perspective, our results would imply that low-arousal affective states such as sadness can influence risk preferences more than high-arousal states such as fear and joy. Having said that, it seems counterintuitive that low-arousal affective states that are supposed to lead to focused information processing, can significantly affect risk preferences whereas high arousal affective states that are assumed to inhibit information processing do not. Additionally, it may be promising to include a cognitive component of affect in future studies because joy, fear, and sadness may differ in the extent to which they are associated with certain appraisals (Lerner and Keltner, 2000; Lerner and Tiedens, 2006). Nevertheless, the differences in arousal levels are a possible explanation for why we find an influence of sadness on risk preferences, but not on fear and joy.

Previous studies on the influence of affect on risk preferences have typically used a variety of affect induction procedures and measurements and have not varied or controlled for differences in valence or arousal levels. This may have introduced an unobservable bias across studies that contributed to the inconsistency of reported results. Therefore, we recommend for future studies that experimenters distinguish between the valence and arousal levels of affective states and, possibly, between the different appraisal components underlying distinct affective states. These distinctions will contribute to our understanding of and how specific affective states influence risk preferences or other decision outcomes. Understanding the definite influences of affective states will help individuals and organizations to improve the quality of their decisions.

One of the possible reasons why our study does not find strong, consistent effects of moods at all levels of financial stakes may be the mood induction technique we chose. Although we used standard procedures from the psychological literature and our participants reported strong mood effects after induction (Cohen's *d*s > 0.80, please see section 3.1), the resulting changes in moods may not have been intense enough to influence risk preferences consistently. This may have been particularly relevant for joy, although participants in the joy group stated the strongest induction effect (Cohen's $d$ = 1.56). Because individuals are typically in a positive resting mood (e.g., Clore and Huntsinger, 2007; Schwarz and Clore, 1983), our mood induction may not have been strong enough to increase this positive resting mood to a sufficiently high level. Table 2 indicates that the mean difference between the participants in the control treatment without mood induction and the participants in the joy treatment is only ~ 0.2 (based on measures with a mean of zero and standard deviation of one). Thus, our film clip for inducing joy had only a slight effect on participants' positive resting mood. By contrast, the participants who watched the sad film clip appear to have experienced a stronger difference from their default positive resting mood to the induced sad mood (mean difference ~ 0.7) than the differences that were observed for either the joy or fear treatments. This conscious deviation from the default mood may explain why we find that hypothetical and low-stakes decisions under risk are affected by sadness but not by joy. However, this argument cannot explain why we find no significant effects of fear on risk preferences (mean difference ~ 0.7).

Despite our successful mood manipulations with film clips, vivid, recently experienced events in the real world, such as natural disasters (Cameron and Shah, 2012; Eckel et al., 2009), terrorist attacks (Viscusi, 2009), traumas (Callen et al., 2011; Voors et al., 2012), the diagnose of a deadly disease (Sunstein 2003), or financial busts and bubbles (Cohn et al., 2012; Guiso et al., 2013; Odeon et al., 2012) might have stronger, longer-lasting affective consequences that might influence risk preferences more profoundly even when the financial stakes are substantial. Moreover, affect that is directly caused by the decision situation (i.e., emotion) instead of being induced independently from the decision (i.e., mood) might also produce stronger effects (Davidson, 1994; Gray and Watson, 2001) on risk preferences.

Nevertheless, recent laboratory experiments that used similar mood induction procedures to ours found significant effects of affect on ambiguity preferences (Baillon et al., 2013), time preferences (Ifcher and Zarghamee, 2011), asset-pricing bubbles (Odeon et al., 2012), and certainty equivalents (Guiso et al. 2013). Whereas the first three studies used incentive-compatible designs, the study by Guiso et al. (2013) investigated the relationship between fear and risk aversion with fixed financial incentives. Yet, these studies imply that short movie clips, such as those used in our study, can—in principle—change economic preferences and behavior. Furthermore, these studies suggest the possibility that affect is more relevant for other types of decisions than choices involving risk in the gain domain that we studied here.

Although it may be possible that weak mood induction is the cause of our consistent null results for joy and fear, this reasoning cannot explain why the significant influence of sadness disappears when the study participants make decisions with serious financial stakes. The mood induction of sadness was equally successful for the fixed-financial-stakes treatment and the high-financial-stakes treatment (the means of the self-reported sadness scores are -0.76 for the fixed-stakes treatment and -0.71 for the high-stakes treatment; $p_{\text{t-test}} = 0.97$, $N = 162$). Therefore, the observed differences in the effect of sadness on risk preferences in the nonexistent-, low- and high-stakes treatments are either caused by the different magnitudes of the financial stakes involved, the different payment procedures we used, or both.

The main difference between the fixed- and the low-stakes treatment is, of course, that decisions were hypothetical in the fixed-stakes treatment, whereas they had small financial consequences in the low-stakes treatment. The difference between the low- and the high-stakes treatment is, however, twofold. First, the expected payoff was 100/36 in the high-stakes treatment, which is ~ 2.8 times higher than the low-stakes treatment by design. For most of our participants, the possible maximum payoff of 1,540 EUR in the high-stakes treatment was likely higher than their monthly income, whereas the maximum payoff of 15.40EUR in the low-stakes treatment was roughly equal to the expected income for 1-2 hours of paid work. Second, the slightly different payoff procedures may have also affected our results. In particular, the lottery for who would be paid the high-stakes conversion rate introduced another layer of uncertainty into this treatment. Furthermore, the expected delay in payments in the high-stakes treatment, although not explicitly stated in the experimental instructions, implies that participants may have discounted their expected payoffs. However, extreme ambiguity aversion and time-discounting factors would be required to offset the higher expected payoffs in the high-stakes treatment. Furthermore, the literature suggests that affective states have an influence on ambiguity (Baillon et al., 2013) and time preferences (Ifcher and Zarghamee, 2011). Thus, these differences in payoff procedures may have increased rather than decreased our chances of finding a significant effect of moods in the high-stakes treatment.

We therefore argue that the different effects across the financial treatments are likely to be driven primarily by the presence and magnitude of financial stakes. Accordingly, our study corroborates methodological concerns that results from hypothetical or low-stakes decision experiments cannot be generalized to settings in which decisions have serious consequences (Smith, 2008; Harrison et al., 2009; Croson and Gneezy, 2009).

## 5. Conclusion

Despite our null results in the high-financial-stakes treatment, our findings do not allow us to reject existing models about affect or to claim that affect is generally irrelevant for decision making under conditions that involve risk. Instead, our main conclusions are of a methodological nature. First, we find different effects for two affective states of the same negative valence (i.e., fear and sadness) in the nonexistent- and low-financial-stakes treatment. This difference reinforces the need to study specific affective states of the same valence but with different arousal levels and possibly with the inclusion of appraisals. Thus, indirect evidence on the role of generally positive and negative affect that is caused by external circumstances and that can have a variety of affective consequences at the individual level, such as different weather conditions, may not be sufficient to unravel if and how affect influences decision making involving risk.

Second, we conducted the first experiment on the role of distinct affective states on risk preferences in the financial domain that separately assessed decisions involving nonexistent, low, and high financial stakes. Our results imply that the influence of affect on risk preferences is sensitive to the magnitude of the financial consequences of the decisions. Because most of the studies on the role of affect on risk preferences are based on hypothetical or low-incentivized decisions, it is unclear how generalizable the (inconsistent) results of these studies may be to high-stakes decisions or to behavior in the field. Our findings emphasize the need for incentive-compatible experimental studies that fulfill the salience and dominance axioms (Smith, 1982).

Eventually, our results provide a degree of confidence that the experimental research on financial decision making involving risk in the gain domain is unlikely to be directly confounded by the unobserved affective states of participants if the financial stakes in these experiments are sufficiently high. Our findings may also indicate that decisions involving risk in organizations may not be affected by individuals' moods when the financial stakes are considerable. This insight can be valuable for designing decision processes and incentive schemes for individuals in organizations.

## REFERENCES


Andersen, S., Harrison, G., Lau, M., Rutström, E., 2006. Elicitation using multiple price list formats. Experimental Economics 9 (4), 383-405.

Ashenfelter, O., Harmon, C., Oosterbeek, H., 1999. A review of estimates of the schooling/earnings relationship, with tests for publication bias. Labour Economics 6 (4), 453-470.

Au, K., Chan, F., Wang, D., Vertinsky, I., 2003. Mood in foreign exchange trading: Cognitive processes and performance. Organizational Behavior and Human Decision Processes 91 (2), 322-338.

Baillon, A., Koellinger, P.D., Treffers, T., 2012. Sadder but wiser: The effects of joy, fear, and sadness on ambiguity attitudes. Unpublished working paper available upon request from the authors.

Blavatskyy, P., 2009. Betting on own knowledge: Experimental test of overconfidence. Journal of Risk and Uncertainty 38 (1), 39-49.

Blier, M.J., Blier-Wilson, L.A., 1989. Gender differences in self-rated emotional expressiveness. Sex Roles 21 (3-4), 287-295.

Bower, G.H., 1981. Mood and memory. American Psychologist 36 (2), 129-148.

Bradley, B.F., Brown, S.L., Chu, S., Lea, R.W., 2009. Effects of orally administered lavender essential oil on responses to anxiety-provoking film clips. Human Psychopharmacology: Clinical and Experimental 24 (4), 319-330.

Callen, M., Isaqzadeh, M., Long, J.D., Sprenger, C., 2011. Violence and risk preference: Experimental evidence from Afghanistan. Working Paper retrieved on July 22nd 2013 from http://econ.ucsd.edu/~mjcallen/pdfs/unv_af.pdf

Camerer, C., Hogarth, R., 1999. The effects of financial incentives in experiments: A review and capital-labor-production framework. Journal of Risk and Uncertainty 19 (1-3), 7-42.

Cameron, L., Shah, M., 2012. Risk-taking behavior in the wake of natural disasters. Working Paper retrieved on July 22nd 2013 from http://www.econstor.eu/bitstream/10419/62540/1/721216366.pdf

Capra, C.M., Lanier, K.F., Meer, S., 2010. The effects of induced mood on bidding in random nth-price auctions. Journal of Economic Behavior & Organization 75 (1), 223-234.

Carver, C., Harmon-Jones, E., 2009. Anger is an approach-related affect: Evidence and implications. Psychological Bulletin 135 (2), 183-204.

Chanel, O., Chichilnisky, G., 2009. The influence of fear in decisions: Experimental evidence. Journal of Risk and Uncertainty 39 (3), 271-298.

Cheung, E., Mikels, J.A., 2011. I'm feeling lucky: The relationship between affect and risk-seeking in the framing effect. Emotion 11 (4), 852-859.

Chow, G., 1960. Tests of equality between sets of coefficients in two linear regressions. Econometrica 28 (3), 591-605.

Clore, G.L., Huntsinger, J.R., 2007. How emotions inform judgment and regulate thought. Trends in Cognitive Sciences 11 (9), 393-399.

Cohen, J., 1988. Statistical Power Analysis for the Behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum.

Cohn, A., Fehr, E., Maréchal, M.A., 2012. The psychological impact of booms and busts on risk preferences in financial professionals. Working paper retrieved on July 22nd 2013 from http://www.econ.uzh.ch/faculty/cohn/PaperCohn.pdf

Colombier, N., Boemont, L.D., Lohéac, Y., Masclet, D., 2008. Risk aversion: An experiment with self-employed workers and salaried workers. Applied Economics Letters 15 (10), 791-795.

Croson, R., Gneezy, U., 2009. Gender differences in preferences. Journal of Economic Literature 47 (2), 448-474.

Davidson, R., 1994. On emotion, mood, and related affective constructs. In: Ekman, P., Davidson, R. (Eds.). The Nature of Emotion: Fundamental Questions. New York, NY: Oxford University Press, 51-55.

Demaree, H.A., Burns, K.J., DeDonno, M.A., Agarwala, E.K., Everhart, D.E., 2011. Risk dishabituation: In repeated gambling, risk is reduced following low-probability “surprising” events (wins or losses). Emotion 12 (3), 495-502

De Silva, D.G., Pownall, R.A.J., Wolk, L., 2012. Does the sun ‘shine’ on art prices? Journal of Economic Behavior & Organization 82 (1), 167-178.

Dickersen, K., Min, Y-I., 1993. Publication bias: The problem that won’t go away. Annals of the New York Academy of Sciences 703, 135-148.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., Wagner, G.G., 2011. Individual risk attitudes: measurement, determinants and behavioral consequences. Journal of the European Economic Association 9(3), 522-550.

Eckel, C.C., El-Gamal, M.A., Wilson, R.K., 2009. Risk loving after the storm: A bayesian-network study of hurrican Katrina evacuees. Journal of Economic Behavior & Organization 69 (2), 110-124.

Ekman, P., 1992. An argument for basic emotions. Cognition and Emotion 6 (3-4), 169-200.

Erdfelder, E., Faul, F., Buchner, A., 1996. GPOWER: A general power analysis program. Behavior Research Methods, Instruments, and Computers 28 (1), 1-11.

Fehr-Duda, H., Epper, T., Bruhin, A., Schubert, R., 2011. Risk and rationality: The effects of mood and decision rules on probability weighting. Journal of Economic Behavior & Organization 78 (1-2), 14-24.

Finucane, M., Alhakami, A., Slovic, P., Johnson, S., 2000. The affect heuristic in judgments of risks and benefits. Journal of Behavioral Decision Making 13 (1), 1-17.

Fischbacher, U., 2007. z-Tree: Zurich toolbox for ready-made economic experiments. Experimental Economics 10 (2), 171-178.

Forgas, J., 1995. Mood and judgment: The affect infusion model (AIM). Psychological Bulletin 117 (1), 39-66.

Forgas, J.P., George, J.M., 2001. Affective influences on judgment and behavior in organizations: An information processing perspective. Organizational Behavior and Human Decision Processes 86 (1), 3-34.

Fredrickson, B., 2002. Positive emotions. In: Snyder, C., Lopez, S. (Eds.). Handbook of Positive Psychology. Oxford University Press: New York, NY, 120-134.

Gerrards-Hesse, A., Spies, K., Hesse, F., 1994. Experimental inductions of emotional states and their effectiveness: A review. British Journal of Psychology 85 (1), 55-78.

Goeree, J.K., Holt, C.A., Palfrey, T.R., 2003. Risk averse behavior in generalized matching pennies games. Games and Economic Behavior 45 (1), 97-113.

Göritz, A., Moser, K., 2006. Web-based mood induction. Cognition and Emotion 20 (6), 887-896.

Gosling, S., Rentfrow, P., Swann, W., 2003. A very brief measure of the Big-Five personality domains. Journal of Research in Personality 37 (6), 504-528.

Grable, J., Roszkowski, M., 2008. The influence of mood on the willingness to take financial risks. Journal of Risk Research 11 (7), 905-923.

Gray, E., Watson, D., 2001. Emotion, mood, and temperament: Similarities, differences and a synthesis. In: Payne, R., Cooper, C. (Eds.). Emotions at Work: Theory, Research and Applications in Management. West Sussex: Wiley, 21-34.

Greiner, B., 2004. The online recruitment system ORSEE - A guide for the organization of experiments in economics. In: Kremer, K., Macho, V. (Eds.). Forschung und wissenschaftliches Rechnen 2003. GWDG Bericht 63 (Research and scientific computation 2003. GWDG report 63). Göttingen: Gesellschaft für Wissenschaftliche Datenverarbeitung, 79-93.

Gross, J., Levenson, R., 1995. Emotion elicitation using films. Cognition and Emotion 9 (1), 87-108.

Gross, J., Sutton, S., Ketelaar, T., 1998. Relations between affect and personality: Support for the affect-level and affective-reactivity views. Personality and Social Psychology Bulletin 24 (3), 279-288.

Guiso, L., Sapienza, P., Zingales, L., 2013. Time varying risk aversion. Working Paper retrieved July 22nd 2013 from http://www.kellogg.northwestern.edu/faculty/sapienza/htm/risk_aversion.pdf

Gujarati, D., 1970. Use of dummy variables in testing for equality between sets of coefficients in linear regressions: A generalization. American Statistician 24 (1), 18-22.

Hagemann, D., Naumann, E., Maier, S., Becker, G., Lürken, A., Bartussek, D., 1999. The assessment of affective reactivity using films: Validity, reliability and sex differences. Personality and Individual Differences 26 (4), 627-640.

Harmon-Jones, E., 2003. Anger and the behavioral approach system. Personality and Individual Differences 35 (5), 995-1005.

Harrison, G.W., Lau, M.I., Rutström, E.E., 2009. Risk attitudes, randomization to treatment, and self-selection into experiments. Journal of Economic Behavior & Organization 70 (3), 498-507.

Heilman, R., Crisan, L., Houser, D., Miclea, M., Miu, A., 2010. Emotion regulation and decision making under risk and uncertainty. Emotion 10 (2), 257-265.

Hewig, J., Hagemann, D., Seifert, J., Gollwitzer, M., Naumann, E., Bartussek, D., 2005. A revised film set for the induction of basic emotions. Cognition and Emotion 19 (7), 1095-1109.

Hirshleifer, D., Shumway, T., 2003. Good day sunshine: Stock returns and the weather. The Journal of Finance 58 (3), 1009-1032.

Hockey, G., Maule, A., Clough, P., Bdzola, L., 2000. Effects of negative mood states on risk in everyday decision making. Cognition and Emotion 14 (6), 823-856.

Holt, C., Laury, S., 2002. Risk aversion and incentive effects. American Economic Review 92 (5), 1644-1655.

Ifcher, J., Zarghamee, H., 2011. Happiness and time preference: The effect of positive affect in a random-assignment experiment. Amercian Economic Review 101, 3109-3129.

Ioannidis, J., 2005. Why most published research findings are false. PLoS Medicine 2 (8), e124.

Isen, A. M., 2000. Positive affect and decision making. In: Lewis, M., Haviland-Jones, J. M. (Eds.). Handbook of Emotion. New York, NY: Guilford Press, 417–435.

Isen, A., Geva, N., 1987. The influence of positive affect on acceptable level of risk: The person with the large canoe has a large worry. Organizational Behavior and Human Decision Processes 39 (2), 145-154.

Isen, A., Patrick, R., 1983. The effect of positive feelings on risk taking: When the chips are down. Organizational Behavior and Human Decision Processes 31 (2), 194-202.

Johansson-Stenman, O., 2010. Risk Aversion and Expected Utility of Consumption over Time. Games and Economic Behavior 68 (1), 208-219.

Johnson, E., Tversky, A., 1983. Affect, generalization, and the perception of risk. Journal of Personality and Social Psychology 45 (1), 20-31.

Kamstra, M., Kramer, L., Levi, M., 2000. Losing sleep at the market: The daylight saving anomaly. American Economic Review 90 (4), 1005-1011.

Kamstra, M., Kramer, L., Levi, M., 2003. Winter blues: A SAD stock market cycle. American Economic Review 93 (1), 324-343.

Kim, M., Kanfer, R., 2009. The joint influence of mood and a cognitively demanding task on risk-taking. Motivation and Emotion 33 (4), 362-372.

Kirchsteiger, G., Rigotti, L., Rustichini, A., 2006. Your morals might be your moods. Journal of Economic Behavior & Organization 59 (2), 155-172.

Kliger, D., Levy, O., 2003. Mood-induced variation in risk preferences. Journal of Economic Behavior & Organization 52 (4), 573-584.

Lee, K., Allen, N.J., 2002. Organizational citizenship behavior and workplace deviance: The role of affect and cognitions. Journal of Applied Psychology 87 (1), 131-142.

Lee, C.J., Andrade, E.B., 2011. Fear, social projection, and financial decision making. Journal of Marketing Research 48, 121-129.

Leith, P., Baumeister, R., 1996. Why do bad moods increase self-defeating behavior? Emotion, risk taking, and self-regulation. Journal of Personality and Social Psychology 71 (6), 1250-1267.

Lerner, J.S., Keltner, D., 2000. Beyond valence: Toward a model of emotion-specific influences on judgment and choice. Cognition and Emotion 14, 473–493.

Lerner, J.S., Keltner, D., 2001. Fear, anger, and risk. Journal of Personality and Social Psychology 81(1), 146-159.

Lerner, J. S., Tiedens, L. Z., 2006. Portrait of the angry decision maker: How appraisal tendencies shape anger’s influence on cognition. Journal of Behavioral Decision Making 19, 115–137.

Lerner, J.S., Small, D.A., Loewenstein, G., 2004. Heart Strings and Purse Strings - Carryover Effects of Emotions on Economic Decisions. Psychological Science 15 (5), 337-341.

Levy, O., Galili, I., 2008. Stock purchase and the weather: Individual differences. Journal of Economic Behavior & Organization 67 (3-4), 755-767.

Odean, T., Lin, S., Andrade, E.B., 2012. Bubbling with Excitment: An experiment, Working Paper retrieved July 22nd 2013 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2024549.

Raghunathan, R., Pham, M., 1999. All negative moods are not equal: Motivational influences of anxiety and sadness on decision making. Organizational Behavior and Human Decision Processes 79 (1), 56-77.

Ruder, M., Bless, H., 2003. Mood and the reliance on the ease of retrieval heuristic. Journal of Personality and Social Psychology 85 (1), 20-32.

Russell, J.A., 1980. A circumplex model of affect. Journal of Personality and Social Psychology 393, 1161-1178.

Sanbonmatsu, D. M., Kardes, F., 1988. The Effects of physiological arousal on information processing and persuasion. Journal of Consumer Research 15, 379–385.

Saunders, E. Jr., 1993. Stock prices and Wall Street weather. American Economic Review 83 (5), 1337-1345.

Scherer, K., 2005. What are emotions? And how can they be measured? Social Science Information 44 (4), 695-729.

Schwarz, N., Clore, G.L., 1983. Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. Journal of Personality and Social Psychology 45 (3), 513-523.

Shu, H., 2010. Investor mood and financial markets. Journal of Economic Behavior & Organization 76 (2), 267-282.

Smith, V., 1982. Microeconomic systems as an experimental science. American Economic Review 72 (5), 923-955.

Stanton, A.L., Kirk, S.B., Cameron, C.L., Danoff-Burg, S., 2000. Coping through emotional approach: Scale construction and validation. Journal of Personality and Social Psychology 78 (6), 1150-1169.

Stiglitz, G., Becker, G., 1977. De gustibus non est disputandum. American Economic Review 67 (2), 76-90.

Sunstein, C., 2003. Terrorism and probability neglect. Journal of Risk and Uncertainty 26 (2-3), 121-136.

Sutton, R.M., Farrall, S., 2005. Gender, socially desirable responding and the fear of crime. Are women really more anxious about crime? British Journal of Criminology 45 (2), 212-242.

Tiedens, L.Z., Linton, S., 2001. Judgment under emotional certainty and uncertainty: The effects of specific emotions on information processing. Journal of Personality and Social Psychology 81, 973-988.

Tversky, A., Kahneman, D., 1991. Loss aversion in riskless choice: A reference-dependent model. Quarterly Journal of Economics 106 (4), 1039-1061.

Verheyen, C., Göritz, A., 2009. Plain texts as an online mood-induction procedure. Social Psychology 40 (1), 6-15.

Viscusi, W.K., 2009. Valuing Risks of Death from Terrorism and Natural Disasters. Journal of Risk and Uncertainty 38 (3), 191-193.

Voors, M.J., Nillesen, E.E.M., Verwimp, P., Bulte, E.H., Lensink, R., Van Soest, D.P., 2012. Violent Conflict and Behavior: A field experiment in Burundi. American Economic Review 102 (2), 941-964.

Wang, X., 2006. Emotions within reason: Resolving conflicts in risk preference. Cognition and Emotion 20 (8), 1132-1152.

Watson, D., Clark, L.A., 1994. The PANAS-X: Manual for the Positive and Negative Affect Schedule - Expanded Form. Iowa City, IA: University of Iowa.

Watson, D., Tellegen, A., 1985. Toward a consensual structure of mood. Psychological Bulletin 98, 219-235.

Watson, D., Clark, L.A., Tellegen, A., 1988. Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology 54 (6), 1063-1070.

Wegener, D., Petty, R., 1994. Mood management across affective states: The hedonic contingency hypothesis. Journal of Personality and Social Psychology 66 (6), 1034-1048.

Westermann, R., Spies, K., Stahl, G., Hesse, F., 1996. Relative effectiveness and validity of mood induction procedures: A meta analysis. European Journal of Social Psychology 26 (4), 557-580.

Yuan, K., Zheng, L., Zhu, Q., 2006. Are investors moonstruck? Lunar phases and stock returns. Journal of Empirical Finance 13 (1), 1-23.

Yuen, K., Lee, T., 2003. Could mood state affect risk-taking decisions? Journal of Affective Disorders 75 (1), 11-18.

## APPENDIX A.

### Experimental Instructions

You will now receive detailed instructions regarding the course of the experiment. It is crucial for the success of our study that you fully understand the instructions. Please read the instructions carefully and do not hesitate to contact the experimenters in case you have any questions.

*Nonexistent financial stakes wording:*

The amount of money you can earn in this experiment is expressed in Experimental Dollars (ED). Irrespective of the results of the experiment, you will receive a participation fee of 9 EUR Nevertheless, you should try throughout the experiment as hard as possible to achieve a good result and to make all your decisions as if you were playing for real money.

*Low financial stakes wording:*

The amount of money you can earn in this experiment is expressed in Experimental Dollars (ED). However, you will be paid out in cash in Euros. The conversion rate of ED to Euros is 100:1. In other words, you will receive 0.01 EUR for every ED you earn during the experiment and you will be paid this amount in cash after the experiment. Thus, the best you can do throughout the experiment is to try as hard as possible to achieve a good result and keep in mind that you are playing for real money.

*High financial stakes wording:*

The amount you can win in this experiment is expressed in Experimental Dollars (ED). These ED will be converted into Euros and paid out at the end of the experiment. The conversion rate from ED to Euros is determined in a lottery in which you participate. Today at 5pm at [address was handed out to the participants after the experiment] every one of the 36 participants will draw a lot with a unique number on it. From these numbers, one winner will be randomly chosen by another lottery at 7pm at the same location. Attendance is not required for the lottery at 7pm. The lottery will be recorded on video and displayed on the Internet. The winner of the lottery will be notified immediately via email and telephone and the high conversion rate will be paid out to the winner. Independently of this procedure, every participant will be paid out with the normal conversion rate directly after this experiment.

The normal conversion rate of ED to Euros is 100:1. In other words, you will receive 0.01 EUR for every ED you earn during the experiment and you will be paid this amount in cash after the experiment. However, the winner of the lottery will be paid with a conversion rate of 1:1! In other words, the lottery winner will receive 100 times as much money for every ED he or she earned during the experiment. Your chances of being the winner are 1:36 or 2.8%. Because you could be the winner, the best you can do throughout the experiment is to try as hard as possible to achieve a good result and to make all your decisions as if you were playing for the high stakes of 1:1.

[The following text is identical to the instructions in Holt and Laury (2002), see the following APPENDIX B.]

**APPENDIX B.**

**Table B1**

Lottery choice task

Below, you will be presented with 10 decision options that ask for your preference between two different gambles. One of the 10 decisions will be randomly determined at the end of the experiment and played out with real money. All 10 decision problems have the same probability of being drawn at the end.

In all 10 gambles below, you will receive one payoff with a specific probability α or, alternatively, you will receive the other payoff with a complementary probability *1-α*. Please indicate in the last two columns if you prefer option *S* or option *R* by making a cross in the respective column. The gamble is played by throwing a ten-sided dice. The number on the dice determines the row that describes the amount that will be paid to you.

| **Options S** | **Option R** | **S** | **R** |
|---|---|---|---|
| 1/10 of ED 800, 9/10 of ED 640 | 1/10 of ED 1540, 9/10 of ED 40 | O | O |
| 2/10 of ED 800, 8/10 of ED 640 | 2/10 of ED 1540, 8/10 of ED 40 | O | O |
| 3/10 of ED 800, 7/10 of ED 640 | 3/10 of ED 1540, 7/10 of ED 40 | O | O |
| 4/10 of ED 800, 6/10 of ED 640 | 4/10 of ED 1540, 6/10 of ED 40 | O | O |
| 5/10 of ED 800, 5/10 of ED 640 | 5/10 of ED 1540, 5/10 of ED 40 | O | O |
| 6/10 of ED 800, 4/10 of ED 640 | 6/10 of ED 1540, 4/10 of ED 40 | O | O |
| 7/10 of ED 800, 3/10 of ED 640 | 7/10 of ED 1540, 3/10 of ED 40 | O | O |
| 8/10 of ED 800, 2/10 of ED 640 | 8/10 of ED 1540, 2/10 of ED 40 | O | O |
| 9/10 of ED 800, 1/10 of ED 640 | 9/10 of ED 1540, 1/10 of ED 40 | O | O |
| 10/10 of ED 800, 0/10 of ED 640 | 10/10 of ED 1540, 0/10 of ED 40 | O | O |

**APPENDIX C.**

**Table C1**

Correlations

| | **Risk_e** | **Control** | **Joy** | **Fear** | **Sadness** | **Study1** | **Female** |
|---|---|---|---|---|---|---|---|
| **Control** | -0.09 | | | | | | |
| **Joy** | -0.06 | -0.32*** | | | | | |
| **Fear** | -0.02 | -0.32*** | -0.34*** | | | | |
| **Sadness** | 0.17** | -0.33*** | -0.34*** | -0.34*** | | | |
| **Study1** | -0.09 | -0.02 | -0.01 | 0.01 | 0.02 | | |
| **Female** | 0.04 | 0.03 | 0.02 | -0.09 | 0.03 | 0.11** | |
| **Age** | 0.03 | 0.00 | 0.05 | 0.01 | -0.07 | 0.08 | -0.10 |
| **Extra.** | -0.02 | -0.15** | 0.17*** | 0.00 | -0.03 | -0.05 | 0.09 |
| **Conscient.** | -0.02 | -0.03 | 0.09 | 0.04 | -0.10 | -0.01 | 0.29*** |
| **Emot.Stab.** | 0.05 | 0.02 | -0.05 | 0.02 | 0.00 | -0.15** | -0.28*** |
| **Open.** | 0.12* | 0.10 | -0.03 | -0.14** | 0.08 | -0.03 | 0.11* |
| **Fixedstakes** | -0.05 | 0.02 | -0.01 | 0.01 | -0.02 | -0.21*** | -0.10 |
| **Lowstakes** | 0.08 | -0.00 | 0.01 | -0.01 | 0.00 | -0.16** | 0.04 |
| **Highstakes** | -0.03 | -0.01 | 0.00 | 0.00 | 0.01 | 0.37*** | 0.06 |
| **Risk_sr** | 0.16** | -0.03 | -0.03 | 0.02 | 0.04 | -0.04 | -0.20*** |

**Table C1 – continued**

Correlations

| | Age | Extra. | Conscient. | Emot.Stab. | Open. | Fixedstakes | Lowstakes | Highstakes |
|---|---|---|---|---|---|---|---|---|
| **Extra.** | 0.04 | | | | | | | |
| **Conscient.** | 0.00 | 0.00 | | | | | | |
| **Emot.Stab.** | -0.07 | 0.00 | 0.00 | | | | | |
| **Open.** | -0.08 | -0.00 | -0.00 | -0.00 | | | | |
| **Fixedstakes** | -0.09 | -0.04 | -0.07 | -0.01 | 0.00 | | | |
| **Lowstakes** | -0.01 | 0.04 | 0.04 | 0.04 | 0.01 | -0.52*** | | |
| **Highstakes** | 0.10 | 0.00 | 0.03 | -0.04 | -0.01 | -0.48*** | -0.50*** | |
| **Risk_sr** | 0.03 | 0.29*** | -0.04 | 0.19*** | 0.24*** | -0.04 | 0.08 | -0.04 |

Note: Pearson correlation coefficient, N = 223.
Risk_e = Elicited risk preferences, Study 1 = Experimental study design 1, Extra. = Extraversion, Conscient. = Conscientiousness, Emot.Stab. = Emotional Stability, Open. = Openness, Risk_sr = Self-reported risk attitudes.
The results are robust for using Kendall's Tau instead of the Pearson coefficient and for using a personality sum score instead of factor scores.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

**APPENDIX D.**

We calculated regressions using the model specifications in Table 3 and using only the incentive-compatible low- and high-financial-stakes observations from our sample in studies 1 and 2 ($N$ = 148). There are no significant main effects of moods on risk preferences. Model 2 in Table D1 shows that joyful people are significantly more risk-seeking in the low-stakes treatment compared to the high-stakes treatment ($\beta$ = -0.34, $p$ = 0.05).

**Table D1**

OLS regressions on risk preferences with incentive-compatible observations.

| | ***Model 1*** | | ***Model 2*** | | ***Model 3*** | |
|---|---|---|---|---|---|---|
| | ***β*** | ***p*** | ***β*** | ***p*** | ***β*** | ***p*** |
| Intercept | *-0.06* | *0.93* | *-0.41* | *0.55* | *-0.28* | *0.69* |
| Joy | 0.03 | 0.84 | 0.18 | 0.22 | 0.18 | 0.25 |
| Fear | 0.10 | 0.42 | 0.13 | 0.38 | 0.09 | 0.59 |
| Sadness | 0.20 | 0.13 | 0.17 | 0.28 | 0.16 | 0.34 |
| Low stakes | 0.06 | 0.54 | 0.20 | 0.29 | 0.16 | 0.47 |
| Joy* Low stakes | | | -0.34* | 0.05 | -0.33 | 0.11 |
| Fear* Low stakes | | | -0.08 | 0.65 | 0.02 | 0.94 |
| Sadness* Low stakes | | | 0.04 | 0.83 | 0.06 | 0.79 |
| Joy* Low stakes* Study 2 | | | | | -0.001 | 0.99 |
| Fear* Low stakes* Study 2 | | | | | -0.29 | 0.34 |
| Sadness* Low stakes* Study 2 | | | | | -0.04 | 0.90 |
| **Model diagnostics** | | | | | | |
| *N* | 148 | | 148 | | 148 | |
| $R^2$ | 0.12 | | 0.16 | | 0.16 | |
| *Prob > F* | 0.22 | | 0.14 | | 0.22 | |

Note: *βs* are standardized for all variables except for the intercept.
Control variables are the experimental study design, experimental study design* mood treatments, experimental study design* financial stakes, personality factor scores, and self-reported risk attitudes.
The reference groups are the control treatment, high financial stakes, and study 1.
The results are robust for the exclusion of control variables, for including additional control variables (such as gender, age, and whether the movie was seen before), for including personality sum scores instead of factor scores, and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

In Table D2, we used the excluded observations from study 1 ($N = 214$) and calculated regressions with identical model specifications as Models 1 and 2 in Table 3. These observations were obtained from participants in study 1 who had completed one or two other tasks between the completion of their mood induction and their risk-preference assessment. Previous studies (e.g., Kim and Kanfer, 2009) have demonstrated that mood induction becomes weaker as the time period between the induction and task measurement becomes longer. It is therefore unsurprising that none of the mood treatments had a significant effect on risk preferences (*p*s > 0.1) in the data from these excluded observations. The results of Model 2 in Table D2 corroborate the finding that the influence of moods is dependent on the magnitude of the financial stakes that are involved. In particular, Model 2 shows that people are generally more risk seeking in the low-stakes treatment than in the treatment with nonexistent financial stakes ($\beta = -0.31$, $p = 0.05$). Although not significant at conventional levels, Model 2 also indicates that sad people are more risk averse in the low-stakes treatment than in the control group ($\beta = 0.25$, $p = 0.07$). However, consistent with our main results, we find no evidence that the risk preferences of participants in the high-stakes treatment were influenced by their moods.

**Table D2**

OLS regressions on risk preferences with the observations excluded from study 1

| | ***Model 1*** | | ***Model 2*** | |
|---|---|---|---|---|
| | ***β*** | ***p*** | ***β*** | ***p*** |
| Intercept | *1.33* | *0.00* | *1.53* | *0.00* |
| Joy | -0.01 | 0.80 | -0.08 | 0.56 |
| Fear | 0.07 | 0.47 | -0.05 | 0.70 |
| Sadness | 0.07 | 0.46 | -0.06 | 0.68 |
| Low stakes | -0.09 | 0.24 | -0.31** | 0.05 |
| High stakes | 0.10 | 0.21 | 0.16 | 0.35 |
| Joy* Low stakes | | | 0.12 | 0.38 |
| Joy* High stakes | | | -0.03 | 0.80 |
| Fear* Low stakes | | | 0.17 | 0.22 |
| Fear* High stakes | | | 0.03 | 0.83 |
| Sadness* Low stakes | | | 0.25* | 0.07 |
| Sadness* High stakes | | | -0.10 | 0.39 |
| *N* | 188 | | 188 | |
| $R^2$ | 0.04 | | 0.08 | |
| *Prob > F* | 0.62 | | 0.59 | |

Note: 26 out of 214 subjects are excluded because of unreasonable or inconsistent choices.
*βs* are standardized for all variables except for the intercept.
Control variables are the personality factor scores and self-reported risk attitudes.
The reference groups are the control treatment and nonexistent financial stakes.
The results are robust for the exclusion of control variables, for including additional control variables (such as gender, age, and whether the movie was seen before), for including personality sum scores instead of factor scores, and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

In Table D3, we used the pooled data from study 1 (*N* = 322) and conducted regression analyses with the model specifications for Models 1 and 2 in Table 3. We find no significant mood effects on risk preferences. In Model 1, participants in the high-stakes treatment are generally significantly more risk-averse (*β* = 0.16, *p* = 0.01) than in the fixed-financial-stakes treatment.

**Table D3**

OLS regressions on risk preferences with pooled observations from study 1.

| | ***Model 1*** | | ***Model 2*** | |
|---|---|---|---|---|
| | ***β*** | ***p*** | ***β*** | ***p*** |
| Intercept | *0.96* | *0.01* | *1.06* | *0.01* |
| Joy | -0.01 | 0.93 | 0.01 | 0.90 |
| Fear | 0.07 | 0.38 | -0.01 | 0.95 |
| Sadness | 0.10 | 0.19 | 0.03 | 0.81 |
| Low stakes | 0.01 | 0.92 | -0.08 | 0.54 |
| High stakes | 0.16*** | 0.01 | 0.18 | 0.17 |
| Joy* Low stakes | | | -0.02 | 0.86 |
| Joy* High stakes | | | -0.03 | 0.78 |
| Fear* Low stakes | | | 0.09 | 0.45 |
| Fear* High stakes | | | 0.06 | 0.50 |
| Sadness* Low stakes | | | 0.15 | 0.19 |
| Sadness* High stakes | | | -0.07 | 0.49 |
| **Model diagnostics** | | | | |
| *N* | 278 | | 278 | |
| $R^2$ | 0.04 | | 0.06 | |
| *Prob > F* | 0.29 | | 0.34 | |

Note: 44 out of 322 subjects are excluded because of unreasonable or inconsistent choices.
*βs* are standardized for all variables except for the intercept.
Control variables are the personality factor scores and self-reported risk attitudes.
The reference groups are the control treatment and nonexistent financial stakes.
The results are robust for the exclusion of control variables, for including additional control variables (such as gender, age, and whether the movie was seen before), for including personality sum scores instead of factor scores, and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

Table D4 shows the regression results by financial stakes when using the pooled data from study 1 (*N* = 322) and the identical model specifications as in Table 4. Model 2 in Table D4 yields a significant effect of sadness (*β* = 0.23, *p* = 0.04) in the low-stakes treatment. Sad people are significantly more risk averse compared to people in the control treatment.

**Table D4**

OLS regressions on risk preferences by stakes with observations from study 1.

| | ***Model 1: Fixed stakes*** | | ***Model 2: Low stakes*** | | ***Model 3: High stakes*** | |
|---|---|---|---|---|---|---|
| | ***β*** | ***p*** | ***β*** | ***p*** | ***β*** | ***p*** |
| Intercept | *0.74* | *0.12* | *1.06* | *0.05* | *1.67* | *0.11* |
| Joy | 0.002 | 0.98 | -0.03 | 0.82 | -0.28 | 0.27 |
| Fear | 0.02 | 0.86 | 0.10 | 0.37 | 0.26 | 0.29 |
| Sadness | -0.02 | 0.89 | 0.23** | 0.04 | -0.22 | 0.37 |
| **Model diagnostics** | | | | | | |
| *N* | 122 | | 123 | | 33 | |
| $R^2$ | 0.02 | | 0.08 | | 0.24 | |
| *Prob > F* | 0.96 | | 0.33 | | 0.52 | |

Note: 44 out of 322 subjects are excluded because of unreasonable or inconsistent choices.
*βs* are standardized for all variables except for the intercept.
Control variables are the personality factor scores and self-reported risk attitudes.
The reference group is the control treatment.
The results are robust for the exclusion of control variables, for including additional control variables (such as gender, age, and whether the movie was seen before), for including personality sum scores instead of factor scores, and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

In Table D5, we used the pooled high-stakes observations from study 1 and from study 2 (*N* = 92) for a regression analysis with the identical model specifications as in Model 1 in Table 3. We do not find significant effects of moods on risk preferences.

**Table D5**

OLS regressions on risk preferences with pooled high-stakes observations from studies 1 and 2.

| | ***β*** | ***p*** |
|---|---|---|
| Intercept | *0.50* | *0.48* |
| Joy | 0.13 | 0.34 |
| Fear | 0.12 | 0.37 |
| Sadness | 0.07 | 0.62 |
| **Model diagnostics** | | |
| *N* | 92 | |
| $R^2$ | 0.04 | |
| *Prob > F* | 0.92 | |

Note: None of the subjects are excluded because of unreasonable or inconsistent choices.
*βs* are standardized for all variables except for the intercept.
Control variables are the personality factor scores and self-reported risk attitudes.
The reference group is the control treatment.
The results are robust for the exclusion of control variables, for including additional control variables (such as gender, age, and whether the movie was seen before), for including personality sum scores instead of factor scores, and for using OLogit instead of OLS.
* denotes > 90% confidence, ** denotes > 95% confidence, and *** denotes > 99% confidence.

| ERIM Report Series *Research in Management* | |
|---|---|
| ERIM Report Series reference number | ERS–2012–014–STR |
| Date of publication | 2012–11–21 |
| Version | 23–07–2013 |
| Number of pages | 36 |
| Persistent URL for paper | http://hdl.handle.net/1765/37344 |
| Email address corresponding author | T.Treffers@tue.nl |
| Address | Erasmus Research Institute of Management (ERIM)<br>RSM Erasmus University / Erasmus School of Economics<br>Erasmus University Rotterdam<br>PO Box 1738<br>3000 DR Rotterdam, The Netherlands<br>Phone: +31104081182<br>Fax: +31104089640<br>Email: info@erim.eur.nl<br>Internet: http://www.erim.eur.nl |
| Availability | The ERIM Report Series is distributed through the following platforms:<br>RePub, the EUR institutional repository<br>Social Science Research Network (SSRN)<br>Research Papers in Economics (RePEc) |
| Classifications | The electronic versions of the papers in the ERIM Report Series contain bibliographic metadata from the following classification systems:<br>Library of Congress Classification (LCC)<br>Journal of Economic Literature (JEL)<br>ACM Computing Classification System<br>Inspec Classification Scheme (ICS) |