
Emotion, Decision, and Risk: Betting on Gambles versus Betting on People

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Abstract— We examined the effects of emotions such as happiness, fear, and anger, on risk-taking behavior in two types of tasks. Lottery-based risk where Uncertainty is generated using a random number generator and Person based risk where Uncertainty is caused by another human being. In the experiment, we used a mechanism to induce the relevant emotion in the participants. Emotion-induced participants are asked to participate in one or more of the three types of experiments. In one they had to make a choice between lotteries (Experiment 1) and the others between actions in risky two-person decisions (Experiment 2 and 3). The experiments involved real money payoffs as an incentive for active participation instead of using hypothetical rewards. In addition to the 2 emotions mentioned in the original paper, we introduced a third emotion (happiness). Results suggest that people induced with happiness favoured riskier choices than people induced with fear.

Keywords— emotions; risk; individual decision making; interactive decision making; appraisal-tendency framework

I. INTRODUCTION

Emotions play a very important role in our day-to-day decision-making processes. The stronger the emotions are the more significant their impact is. A very recent development is systematic research on decision-related emotions. Very early phases of this kind of research included the evaluation of positive or negative emotions in rational decision-making. Various studies have been conducted to check the overall positive or negative effect of these emotions. Only recently that there have been emotion-specific studies such as regret ([1]), disappointment ([2]), fear [3] etc. Several pieces of conclusive evidence have been obtained that showcased that emotions can indeed affect decision-making and that individual behavior in a risky situation is affected by the state of emotion the individual is experiencing. In their work with Appraisal Tendency Framework [4], Lerner and Keltner [5] have done exceptional work. Appraisal theory describes how and why emotions affect judgement and decisions. The ATF is based on emotion connecting to an immediate cognitive response or appraisal, leading to an effect on judgement. It states that emotions are extracted from our evaluation of events that cause specific reactions in different people. Essentially, our appraisal of a situation causes an emotional or affective, response that is going to be based on that appraisal. An example of this is going on a first date. If the date is perceived as positive, one might feel happiness, joy, giddiness, excitement, and/or anticipation, because they have appraised this event as one that could have positive long-term effects, i.e. starting a new relationship, engagement, or even marriage. On the other hand, if the date is perceived negatively, then our emotions, as a result, might include dejection, sadness, emptiness, or fear.

In this study, we focus on three different emotions: happiness, fear, and anger. Where Fear and anger fall under the umbrella of negative appraisals and happiness falls un-

	Emotion		
	Happiness	Anger	Fear
Theme	Pleasure	offence	Threat
Valence	Positive	Negative	Negative
Certainty	Certain	Certain	Uncertain
Control	Certain	Human	Situation

TABLE 1: THE APPRAISAL THEMES AND DIMENSIONAL STRUCTURE OF TWO EMOTIONS

der positive appraisals. According to Smith and Ellsworth [6], ATF considers anger as an emotion that got to do with high certainty and emphasizes individual control. In contrast, fear is considered to have low certainty and emphasizes situational control rather than person-based control. Along with these two in this study, we explore the happiness emotion as well which according to appraisal theory, Happiness, although of positive valence, is associated with an elevated sense of certainty and individual control, just like anger[7]. Therefore, happiness, at least in one respect, resembles anger more so than fear. The appraisal themes and dimensional structure of the emotions have been showcased in the 1.

Although ATF has been quite popular it has attracted a lot of controversy in recent years. Several studies ([5]) highlight the several limitations and shortcomings of the theory and some others believe that the theory can be extended and strengthened.

With this, we try to explore the links between emotions and the decision process by using ATF to draw hypotheses concerning the linkages between emotions and decision processes. At this stage of its development, empirical findings may well do as much to help grow and clarify ATF as ATF does to guide empirical discovery.

From their work in 2001, Lerner et al. drew on ATF and predicted that Fearful people would have the tendency to have some appraisal patterns that tend to emphasize more

the uncertainty of the situation and lack of control and hence consider the situation as that of high risk and threatening and frightening and behave more risk aversively. In contrast, angry people whose appraisals are to emphasize certainty and control would be relatively more risk-seeking in nature and are optimistic about their chances. In a series of experiments, Lerner and Keltner successfully demonstrated the predicted contrast between angry and fearful people in both risk assessments and hypothetical risky choices. For both naturally occurring and experimentally induced emotions, angry people tended to make optimistic risk assessments and risk-seeking choices, while fearful people made pessimistic risk assessments and risk-averse choices. Similarly, in 1999, Ragnathan and Pham [8] report similarly divergent effects of anxiety and sadness. Anxious individuals were more risk-averse and sad individuals were more risk-seeking, in both hypothetical gambles and other hypothetical tasks. In 2010, Kugler et al conducted a series of experiments with two objectives. First, they tried to replicate earlier studies of different negative emotions on risk-taking in hypothetical tasks and extend these choices to real money payoff scenarios. They made the previous results in the literature more compelling. Second, their objective was to extend the range of emotion-based risk-taking tasks to both lottery-based risk and person-based risks. The impact of incidental emotions on risk-taking behavior was found to be contingent on the uncertainty involved in the task. Fear increased the frequency of risk-averse choices and anger reduced them in the case of lottery-based risk. They found a reverse pattern when the type of risk was person based risk. It was concluded that the effect was specifically on differences in willingness to take risks rather than on differences in judgments of how much risk was present. The impact of different emotions on risk-taking or risk-avoiding behavior is thus contingent on the type, as well as the degree, of uncertainty the decision maker faces.

In this study we would like to expand on them and replicate their results with slight modifications. In addition to anger and fear we also explore the impact of happiness, in the decision-making process. Hence we repeat some of the experiments that have been conducted by Kugler et al [9], with the emotion being happiness, fear and anger. As proposed in their work the experiments are vulnerable to some cases which are "cheap talk" with no real consequences. Which essentially means the cases where participants are not taking the experiment seriously. To avoid this, Kugler et al, included substantial real money payoffs. To imitate this to some extent we offered the participants a probability of winning the money they gambled in the choices they filled. We choose a portion of participants on a random basis and replayed their gambles with real money according to the choices they filled. Similar to Kugler et al. we wanted to examine the effects of induced emotions both in situations in which uncertainty arises from the spin of a roulette wheel or the roll of a die (which we will refer to as lottery-based risk) and in situations where it results from the behavior of another individual (which we will refer to as person-based risk). Hence we adopt three experiments proposed by Kugler et al. In short we performed three experiments namely 1B, 2 and 3 from the experiments conducted by Kugler et al.

The first two experiments were conceptual replications of Lerner and Keltner's (2001) anger versus study using choices

between real money lotteries with the addition of Happiness as the emotion under study along with fear and anger. Experiments 2 and 3 provide a single-actor baseline for the later studies as Experiment 2 tested for the reversal of risk attitude finding when two emotions are induced in an equivalent two-person interactive game along with the happiness emotion. Experiment 3 is a slightly modified experiment 2 to probe this reversal

II. METHODS

a. Participants

56 University students were asked to fill different sets of google forms. 10 out of these participants will be randomly chosen and be paid off in real money based on one of the gambles they chose.

b. Procedure

Our experiment involved us creating 6 different google forms. 3 forms were made to act as emotion inducers for happiness, fear and anger. The remaining 3 forms were used to conduct experiment 1, experiment 2 and experiment 3. Each participant was sent 4 forms, the first form held links to one of the 3 different emotions, the next three forms held the links to the different experiments. We tried our best to ensure we had equal number of participants for all the 3 emotions. We also made sure to randomize the experiments in the 3 links given so that we negate any bias induce by filling the forms sequentially.

c. Emotion Induction

A 3 (emotion) x 1 (manipulation check) between-subjects factorial design was employed. The first factor represents the emotion that was induced (happiness or fear or anger). The second factor reflects the manipulation check of the intended emotion induction. The manipulation check was placed immediately after the emotion-induction task to ensure that the measure was of incidental (pre-decision) rather than inherent (post-decision) emotion. In the original experiment, only half the participants were given the manipulation check, but as they found no change in results for participants with and without a manipulation check, we decided to use a manipulation check on all the participants.

For inducing the emotion we use to provide a video that tries to induce the relevant emotion and along with this participants are asked to describe one of the situations that they have experienced where they felt the emotion under consideration. For choosing appropriate we follow the guidelines presented by Chen et al ([10]). They have proposed a dataset of professional and amateur videos dataset that elicit basic emotions. To check the emotion is induced or not, we used a simplified version of Positive and Negative Affect Schedule (PANAS; Watson and Clark, 1994 [11]). Where the original schedule had 60 different emotions and asks respondents to rate on a 9 point scale, we only took a subset of these, 10 of them such that we had 3 for fear, 3 for anger and 4 for happiness, and 5 filler emotions.

Decision No	Option A	Option B	Your Choice
1	Winning 100 Rs for sure	1/10 chance of winning 200 Rs, 9/10 chance of winning 0 Rs	A/B
2	Winning 100 Rs for sure	2/10 chance of winning 200 Rs, 8/10 chance of winning 0 Rs	A/B
3	Winning 100 Rs for sure	3/10 chance of winning 200 Rs, 7/10 chance of winning 0 Rs	A/B
4	Winning 100 Rs for sure	4/10 chance of winning 200 Rs, 6/10 chance of winning 0 Rs	A/B
5	Winning 100 Rs for sure	5/10 chance of winning 200 Rs, 5/10 chance of winning 0 Rs	A/B
6	Winning 100 Rs for sure	6/10 chance of winning 200 Rs, 4/10 chance of winning 0 Rs	A/B
7	Winning 100 Rs for sure	7/10 chance of winning 200 Rs, 3/10 chance of winning 0 Rs	A/B
8	Winning 100 Rs for sure	8/10 chance of winning 200 Rs, 2/10 chance of winning 0 Rs	A/B
9	Winning 100 Rs for sure	9/10 chance of winning 200 Rs, 1/10 chance of winning 0 Rs	A/B
10	Winning 100 Rs for sure	10/10 chance of winning 200 Rs, 0/10 chance of winning 0 Rs	A/B

TABLE 2: ABSOLUTE RISK ATTITUDE SCALE, EXPERIMENT 1

d. Experiment-1

In this experiment (see Table 2), participants made choices between 10 pairs of options, one with a certain payoff of 100 Rs, the other a two-outcome lottery with payoffs of 200 Rs or 0 Rs. The probability of winning the 200 payoff was specified for each pair, and increased systematically from 1/10 (pair 1) to 10/10 (pair 10). As before, to maintain incentive compatibility, participants were told initially and reminded throughout that one choice pair would be selected at random for real-money play if they were one of the 10 participants selected. Expected value of the gamble option increases linearly from pair 1 ($EV = 20$) to pair 10 ($EV = 200$), so a risk neutral player will choose the safe (100) option up to pair 4, be indifferent at pair 5, and choose the risky option thereafter.

e. Experiment-2

In this experiment we measured risk preference by the participants' choices in a Stag Hunt Game with the hunting context replaced with abstract monetary options. Following the emotion induction participants received instructions for the game.

They were told:

"For the following task, you have been divided into pairs. You will now need to choose between two options: option A and option B. If you choose option A you will receive 100 Rs regardless of the choice of the other participant. If you choose option B your payoff will depend on the choice of the other participant. If the other participant also chooses option B, both of you will receive 200 Rs. If the other participant chooses option A, you will receive 0 Rs (and the other participant will receive 100 Rs). The other participant is facing exactly the same decision. You will not know, now or later, who the other participant is."

After making their decision, and before being told the other participant's choice, participants were asked to estimate the chances that the other participants would choose option A or B. They were asked: "By what probability do you think the other participant would have chosen Option B on a scale of 100".

f. Experiment-3

For this experiment, we intended to replace person based risk in experiment 2 with lottery risk while keeping the same

game style. Following the emotion induction participants received instructions for the game.

They were told:

"There are several people participating in this experiment. In the beginning of the experiment, the participants have been randomly matched into pairs of participant A and participant B. You are participant A, but you will not know, now or later, who the other participant in your pair is, nor will s/he know who you are. During the experiment, you will make a choice with a chance of real money consequences. This choice will affect both your payoffs and the payoffs of participant B. Participant B will NOT make any decisions, though s/he may get a payoff, depending on what option you pick.

You will now need to choose between two options: option A and option B. If you choose option A you will receive 100 Rs regardless of the choice made by your opponent (a lottery). If you choose option B your payoff will depend on the choice of the lottery. If the lottery also lands on option B, you and other participant will receive 200 Rs. If the lottery lands on option A, you will receive 0 Rs. (participant B will receive a random amount between 0 and 100). The lottery will choose option B with 60% probability."

The probability of 60% was chosen because this was the value reported in the original study based on the responses given by participants in experiment 2 where they thought the other participant would choose option B with 60% probability. Hence, the odds with both person-based and lottery based risk should be the same, with variability only coming in the form of type of risk for the participants.

III. RESULTS AND DISCUSSIONS

In total we are able to get 56 people to participate in our study. Out of which the demographic split who went through the Happy, Fearful and Angry emotion induction forms were 20, 20 and 16 respectively. We were forced to discard approximately 21% of the responses because of their in-validness (reasons like the options being irrational, filling the same option for everything, alternating options). To validate that our emotion inductions had worked, we had asked all participants to fill a PANAS form on a 1-9 scale for 15 emotions. The score obtained for happy ($M=5.96$, $S.D=1.94$), fear ($M=4.3$, $S.d=2.5$) and anger ($M=4.5$,

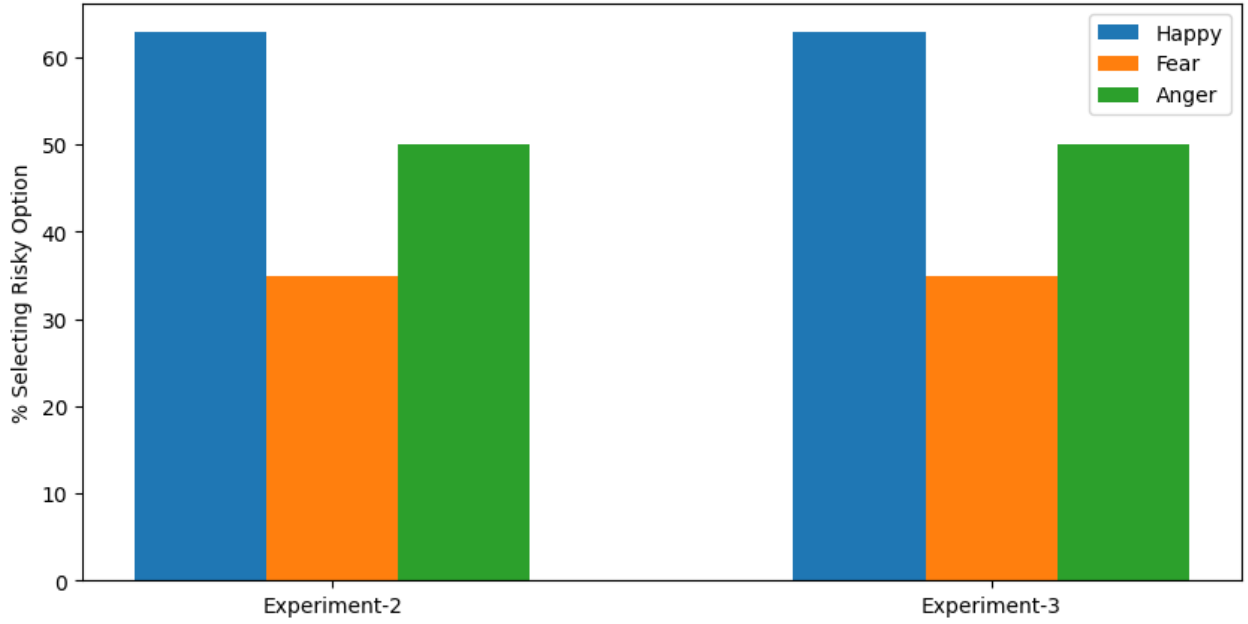


Fig. 1

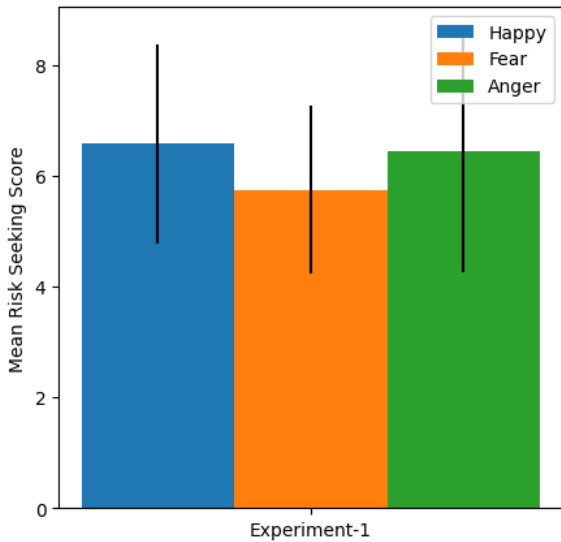


Fig. 2

S.d=3) indicate that there has at least been some level of emotion induction. Moving on to our experiment results, for Experiment-1, just like in the original study we were also able to observe that induced with fear were more risk averse than people induced with anger. We also noted that people induced with happiness behave similarly to people induced with anger (Refer to 1). For Experiment-2 and Experiment-3 we obtained very interesting results where for both experiments the results were matching to a very high degree for every emotion induced. The tendency of the participants was that, just like in experiment 1, people induced with anger were more risk taking than people induced with fear. An interesting result is that people induced with happiness were more risk seeking than people induced with anger in this task (Refer to 2).

As per the original study, we were expecting a flip in the stag hunt game when switching from person based risk to lottery based risk. But the results we obtained do not show any such characteristics. We believe that the reason for this is that the participants are aware of the intention of the questions and are not biased in any manner and are treating person based risk and lottery based risk in a similar manner. Hence, both the experiment 2 and experiment 3 had very similar results which was not expected. One of the other reason that could be attributed for this change is that all the experiments have been conducted via google forms unlike in the way it has been performed in the original study, where the proper experiment ambience was present.

As we can see that from the experiment 1, the people who had been exposed to happy emotion and the people who have been exposed to the anger emotion behaved in a similar way. This was kind of what we hypothesised, given that according to Appraisal Theory Framework, the conditions such as certainty and control are similar for both happy and anger. That is both of them have a certainty appraisal of high certainty and individual control. For this reason we believe that our results suggest that happier people are more likely to take riskier choices in lottery based risk.

IV. CONCLUSIONS

In this study we tried to replicate the paper "Emotion, Decision, and Risk: Betting on Gambles versus Betting on People". As an addition to this study, we introduced a new emotion parameter (Happiness) to what was already done by the authors (Fear, Anger). To some extent our results do seem to match the original paper but we do see some significant deviations. We majorly attribute this to our study setting (google forms), our demographic and the reduced number of data points. We were still able to learn quite a lot from this study, especially by the results produced from our addition to the original study.

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V. APPENDIX

The Google forms used in the study are given below:

- Happiness : <https://forms.gle/MD2wozc5j145kA1A8>
- Fear : <https://forms.gle/QFekbxesG228g9tbA>
- Anger : <https://forms.gle/y8Auf6q4ttkw3Ms3A>
- Experiment-1: <https://forms.gle/tzsFJTfTE725P5t89>
- Experiment-2: <https://forms.gle/KPJ34QiLNwHtdEZQ8>
- Experiment-3: <https://forms.gle/krPA28mzCKpXQCCn6>