Effects of mood induction and bias-inducing contextual cues on decision making in gamblers and healthy individuals

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Abstract

This study investigated the effect of mood and bias-eliciting contextual cues on decision making in problem gamblers and healthy individuals. The experimental design involved two between-subjects variables: mood induction (none induction, positive induction, negative induction) and gambling attitude (problem gamblers, healthy individuals), and one within-subjects variable: bias-inducing contextual cues (gambler's fallacy, illusion of control, wishful thinking, endowment effect). In four decision tasks, participants were asked to select one option among four (very prudent, prudent, hazardous, very hazardous) after having been induced with negative or positive mood (or without mood induction for control group). They filled the South Oaks Gambling Screen at the end of the experiment. Results showed that mood did not influence healthy participants; however, problem gamblers were more risk-seeking after negative mood induction.

Keywords: decision making, mood, gambling, cognitive distortion.

Introduction

Emotions have a great influence on the choices people make. Currently, there is an amount of empirical evidences suggesting that emotions play a role in human, social and economic decision-making (Damasio, 1996; Loewenstein & Lerner, 2003; Webb *et al*., 2014). For example, the well known hypothesis of somatic marker (Damasio 1996; Bechara & Damasio 2005) posits that emotional bodily changes evoked by expected negative or positive outcomes of a choice influence decision making by inhibiting the disadvantageous choices and favouring the advantageous ones. So, according to this point of view, instead of interfering with rational evaluation and judgment of the concurrent options, emotion plays a beneficial role in decision making, by prompting cognition in right direction. Another similar influential suggestion is affect heuristic (Slovic *et al*. 2002), according to which objects' representations are associated with affective reactions generating an overall and synthetic evaluation of options at stake in decision making. Somatic markers and affect heuristic are instances of integral affective responses, i.e. the responses elicited by the features of the object of the decision (Bodenhausen, 1993; Pham, 2007) and which are thought to function as "proxies for value" (Pham 2007), leading to choose the liked things and to avoid the disliked ones.

Another class of emotions affecting decision making is represented by incidental emotional states, i.e. emotions not elicited by the decision objects but influencing their evaluation (Bodenhausen, 1993; Pham, 2007), e. g. emotions or mood felt at the moment of the decision making and dispositional affects.

However, the studies investigating the effect of incidental emotions on judgment and decision making have obtained controversial results, in conformity with the contrasting hypotheses deriving from two influential theories: the Mood Maintenance Hypothesis - MMH (Isen, 1978) and the Affect Infusion Model - AIM (Forgas, 1995). According to the MMH, individuals in a positive mood avoid taking risks in order to maintain their positive affective state, behaving in a risk averse manner; on the contrary, individuals in a negative mood tend to take greater risks in order to improve their affective state, engaging in high risk-taking behaviours. This theory also supposes that people's judgments differ as a function of mood. In particular, positive mood would facilitate creativity, cognitive flexibility, openness to alternative options and would diminish the use of routine procedures and heuristic strategies, then leading to a more efficient decision task (Isen, 2001). In line with this hypothesis, Wegner and Petty (1994) found that people in a positive mood undertook activities in order to maintain it, and Kliger & Levy (2003) revealed that positive mood were associated with risk aversion. As to negative mood, Gehring & Willoughhby (2002) showed that risky choices increased after experiencing losses, and that they were used as a strategy to improve the current affective states. Similarly, in the study of Chuang & Kung (2005), participants in the negative mood state showed riskier choices than participants in the positive mood state.

The Affect Infusion Model, by assuming that emotion can influence evaluative judgment and decision making through mood-congruence effect and through information processing, makes predictions opposite to those of MMH. Via mood-congruence effect, AIM assumes that a positive mood can cause individuals evaluate own thoughts or

environment objects more positively, and that such positive evaluation can lead to an increased risk-seeking behaviour. Conversely, a negative mood, by influencing judgments in a congruent way, can lead to risk-avoidance behaviours. Moreover, AIM posits that negative mood increases substantive and deliberative processing that in turn promote less risky decision making. On the opposite, positive mood is thought to decrease the accuracy of information processing and to increase heuristic and context-based judgments, leading to riskier decision making. In line with this hypothesis, several studies found that individuals in a negative mood state were engaging in less risky decision making than those in a positive mood state (Forgas, 1999; Yuen & Lee, 2003), while others found that positive affect leaded to more optimistic assessment regarding risk (Lerner & Keltner, 2001). Tiedens & Linton (2001) found that positive mood could make individuals optimistic about their chance of winning gambles and generally less likely to engage in deep or effortful cognitive processing. In the study of Clore & Huntsinger (2007), positive mood led participants to discount potential negative consequences of risk-taking. More recently, Xie et al. (2011) found that positive mood also increases optimism and decreases risk perception. Furthermore, Stanton and colleagues (2014) found that happiness increases risk-taking. Other studies (Mayer et al., 1992; Constants & Mathews, 1993), investigating the influence of mood on the estimates of likelihood of future events, show that people in positive mood evaluate as more likely the occurrence of positive events, than individuals in negative mood; conversely, people in negative mood estimate as more probable the occurrence of negative events.

Another large body of research has investigated how cognitive distortions can influence decision making in risky or uncertain situations. Among the most investigated biases, there are the gambler's fallacy, the illusion of control, wishful thinking, and the endowment effect. In the gambler's fallacy bias (Tversky & Kahneman, 1973), people tend to overestimate or underestimate the probability of future events as function of previous outcomes, even if they are actually independent from each other. Therefore, in a coin flip, for example, in which the probability outcome is always 50% for both head and tail, people tend to overestimate the probability of head when tail came out several times in a row and vice-versa. Several studies (e.g. Ayton & Fischer, 2004; Gronchi & Sloman, 2008), in which participants were asked to predict future outcomes given some sequences of outcomes, provided empirical evidence that people make predictions according to this fallacy.

In the illusion of control (Langer, 1975), people believe that they have control over outcomes that are, in fact, uncontrollable, and then overestimate the probability of certain outcomes. Therefore, the expectation of a personal success probability is higher than the objective probability. It has been found, for example, that people assign higher monetary values to lottery tickets they personally chosen, respect to lottery tickets which have been handed out (Langer, 1975; Wohl & Enzle, 2002). Similar erroneous beliefs occur with wishful thinking bias (Kunda, 1990), in which an over-optimism about the occurrence of a desired outcome make people more confident that the outcome will actually happen. Studies showed that people tend to overestimate the probability of preferred outcomes and underestimate the probability of undesirable outcomes (Camerer & Lovallo, 1999). Finally, in the endowment effect (Kahneman, 1990) the gap between the buying and the selling price of an item is dependent on the status of the individual respect to the item: ownership or buyer. In fact people confer higher monetary values to the objects they own due the fact that they belong them: so the price fixed to sell an object they possess is higher than the price they are disposed to pay to buy the same object (Morewedge et al. 2009; Shu & Peck, 2011). Lin et al. (2006) found that the endowment effect might be absent when a negative emotion is induced, supposing that this cognitive bias only occurs when people are induced in a positive affective state.

The influence of affective states and cognitive biases in risky and uncertain decisions has been also investigated in addictive behaviours, especially the pathological gambling (see Van den Bos et al., 2013 for a review). Some scholars posit, indeed, that both affective states (Stewart et al., 2008) and cognitive biases (Hudgens-Haney et al., 2013) contribute to the development and maintenance of gambling behaviors. Several studies investigated cognitive phenomena, such as cognitive distortions and erroneous beliefs, associated with pathological gambling. For example, as regard the illusion of control bias, Cantinotti and colleagues (2004) found that regular gamblers overestimate their ability to predict a certain outcome. Similarly, Breen *et al.* (2001) showed that after several losses, problem gamblers bet more. This result can be explained by gamblers' fallacy, since problem gamblers misunderstand independent outcomes with dependent ones.

As regard the influence of affective states on gambling, Stewart et al. (2008) suggested that problem gamblers can engage in risky behaviours to reduce or eliminate negative affect or to enhance or induce positive affect. Other studies showed that positive mood can be an important incentive for gambling (Ledgerwood & Petry, 2010). More recently, Hudson et al. (2013) observed that problem gamblers can have attentional biases for information that are congruent with their affective states. They found that, in negative mood, the negative affective stimulus was more motivationally relevant. Hence, problem gamblers who gamble to avoid negative affect may be biased to pay more attention to negative affective information; on the contrary, gamblers who are motivated to enhance positive mood show biases for positive information.

Finally, Baldassarre and colleagues (in press) showed that problem gamblers adopted a risk-seeking behaviour in negative mood condition, rather than in the control condition. On the opposite, healthy individuals were more risk avoidant after negative mood induction.

Experiment

The main aim of this study was to investigate whether incidental affective states (positive vs. negative) influence risky or uncertain decision making and whether healthy individuals and problem gamblers adopt different pattern of choices in terms of risk-seeking or risk-aversion. Moreover, bias-inducing contextual cue, which consists of bias-inducing information integrated with the scenarios, has been assumed as moderating variable.

More specifically, in conformity with the results of previous studies (Baldassarre et al., in press), we expected that, in comparison with control conditions, incidental emotions, irrespective of their valence, would induce more prudent choices in healthy individuals, whereas incidental negative mood would induce more hazardous choices in gamblers. We also expected that positive mood would have a similar effect on gamblers.

Method

Participants were 150 individuals, 77 male and 73 female, with mean age 33.50 (s.d.=8,86). They were not paid for their participation and they were asked to give informed consent.

The 3 x 2 x 4 mixed design involved two between-subjects variables - mood induction (none induction, positive induction, negative induction) and gambling attitude (problem gamblers, healthy individuals) - and one within-subjects variable: contextual scenario (gambler's fallacy, illusion of control, wishful thinking, endowment effect).

Participants were divided into six groups on the basis of the two between-subjects variables: mood induction, which was manipulated, and attitude toward gambling, which has been not manipulated. As concerning the mood manipulation, participants were induced with negative or positive mood through the emotional event recall technique; before and after induction, they filled the PANAS questionnaire (Watson et al., 1988), which is a 20-item self-report measure of positive and negative affect.

In order to divide participants in two groups according to their attitude toward gambling, that is problem gamblers and healthy individuals, the South Oaks Gambling Screen (SOGS, Lesieur & Blume, 1987) has been presented at the end of the experiment. This questionnaire consists of 20 items designed to assess the attitude toward gambling and to identify individuals who are problem gamblers.

Participants were presented with a paper and pencil questionnaire. At first, a brief description of the study was presented followed by the consensus and the request to indicate their sex and age. Then participants filled the PANAS questionnaire. After that, in both positive and negative mood conditions, participants were asked to recall and describe in detail a positive/negative autobiographical event and to refill the PANAS. The control group participants, without mood induction, were asked to fill the PANAS once. Successively, all participants were asked to make a choice among four options in four different described situations, presented through the scenario technique.

Each scenario was built with some typical features assumed to induce the following biases: gambler's fallacy, illusion of control, wishful thinking, endowment effect. For each scenario, participants were asked to choice among four options: very prudent, prudent, hazardous and very hazardous. The presentation order of the scenarios and of the options was randomized across participants.

The gambler's fallacy scenario was the following:

"It's your first time in a gambling casino. After having observed different gaming situations for about an hour, you are ready to start playing. You changed 500 euro in fiches. After a sequence of situations of game, now you have 600 euro in fiches. You start playing roulette. Red came out 4 times in a row and people around suggest you to wager a large bet on black: "This is your chance!", they say. At this point, you have to decide what to do, also because after this bet you have to come back home. What do you do?"

The four options were:

1. You decide to go away without betting
2. You decide to bet 100 euros
3. You decide to bet 300 euros
4. You decide to bet 600 euros

Note that the four options were ranged from very prudent (1) to very hazardous (4).

The other scenarios were the following:

Illusion of control scenario: The protagonist is buying some magazines; in the meanwhile he takes 2 scratch cards with his hands and wins 25 euros. He is feeling his hands are lucky. He has to decide whether collect the change (+7 euros) or buy another scratchcard (of -2 or -10 or -20 euros).

Wishful thinking scenario: The protagonist is going to watch the final match of his favourite team. He really desires his team to win. In that moment, his friends are betting for the winning of the team. He has to decide whether to bet and, if yes, the bet amount (2, 10 or 20 euro).

Endowment effect scenario: The protagonist is selling some of his stuff and he is forced to sell a bicycle he loves. The estimated price is 200 euro and he has to establish the minimum price at which he is willing to sell it (180, 190, 210 or 220 euros). After having selected an option for each scenario, participants completed the SOGS questionnaire.

Results

In order to check whether the participants' emotional states differed before the experimental manipulation, a MANOVA was performed with positive and negative PANAS pre-mood induction scores, as dependent variables, and the three experimental groups (control, positive and negative induction), as independent variable. As expected, no difference between PANAS scores before mood induction emerged. Then, in order to check whether the mood manipulation was successful, a 2 (positive vs. negative induction) x 2 (Pre vs. Post PANAS scores) x 2 (positive vs. negative PANAS scores) mixed ANOVA was performed, with the type of induction as between-subject variable, and

Table 1: Means (and s.d.) of choices

	Control Group		Positive Mood		Negative Mood	
	HI	PG	HI	PG	HI	PG
Gambler's fallacy	2,14 (.9)	2,31 (.95)	2 (.9)	2,19 (.98)	1,81(.62)	2,29 (.59)
Illusion of Control	1,86 (.64)	2,13 (.81)	1,68 (.62)	2,25 (1.13)	1,67 (.73)	2,06 (1.09)
Wishful Thinking	2,17 (1)	2,19 (1.05)	1,84 (.97)	2,38 (.81)	1,67 (.73)	2,76 (1.15)
Endowment Effect	1,56 (.81)	1,44 (.89)	1,61 (.82)	1,44 (.89)	1,3 (.67)	1,94 (1.2)

HI= Healthy Individuals; PG=Problem Gambler

the other two variables as within-subject variables.

The expected three-way interaction effect($F_{1,96}=77.36$; $p<.001$; $p\text{-}\eta^2=.45$) was examined by means of simple effect analysis with Bonferroni adjustment: it revealed that in the positive induction group, positive PANAS scores were higher after (M=35.91; s.e.=1.02) rather than before (M=32; s.e.=.83) mood induction ($p<.001$); on the contrary, in the negative induction group ($p<.001$) they were lower post (M= 26,36; s.e.=.92) rather than before induction (M= 31,64; s.e.=1.13). Furthermore, negative PANAS scores were lower after (M=16,41; s.e.=1.13) rather than before (M=18,22; s.e.=1.12) mood induction ($p<.05$) in the positive induction group, whereas, in the negative induction group ($p<.001$), they were higher post (M= 21,32; s.e.=1.25). Thus, the results confirmed that positive and negative mood inductions were both successful.

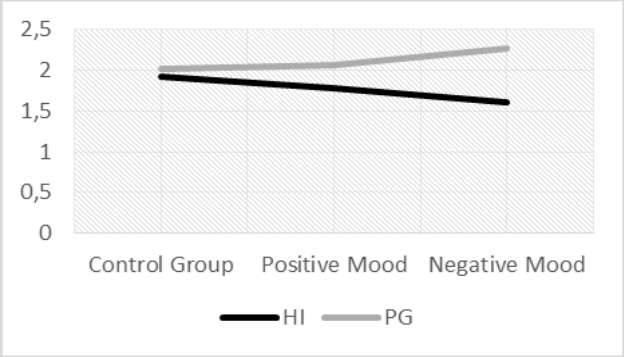

Fig.2. Interaction effect between mood condition and attitude toward gambling. N.B. HI= Healthy Individuals; PG=Problem Gamblers

Participants' choices were coded on a Likert scale ranging from 1 (very prudent) to 4 (very hazardous). In order to analyse the participants' choices, a mixed ANOVA 3 (mood induction: positive vs. negative vs. none) x 2 (attitude toward gambling: problem gamblers vs. healthy individuals) x 4 (type of bias-inducing scenario: gambler's fallacy, illusion of control, wishful thinking, endowment effect) was conducted on participants' choices. The first two variables were between-subjects, the last was within-subjects. SOGS scores have been transformed in a dummy variable: gamblers (SOGS≥3; 49 participants) and no-gamblers/healthy individuals (SOGS<3; 101 participants). Means (with standard deviations) of choices are reported in Table 1.

Results showed two main effects: bias-inducing scenario ($F_{3,432}=16.66$; $p<.001$; $p\text{-}\eta^2=.10$) and attitude toward gambling ($F_{1,144}=13.86$; $p<.001$; $p\text{-}\eta^2=.09$). On the wishful thinking (M=2,13; s.e.=0.7) and gambler's fallacy (M=2,17; s.e.=0.8) scenarios there were higher scores than on the illusion of control (M=1,94; s.e.=0.7)

scenario and on the endowment effect scenario (M=1,55; s.e.=0.8), which elicited the lowest scores. Gamblers (M=2,11; s.e.=0.8) scored higher than participants classified as healthy individuals (M=1,78; s.e.=0.5).

Results also revealed an interaction effect between mood induction and attitude toward gambling ($F_{2,144}=3,28$; $p<.05$; $p\text{-}\eta^2=.04$). Pairwise comparisons with Bonferroni adjustment showed that in negative mood condition ($p<.001$) problem gamblers scored higher (M=2,27; s.e.=.1) than healthy individuals (M=1,61; s.e.=.1). No significant difference emerged with control group and positive mood group (fig. 2). Furthermore, as suggested by reviewers, four univariate 3 (mood induction: positive vs. negative vs. none) x 2 (attitude toward gambling: problem gamblers vs. healthy individuals) ANOVAs have been separately conducted for each bias-inducing scenario respectively. Results were analogous to those obtained with the previous analysis: in particular, for each scenario, no effect of mood induction was found on the participants' choices.

Conclusion

In the present study we examined the influence of positive and negative mood on decisions in both healthy individuals and problem gamblers. As expected, results of mood manipulation on PANAS scores showed that positive scores were higher in positive mood and lower in negative mood induction condition, the opposite occurring with negative scores.

The results on participants' choices showed, not surprisingly, that problem gamblers made more hazardous choices rather than healthy individuals. With respect to scenario results, participants were less prudent with gambler's fallacy and wishful thinking scenarios, whereas with endowment effect scenario they adopted a more prudent behaviour. These findings suggest that the bias-inducing cues embedded in the scenarios affected differently the participants' choices. However, despite the mutual differentiation among the scenarios, it should be noted that, differently from previous findings (Ayton & Fischer, 2004;

Gronchi & Sloman, 2008; Wohl & Enzle, 2002; Camerer & Lovallo, 1999; Morewedge et al., 2009; Shu & Peck, 2011), none of the scenarios promoted hazardous choices, given that the mean-low values of choices depict, in general, a behaviour oriented toward prudence. Furthermore, the results do not corroborate previous findings (Lin et al., 2006), according to which endowment effect decreases with negative mood: in our study this effect is always low irrespective of mood state.

In line with previous studies (e.g. Baldassarre et al., in press), results showed that problem gamblers chose more hazardous options after negative mood induction, whereas no significant difference appeared in positive and control condition. The fact that negative affective states increase risk seeking in gamblers supports the idea that problem gamblers tend to risk more in order to avoid or to reduce negative emotional feelings (Stewart et al., 2008).

The absence of a mood effect on healthy individuals is the most intriguing and remarkable result of this study.

Since mood has not affected healthy participants at all, these results do not corroborate both Mood Maintenance Hypothesis (Isen, 1978) and Affect Infusion Model (Forgas, 1995) predictions as well as the evidences showing mood effects on decision making with healthy individuals (Tiedens & Linton, 2001; Clore & Huntsinger, 2007; Mayer et al., 1992; Constants & Mathews, 1993; Xie et al., 2011; Baldassarre et al. in press). In our study, although the mood induction was successful, the participants' choices remained insensible to mood modification.

A possible explanation for these results lies with the nature of the mood, which does not refer to a specific emotion, but to a valenced affective state. However, some studies (e.g. Lerner & Keltner, 2000, 2001) showed that the emotions, especially the negative ones, have peculiar and often opposite effects on decision making. For example, fear or anxiety would diminish the risk proneness, while sadness showed the opposite effect (see Pham 2007 for a review). Perhaps the autobiographical recall, on which mood induction was based, induced different emotions that, in turn, produced opposite effects on decision making, thus cancelling each other out.

Further studies will be based on the induction of specific emotions in order to test more appropriately their putative effect on decision making.

Otherwise, these results can be explained by the scenarios characteristics. We assume that the efficacy of the scenario technique has been supported by the finding that participants made generally prudent choices, instead of making more hazardous choices given that the situation was only imaginary and they did not run any real risk: so, we can infer that participants identified with the protagonists. Furthermore, the effect due to the scenarios proves that the situations they described and the biases they are supposed to entail have been perceived as reciprocally unrelated. On the other hand, it is possible that bias-inducing contextual-cues per se promoted a paradoxical induction effect toward a prudent rather than hazardous behavior and this effect were greater than the mood one.

Further studies will be performed to explore the effect of specific emotions in both bias-inducing and neutral decision-making tasks, in order to systematically investigate whether decisions are influenced by cognitive or affective factors.

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