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The Impact of Emotions on Problem Gambling

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ABSTRACT

According to theories of anticipated emotion, feelings about expected outcomes are factored into the decision-making process. The present study examined how accurately high- and low-frequency gamblers predict the positive or negative emotions associated with gambling-related choices, and whether mood has an effect on emotional anticipation. Participants underwent a mood-induction procedure and were shown a series of two-pair gambles. In the first session, they chose between gambles and imagined how they would feel about hypothetical outcomes. One week later, they actually played the gambles and then rated how they felt about the outcomes. High-frequency gamblers showed a greater discrepancy between anticipated and actual emotions compared to low-frequency gamblers, whereby negative emotions were underestimated. Frustrated mood was associated with larger prediction errors. The findings suggest that the inaccurate anticipation of emotions might contribute to the development and maintenance of problem gambling.

INTRODUCTION

Much research has been devoted to the role of cognitive biases and arousal in problem gambling (e.g., Coventry & Norman, 1997, 1998; Griffith, 1995; Ladouceur et al., 2002; Sharpe, 2002), but to date little attention has been paid to other emotional

factors. Yet evidence from laboratory and real-world studies suggests that people, when faced with a decision, often think about how they will feel once they learn the outcome and these anticipated emotions are factored into the decision-making process. Mellers et al. (1999) showed in an experiment that people are fairly accurate in anticipating the pleasure they experienced when outcomes were favorable and the disappointment and regret, when outcomes were unfavorable. Moreover, physicians were shown to prescribe a controversial diagnostic test for prostate cancer more often to younger patients because they anticipated that they would experience regret over not detecting cancer in its initial phase (Sorum et al., 2004). Drug users who were infected with HIV were more likely to use a condom with a steady sex partner because they anticipated feeling regret over infecting their partner (Van Empelen et al., 2001).

Observations like these have been formalized in theories of anticipated emotion, including theories that emphasize anticipated negative emotions, such as disappointment and regret (e.g., Bell, 1982, 1985; Loomes & Sugden, 1982; Ritov & Baron, 1995), and those that focus on anticipated pleasure, such as decision affect theory (Mellers, 2000; Mellers & McGraw, 2001; Mellers et al., 1997). The main idea of these theories is that, during decision-making, people weigh anticipated feelings of pleasure or regret over an expected outcome by the perceived chances of the outcome occurring and then choose accordingly.

If gambling is analyzed within the conceptual framework of anticipated emotion, the decision to place a bet is thought to be guided by certain deliberations that include imagined feelings of joy or regret. To illustrate, assume that a player has lost $275 at a high-stakes roulette table and is deciding whether to bet her last $25 chip on her “lucky number” for an expected payoff of (36x25 =) $900. Her decision to bet will be influenced by how she perceives her chances of winning and what she anticipates to feel after winning or losing. If she believes that winning is quite unlikely and she imagines the regret she will experience at losing her last $25, she will not gamble. However, if she feels optimistic and imagines how elated she will be at winning $900, she will run the risk and gamble.

If negative emotions such as regret are to prevent gamblers from making risky choices, a key assumption is that they must be able to anticipate these emotions correctly. To date, no research exists to show that this is indeed the case. While some persons are able to predict emotions correctly (Mellers et al., 1999), others may be prone to systematic prediction errors because they are guided by personal theories and heuristics that may be incorrect (Loewenstein & Schkade, 1999). Such errors may be particularly likely in a gambling context. To illustrate, research has shown that when the last four spins of a roulette wheel stopped in black, people predict that red is more likely to win in the next round (Baron, 2000), even though these events are independent. Therefore, if gamblers anticipate their emotions based on such incorrect thinking, it is quite plausible that their decisions will not be affected by any disappointment or regret they are bound to experience later. This may particularly be the case for problem gamblers as they seem to hold more distorted beliefs than gamblers who only play occasionally (Ladouceur, 2004).

Another factor that often affects people's decision-making processes is their mood state. According to the affect infusion model (Forgas, 1995), a current negative mood state (anger, sadness, frustration) can induce strong and specific motivational pressures toward mood repair. This may have implications for gamblers. Several studies have reported that problem gamblers tend to be motivated more by attempts to escape from depression or by the desire to achieve a heightened state of arousal (Anderson & Brown, 1984; Coventry & Norman, 1997, 1998; Griffith, 1995). Further, when depressed or frustrated, high-frequency gamblers' decision-making ability seems impaired as they tend to persist longer at gambling than those in a neutral mood state (Griffith, 1995). However, these findings are not unequivocal. Hills et al. (2001) found that neither negative nor positive mood had an effect on high-frequency gamblers' persistence at gambling, although negative mood inhibited low-frequency gamblers' behavior. Thus, the exact relationship between mood and gambling is somewhat unclear.

Even less clear is the role of mood states on anticipated emotions. Some studies have shown that people seriously underestimate the power of specific arousal states, such as drug cravings (Loewenstein, 1999) or sexual excitement (Loewenstein, Nagin, & Paternoster, 1997), when they do not experience them during the anticipation process. This suggests that mood may also affect the anticipation of emotions. Yet this assumption to date has never been formally tested. Therefore, research is needed to elucidate the possible effect of mood on anticipated emotion and its role in gambling.

Present Study

The present study was conducted to examine two key factors which according to the previously cited theories might play a role in gambling: mood state and the ability correctly to anticipate emotions resulting from gambling-specific choices. The participants were college students classified as either high- or low-frequency social gamblers. It was hypothesized that high-frequency players would make larger prediction errors in anticipating how they would feel about the outcomes of gambles they played. The second hypothesis was that these prediction errors would increase in a state of frustration.

METHOD

Participants

The research participants were 120 undergraduate students (59 men and 61 women) enrolled in introductory psychology courses. The students' ages ranged from 18 to 26, with a mean age of 19.2.

Design

The study used a 2 (high- vs. low-frequency players) x 2 (frustrated vs. neutral mood) experimental design. The dependent variable was the difference between anticipated and actual emotions.

Materials

All research participants completed the South Oaks Gambling Screen (Lesieur & Blume, 1987). Questions 1a-k of this instrument examine frequencies of betting on various events (e.g., lotteries, sports). Following Hills et al. (2001), students who gambled less than once a month were classified as low-frequency gamblers (n=70), whereas those who gambled at least once a month were classified as high-frequency gamblers (n=50).

Mood Induction

One half of the participants were randomly assigned to the neutral mood condition; the other half to the frustration condition. All students were instructed to solve 15 word puzzles within a time limit of 10 minutes. Participants were told that it was necessary to equate individuals on verbal ability, that aptitude in solving word puzzles was a valid indicator of verbal IQ, and that college students on average solved 13 of 15 puzzles. In the neutral condition, all word puzzles were solvable. Unbeknownst to participants, in the frustration condition 12 of the 15 word puzzles were unsolvable.

Gambling Task

The computerized task used in the present experiment was developed by Mellers, Schwartz, and Ritov (1999) and consisted of pairs of two-outcome gambles, each in the form of a pie chart. Each pie chart was divided into two areas, proportional to the probability (0.2, 0.5, or 0.8) of a specific monetary outcome (losing/winning $8 or losing/winning $32). To illustrate, in a pair of gambles, the area of one pie chart might be divided to depict a 0.8 probability of winning $8 and a 0.2 probability of losing $32; the area of the second pie chart might represent a 50:50 chance of either winning $8 or losing $8. Following Mellers et al. (1999), gambles were based on combinations of so-called *better* outcomes ($32, $8, -$8) and *worse* outcomes ($8, -$8, -$32). A pair was excluded if the worse outcome was as good as or better than the better outcome. This resulted in 6 outcome pairs (one pair of gambles each resulting in winning $32 vs. winning $8; winning $32 vs. losing $8; winning $32 vs. losing $32; winning $8 vs. losing $8; winning $8 vs. losing $32; and losing $8 vs. losing $32). As each gamble was combined with three probability levels (0.2, 0.5, and 0.8), this method resulted in 18 gambles, which, when paired with each other, yielded 36 nondominant pairs of gambles. Each pair was presented twice for a total of 72 pairs, with trial order and gamble position (left vs. right) being randomized.

Procedure

The 120 research participants provided written informed consent and agreed to participate in two experimental sessions scheduled one week apart. They were told that the experiment involved decision-making strategies when faced with hypothetical gambling choices. Based on responses to the gambling screen, participants were classified either as high-frequency gamblers (gambling once a month or more) or low-frequency gamblers (gambling less than once a month) and then randomly assigned to either a neutral mood condition (27 high- and 33 low-frequency gamblers) or a negative

mood condition (23 high- and 37 low-frequency gamblers). Next participants provided mood ratings in response to nine adjectives (e.g., bored, happy, frustrated), from 0 (not at all) to 4 (extremely). This was followed by the mood induction procedure. After completing the puzzle task, participants again were asked to rate their current mood on the nine items.

Next, participants were presented with the computerized gambling task. In the first session, they were shown pairs of gambles and asked to indicate with the mouse the one they preferred. Next, they were presented with a *hypothetical* outcome for each of the two gambles and asked to imagine that these were the real outcomes. For each outcome, they were then asked to provide an emotional rating on a scale ranging from –50 (extremely unhappy) to +50 (extremely happy) to indicate how they would feel if a given outcome had indeed been obtained. This procedure was continued for all 72 pairs of gambles.

In the second session, one week later, the research participants underwent a similar type of mood-induction procedure, were shown the same pairs of gambles and asked to select the gambles they preferred. This time, however, they were asked to actually play the preferred gamble. On each trial, a mouse click on the chosen pie chart resulted in the pie spinning similar to a wheel of fortune. When the pie chart stopped rotating, an arrow pointed to the area of the winning outcome. Then the participants indicated on a scale from -50 (extremely unhappy) to +50 (extremely happy) how they felt about the outcome.

RESULTS

To test whether the mood induction procedure was effective, the mean mood scores along 9 different dimensions were calculated after the participants finished the word puzzles. These post-induction means for the neutral and frustrated conditions are illustrated in Figure 1. It is evident that the participants in the frustrated mood condition scored higher in terms of feeling more anxious, bad tempered, frustrated, annoyed, and bored. However, only the first four dimensions exhibit statistically significant difference between the participants in the frustrated and neutral mood conditions. These results indicate that the mood induction procedure was successful for the purposes of the study.

To examine whether gambling frequency and frustration are related to the research participants' ability to anticipate their emotional reactions to the outcome of the choices they make, the data were analyzed using a linear regression model. The dependent variable was measured as the absolute value of the difference between the emotional ratings of the first and second sessions. This difference served as a proxy for the accuracy in anticipating emotions: the larger the difference, the larger the prediction error, and the lower the ability to correctly anticipate emotions. Type of gambler (low- vs. high-frequency) and mood condition (frustrated vs. neutral) were measured as categorical variables and represented the independent variables. An interaction term between the two variables was also included in the model.

Figure 1

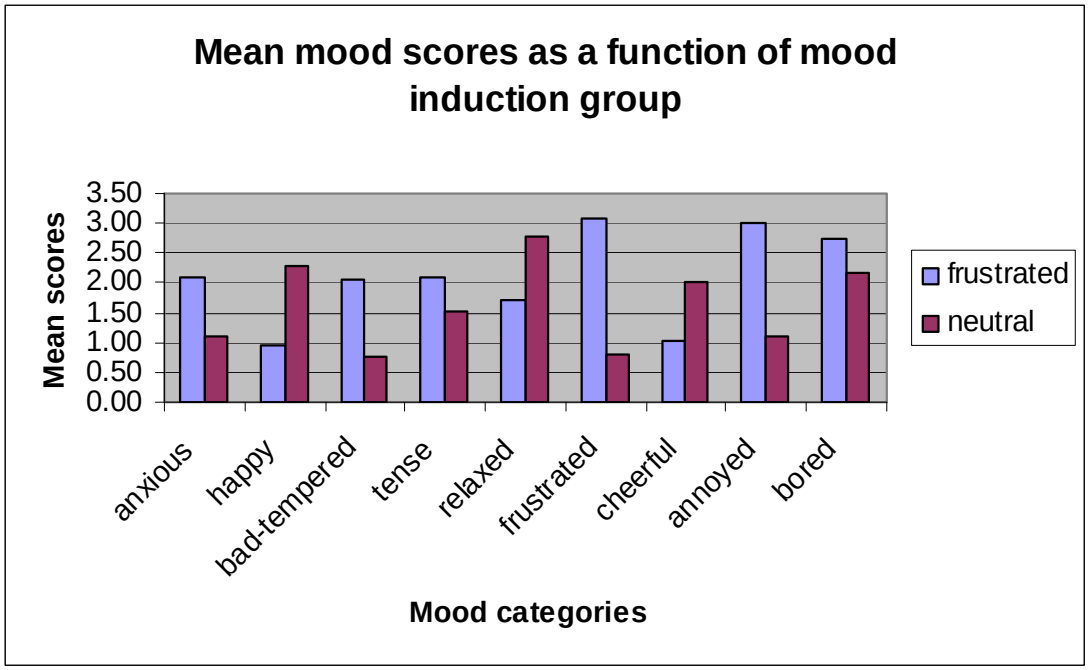

Table 1

Summary of Regression Analysis for Variables Predicting Anticipated Emotions

Variables	Estimated coefficients
Constant	10.68* (1.78)
Mood	5.10* (2.45)
Type of gambler	7.98* (2.65)
Interaction	7.70* (3.80)
R^2 = .34 Adj. R^2 = .32	

* p<.05; Standard errors in parenthesis.

As shown in Table 1, the regression yielded significant coefficients for type of gambler ($\beta = 7.98$, $t = 3.01$, $p < .05$) and mood condition ($\beta = 5.10$, $t = 2.08$, $p < .05$), as well as for their interaction effect ($\beta = 7.70$, $t = 2.03$, $p < .05$).

These coefficients can be used to calculate the average error for the different experimental groups as well as to test for differences between them. As a categorical variable, type of gambler takes the value of zero for low-frequency gamblers and one for high-frequency gamblers. Similarly, the variable for mood takes the value of zero for participants in neutral mood and of one for those in a frustrated mood. Consequently, the mean difference between actual and anticipated emotions for the group of low-frequency gamblers in neutral mood is given by the constant in the regression model. The coefficient of the type of gamble variable represents the difference between high- and low-frequency gamblers in neutral mood. The coefficient for the mood variable denotes the difference between low-frequency gamblers in neutral and frustrated mood. Lastly, the coefficient for the interaction effect shows the additional error committed by high-frequency gamblers in frustrated mood.

The mean prediction errors for the various groups of participants calculated from the estimated coefficients are displayed in the last two columns of Table 2.

Table 2

Mean Error in Anticipated Emotions for Different Groups

Variable	B_0	B_1	B_2	B_3	Mean	*SD*
Low-frequency gamblers in neutral mood	10.68				10.68	1.78
Low-frequency gamblers in frustrated mood	10.68	5.10			15.78	4.23
High-frequency gamblers in neutral mood	10.68		7.98		18.68	4.43
High-frequency gamblers in frustrated mood	10.68	5.10	7.98	7.70	31.48	10.68

Note: Bo, the intercept of the regression line, represents the mean error of low-frequency gamblers in neutral mood

B1 represents the difference in anticipation error between low-frequency gamblers in neutral and frustrated moods.

B2 represents the difference in anticipation error between low-frequency gamblers in neutral mood and high-frequency gamblers in neutral mood.

B3 represents the difference in anticipation error between high-frequency gamblers in frustrated mood and all other groups.

It is evident that high-frequency gamblers were less able to anticipate their emotions correctly than low-frequency gamblers. The results also indicate that gamblers in neutral mood had a smaller prediction error than those in a frustrated mood. Furthermore, low-frequency gamblers in the neutral mood condition (M = 10.68, SD = 1.78) were more accurate in anticipating their emotions than frustrated low-frequency gamblers (M = 15.78, SD = 4.23). High-frequency gamblers in a neutral mood state (M = 18.68, SD = 4.43) made more accurate predictions of their emotions than frustrated high-frequency gamblers (M = 31.48, SD = 10.68), but their anticipation was less accurate when compared to low-frequency gamblers in either a neutral or a frustrated mood state. Thus, in the present study mood had a larger negative effect on the accuracy of anticipating emotions for high-frequency gamblers, compared to low-frequency gamblers. Finally, the prediction error of high-frequency gamblers in the neutral mood condition was only 3 points larger than the error of the frustrated low-frequency gamblers. The results indicate that frequency of gambling and negative mood are inversely related to the accuracy of emotional anticipation.

Over- vs. Underestimation of Anticipated Emotions

The anticipation of negative emotions could play the role of an inhibitor to continued gambling, whereas the expectation of positive emotions could encourage it. Accordingly, it was important to examine whether participants made prediction errors in positive or negative feelings or both. To do this, those observations where the difference between the first and second sessions was equal to zero (i.e., no prediction error) were excluded since they did not provide any information about under- or overestimation of emotions.

To examine the role of positive emotions, the dependent variable was first limited to include only positive prediction errors. For instance, if participants rated their emotions in the first session at 10 and in the second session at 40 on the scale of –50 to +50, the prediction error was 30; analogously, if the first rating was -40 and the second rating –20, the prediction error was 20. Both cases exemplify that participants felt better about the outcome of a given gambling pair during the real gambling session than they had expected during the hypothetical gambling session; i.e., they had underestimated the positive quality of their reactions.

The positive prediction errors were regressed on the independent variables mood condition and gambler type. The results of this regression presented in the first column of Table 3 show that, except for the intercept describing the control group, none of the coefficients was statistically significant at the p = .05 level. Consequently, not enough evidence was found to conclude that mood and gambling type are associated with overestimating regret or underestimating happiness.

As it is possible that individuals who gamble with low vs. high frequency differ in their ability to correctly estimate any negative feelings they might experience as a result of their decisions, in the following analysis the dependent variable was now restricted to negative prediction errors. For instance, if participants rated their emotions in the first

session at 40 and in the second session at 10, the prediction error was -30; similarly, if their ratings were -10 at session one and -30 at session two, the prediction error was -20. This means that during the hypothetical gambling session these individuals anticipated that they would feel more positively about the outcome of their decisions than was the case during the real gambling session a week later.

Table 3

Summary of Regression Analysis for Variables Predicting Over- or Underestimation of Emotions

Variables	Positive errors	Negative errors
Constant	14.89**	-14.86**
	(2.49)	(2.29)
Mood	5.78	-6.32*
	(3.37)	(3.15)
Type of gambler	5.82	-6.97*
	(3.65)	(3.41)
Interaction	6.18	-8.34[a]
	(5.22)	(4.88)

** $p<.01$; * $p<.05$; [a] $p<.10$; Standard errors in parenthesis.

The results of the regression of the negative prediction errors on mood condition and type of gambler are shown in the second column of Table 3. The coefficients for type of gambler (β = -6.97, t = 2.01, $p < .05$) and mood condition (β = -6.32, t = 2.04, $p < .05$) were statistically significant, but their interaction was not (β = -8.34, t = 1.71, $p < .10$). The mean negative prediction error for each group is displayed in Table 4. Low-frequency gamblers in frustrated mood and high-frequency gamblers in neutral mood miscalculated their emotions by approximately 6 points in comparison to the control group. The mean negative anticipation error for high-frequency gamblers in frustrated mood (M = 36.49, SD = 13.73) was more than twice the mean error of low frequency gamblers in neutral mood (M = 14.86, SD = 2.29). These results suggest that higher frequency of gambling and frustrated mood are associated with a higher probability of underestimating negative feelings associated with a given gamble outcome.

Table 4

Mean Negative Error in Anticipated Emotions for Different Groups

Variable	B_0	B_1	B_2	B_3	Mean	*SD*
Low-frequency gamblers in neutral mood	14.86				14.86	2.29
Low-frequency gamblers in frustrated mood	14.86	6.32			21.18	5.44
High-frequency gamblers in neutral mood	14.86		6.97		21.83	5.70
High-frequency gamblers in frustrated mood	14.86	6.32	6.97	8.34	36.49	13.73

Note: Bo represents the mean negative anticipation error of low-frequency gamblers in neutral mood

B1 represents the difference in negative anticipation error between low-frequency gamblers in neutral and frustrated moods.

B2 represents the difference in negative anticipation error between low-frequency gamblers in neutral mood and high-frequency gamblers in neutral mood.

B3 represents the difference in negative anticipation error between high-frequency gamblers in frustrated mood and all other groups.

DISCUSSION

The present study has drawn attention to the possible link between inaccurately anticipated emotions and gambling. Specifically, it was hypothesized that high-frequency gamblers would make larger errors in predicting their emotions resulting from the outcomes of gambles than those who gamble with low frequency. The results showed that there was indeed a discrepancy between anticipated and actual emotions, and that the discrepancy was more the result of underestimating regret or disappointment than overestimating happiness. This finding is important because anticipated emotions have never been considered as a possible factor in gambling, even though they may be one of the many contributing factors to persistent gambling.

Hills et al. (2001) showed that high- and low-frequency gamblers use different strategies when making choices. The less accurate anticipation of emotions of high-frequency gamblers could be the result of using the *motivated processing strategy* (Hills et al., 2001) when deciding whether to continue gambling. Mood repair and mood

maintenance are the triggers of the motivated processing strategy since they are defined as the ultimate goal of the gambling behavior. But to sustain their motivation toward achieving a positive mood state, high-frequency gamblers would have to imagine themselves in a happy mood *ex ante* during the entire decision-making process. When a high-frequency gambler is losing money, the goal of mood repair makes it necessary to anticipate ultimate happiness, which in turn provides the motivation for continued gambling. When that gambler is on a winning streak, the goal of mood maintenance follows a similar process. Either way the high-frequency gambler is strongly motivated to achieve a goal, which is possible only through the anticipation of a final positive mood state and the discounting of negative emotional reactions. The anticipation of possible regret or disappointment is not allowed to interfere in the decision making process because it distracts from achieving and/or maintaining a positive mood. This may result in an underestimation of negative emotions, which is consistent with our findings that college students who gambled with high frequency were more likely to underestimate the regret they experienced over losses they incurred. High-frequency gamblers in general may discount the possibility of experiencing regret over not stopping to gamble, which would explain why they tend to gamble until all money is lost.

Hills et al. (2001) further showed that in contrast to high-frequency gamblers, low-frequency gamblers are assumed to be guided by the *heuristic processing strategy*, which is characterized by the absence of a strong and specific motivational drive. The decision on whether to continue gambling is not based on achieving mood repair or mood maintenance as an ultimate goal of personal relevance. Instead, gamblers using the heuristic processing strategy play as long as they anticipate experiencing pleasure from the next round; once they anticipate that the regret of losing is greater than the pleasure of winning, they stop gambling. It is possible that low-frequency gamblers are better at anticipating regret as they are not driven by the urge for mood repair or mood maintenance. Our results with college students support this line of reasoning. Students who gambled with low frequency underestimated their negative feelings in the face of losses to a much lesser extent than students who gambled with high frequency.

Aside from the frequency of gambling, the present study also suggests that a pre-existing mood state may affect gamblers' ability to anticipate emotions. Frustrated gamblers, even those who gambled with low frequency, predicted their feelings less accurately than those in a neutral mood state. One reason may be that frustrated individuals in general have difficulty imagining how they would feel in a positive mood state (Loewenstein & Schkade, 1999).

Assuming that high-frequency gambling is associated with mood repair, a pre-existing frustration might induce an even stronger motivation toward mood enhancement. The stronger the motivation, the more important it would seem to change the mood, and the more distorted the anticipation of emotions may become since a correct focus on possible regret and disappointment would get in the way of obtaining the desired outcome (mood repair). This interpretation is consistent with the empirical evidence presented in this study, showing that frustrated students who gambled with high

frequency made the largest prediction errors in the estimation of feelings resulting from the gambling-related decisions they made.

Limitations and Future Directions

The primary aim of the present study was to demonstrate that anticipated emotions may be an important factor that affects gambling behavior. One limitation of this study was that participants were recruited from a college population and thus do not represent gamblers more generally. High-frequency gamblers as defined here are not necessarily equivalent to high-frequency gamblers who can be found in casinos or on the racetrack. Therefore, an important question left for future research is whether high- and low-frequency gamblers recruited from community settings show similar differences in their ability to anticipate emotions as the college students. Furthermore, the present study focused exclusively on the effects of frustration on anticipated emotions. It is very likely that other negative mood states (e.g., anger, boredom) as well as positive mood states (e.g., a celebratory mood) play a role in the anticipation process. Future studies should therefore examine the relationship between other mood states and gamblers' ability to anticipate emotions.

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