Video lottery: winning expectancies and arousal

Robert Ladouceur¹, Serge Sévigny¹, Alexander Blaszczynski², Kieron O’Connor³ & Marc E. Lavoie³
Laval University, Quebec, Canada¹, University of Sydney, Sydney, Australia², and Centre de Recherche Fernand-Seguin, Louis-H. Lafontaine Hospital, University of Montreal, Montreal, Canada³

ABSTRACT
Aims This study investigates the effects of video lottery players’ expectancies of winning on physiological and subjective arousal.

Design Participants were assigned randomly to one of two experimental conditions: high and low winning expectancies.

Setting Participants played 100 video lottery games in a laboratory setting while physiological measures were recorded. Level of risk-taking was controlled.

Participants Participants were 34 occasional or regular video lottery players. They were assigned randomly into two groups of 17, with nine men and eight women in each group.

Intervention The low-expectancy group played for fun, therefore expecting to win worthless credits, while the high-expectancy group played for real money.

Measurements Players’ experience, demographic variables and subjective arousal were assessed. Severity of problem gambling was measured with the South Oaks Gambling Screen. In order to measure arousal, the average heart rate was recorded across eight periods.

Findings Participants exposed to high as compared to low expectations experienced faster heart rate prior to and during the gambling session. According to self-reports, it is the expectancy of winning money that is exciting, not playing the game.

Conclusions Regardless of the level of risk-taking, expectancy of winning is a cognitive factor influencing levels of arousal. When playing for fun, gambling becomes significantly less stimulating than when playing for money.

KEYWORDS Arousal, expectancy, gambling, video lottery.

INTRODUCTION
Over the last 20 years, empirical research has contributed considerably to the understanding of psychological events contributing to the maintenance of habitual gambling behaviors. A number of studies have attempted to identify and describe factors of potential importance in modulating the level of excitement experienced by players. For example, a number of studies have demonstrated the presence of increased heart and pulse rates in response to certain gambling situations (Anderson & Brown 1984; Leary & Dickerson 1985; Coulombe et al. 1992; Dickerson et al. 1992; Griffiths 1993; Carrol & Huxley 1994; Coventry & Norman 1997). Furthermore, the results of one study suggested that gambling events affect players’ cognitive, emotional and physiological states (Meyer et al. 2000); conversely, others have shown that aspects of gambling behavior are influenced by levels of arousal (Anderson & Brown 1984; Griffith 1990, 1995).

These findings suggest that level of arousal may be a significant factor modulating the duration and frequency of gambling sessions. Some gamblers report playing mainly for the possibility of winning money, while others mention playing for entertainment or for the excitement of the game (Mississippi State University...
associated with monetary expectancies, it would then question the chances of winning money. If excitement is closely associated with their variables will determine if the level of excitement varies taking 'and 'monetary loss' variables. Controlling these variables and impact of 'winning expectancies' from the risk—money, no study has attempted to clarify the relative role the possibility of winning or losing large amounts of money, no study has attempted to clarify the relative role the possibility of winning or losing large amounts of money, and that this expectancy is the main source of excitement, not the game. Within the latter perspective, excitement generated by the game itself as the motivating factor would, in actuality, maintain a secondary role when compared with the excitement of winning money.

Supporting this last perspective, recent findings demonstrate that monetary risk-taking and the recognition of such risks are instrumental in eliciting arousal and/or excitement, in addition to feelings of wellbeing, power and success (Legg Englang & Götestam 1991; DeCuria et al. 1996). Arousal as a state is operationalized usually in terms of activation of one of three systems: behavioral, physiological and cognitive/emotional. There can be a discrepancy between these three systems, and choice of type of physiological system (cortical, motor, autonomic) is important to maximize synchrony. Heart rate (HR) or heart period is recognized as a reliable indicator of cognitive/emotional activation (Obrist 1981). It discriminates well between positive and negative arousal and positive and negative stress (Mackay 1980). Both arousal and stress are clearly associated with distinct subjective mood states. In addition, HR discriminates between cognitive processes of attention/orienting—where it slows compared with baseline—and expectancy/preparatory processes, where it increases compared with baseline. HR increase is more consistently associated with expectancy when it is linked to reward rather than to punishment (Fowles 1980). The fact that HR responds principally to stimulation is shown by the equivalence of expectancy effects on HR to central nervous system stimulants such as nicotine (O’Connor 1992). HR can also be influenced by behavioral activity via cardiac—somatic coupling, but in the present study physical activity was kept uniform across participants. While it is apparent, and even predictable, that HR increases would show a positive correlation with degree of risk (Anderson & Brown 1984) and that gamblers may become excited by the possibility of winning or losing large amounts of money, no study has attempted to clarify the relative role and impact of ‘winning expectancies’ from the ‘risk-taking’ and ‘monetary loss’ variables. Controlling these variables will determine if the level of excitement varies according to the players’ expectancies about their chances of winning money. If excitement is closely associated with monetary expectancies, it would then question the assertion made by some individuals that they gamble for reasons other than money. More importantly, it would indicate that regardless of the level of risk-taking, monetary expectancy is a powerful trigger of excitement or arousal, and, as such, is a factor influencing gambling duration and frequency.

We already know that outcome expectancies play a critical role in determining one’s cognitive representation of an event, as well as one’s level of motivation to engage in a behavior (Bandura 1977). Except for Walters & Contri’s (1998) study in a male prison and Wasserman’s (2002) study on the role of expectancies in gambling behavior, there has been almost no research specifically targeting gambling expectancies. Using the Gambling Expectancy Effects Questionnaire, Walters & Contri showed that heavier gambling is associated with positive and arousing expectancies. Similarly, Wasserman reported that outcome expectancy factors (risk-taking, arousal and negative effects), as measured by a questionnaire, were predictive of gambling behavior. Thus, past findings suggest that outcome expectancies may ultimately be the variable that links arousal to gambling (Walters & Contri 1998).

Therefore, the purpose of the present study is to examine the effect of winning expectancies on a measure of arousal (HR) in a sample of occasional and regular video lottery players. It was hypothesized that in the period prior to a gambling session, participants with high winning expectancies would experience higher pulse rates (arousal) as compared with those with low expectancies. It was further hypothesized that such a between-group difference in HR would be maintained throughout all conditions of the gambling session.

**METHOD**

**Participants**

Participants were recruited through newspaper advertisements in the Quebec City region and by way of posters placed on bulletin boards at Laval University. Individuals who responded to these advertisements were administered a French version of the South Oaks Gambling Screen (SOGS; Lesieur & Blume 1987) adapted for telephone survey use (Volberg & Steadman 1988). The SOGS is a 20-item self-report scale on which each item scores 1 point. The scale has adequate reliability and validity and is the most widely used instrument in clinical and epidemiological studies to classify problem gamblers. For inclusion in the study, Lesieur & Blume’s classification system was used to select only those respondents who were considered not to be ‘probable pathological gamblers’—that is, the cut-off point was a SOGS score of 4 or less. In order to increase the internal validity of the
Participants were 34 occasional or regular video lottery terminal (VLT) players over the age of 18 (mean = 42.88; SD = 18.04). Occasional players were those who played less than once a month and regular players were those who played at least once a month. These participants were assigned randomly into two groups of 17, with nine men and eight women in each group. Participants played a standard VLT eight-lines fruit game called ‘Swinging Bells’. This game has a three-by-three structure that allows the gamblers to win (e.g. three oranges) on one or many of the eight lines at the same time. There are three horizontal lines, three vertical lines and two diagonals. Players had to bet one credit on each line at each game. Participants were assigned randomly to one of two experimental conditions: (1) high winning expectancies condition and (2) low winning expectancies condition. Winning expectancy is defined as the degree to which a person anticipated or believed that he or she could or would win money in a particular gambling task. In the low winning expectancy condition, participants believed that they could not win money—that they could only win credits that have no monetary value. In the high winning expectancy condition, participants believed that they had a chance of winning real money.

The mean age for the high-expectancy group was 45.35 (SD = 16.67; range 22–73) and 40.41 (SD = 19.51; range 19–76) for the low-expectancy group. Participants in the high-expectancy group had gambled a mean number of 20 times during the last 6 months (SD = 24.53; range 0–72), compared with 17.71 times in the low-expectancy group (SD = 21.4; range 0–72). The mean SOGS score was 1.71 (SD = 1.45; range 0–4) for the high-expectancy group and 1.29 (SD = 1.31; range 0–4) for the low-expectancy group. T-tests revealed no significant between-group differences for the variables of age, gambling experience and mean SOGS scores.

Procedure

During the recruitment phase and prior to arrival at the laboratory, participants were informed by telephone that they would play 100 games while physiological measures were recorded. Once in the laboratory, they received $10 for their participation. In order to enable valid comparisons, trials (hereafter referred to as games) were programmed so that participants experienced uniform playing outcomes and conditions, aside from the expectancy manipulation (low expectancy versus high expectancy).

Phase 1: familiarization

For both groups, the first part of the experiment comprised three periods referred to as T1, T2 and T3 (see Fig. 1). This first part was designed to ensure that participants would have equal exposure to task acclimatization. At T1, participants rested for 1 minute while sitting still; at T2, they were given the task instructions; at T3, they were primed to expect a 92% return rate while playing the first 50 games. Explanations about the return rate were given. In brief, participants were told that the return rate was an estimation of the percentage of money given back by the machine in the long run. Phase 2 commenced after completion of the first block of 50 games.
Phase 2: expectancy modulation

In this second part involving the manipulation of winning expectancies, each group rested for 1 minute (T4) before receiving explanations about the 200% return rate they could expect while playing the last 50 games. In addition, each group also received information about the possible amount of money they could expect to win (T5): participants in the low-expectancy group were told that regardless of the number of credits they won while playing with the new return rate of 200%, they could not win or lose any actual money; the high-expectancy group members were informed that they could now win an additional $40 while playing the last 50 games with the new return rate of 200%.

In order to measure physiological arousal associated with the expectancies of a potential monetary gain, a 30 second waiting period (T6) was used to offer participants a sufficient period of time to think about the unexpected possibility of winning money. Both groups then commenced playing all 50 games (T7) followed by a final rest period (T8) before the administration of the post-experimental questionnaire, which rated each player’s subjective perceptions of arousal. For the last 50 games, players were requested to insert all of the $10 they received at the beginning of the experiment while remaining aware that they could not lose any of this amount.

EKG recordings and data extraction

The raw electrocardiograph (EKG) signal was recorded from two electrodes (EKG-Flex, Biograph, Thought Technology Ltd, Montreal, Canada) placed across both wrists and a ground electrode placed on the left forearm. The signal was fed into a bioelectric digital amplifier (Procomp+/Biograph Biofeedback System, Thought Technology Ltd, Montreal, Canada) with a bandpass of 0.1 and 30 Hz, digitized continuously at a sampling rate of 256 Hz. The amplifier was connected via an optical cable to the parallel port of a PC. The Biograph 2.0 software was used for recording, scoring and processing the EKG signal.

Arousal was operationalized as a significant deviation, which was calculated as an algebraic difference between average HR while playing and the baseline HR measure during the rest period. In order to measure arousal, the average HR was recorded across eight periods (Fig. 1). HR frequency was based on the detection of the R-wave peak amplitude and translated into beat per minute units. Important periods (from T1 to T8) were marked online and the average HR frequency within each period was computed.

Other measures

The number of credits played per game, recorded by video camera, was used to control for the players’ level of risk-taking during the experiment. At the end of the session, participants answered a questionnaire assessing the following variables: (1) when playing the first 50 games, did you feel excited?; (2) when playing the last 50 games, did you feel more excited than with the first 50 games?; (3) generally speaking, what is exciting when you gamble?; (4) how often would you gamble if there were no money to be won?

RESULTS

Physiological HR differences

An analysis of covariance was carried out to investigate a group effect (high expectancy versus low expectancy) on the average pulse rate. Players’ experience (the exact number of times they reported playing on a VLT in the last 6 months) was used as a covariate in conjunction with the mean pulse rate at baseline (1 minute of rest whilst keeping still). As shown in Table 1, and illustrated in Fig. 1, participants in the high-expectancy condition showed significantly higher arousal than those in the low-expectancy condition while waiting to play the last 50 games ($F = 8.63; P < 0.01$). A closer inspection of the data revealed that high-expectancy participants commenced displaying a faster HR, as compared with the low-expectancy players, at the point when the possibility of winning money was first introduced ($F = 9.81; P < 0.01$). Both groups also differed on arousal while gambling ($F = 4.479; P < 0.05$).

<table>
<thead>
<tr>
<th>Pulse rate</th>
<th>High expectancy</th>
<th>Low expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>When informed of money to be won</td>
<td>83.41 (17)</td>
<td>77.78 (17)</td>
</tr>
<tr>
<td>When waiting to begin playing</td>
<td>82.92 (17)</td>
<td>77.80 (17)</td>
</tr>
<tr>
<td>When playing the last 50 games</td>
<td>83.00 (17)</td>
<td>78.66 (17)</td>
</tr>
</tbody>
</table>

*P < 0.05; **P < 0.01.
Self-report assessment

According to self-perception questionnaire variables, only half of the participants endorsed a response suggesting that playing was a little bit exciting (versus not exciting) when there was no possibility of winning money ($\chi^2 = 0.290; P > 0.05$). Not surprisingly, all players in the high-expectancy group reported feeling more excited during the last 50 games. In the low-expectancy condition, although their pulse rates did not indicate such a tendency, 11 participants reported that it was more exciting to play when the return rate was at 200% than when it was set at 92%. When asked what was exciting about gambling, 30 participants reported that it was the potential to win money, while only four gave other reasons ($\chi^2 = 72.588; P < 0.001$). When asked if they would play even if there was no possibility of winning money, 28 players stated that they would play less ($\chi^2 = 20.161; P < 0.001$; three missing values).

DISCUSSION

The results of the present study support the hypothesis that winning expectancy is a significant factor influencing arousal. Generating expectancies of winning up to $40 by playing led to an increase in arousal before and during the second gambling session. Even if the excitement experienced while playing could be, in part, the result of wins accumulated while playing, it seems clear that the excitement preceding the game was generated by a winning expectancy. In brief, while playing a video lottery game without the possibility of monetary gain or losses may arouse interest, and even generate an increase in HR, it appears that elevations in arousal become evident when monetary winning expectancies are present. In the absence of monetary winning expectancies, playing becomes less stimulating. These findings show that arousal is not solely due to the fun of playing or to the excitement resulting from monetary risk-taking.

Since the player’s level of arousal influences his or her gambling behavior (Anderson & Brown 1984; Griffiths 1990, 1995), and given that the present results support the hypothesis that expectancies represent one of the variables responsible for the relationship between arousal and gambling (Walters & Contri 1998), it is therefore probable that expectancies are a predominant factor explaining the mechanism underlying the maintenance of gambling habits. These results are consistent with the findings of previous studies reporting that HR increases in certain gambling situations (Anderson & Brown 1984; Leary & Dickerson 1985; Coulombe et al. 1992; Dickerson et al. 1992; Griffiths 1993; Carrol & Huxley 1994; Coventry & Norman 1997) and support the notion that gambling may affect an individual’s mental, emotional and physiological states (Meyer et al. 2000).

It seems possible that the manipulation was confounded with surprise, which might also be related to arousal. This potential confound could imply that the T5 arousal measure comprised both monetary winning expectancy and the surprise effects. However, if there is a surprise effect, this could not have lasted very long and probably would have been registered only at T5. It would probably have had time to fade out before T6 and T7 measures were taken. While we think surprise is an unlikely alternative explanation for the results, we have to consider that it may have had a possible effect on the T5 measure.

Despite the strength of the findings, and even though most participants asserted that the amount of money they expected to win affected arousal, more studies examining the relation between arousal and gambling are needed. In fact, a way of confirming the role of cognitive processes would be to test if different degrees of expectations distributed along a continuum, ranging from none to very high, result in different degrees of excitement. Furthermore, if winning expectancy motivates the player at the beginning of the sessions, it seems possible that as time progresses, winning expectancies will be transformed into a losing expectancy. Does this losing expectancy at the end of a session generate excitement, or another emotion, and eventually other behavior? This question should be explored with further research.

Furthermore, taking into account the influence of risk-taking, as well as the influence of winning and losing expectancies, we obtain a set of three variables that are likely to have an impact on the player’s behavior. Evaluating their respective effects on arousal and behavior would be informative. For example, can arousal alone account for the gambler’s decisions? Would a decrease in winning expectancies among gamblers have the effect of decreasing the frequency with which they gamble? If this is the case, then properly informing players as to the real winning and losing probabilities of VLTs would likely have an impact on their present and future gambling behaviors. The present findings could be included in the cognitive treatment strategy targeting the correction of misconceptions held by gamblers concerning their expectancies. There is no doubt that exploration of all these avenues will contribute to a better understanding of the physiological, emotional and cognitive phenomena related to gambling.

ACKNOWLEDGEMENTS

This study was supported financially by a grant from Loto-Québec.
REFERENCES


