The Role of Subjective Mood States in the Maintenance of Fruit Machine Gambling Behaviour

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Explanations involving the etiology of pathological gambling have tended to emphasize psychosocial factors. However, the possibility that psychobiological factors are important should not be ruled out. Two currently researched psychobiological approaches to gambling involve the role of (i) arousal and (ii) depression. A study analyzing the subjective mood variables of 60 gamblers (44 males and 16 females; mean age 23.4 years) using self report measures was carried out in an attempt to identify which mood states are critical to gambling maintenance. Results indicated that regular and pathological gamblers experienced more depressive moods before playing and that regular and pathological gamblers experienced significantly more excitement during gambling than non regular gamblers. These results are discussed in relation to contemporary literature regarding the roles of arousal and depression in the maintenance of gambling behaviour.

INTRODUCTION

Explanations involving the etiology of pathological gambling have tended to emphasize psychosocial factors. Accepting that these expla-

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nations are of major significance, the possibility that psychobiological factors are also important should not be ruled out. It is possible (and most probable) that such factors interact with psychosocial factors in the development of pathological gambling behaviour. Two psychobiological approaches to gambling that are actively being researched involve the role of (i) arousal and (ii) depression. It could further be the case that these two psychobiological factors are extreme ends of the same continuum with arousal as a positive reinforcer and depression as a negative reinforcer.

The Role of Arousal

Excitement has often been referred to as the gambler's drug (e.g. Boyd, 1982). From psychophysiological studies it has been shown that there is a significant correspondence between the arousal a subject feels and reports and the arousal that is so-called objectively measured (Brown, 1989). Although there has been a much reported link between excitement and gambling, there was little empirical evidence (until recently) to substantiate such claims. In fact, most experiments involving the monitoring of heart rate as a measure of arousal during gambling had found no heart rate increases (e.g. Rule & Fischer, 1970; Rule, Nutler & Fischer, 1971). However, in a pioneering study by Anderson and Brown (1984), the question of ecological validity was raised. Anderson and Brown studied a group of regular gamblers and reported that their heart rates did not increase in laboratory conditions but did in field conditions (i.e. in the casino). This finding provided a possible explanation as to why studies on arousal during laboratory gambling had failed to find heart rate increases above baseline levels.

There is now limited empirical support for the assertion that regular gamblers become aroused during gambling (see Table 1). These studies which have used either heart rate measurement or self report, suggest that gambling is very exciting and that some form of arousal or excitement is a major, or *the* major reinforcer for regular gamblers (Brown, 1987). Brown also suggested that the excitement is subjectively experienced and is an objectively verifiable state of arousal—not sexual, but probably autonomic and/or cortical. There is also an assumption that the gambler is not striving to win a fortune but aiming to maintain a phenomenological state of excitement and/or escape (i.e. an optimum level of arousal). It is also assumed that the

Table 1
Studies of Arousal in Gambling

Researcher	*Type of Gambler*	*n*	*Methodology*	*Finding*
Wray & Dickerson 1981	GA members	51	Retrospective self-report	70% of gamblers feel very/extremely excited during gambling
Anderson & Brown 1984	Blackjack players & undergraduates	24	Heart rate	Regular gamblers' heart rates increased by 23 bpm on average
Leary & Dickerson 1985	Poker machine players	44	Heart rate	High frequency players' heart rates increased by 13.5 bpm
Dickerson & Adcock 1987	Poker machine players	43	State-Trait Anxiety questionnaire	Persistent gamblers significantly more excited than non-persistent gamblers on subjective ratings
Dickerson, Hinchy & Fabre, 1987	Off course bettors	36	State anxiety portion only	(as above)
Brown, 1988	Fruit machine players	12	Heart rate	Players' heart rates increased to an average of 26.75 bpm above baseline after nine minutes
Griffiths, 1990b; 1991	Fruit machine players	50	Self report questionnaire	Pathological gamblers significantly more excited during gambling than non-pathological gamblers
Griffiths, 1993a	Fruit machine players	30	Heart rate	Both regular and non-regular players increased heart rates by 22 bpm

excitement or euphoria is addictive and that because it is short lived, it needs to be repeated (Boyd, 1982).

The Role of Depression

It has long been reported that depression may be a major factor involved with gambling disorders (Israeli, 1937; Greenson, 1947) and was reported by Moran (1970) as the primary orientation of one of his

five types of pathological gambler (i.e. 'symptomatic' type). However, it was not until a study of McCormick, Russo, Ramierez and Taber (1984) that the incidence of co-existent affective disorders was monitored. They found in a study involving 50 pathological gamblers that 76% had a major depressive disorder, 38% were hypomanic, 8% manic and 2% schizo-affective. However, the main problem involving the link between gambling and depression is the direction of causality (i.e. which came first, the gambling or the depression?). McCormick et al.'s study did not distinguish between depression as a consequence of gambling and depression preceding gambling but it did indicate that gambling appeared to function as an "anti-depressant", and suggested that gambling was the only thing which could 'lift' the patients out of depression. Linden, Pope and Jonas (1986) reported in a study of 25 Gamblers Anonymous members they interviewed that 18 of their subjects (72%) had experienced at least one major depressive episode and that 52% had recurrent major affective episodes. There was also a fairly high rate (20%) of panic disorder.

Further evidence that depression is a major problem for pathological gamblers appears in a number of studies by Blasczcynski and his associates (Blasczcynski & McConaghy, 1988; 1989; Blasczcynski, McConaghy & Frankova, 1990) using psychological measures of depression. Logically, if pathological gamblers have co-existent depressive disorders, the use of anti-depressants could be utilized in treating pathological gamblers. Psychopharmacological approaches have been utilized by both Moskowitz (1980) and McCormick et al. (1984) who have reported success by administering lithium to pathological gamblers reducing their impulsiveness and excitability. However, it must be noted that Moskowitz only reported three case studies. More recently, Hollander and his associates (Hollander, Frenkel, Decaria, Trungold & Stein, 1992; Stein, Hollander & Leibowitz, 1993) have advocated the use of clomipramine in the treatment of pathological gambling and have reported success with small numbers of pathological gamblers.

The study to be reported analyzed the subjective mood variables of non regular, regular and pathological gamblers using self report measures in an attempt to identify which mood states appear to be critical to gambling maintenance. Since the study was of an exploratory nature there were no specific hypotheses.

METHOD

Sixty subjects (44 males and 16 females; mean age 23.4 years) all of whom had gambled on a fruit machine at least once in their lives participated. A majority of the 60 subjects were recruited via a small poster advertisement circulated around local university and college campuses. The remainder were recruited via a regular gambler known to the author.

Regular gamblers (29 males and 1 female; mean age 21.6 years) were defined as those who gambled on fruit machines at least once a week. Non-regular gamblers (15 males and 15 females; mean age 25.3 years) were defined as those who gambled on fruit machines once a month or less. It would have been desirable to have equal numbers of males and females in each group, however, only one regular female gambler was located.

The data were derived from a larger experimental study examining the role of cognitive bias and skill in fruit machine gambling, the results of which have been published elsewhere (see Griffiths, 1994). After each subject had taken part in the experimental study, a semi-structured interview followed. During the interview, all subjects were screened for signs of pathological gambling using the DSM-III-R criteria (American Psychiatric Association, 1987) followed by a self report measure developed in previous stages of this research program (see Griffiths, 1990a; b; 1993b) which assessed the mood states of gamblers before, during *and* after gambling. Since there were so many statistical calculations performed during the data analysis, the significance level was set at the 1% level.

RESULTS

Analysis of DSM-III-R Criteria for Pathological Gambling

Of the sixty gamblers, eleven (18%) were diagnosed as pathological gamblers (10 males and 1 female), nineteen (32%) were defined as regular (non-pathological) gamblers (all male) and thirty (50%) were defined as non-regular gamblers (15 males and 15 females). Table 2 displays each diagnostic criterion for pathological gambling and shows

Table 2
Percentages of Non-Regular Gamblers (n = 30), Regular Non-Pathological Gamblers (n = 19) and Pathological Gamblers (n = 11) Meeting Diagnostic Criteria of DSM-III-R for Pathological Gambling and Signficant Differences Between Them[1]

Criterion	*NRG* %	*RG* %	*PG* %	*Sig NRG vs RG*	*Sig RG vs PG*	*Sig NRG vs PG*
Frequently gamble and obtain money to gamble	7	37	91	$p < 0.02$*	$p < 0.007$	$p < 0.0001$
Frequently gamble larger amounts of money	0	5	55	n.s.	$p < 0.005$	$p < 0.0001$
Need to gamble more to get more excited	7	11	45	n.s.	$p < 0.03$*	$p < 0.0096$
Restless if you cannot gamble	0	5	45	n.s.	$p < 0.016$*	$p < 0.0006$
Return to gamble to win back losses	3	58	91	$p < 0.0001$	n.s.	$p < 0.0001$
Make repeated efforts to stop gambling	0	11	36	n.s.	n.s.	$p < 0.003$
Gamble instead of going school/job	0	5	36	n.s.	$p < 0.048$*	$p < 0.003$
Sacrifice other activities to gamble	0	21	64	$p < 0.019$*	$p < 0.047$*	$p < 0.0001$
Continue to gamble even when you owe money	3	42	64	$p < 0.011$*	n.s.	$p < 0.0001$

[1]All percentages to the nearest whole number

Key: NRG = Non-regular gamblers RG = Regular (non-pathological) gamblers
PG = Pathological gamblers *Indicates a trend although not significant at 1% level

the percentages of non-regular gamblers, regular gamblers and pathological gamblers who answered 'yes' to each criterion. Since the DSM-III-R criteria diagnose pathological gambling and the pathological gamblers in this study were differentiated using the DSM-III-R criteria, the pathological gamblers *have* to have a higher total scores on the

criteria than the non pathological gamblers. However, this does *not* necessarily mean they will definitely score higher on each individual criterion. The results show that the more a person gambles the more likely they are to experience signs of pathological gambling. For example, Criterion 1 ("Do you frequently gamble and obtain money to gamble?") was answered "yes" by 7% of the non-regular gamblers, 37% of the regular gamblers and 91% of the pathological gamblers. This order of ascendancy occurred in every one of the nine criteria.

The results also demonstrated that many regular (and a few non-regular) gamblers show signs of pathological gambling. For instance, over a half (58%) of this sample returned to win back their losses (Criterion 5). In comparing DSM-III-R responses of regular versus non regular gamblers, regular gamblers versus pathological gamblers, and pathological versus non pathological gamblers, results (outlined in Table 2) showed that regular gamblers significantly outscored non regular gamblers on four of the criteria, pathological gamblers significantly outscored regular gamblers on six of the criteria, and pathological gamblers significantly outscored non pathological gamblers on all the criteria (see Table 2).

Analysis of Subjective Mood Variables

A number of questions were asked relating to the moods the players experienced before, during and after gambling on fruit machines. Subjects were under no obligation to answer in any one particular way relating to the mood(s) they experienced. As a consequence, it was possible for some gamblers to report that during gambling they felt both aroused and depressed at differing times during the same gambling session. Tables 3, 4 and 5 display the percentages of non-regular, regular and pathological gamblers who experienced various moods and subjective feelings. Most gamblers (approximately two-thirds) usually experienced good moods before, during and after gambling. Using Fisher's Exact Test, results showed that before gambling both regular gamblers ($p < 0.008$) and pathological gamblers ($p < 0.0096$) were significantly more likely to report being fed up / depressed than non-regular gamblers. During gambling, results showed that there were no significant differences between regular and pathological gamblers but that regular gamblers were significantly more likely to experience excitement ($p < 0.01$) than non-regular gamblers, and that patholog-

Table 3
Moods Felt Before Playing Fruit Machines: Percentages of Non-Regular Gamblers (n = 30), Regular Non-Pathological Gamblers (n = 19) and Pathological Gamblers (n = 11) and Their Significant Differences Between Them[1]

Mood	*NRG* %	*RG* %	*PG* %	*Sig NRG vs RG*	*Sig RG vs PG*	*Sig NRG vs PG*
Good mood	60	63	63	n.s.	n.s.	n.s.
Bad mood/angry	3	5	9	n.s.	n.s.	n.s.
Excitement	17	5	18	n.s.	n.s.	n.s.
Fed up/depressed	7	42	45	$p < 0.008$	n.s.	$p < 0.0096$
Other moods[2]	37	16	18	n.s.	n.s.	n.s.

[1]All percentages to the nearest whole number and some players gave more than one response
[2]Other moods refers to those players whose general mood before could not be determined
Key: NRG = Non-regular gamblers RG = Regular (non-pathological) gamblers
PG = Pathological gamblers

Table 4
Moods Felt During Playing Fruit Machines: Percentages[1] of Non-Regular Gamblers (n = 30), Regular Non-Pathological Gamblers (n = 19) and Pathological Gamblers (n = 11) and Their Significant Differences Between Them

Mood	*NRG* %	*RG* %	*PG* %	*Sig NRG vs RG*	*Sig RG vs PG*	*Sig NRG vs PG*
Good mood	43	68	55	n.s.	n.s.	n.s.
Bad mood/angry	3	21	9	n.s.	n.s.	n.s.
Excitement	33	84	82	$p < 0.01$	n.s.	$p < 0.01$
Fed up/depressed	7	32	45	$p < 0.043$*	n.s.	$p < 0.0096$
Not wanting to stop playing	17	32	45	n.s.	n.s.	n.s.
Cannot stop playing	0	0	18	n.s.	n.s.	n.s.
Other moods	37	5	9	$p < 0.017$*	n.s.	n.s.

[1]All percentages to the nearest whole number and some players gave more than one response
[2]Other moods refers to those players whose general mood before could not be determined
Key: NRG = Non-regular gamblers RG = Regular (non-pathological) gamblers
PG = Pathological gamblers
*Indicates a trend although not significant at 1% level

Table 5
Moods Felt After Playing Fruit Machines: Percentages[1] of Non-Regular Gamblers (n = 30), Regular Non-Pathological Gamblers (n = 19) and Pathological Gamblers (n = 11) and Their Significant Differences Between Them

Mood	*NRG* %	*RG* %	*PG* %	*Sig NRG vs RG*	*Sig RG vs PG*	*Sig NRG vs PG*
Good mood	53	84	73	$p < 0.034$*	n.s.	n.s.
Bad mood/angry	3	26	45	$p < 0.027$*	n.s.	$p < 0.0032$
Excitement	23	16	36	n.s.	n.s.	n.s.
Fed up/depressed	10	53	55	$p < 0.02$*	n.s.	$p < 0.0058$
Wishing you were still playing	7	32	63	$p < 0.043$*	n.s.	$p < 0.0004$
Other moods	33	21	0	n.s.	n.s.	$p < 0.04$*

[1]All percentages to the nearest whole number and some players gave more than one response
Key: NRG = Non-regular gamblers RG = Regular (non-pathological) gamblers
PG = Pathological gamblers
*Indicates a trend although not significant at 1% level

ical gamblers were more likely to experience excitement ($p < 0.01$) than non-regular gamblers. After gambling, results showed there were no significant differences between either regular and pathological gamblers but that regular gamblers were more likely to feel in a bad mood / angry ($p < 0.027$) or to feel fed up / depressed ($p < 0.02$) than non-regular gamblers (although these two findings again just failed to reach statistical significance), and that pathological gamblers were significantly more likely to feel in a bad mood / angry ($p < 0.0032$), to feel fed up / depressed ($p < 0.0058$) and to wish they were still playing ($p < 0.0004$) than non-regular gamblers.

DISCUSSION

Results demonstrated that the more regularly gamblers gambled the more likely they are to display signs of pathological gambling as outlined in the DSM-III-R criteria. Although it is virtually tautological that pathological gamblers answered "yes" to each individual DSM-III-

R criterion significantly more than non pathological gamblers (since that is what is trying to be measured), it is interesting to note that regular gamblers also answered "yes" to each of the criteria more than non regular gamblers (and significantly so on four of the criteria) which suggests that some of these regular gamblers are potential pathological gamblers. Those criteria in which the pathological gamblers were significantly different from regular gamblers could be the most important factors that make a regular gambler become pathological (i.e, frequently gambling and obtaining money to gamble, gambling larger amounts of money, excitement during gambling, restlessness if unable to gamble, gambling instead of going to school / job and sacrificing other activities to gamble). Significant differences between regular and non-regular gamblers on the criteria also suggest that these factors are those which appear in the development of gambling from non-regular to regular (i.e. frequently gambling and obtaining money to gamble, returning to win back losses, sacrificing other (non-school / job) activities to gamble and continuing to gamble even when money is owed).

In analysis of the subjective mood variables, the main problem was that so many people consistently gave more than one answer, especially on what moods they experience subjectively after playing. However, most of these related to whether they had won, lost or had experienced a "good" play, i.e. most people said they were in a good mood / excited if they had won a lot of money or had stayed on the machine for a long time, but experienced a bad mood and / or were depressed if they had lost a lot of money or lost what money they had quickly. Despite multiple answers to these questions a number of significant differences still occurred. Both regular and pathological gamblers experienced significantly more depressive moods than non-regular gamblers before and during gambling which once again strengthens the findings of a causal or associational link between depression and gambling (e.g. McCormick et al., 1984). Interestingly, both regular gamblers and pathological gamblers claimed they were still more depressed than non regular gamblers after playing although it was only significant in the case of pathological gamblers versus non-regular gamblers. It could be that one of the reasons pathological gamblers gamble excessively is because their depression is relieved more (however temporarily) after gambling on fruit machines whereas in regular gamblers it is not as much.

Both regular and pathological gamblers experienced significantly more excitement during gambling than non regular gamblers. This finding confirms other studies (e.g. Anderson & Brown, 1984) that excitement during gambling may be a reinforcing factor in facilitating regular and pathological gambling. Combined with the finding that regular gamblers do not need to gamble more to get more excited, it could be that regular gamblers are reinforced through excitement but develop no tolerance whereas pathological gamblers do. Evidence for such an assertion has recently been put forward by this author (Griffiths, 1993a) who reported in an experiment monitoring arousal levels (as measured by heart rate) of 15 regular versus 15 non-regular gamblers, that regular gamblers' heart rates decreased immediately after gambling to baseline levels whereas the non-regular gamblers' heart rates stayed raised. It was argued by the author that the study may be demonstrating tolerance in gamblers in that the non-regular gamblers got "high" while gambling and were still "high" after the playing period was over, whereas the regular gamblers got "high" while gambling but that the "high" disappeared immediately after the playing period was over and therefore would have to play again (or more often) to repeat the experience.

Unsurprisingly, during gambling, pathological gamblers were more likely than non-regular gamblers to say they did not want to and / or could not stop gambling (although, again, this did not quite reach significance) and that after the session was over they were significantly more likely to wish they were still gambling. The finding that regular and pathological gamblers experience significantly bad moods after gambling can almost wholly be explained by the fact that these gamblers reported more big losses and / or bad runs on the machines.

Further to this, results suggest a very strong similarity between pathological gamblers and regular gamblers, i.e. whenever one group expresses a mood difference, the other one does too. The only difference is a matter of *degree*. Such an argument confirms the assertions that have been consistently put forward by Dickerson (e.g. Dickerson & Adcock, 1987; Dickerson, 1989) that excessive gambling has no clear cut characteristics and that persistence at gambling is maintained by differing degrees of arousal and disturbed mood states.

In essence, the study indicated that the subjective moods of the

gamblers do appear to have an effect on their gambling behaviour but that both 'depressed' and [paradoxically] 'excited' states appear to be important in the maintenance of fruit machine gambling. The study was unable to determine which mood variable seemed to be the most important and concludes more work is needed. Possible lines of research include the diagnosis of depression using clinical criteria rather than subjective report and the objective measure of arousal using psychophysiological equipment. It is also unclear to what extent the current findings are applicable to other forms of gambling. This therefore suggests that research into subjective mood states associated with other types of gambling may also be necessary.

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