

The Cognitive Psychology of Gambling

Mark D. Griffiths

University of Exeter, Washington Singer Laboratories

A number of recent studies have shown there may be a strong cognitive bias in explaining persistent gambling. Theories that have been put forward include the illusion of control, "cognitive regret," biased evaluations and the "psychology of the near miss." Two exploratory studies examining the acquisition, development and maintenance of gambling behaviour involving adolescent fruit machine gamblers were carried out. Those factors which directly relate to the cognitive biases (notably erroneous beliefs about skill) during gambling activity are discussed with reference to the above cognitive influences.

People from many schools of thought have asked why some people continue to gamble in spite of persistent losses. Psychoanalytic theorists argue that compulsive gamblers have an unconscious desire to lose and gamble to relieve psychic guilt (e.g. Freud, 1928; Bergler, 1957) whereas behaviourists view pathological gambling as a learned maladaptive behaviour (e.g. Skinner, 1953). Physiological theories argue that the gambler may have a pre-disposed physiological and/or biological

The author would like to thank the United Kingdom Economic and Social Research Council for funding this work through a research studentship. The author would also like to thank S.E.G. Lea for his invaluable advice during the preparation of this manuscript.

Parts of this paper were presented at The Cognitive Psychology Section Conference, British Psychological Society, Cambridge, England, September, 1988.

Requests for reprints should be addressed to Mark Griffiths, BSc, Department of Psychology, University of Exeter, Washington Singer Laboratories, Exeter, EX4 4QG, England.

base to gamble heavily (e.g. Blaszczynski, McConaghy and Winter, 1985) and personality theorists speculate there may be a "gambling personality," that is a trait-cluster that marks the gambler as a habitual or compulsive risk taker (e.g. Greenberg, 1980). However, it seems unlikely that any one theory can fully explain persistent gambling and that the best conceptual models of gambling are those which take an eclectic approach (e.g. Brown, 1986).

Besides the psychoanalytic, behavioural and biological approaches to behaviour, gambling can also be viewed from a cognitive standpoint. Although a single theory of the cognitive psychology of gambling is as unlikely as the other approaches outlined to fully explain persistent gambling, a number of recent studies show there may be a strong cognitive bias involved in gambling behaviour (e.g. Gilovich, 1983) and that gamblers may suffer from illusion of control (Langer, 1975) and other erroneous perceptions, i.e., reference to factors other than chance (Ladouceur and Gaboury, 1988). Psychological variables such as belief in luck and skill are also considered important (Furnham and Lewis, 1983).

THE ILLUSION OF CONTROL

Probably the most influential contribution to the cognitive psychology of gambling was Langer's (1975) experiments on the illusion of control. Langer's hypotheses were based on the observations that some people treat chance events as controllable. For instance, Goffman (1967) reported that Las Vegas dealers who experienced runs of bad luck could easily lose their job. Henslin (1967) studied dice-players and noticed they behaved as if they were controlling the outcome of the toss. This was confirmed when players threw the dice softly for low numbers and hard for high numbers. A year earlier, Strickland, Lewicki and Katz (1966) had shown experimentally that when playing with dice, people bet less money and were less confident if asked to bet after someone else had thrown the dice rather than throwing it themselves, even though probability of success was the same in both situations. Langer argued that these behaviours were rational if the player believed their game was a game of skill.

The illusion of control was defined by Langer (1975) as being "an expectancy of a personal success inappropriately higher than the objec-

tive probability would warrant.” This was tested for experimentally in a series of studies which supported her original hypothesis, i.e., under some circumstances people will produce skill orientations towards chance events.

Langer reported that subjects bet more when cutting cards against a “nervous” competitor than against a “confident” one, and that subjects would sell previously bought lottery tickets for a higher price if they had picked it themselves as opposed to having the ticket “assigned” by someone else. Other experiments showed that certain factors such as the nature of the competition, the familiarity of the task and the degree of personal involvement influence the belief that skill is a controlling force. In essence, Langer’s basic assumption was that in some chance settings, those conditions which involve factors of choice, familiarity, involvement and/or competition may stimulate the illusion of control to produce skill orientations. In a later study involving the prediction of “heads” or “tails” after a coin was tossed, Langer and Roth (1975) reported that early wins during chance games induced a skill orientation. A similar finding was reported by Reid (1986) using a rigged slot machine.

Biased Evaluations and Erroneous Perceptions

Oldman (1974) reported that roulette players see their game as skillful and offer explanations of why they failed. This observation was later tested experimentally by Gilovich (1983) in a study of the biased evaluations in gambling behaviour. In three studies using people who bet on football games, Gilovich demonstrated that subjects transformed their losses into “near wins.” Subjects pinpointed random or “fluke” events that contributed to a loss but were unaffected by identical events that contributed to a win. It was also reported that subjects spent more time discussing their losses and discounting them in addition to “bolstering” their wins. The same effects were also found in gambling activities (e.g. computerised bingo) in which losses could not easily be explained away (Gilovich and Douglas, 1986).

More recently, Gaboury and Ladouceur (1988) reported on the erroneous perceptions people produce while gambling. In two studies they evaluated the cognitive activities of subjects while they played either slot machines or roulette using the “thinking aloud” method. Analysis of the verbalizations revealed that erroneous perceptions of

the games (80%) far outnumbered the adequate perceptions. For instance, people attributed their success to personal factors such as skill whereas external factors (like bad luck) accounted for losses. Similar findings have been reproduced in other experiments by Ladouceur and associates (Ladouceur and Gaboury, 1988; Ladouceur, Gaboury, Dumont and Rochette, 1988).

Cognitive Regret and the Psychology of the Near Miss

Reid (1986) noted that near misses, i.e., failures that are close to being successful, are believed to encourage future play, and that some commercial gambling activities (e.g. coin-in-the-slot fruit machines and instant lotteries) are formulated to ensure a higher than chance frequency of near misses.

Reid argued that at a behaviouristic level, a near miss may have the same kind of conditioning effect on behaviour as a success. For example, a fruit machine pays out money (and thus reinforces play) when three winning symbols are displayed. However, a near miss, e.g., two winning symbols and a third losing one, is still strongly reinforcing at no extra expense to the machine's owner. Thus, at a lower cognitive level, a near miss could produce some of the excitement of a win (i.e., cognitive conditioning through secondary reinforcement). Reid pointed out that the near miss can also be explained in terms of Amsel's (1958) frustration theory. Basically, failing to fulfill a goal produces frustration which (according to the theory) strengthens ongoing behaviour.

According to Kahneman and Tversky (1982), the frustration produced by "nearly winning" induces a form of cognitive regret. Loftus and Loftus (1983) elaborated on this idea and suggested that the elimination of regret may be achieved by playing again — encouraging persistent play (see Reid, 1986).

Fruit Machines

Traditionally, fruit machines have been viewed as games of pure chance. Most machines have the same basic design consisting of three reels with differing numbers of "fruit" symbols which spin on a random ratio schedule after money has been inserted. The pay out rates of between 70–90% are decided by the owner and/or manufacturer and money is won when the reels show a winning line, e.g., a row of three

“cherries.” However, the machines have become increasingly complex and with the emergence of “nudge” and “hold” buttons, elements of perceived skill have been introduced (see Appendix for definitions of play features on fruit machines).

The purpose of the following two studies was to examine the existence of erroneous beliefs about skill in chance settings (i.e., the illusion of control) in adolescents. Most of the previous research examining cognitive biases in gambling behaviour has been performed in the laboratory with undergraduate students. However, the following research to be reported are essentially two *field* studies which attempt to examine the cognitive biases of *actual* gamblers.

Study 1 was an exploratory study involving a group discussion with a small group of self confessed “addicted” gamblers. The findings suggested a skill orientation among adolescent gamblers which was examined more systematically with a larger sample of adolescent gamblers in Study 2.

STUDY 1

Method

During an informal discussion, a group of self confessed addicted adolescent fruit machine gamblers ($n = 8$, male; mean = 19 years) were asked questions about the acquisition, development and maintenance of their gambling behavior, however, only those factors which relate to cognitive biases during gambling are discussed. Although they were not tested for signs of pathological gambling using the diagnostic criteria of the American Psychiatric Association (1987), it was clear from initial conversation that the criteria would have been fulfilled had the diagnosis been undertaken.

Results

During the discussion, all the group commented upon the skillful aspects of fruit machine playing. They claimed they were fully aware that they would lose every penny they possessed in the long run (playing “with” money rather than “for” it) but their expressed philosophy behind playing was “to stay on the machine as long as possible

using the least amount of money" in much the same way as a video game player would. This statement implies that fruit machine playing has an element of skill in that the time taken to lose all your money can be lengthened by skillful playing. However, it was explained that chance could still be an overriding factor because "an 'experienced' player could lose £5 in as many minutes." Even the use of the word "experienced" implies some players are better than others through their skillful play.

Knowledge of the reel positions was the single most important factor in skillful playing and was a necessity when using the "nudge" buttons, and to some extent when using the "hold" buttons. However, the group acknowledged that the complexity of fruit machines had evolved rapidly in the ten years that some of them had been playing them, and that skillful playing now involved good tactile, visual and auditory co-ordination. The fact that most of them had "favourite machines" reflected the belief that they were better (through familiarity) on one particular fruit machine than other less familiar ones.

None of the group claimed to use any kind of mathematical probability evaluation when playing, but a couple of the group sometimes watched others playing, mentally noting pay outs in addition to watching the machines "fill up with other people's money." By watching the machines, regular players could apparently get a rough idea of which machines paid out the most and when, and give themselves a longer play expectation.

Interestingly, the group unanimously stated they experience a "high" while playing which they claimed was physiological (as opposed to psychological) because they could feel their heartbeats getting faster and faster. This was especially noticeable to the players when they were winning or "near winning," i.e., a visual display showing two winning symbols and a third losing one.

STUDY 2

Method

Sixty-nine adolescent fruit machine players were approached as they came in or out of an amusement arcade and were asked if they would participate in a questionnaire study examining factors in the

acquisition, development and maintenance of gambling behavior. The questionnaire consisted of fifty-eight questions, six of which were open ended. All remaining questions were of a forced choice variety. Only those questions relating to skill perceptions will be discussed since the remaining findings have been reported elsewhere (Griffiths, 1988a). Fifty players (thirty-nine males, eleven females; mean = 16.2 years) agreed to take part, and nine of these (all male) were deemed to be pathological gamblers according to the American Psychiatric Association (1987) diagnostic criteria.

Results

In response to the forced choice question "Why did you first start playing fruit machines?" and "Why do you play fruit machines now?", 28% and 18% of the sample respectively reported "for a challenge" as at least one of their reasons (see Table 1 for other reasons). This answer implied that fruit machine gambling was an activity that could be mastered, although the higher "reason for starting" figure (28%) over "reason for continuing" (18%) was probably due to incorrect preconceived expectations, i.e., some players who originally started for a challenge eventually realized the fruit machine could not be beaten in the long run.

When asked the forced question "Is there any skill in playing fruit machines?" only 12% reported there was no skill whatsoever, although 40% reported that "mostly chance" factors were present when playing. However, 48% of the respondents reported there was some degree of skillful activity. Interestingly, all nine players who were classified as pathological gamblers reported there was some skill in playing fruit machines (see Table 2). By collapsing the responses into two categories "all/some skill" vs. "all/mostly chance," the difference between pathological ($n = 9$) and non-pathological ($n = 41$) gamblers was significant using the Fisher Exact ($p < .001$).

In an open ended question asking specifically "What skill is involved in playing fruit machines?", the 48% who originally reported that playing was in part skillful gave nine different answers. (All the replies are recorded in Table 3, constructed inductively by the author after going through responses). Six of the nine responses included a reference to "knowledge" of some particular feature of the fruit machine. Some of the replies were quite elaborate, e.g., "each machine

Table 1
Reasons for playing fruit machines as reported by players (n = 50)

	<i>Reason(s) for starting</i>	<i>Reason(s) for playing now</i>
<i>Parents did/do</i>	26 %	0 %
<i>Friends did/do</i>	44 %	58 %
<i>To impress friends</i>	4 %	2 %
<i>Nothing else to do</i>	38 %	50 %
<i>For a challenge</i>	28 %	18 %
<i>For fun</i>	90 %	84 %
<i>To win money</i>	70 %	48 %
<i>To meet friends</i>	20 %	30 %
<i>Miss if not</i>	–	20 %
<i>Can't stop</i>	–	10 %

N.B. Most players gave more than one answer.

Table 2
Players replies to "Is there any skill in playing fruit machines?"

	<i>Non-Pathological Gambling Sample (n = 41)</i>		<i>Pathological Gambling Sample (n = 9)</i>		<i>Total Sample (n = 50)</i>	
	<i>No. of people</i>	<i>%</i>	<i>No. of people</i>	<i>%</i>	<i>No. of people</i>	<i>%</i>
<i>All Skill</i>	0	0	0	0	0	0
<i>Mostly Skill</i>	15	36	9	100	24	48
<i>Mostly Chance</i>	20	49	0	0	20	40
<i>All Chance</i>	6	15	0	0	6	12
<i>Total</i>	41	100	9	100	50	100

has its own personality and you have to master it. You have to relate to it and know what its next move is going to be." However, in simple terms it meant little more than knowing how to operate a particular machine. One player's reply did not actually mention a particular feature of skillful playing but he implied skill existed by reporting "like

Table 3
Skill factors in fruit machine gambling as reported by the players
(n = 24)

<i>Skill Factor</i>	<i>No of people Reporting</i>	<i>% Total of Sub sample (n = 24)</i>	<i>% Total of Whole sample (n = 50)</i>
Knowledge of reel positions and symbol displays	17	71	34
Knowledge of "nudge" and "hold" buttons in prolonging play	9	38	18
Knowledge of a particular machine and how to operate it	8	33	16
Knowledge of "bank" buttons and "double or quit" ("gamble") strategies	4	17	8
Knowledge of token pay outs vs. money pay outs	4	17	8
Quick reflexes and quick decisions re: display	4	17	8
Hand-eye co-ordination	2	8	4
Knowing when the machine is "full of money"	2	8	4
Probability of pay outs	1	4	2

Notes (a) Most players gave more than one answer.
(b) Percentages are to the nearest whole number.

any game, the more you play the better you get." This was a clear example of someone who believed "practice makes perfect."

It was noted that 42% of the players reported that they had lost over £10 in one playing session at least once and that a number of them spontaneously added comments like "I had some bad luck," "I was having a bad day," or "I wasn't concentrating," i.e., they discounted big losses as due to external influences.

Discussion

These exploratory studies of adolescent gambling behaviour add to the growing body of findings which suggest that cognitive factors are important in the explanation of gambling activity. Although other factors in adolescent gambling behaviour have been explored (e.g., Lesieur and Klein, 1987; Ladouceur and Mireault, 1988; Griffiths, 1988a; b) it is unclear to what extent cognitive variables influence its persistence.

One factor that should be examined is whether the skill in playing fruit machines is "actual" or "perceived." This could be achieved by giving the same amounts of money to regular players and very occasional players and determining whether regular players can play on the fruit machines for significantly longer periods than the novices. It could be that the recent introduction of specialist play features (e.g., "nudge" and "hold" buttons) stimulate the illusion of control through personal involvement and familiarity of particular machines, in addition to their being perceived as elements of skill.

It appears that those players defined as pathological gamblers had a greater skill orientation than other less regular players. This strengthens the argument that cognitive factors may be crucial in understanding persistent gambling. The observation that gamblers give biased evaluations (Gilovich, 1983) and make erroneous perceptions (Gaboury and Ladouceur, 1988) towards their gambling behaviour was supported. This was particularly apparent in the explaining away of big losses or in reasons for "bad playing," although the explanations tended to come from the non-pathological gamblers. It also appears that statistical and probabilistic knowledge play little part in evaluating gambles made on the fruit machines and that regular players simplify judgements by focusing on prolonged play rather than winning money.

A factor that could prove rewarding in the explanation of persistent fruit machine gambling is the psychobiology of the near miss. Findings suggested that regular players get physiologically aroused when they win or when they "nearly win" and this may explain why the player continues to gamble in spite of constant losses. In the gamblers' terms, they have constant "near wins" which are physiologically stimulating and reinforce further play.

If, as it seems, cognitive factors do play an important role in the development and maintenance of gambling behaviour, the knowledge of the gambler's own negative thoughts and feelings could provide potentially useful cues in cognitive behaviour modification (Stumphauzer, 1980; Griffiths, 1989) and, as Gaboury and Ladouceur (1988) conclude, recognition of biased perceptions may help not only in treatment of the pathological gambler but also in future programmes of gambling prevention schemes.

APPENDIX 1

Glossary of Play Features on a Fruit Machine

- NUDGE:** When lit, the "nudge" button can be pressed to move any fruit machine reel into a winning position after automatic play is over.
- HOLD:** When lit, the "hold" button can be pressed to keep stationary any fruit machine reel in a winning position before automatic play has started.
- COLLECT:** When pressed, the "collect" button releases all winnings into the pay out tray.
- BANK:** When lit, the "bank" button can be pressed to store winnings to either "collect" when voluntary play is over or for use in further playing once the player has no more money.
- GAMBLE:** When some of the fruit machines' graphics flash on and off, simultaneous pressing of the "gamble" button while selected graphics are lit doubles the winnings. This is a "double or quit" feature, but is subject to variations on a number of machines.
- TOKENS:** These are winnings which have no real monetary value except the entitlement of "free plays" on the machine. However, it is possible to win money on a token play.

REFERENCES

- American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders*, (3rd Edition - revised), Author: Washington D.C.
- Amsel, A. (1958). The role of frustrative non-reward in non-continuous reward situations. *Psychological Bulletin*, 55, 102-119.
- Bergler, E. (1957). *The psychology of gambling*. Hill and Wang: New York.
- Blaszczynski, A.P., McConaghy, N. & Winter, S.W. (1986). Plasma endorphin levels in pathological gambling. *Journal of Gambling Behavior*, 2, 3-14.
- Brown, R.I.F. (1986). Arousal and sensation seeking components in the general explanation of gambling and gambling addictions. *International Journal of the Addictions*, 21, 1001-1016.
- Freud, S. (1928). Dostoyevsky and parricide. In J. Strachey (Ed.). *The standard edition of the complete psychological works of Sigmund Freud*, 21, 177-121. Hogarth Press: London.
- Furnham, A. & Lewis, A. (1983). *The economic mind*. Harvester Press: London.
- Gaboury, A. & Ladouceur, R. (1988). *Erroneous perceptions and gambling*. Unpublished manuscript.
- Gilovich, T. (1983). Biased evaluations and persistence in gambling. *Journal of Personality and Social Psychology*, 44, 1110-1126.
- Gilovich, T. & Douglas, C. (1986). Biased evaluations of randomly determined gambling outcomes. *Journal of Experimental Social Psychology*, 22, 228-241.
- Goffman, E. (1967). *Interaction ritual*. Anchor: New York.
- Greenberg, H. (1980). Psychology of gambling. In Kaplan, H.I., Feedman, A.M., and Sadcock, B.J. (Eds.): *Comprehensive textbook of psychiatry*, 3rd Edition. New York: Williams and Wilkins.
- Griffiths, M.D. (1988a, September). *The acquisition, development and maintenance of fruit machine gambling in adolescents*. Paper presented at the Social Psychology Section Conference, British Psychological Society, University of Kent, Canterbury.
- Griffiths, M.D. (1988b). Fruit machine gambling in addicted adolescents. *Society for the Study of Gambling Newsletter*, 14, 17-19.
- Griffiths, M.D. (1989). Gambling in children and adolescents. *Journal of Gambling Behavior*, 5, 66-83.
- Henslin, J.M. (1967). Craps and magic. *American Journal of Sociology*, 73, 316-330.
- Kahneman, D. & Tversky, A. (1982). The psychology of preferences. *Scientific American*, January, 136-142.
- Ladouceur, R. & Gaboury, A. (1988). Effects of limited and unlimited stakes on gambling behavior. *Journal of Gambling Behavior*, 4, 119-126.
- Ladouceur, R., Gaboury, A., Dumont, M. and Rochette, P. (1988). Gambling: Relationship between the frequency of wins and irrational thinking. *Journal of Psychology*, 122, 409-414.
- Ladouceur, R. & Mireault, M. (1988). Gambling behaviors among high school students in the Quebec area. *Journal of Gambling Behavior*, 4, 3-12.
- Langer, E.J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, 32, 311-328.
- Langer, E.J. & Roth, J. (1975). The illusion of control as a function of the sequence of outcomes in a purely chance task. *Journal of Personality and Social Psychology*, 32, 951-955.
- Lesieur, H.R. & Klein, R. (1987). Pathological gambling among high school students. *Addictive Behaviors*, 12, 129-135.
- Loftus, G.R. & Loftus, E.K. (1983). *Mind at play*. Basic Books: New York.
- Oldman, D. (1974). Chance and skill: A study of roulette. *Sociology*, 8, 407-426.
- Reid, R.L. (1986). The psychology of the near miss. *Journal of Gambling Behavior*, 2, 32-39.
- Skinner, B.F. (1953). *Science and human behavior*. Macmillan: New York.
- Strickland, L.H., Lewicki, R.J. & Katz, A.M. (1966). Temporal orientation and perceived control as determinants of risk-taking. *Journal of Experimental and Social Psychology*, 2, 143-151.
- Stumphauzer, J.S. (1980). Learning to drink: Adolescents and alcohol. *Addictive Behaviors*, 5, 277-283.