

Underlying Cognitions in Gambling Behavior Among University Students¹

HAYLEY R. BABOUSHKIN, KAREN K. HARDOON,
JEFFREY L. DEREVENSKY,² AND RINA GUPTA

McGill University

Differences in underlying cognitions across gambling tasks were examined. The South Oaks Gambling Screen, a measure of pathological gambling, was completed by 60 undergraduate students. They also played computer-simulated games of roulette, slots, and blackjack in a laboratory setting. The "think-aloud" procedure was used to reveal subjects' cognitions, which were subsequently categorized into cognitive heuristics. Individuals were classified as social gamblers with and without problems and probable pathological gamblers. Results reveal that certain heuristics, including references to an explanation of their losses, hindsight bias, personification of the dealer/machine, chasing behavior, and past experiences were most frequently endorsed by probable pathological gamblers. Empirical evidence supports that probable pathological gamblers are qualitatively different from social gamblers in their emitted verbalized cognitive heuristics.

Research on gambling generally has focused on identifying the reasons reported for engaging in gambling behavior in order to determine the underlying motivations or rationale behind this activity. The primary reasons for gambling are reported to be enjoyment, excitement, and winning money, with similar results being found for adolescents and adults (Gupta & Derevensky, 1998; Wynne, Smith, & Volberg, 1994). Although previous studies have suggested that the primary reasons reported for gambling focus on the entertainment, excitement, and enjoyment derived from gambling, a growing body of research has centered on the cognitive biases that promote and maintain gambling behavior in spite of repeated failure.

A cognitive perspective may be one component to the understanding of the regular gambler's behavior and provides an explanation of the individual's perseverance despite persistent failure. Regular gamblers hold a set of beliefs, many of which are false (irrational thoughts, erroneous cognitions, and misperceptions),

¹This is a revision of a paper presented at the 10th International Conference on Gambling and Risk-Taking, Montreal, Quebec, Canada, 1997. This research was partially supported by a grant from Loto-Quebec to Jeffrey Derevensky.

²Correspondence concerning this article should be addressed to Jeffrey L. Derevensky, Department of Educational and Counseling Psychology, McGill University, 3724 McTavish Street, Montreal, Quebec, Canada H3Y 1A2. e-mail: in04@musicb.mcgill.ca

have an illusion of control (Langer, 1975), and perpetuate the inaccuracies associated with a lack of knowledge concerning the independence of chance events (Ladouceur, Dubé, Giroux, Legendre, & Gaudet, 1996). The underlying assumption, from a cognitive framework, is that the motivational component of gambling, the expectation of overall monetary gain, and the desire to beat the game combine with these erroneous beliefs and propel the individual to continue to gamble despite repeated losses (Ladouceur & Walker, 1996).

In order to understand gambling behavior, one perspective is to view it within the context of a theory of cognition. According to Wagenaar (1988), an understanding of one's heuristics and biases provides a contextual paradigm in which to examine gambling behavior. These heuristics and biases provide the necessary framework that underlies gambling behavior. In general, individuals have a large repertoire of strategies to use for decision making and select specific strategies based on the similarity between a current situation and previous situations in which their behavior was successful. Wagenaar has delineated several heuristics and cognitive biases employed in daily problem solving. Yet, these same previously successful problem-solving strategies and heuristics, when used in gambling situations, are often deemed irrational. Such heuristics include (a) *hindsight bias*, where individuals are not surprised retrospectively about the outcome, and even believed that they actually had predicted it; (b) *flexible attributions*, the tendency to attribute success to one's own skill and failures to external influences; and (c) *availability bias*, where probability judgments are affected by examples easily recalled from memory.

Another salient cognitive distortion common among gamblers is the *illusion of control*, such that the gambler behaves as if the activity contains a high degree of skill that is instrumental in predicting the outcome. When gambling, many individuals maintain disproportionately high expectations despite the fact that the actual probability of success is quite low. Langer (1975), identifying factors underlying this illusion of control, suggested that in situations involving chance events, where outcomes are unpredictable, individuals behave as they would in situations that require skill and subsequently incorrectly perceive that they maintain control over the outcome. A recent study examining children's perceptions of gambling revealed that while 70% believed that gambling behavior involves "a lot of luck," 56% reported that "a lot of skill" is also instrumental (Derevensky, Gupta, & Della Cioppa, 1996). While acknowledging that luck plays a large role in gambling, even young children maintain the illusion that a substantial degree of skill is necessary in predicting the outcome of chance events.

The concept of *chasing behavior*, the perpetuation of gambling following a series of losses often with increased bets, is similarly an important construct to consider in understanding the behavior of problem gamblers (Dickerson, 1993). The pathological gambler increases wagers in an attempt to recoup losses, and subsequently gets caught up in the excitement of the game (Lesieur, 1979).

Research indicates that chasing behavior is evident in both the gambler's cognitions as well as actual playing behavior, and that personality and cognitive factors can serve to influence chasing behavior (Breen & Zuckerman, 1996).

The notion of employing faulty cognitions that ultimately maintain and support one's gambling behavior is not exclusive to those who gamble. Nongamblers employ many cognitive distortions when gambling in a laboratory setting, and thus cognitive biases by themselves do not constitute a sufficient explanation as to why individuals continue to gamble or gamble to excess. Nevertheless, these biases and erroneous perceptions are more prevalent as gambling involvement increases in the face of consistent and pervasive losses (Ladouceur & Walker, 1996).

In an investigation of the erroneous cognitions associated with slot-machine playing, Walker (1992) concluded that it is erroneous cognitions that maintain the individual's gambling behavior despite repeated losses. The occasional large payoff provides sufficient reinforcement for players who inaccurately believe that they can influence the outcome and inevitably win. These distorted biases promote the false notion that overall monetary gain can be achieved through perseverance and hard work.

Griffiths (1994) further investigated the role of cognitive bias in 60 young adults playing fruit machines (slot machines). Having the participants use the think-aloud procedure, he found that regular gamblers (gambling once a week or more) made significantly more verbalizations in two categories: personification of the machine (e.g., "The machine likes me") and references to the "number system" (e.g., "I got a 2 there"). Although the majority of both regular and nonregular gamblers' (once a month or less) verbalizations were rational, regular gamblers produced a larger number of irrational statements. The results suggest that individuals who gamble on a regular basis exhibit a greater frequency of faulty cognitions. However, it remains to be seen whether erroneous cognitions play a further role in distinguishing between individuals who demonstrate pathological gambling problems and those who merely gamble on a regular basis but do not exhibit patterns of severe gambling problems. Further, fruit machines represent only one type of gambling activity—one based entirely on luck.

Prior research examining cognitive biases that individuals endorse while gambling is limited in that it only focused on cognitions with respect to one form of gambling activity. It remains unclear whether there are differences in individuals' cognitions across various games that incorporate varying levels of skill and luck. A repeated-measures design would permit generalizability of the results.

Despite some inconsistent findings, much of the gambling literature suggests that gambling is more popular among males than females (Fisher, 1993; Ladouceur, Dubé, & Bujold, 1994; Lesieur et al., 1991; Stinchfield & Winters, 1998), with pathological gambling being twice as prevalent for males than females (Lesieur & Klein, 1987; Lesieur et al., 1991; Stinchfield & Winters,

1998; Volberg, 1994; Volberg & Steadman, 1988, 1989). Within a cognitive context, no research has sought to determine whether any differences in cognitive distortions exist between males and females.

The examination of erroneous cognitions in individuals of varying levels of severity of gambling problems is a necessary component of research aimed at identifying the possible causes and correlates of pathological gambling. Such research serves to distinguish motivational factors and conditions of maintenance associated with gambling behavior. Differences in the heuristics and biases maintained by individuals with varying levels of gambling involvement and severity of gambling problems need to be examined.

The present study builds on previous research by investigating possible differences in cognitive beliefs and perceptions across various games, including blackjack, roulette, and slots. Since regular gamblers engage in multiple forms of gambling, it is important to examine whether cognitive perceptions vary across games. A determination of the differences in underlying cognitions manifested in games of varying levels of skill may have important clinical implications.

Method

Participants

The sample originally consisted of 63 undergraduate students; however, 3 individuals did not produce verbalizations (i.e., did not speak while playing the games) and were thus excluded from the present analyses. The final sample consisted of 60 participants (30 females, 30 males) who were attending McGill University in Montreal. The students, ages 19 to 33 years ($M = 22.4$, $SD = 3.3$), were recruited from various departments across the university in order to provide a representative sample. This sample was part of a larger study designed to examine the relationship between gambling and risk-taking behavior.

All of the participants were volunteers. Furthermore, it is important to note that the present sample was self-selected. Because of time and financial constraints, it was impossible to recruit additional subjects. However, despite the small sample, there was an adequate number of probable pathological gamblers, which permitted a careful examination of this group.

Measures

South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). This is a 20-item scale used to determine the presence or absence of pathological gambling. The measure was developed on a clinical sample and is the most widely used instrument to assess problem/pathological gambling. The SOGS should not be viewed as a predictive instrument, but rather is designed to capture a snapshot in

time. The SOGS has good internal reliability ($r = .97$) and validity ($r = .86$). Test-retest correlations were found to be better for outpatients ($r = 1.00$) than for inpatients ($r = .61$). Further, the SOGS was found to be highly correlated with the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R; American Psychiatric Association, 1987; $r = .94$).

Although the original classification for probable pathological gambling by Lesieur and Blume (1987) consists of a score of 5 or more, the authors of the present study wished to distinguish between pathological gamblers and gamblers experiencing some problems. Thus, a total score was calculated by classifying a gambler as having no problems (SOGS = 0), some problems (SOGS = 1-4), or as a being probable pathological gambler (SOGS \geq 5).

Gambling activities. Computer-simulated games of blackjack, roulette, and slots were included. An IBM-compatible computer was used in order to render the games as realistic as possible. The MS-DOS computer software *Blackjack! Version 2.20D* (Granger, 1991) simulates a casino blackjack game. The computer software *Caesar's Palace for Windows* (Masteller & Masteller, 1993) was used to simulate roulette and slot machines. Blackjack was selected since it incorporates both elements of randomness and skill (using laws of probability). Although roulette is primarily perceived as a game of chance, it involves some choice and thus contains a perceived element of control. In contrast, slots are purely a game of chance involving no choice, and therefore may be perceived as involving less skill. Thus, the three different games selected are believed to represent gambling activities with varying degrees of perceived skill.

Procedure

Students were ensured confidentiality, and the identity of the participants remained anonymous. Upon completion of a questionnaire and the SOGS (Lesieur & Blume, 1987), all of the participants played the computer-simulated casino games, which were administered in a random order.

Because of ethical constraints, the participants did not play with real money during the gambling task. Rather, they were provided with a bankroll of \$100 and were given the incentive of acquiring movie and restaurant gift certificates proportionate to their winnings. More specifically, for every \$10 they won above the initial \$100 at the conclusion of the game, they were given a ticket to be entered into a drawing for three prizes (1st prize was a \$30 gift certificate for a popular restaurant, 2nd prize was a \$20 movie gift certificate, and 3rd prize was a \$10 gift certificate to a local restaurant). Therefore, the greater the number of tickets a participant won and entered into the drawing, the greater the chance of winning a prize.

Participants played each game for 10 min (a total of 30 min on the computer), until their bankroll was depleted, or until they wished to terminate. A research

assistant administered standardized instructions to the participants while providing a demonstration specific to each game. In order to ensure adequate understanding of the tasks, participants had several practice trials for each game in the presence of the research assistant. In order to simplify the game of roulette, the type of bet was limited such that participants could only bet on even, odd, black, or red. This served to maintain the same probability and odds of winning for each participant.

The think-aloud procedure, developed by Ladouceur, Gaboury, Dumont, and Rochette (1988), was used to reveal participants' cognitions while they were playing. The following standardized instructions were given to each individual:

1. Say everything that goes through your mind. Do not censor intentions, ideas, or images. Do not try to judge whether it is interesting or not.
2. Speak as continually as possible, even if your ideas are not well structured or even if they are repetitive.
3. Speak aloud and clearly.
4. You may speak in telegraphic style; do not worry about complete sentences.
5. Do not try to justify yourself.

All verbalizations for each game were audiotaped while individuals were playing. The tapes were later transcribed and coded into either cognitive or affective/qualitative heuristics (Table 1). The cognitive heuristics involve erroneous perceptions or false beliefs and include references to an illusion of control, hindsight bias, and references to chasing behavior. The affective/qualitative heuristics encompass verbalizations that are noncognitive in nature and include statements or questions pertaining to the game, statements reflecting confusion, statements about the playing experience, and references to wins and losses. An interrater reliability of .80 was obtained for the coding. The cognitive heuristics were then divided into rational and irrational categories (Table 2). Many of these heuristics were based on previous research and theoretical concepts of Langer (1975), Wagenaar (1988), and Griffiths (1994), while others were developed according to the verbalizations produced.

Results

Because of the small sample size, the means for each heuristic were quite small. Further, there was variation within the levels of gambling involvement with respect to amount of verbalizations, with some participants making many statements and others making relatively few. As a result, analyzing the total number of statements and examining raw means would distort the findings.

Table 1

Cognitive Heuristics/Biases

Heuristic	Definition/examples
Reference to luck	All statements referring to the fact that the gambling task involved an element of luck: "That was pure luck, this game involves luck, no skill"; "It doesn't matter what I do or bet, nothing I can do to increase chances of winning, all are due to chance"
Reference to skill	All statements referring to the fact that the gambling task involved an element of skill (both rational and irrational), control, or strategy: "This one (blackjack) you have a little more control," rational; "The strategy is if you bet low at first and if you win you keep betting low, and if you lose the next time you bet higher because you're eventually going to lose if you keep losing," irrational
Laws of randomness†	Attempts to determine laws of nature, equilibration, 50/50, keeping same bet because it hasn't come up lately and is bound to win, change bet after winning/losing, break pattern to avoid regularity: "I'm going red and even—it has been mostly black"; "Odd hasn't come up lately so I'll bet it"
Illusion of control††	Cause and effect, relating outcome to amount bet: "When I bet 2 coins, it's nice to me"
Hindsight bias‡	After the outcome has been revealed, individuals say they knew it would happen and act as if they had predicted it: "I knew it!"
Reference to risky behavior	Statements referring to taking risks or to the risky nature of the gambling task: "Go for the gold, put all my money left on . . ."; "This is a risky game"; "I'll take a risk"
Reference to addiction	Includes references to the fact that it's hard to stop playing: "This game is addictive . . . one more try . . . one more try"
Reference to chasing behavior	Increases bet to chase losses without mention that increase of bet might also lead to further losses: "I doubled my bet because I lost now"; "I am going high, I have to go high, I have to win my money back"

(table continues)

Table 1 (Continued)

Heuristic	Definition/examples
Past experience†	When past experiences (within experiment or previously) seem to be influencing current betting (learned behavior): "Red is not coming anymore so I'll bet \$25 on black"; "I'll go for black again—black was good for me last time"
Significant numbers/colors	References to lucky/significant numbers or preferred colors: "I like the color red"; "I'll bet 3 . . . 3 is my lucky number"
Personification ††	Adjectives/attributes, talking/swearing at machine/dealer, saying, "Come on/Yeah" in response to machine: "Let's go, even!"; "Come on, red!"; "I wish I had more money—I could kick his ass!"
Explaining away losses††	Statements reflecting attempts to provide justifications for losses (both rational and irrational): "I would have lost anyway"; "I would have busted anyway, so big deal, rational; "I never win both (color and even/odd), so I can just bet one thing—that's probably why I'm losing"; "Oh no (lost)—this is what happens when you play fast," irrational
Reference to behavior maintaining winning streak	Increase bet after winning in order to further increase wins (greedy): "I'm winning some money back, so I'll bet a bit more"
Reference to behavior minimizing losses	Conservative play, decrease bet after losses, not increasing or decreasing bet to secure winnings: "I'm losing my money, so I'll lessen my bet."
Conditional statements	Making a deal: "If I win, then I'll increase my bet"
Regret	Statements referring to the fact that they regret decisions made or wish they had done things differently: "I should have done this . . ."; "I wish I had . . ."
Affective/qualitative heuristics	
Blackjack dealer hand	Referring to the dealer's hand when it influences judgments/betting: "The dealer has 13, so I'm sticking with 14"

(table continues)

Table 1 (Continued)

Heuristic	Definition/examples
Decision to stop playing	Stop because of loss/dislike, stop in order to secure winnings or minimize further losses: "I might as well quit while I'm behind"; "I'm up by 10—I'm going to quit"
Statements about playing experience	Physical/physiological (heart rate, tired, sweating), emotions (excited, bored, nervous, frustrated, stressed), enjoyment: "I can't decide whether this game is fun, exciting, or actually puts you in a drone state—it is fun, though"
Reference to win/near win/loss††	Direct and indirect references to wins and losses: "I won/lost"; "I'm down/up to . . ."; "I only have \$X"
Questions/statements relating to confusion††	Statements referring to confusion: "What's going on?"; "Why am I losing?"; "I don't understand this"
Self-statements	Statements that characterize themselves: "I'm good at this game"; "I'm a good gambler"; "I'm not a risk taker"; "I'm lucky"
Reference to unrealistic setting	Statements referring to the fact that the laboratory setting is unrealistic or that they are not playing with real money: "I wish it were real money"; "Too bad I don't get this money"; "If this was my money, I would probably not play this—probably be more conservative"
Miscellaneous	Statements relating to games or gambling in general, playing behavior, and cognitions that do not fit into any of the other categories: "I can't believe people spend money on slot machines"; "It's fun watching this game in the casino because of how much money flies around!"

Adapted from: †Ladouceur et al. (1988), ††Langer (1975), ‡Wagenaar (1988), ††Griffiths (1994).

Therefore, the percentage of individuals endorsing a particular heuristic was examined in order to obtain a more accurate representation. Further, analyses comparing nongamblers and gamblers were excluded from the present results because of large differences in the sizes of these groups.

Table 2

Cognitive Heuristics Categorized as Rational and Irrational

Rational	Irrational
Reference to luck	Reference to skill (irrational)
Reference to skill (rational)	Laws of randomness
Reference to risky behavior	Illusion of control
Reference to addiction	Hindsight bias
Behavior minimizing losses	Reference to chasing behavior
Blackjack dealer hand	Past experience
	Significant number/color
	Personification
	Explaining away losses (irrational)
	Maintaining winning streak

Distribution of Participants

Of the entire sample, 8% reported never having gambled ($n = 5$), 37% were classified as no-problem gamblers (SOGS = 0; $n = 22$), 38% as some-problem gamblers (SOGS = 1-4; $n = 23$), and 17% as probable pathological gamblers (SOGS ≥ 5 ; $n = 10$). It is important to note that a disproportionately large portion of the sample falls into the probable pathological gambler group. This is likely the result of the recruitment of participants on a volunteer basis for a gambling study, causing a self-selection bias to occur where a large number of problem gamblers volunteered to participate in this research. As a result, while the distribution of the present sample is not reflective of the general population, it nevertheless includes a sizable number of probable pathological gamblers.

Differences in Heuristics for the Total Sample

The most commonly endorsed heuristics made by the total sample were references to behaviors minimizing losses (67.9%), personification of the dealer (computer; 66.1%), references to the laws of randomness (55.4%), and references to past experiences (55.4%). For the entire sample, there were significantly more references to behavior minimizing losses ($M = 2.02$, $SD = 2.97$) than to statements reflecting chasing behavior ($M = 1.11$, $SD = 2.14$), $t(55) = -3.94$, $p < .001$. An examination of the differences in heuristics across the games reveals that there were significantly more irrational ($M = 5.41$, $SD = 5.72$) than rational statements ($M = 1.02$, $SD = 1.29$) made in roulette, $t(57) = 6.06$, $p < .001$, as compared to blackjack and slots, where there were no significant differences between irrational and rational statements.

Differences Across Levels of Gambling Involvement

References to luck were highest for the probable pathological gambler group, particularly on the roulette and slot-machine games. Probable pathological gamblers also made the greatest percentage of references to skill, which was most apparent in blackjack. With respect to references to the laws of randomness, there was an increase from the no-problem (47.6%) to the some-problem group (60.0%), while an equal percentage of the some-problem (60.0%) and probable pathological gambler (60.0%) groups endorsed this cognitive heuristic. Contrary to the idea that problem gamblers exhibit an illusion of control, such statements decreased as level of gambling involvement increased.

References to hindsight bias steadily increased from the no-problem group to probable pathological gamblers. A chi-square analysis reveals that the cells differed significantly for this heuristic, $\chi^2(3, N = 56) = 14.72$, $p < .002$.

References to risky behavior increased steadily with level of gambling involvement, while the reverse trend was observed for references to significant numbers or colors. Individuals most often endorsed the latter heuristic during roulette. Such statements included references to favorite numbers or preferred colors (e.g., "Those are my lucky numbers" and "I like red"). In slots, only one participant made such verbalizations (i.e., "I think I'll bet three [coins]; three is my favorite number"), while none were made while individuals played blackjack. Thus, it appears that this is a heuristic primarily associated with roulette, given that the game involves the choice of color and number, whereas no such choice is available in blackjack or slots (Figure 1).

The greatest percentage of references to previous experiences (whereby participants use past betting patterns or outcomes to determine present bets) was observed in the probable pathological gambler group. This was most apparent in roulette, where such statements showed an increase from the no-problem (43.0%) and the some-problem groups (41.0%) to the probable pathological gamblers (60.0%). Verbalizations reflecting the personification of the dealer (computer) also increased as level of gambling involvement increased. Such statements increased from the no-problem (47.6%) to the some-problem (65.0%) to the probable pathological gamblers groups (90.0%). A chi-square analysis reveals these differences to be significant, $\chi^2(3, N = 56) = 8.32$, $p < .04$. Both rational and irrational explanations of losses were highest among probable pathological gamblers. Tukey HSD post hoc analyses indicate that in roulette, probable pathological gamblers made significantly more references to chasing behavior than did some problem gamblers, $F(3, 54) = 4.81$, $p < .005$ (Figure 2).

References to behavior maintaining a winning streak increased steadily as the level of gambling involvement increased for the total percentage of statements. Overall references to behavior minimizing losses were highest for the some-problem group. Although the probable pathological gambler group made the

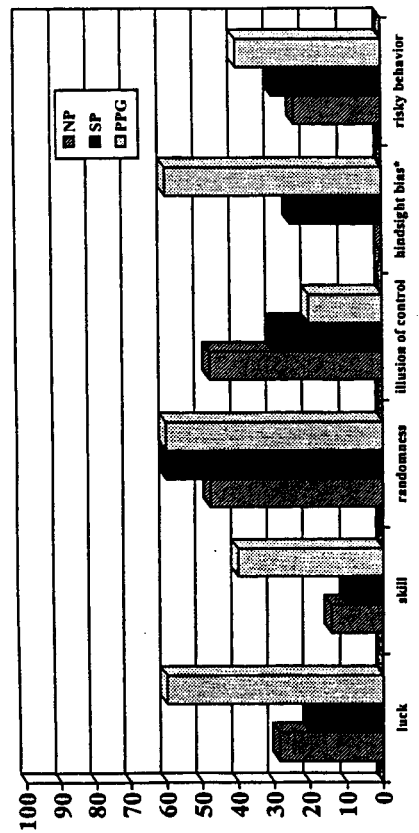


Figure 1. Percentage of individuals producing verbalizations across levels of gambling involvement. NP = no-problem gambler, South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) score = 0; SP = some-problem gambler, SOGS score = 1-4; PPG = probable pathological gambler, SOGS score > 5 (**p* < .05).

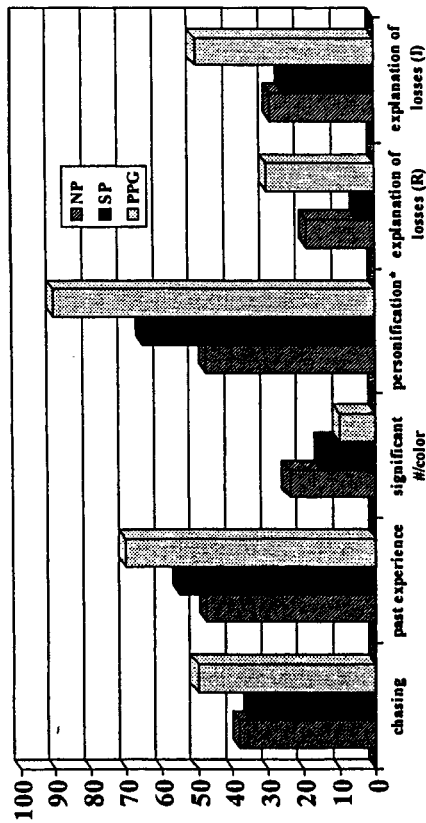


Figure 2. Percentage of individuals producing verbalizations across levels of gambling involvement (continued). NP = no-problem gambler, South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) score = 0; SP = some-problem gambler, SOGS score = 1-4; PPG = probable pathological gambler, SOGS score > 5 (**p* < .05). R = rational, I = irrational.

greatest percentage of references to the situation being unrealistic, this group nevertheless had the lowest percentage of references to a decision to stop playing. The percentage of total irrational statements was equal for the some-problem and probable pathological gambler groups, which were higher than the

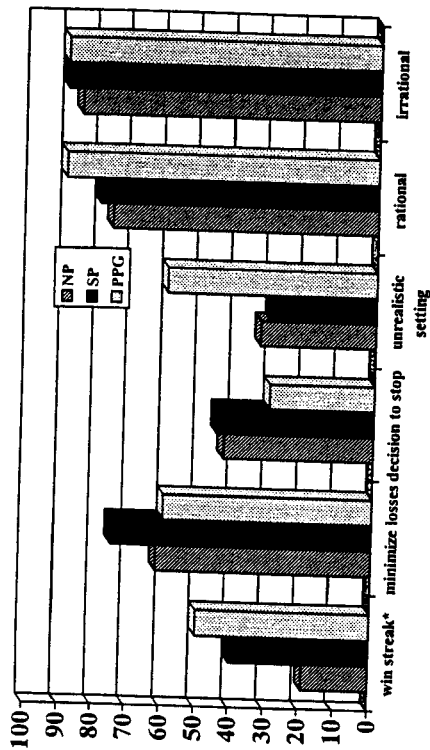


Figure 3. Percentage of individuals producing verbalizations across levels of gambling involvement (continued). NP = no-problem gambler, South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) score = 0; SP = some-problem gambler, SOGS score = 1-4; PPG = probable pathological gambler, SOGS score ≥ 5 (**p* < .05).

no-problem group, while the percentage of total rational statements was greatest for the probable pathological gambler group (Figure 3).

Given that for each of the three games the participants' verbalizations were categorized into many different heuristics, the cell sizes were quite small. Thus, no meaningful differences were noted when examining the various heuristics across the blackjack, roulette, and slots games.

Gender Differences

With respect to illusion of control, females ($M = 1.03, SD = 1.59$) made significantly more such references than did males ($M = 0.33, SD = 0.83$), $t(43) = 2.09, p < .043$. Furthermore, females made significantly more references to behaviors minimizing their losses ($M = 2.79, SD = 3.72$) than did males ($M = 1.19, SD = 1.55$), $t(38) = 2.14, p < .039$. While not significant, it was interesting to note that females made a greater percentage of references to behavior maintaining a winning streak, to chasing behavior, as well as to significant numbers or colors. Finally, a greater percentage of males endorsed the cognitive heuristic of hindsight bias (Figure 4).

Discussion

The results of this study, using a variety of gambling activities incorporating varying degrees of both luck and perceived skill, offer insight into differences in

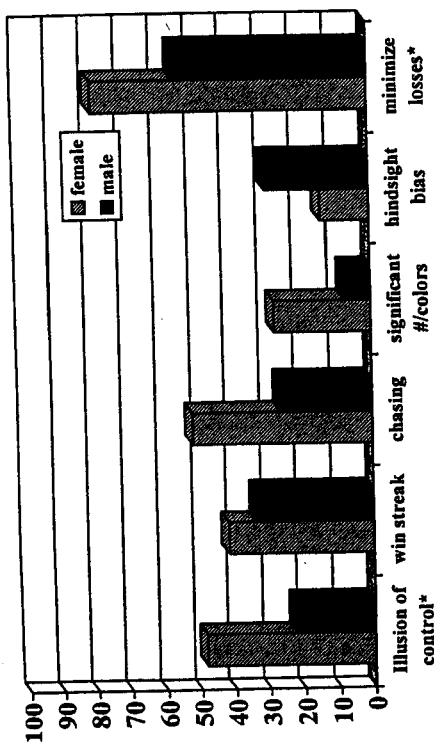


Figure 4. Percentages of verbalizations for females and males ($*p < .05$).

the underlying cognitions of individuals differing in terms of gambling involvement. When examining the verbalizations, it is important to note that there was considerable variation between individuals, with several making numerous statements and others making relatively few. The most commonly endorsed heuristics for the entire sample across the three tasks were references to behaviors minimizing losses (67.9%), personification of the dealer (computer; 66.1%), references to the laws of randomness (55.4%), and comments related to past experiences (55.4%).

The results reveal that references to luck were greatest for both the games of roulette (20.7%) and slots (26.3%), whereas the percentage of references to skill for roulette and slots were 3.4% and 5.3%, respectively. In blackjack, only 11.7% of individuals made reference to luck, while 16.7% made skill-based statements. References to skill were most prevalent in blackjack for probable pathological gamblers (30.0%), while the percentage of such references for roulette and slots were 20.0% and 10.0%, respectively. There is controversy in the literature regarding the issue of the amount of skill versus randomness involved in blackjack, based on an understanding of the laws of probability (Gupta & Derevensky, 1996). However, the present comparison between the different games sheds some light on this debate. Results reveal that, for adults, roulette and slots are games that are perceived to primarily involve luck, while blackjack is viewed as containing more elements of skill.

The majority of the cell sizes for each heuristic across the blackjack, roulette, and slots tasks were quite small. Thus, when comparing the number of individuals who endorsed the heuristics across the three games, no other significant or meaningful differences were noted.

The findings indicate that the greatest difference in the heuristic of laws of randomness occurred between social gamblers (no gambling-related problems) and those with some gambling problems. In addition, probable pathological gamblers responded with the same frequency as did some-problem gamblers. Such references refer to the cognitive belief that the outcomes of a gambling activity will follow a specific pattern and are equilibrated over time. This cognitive distortion appears to be associated with problem gambling and probable pathological gambling. Ladouceur et al. (1996) postulates three mechanisms by which the faulty belief toward the notion of randomness is expressed: (a) equilibration of events in a small sample according to a theory of probability, (b) avoidance of repetition, and (c) breaking logical patterns or order of events. The belief in rules or principles that govern chance events promotes faulty (inaccurate) cognitions and an illusion of control. Individuals who attempt to delineate a set of deterministic rules in a game that is primarily based on chance may develop the belief that the activity incorporates some skill. As such, this fosters the belief that they have an element of control over the outcome of the game (Langer, 1975). Ladouceur et al. (1996) found that individuals erroneously described a bet to be "unlucky" if it created a perceived imbalance of events in a small sample, a long series of similar events, or patterns. For example, adults preferred lottery tickets and sequences in roulette that appeared to be random. The results of the present study confirm the notion that the belief in rules or laws of randomness is a cognitive distortion that operates when gambling. The differences observed among adults with varying levels of gambling involvement illustrate that these erroneous beliefs may distinguish between individuals who do not experience any difficulties as a result of their gambling and those who do. This has clinical implications for the identification and treatment of problem gambling such that it validates the need to incorporate the modification of these inaccurate cognitions during treatment.

The study found that for each level of gambling involvement, irrational explanations of losses were greater than were rational justifications. However, the probable pathological gambler group made the greatest percentage of references to both rational and irrational explanations of losses. This finding is consistent with Griffiths (1994), who found that regular gamblers made more irrational statements explaining away losses than did nonregular gamblers. The present findings build on Griffiths' work in that they demonstrate that even among individuals who gamble regularly, there are distinctions in the endorsement of erroneous cognitions. More specifically, probable pathological gamblers appear to feel the greatest need to explain away their losses by providing both rational and irrational justifications.

Among probable pathological gamblers, there were different types of explanations of losses. Some rationalizations reflected the belief that they were able to utilize their skill in order to control the outcome (e.g., "I never win both [color

and even/odd in roulette), so I can just bet one thing [coin]—that's probably why I'm losing." "Oh no [loss], this is what happens when you play fast," "Of course if I do stupid things, I lose"). These justifications imply that individuals believe that they can control the outcome of the game by employing skill, such as changing their speed of play or changing their betting strategies. This is meaningful in that it may explain why problem gamblers continue to gamble despite persistent losses. By providing reasons or rationalizations for their losses, perhaps these individuals believe that they can still preserve an element of control over future outcomes. This likely serves to maintain their hopes of eventually winning and leads to persistence when gambling.

Other types of rationalizations involve externalization of the outcome of the game as being beyond the participants' control, particularly in the case of loss. Such justifications include "I lost but I would have probably lost anyway" and "I would have busted anyway (blackjack), so big deal." Research has found that individuals attribute success to their ability and effort, while attributing failure to external factors such as bad luck or degree of difficulty of the activity (Whitley & Frieze, 1985, 1986).

Although success is primarily governed by chance, there are elements that foster the perception that skill is involved. Thus, gambling situations that combine some element of skill and chance are especially susceptible in eliciting these erroneous cognitions. Winners can easily attribute their successes to their skill, while losers attribute their losses to chance and bad luck. Thus, regardless of the actual outcome, pathological gamblers develop rationales that enable them to persist in the activity (Gilovich, 1983). The current results shed light on a distinction between regular gamblers and those who have pathological gambling problems, and the findings suggest that pathological gamblers are qualitatively different in their cognitive distortions from those who gamble regularly and do not exhibit gambling-related problems.

References to hindsight bias increased significantly as a function of level of gambling involvement. This expands on the research of Griffiths (1994), who found that gamblers frequently used the hindsight bias heuristic. The present study further reveals that it is the probable pathological gambler group that makes the greatest use of such references, suggesting yet another reason why individuals continue to gamble despite losses. Individuals may attempt to convince themselves that they could predict the outcome and thus maintain a sense of control that empowers them to continue in the face of consistent failure.

The results further suggest that the percentage of individuals endorsing the personification heuristic increased significantly as level of gambling involvement increased. Once again, this finding is consistent with Griffiths (1994), who reported that regular gamblers made significantly more personifications related to the fruit machine than did nonregular gamblers, yet further adds that it is specifically the pathological gamblers who endorse such cognitive distortions. The

findings of the present study indicate that in both blackjack and slots, a greater percentage of probable pathological gamblers made personification statements than did social gamblers with some gambling problems, and thus emphasize the importance of differentiating among levels of gambling involvement when conducting research. The results, which distinguished between no-problem gamblers, some-problem gamblers, and probable pathological gamblers supports the hypothesis that this latter group is qualitatively different in their cognitive representations of gambling.

Probable pathological gamblers had the greatest reference to past experiences, with the highest percentage occurring in roulette, in which many participants based current betting patterns on previous outcomes. Such references included "I'll go for black again; black was good for me last time" and "Red is not coming up anymore, so I'll bet \$25 on black." In using past experience to determine present bets, individuals falsely connected past and current experiences and failed to recognize the independence among chance events. This is consistent with Ladouceur et al. (1996), who analyzed verbalizations of individuals playing roulette and found that bets were primarily based on past wins and losses. The authors identified the main source of error as being the inability to apply the principle of independence among chance events. They postulate that one reason why individuals maintain the false belief that independent events are linked is their physical proximity, inducing the perception that they are not independent. A large number of individuals in both Ladouceur et al.'s study and the present study referred to past events when predicting future outcomes. The fact that individuals learn from past experience and make reference to past performance to ameliorate present and future experiences is a concept taught in school and a principle that works exceedingly well in most circumstances. Gambling activities are unique in that they are based on chance events. As such, attempts to draw on past outcomes in determining current events are not only futile, but are counterproductive. The results of the present study reaffirm the importance of the instruction of the notion of independence of chance events as a component of cognitive behavioral treatment programs.

The results enable the comparison of cognitive beliefs pertaining to three popular casino games. Only in roulette was there a significant difference between irrational and rational statements, with the irrational statements being the most prevalent. The main source of these irrational verbalizations was the misperception of the independence of chance events, whereby individuals based current betting patterns on previous experience and outcomes. This illustrates that certain characteristics of the game of roulette elicit irrational patterns of cognitive beliefs and may be a result of the fact that roulette affords players a considerable choice of numbers and colors, despite being a game of pure chance. Individuals frequently had the misperception that they have an element of control over the final outcome. Further, in roulette, probable pathological gamblers made significantly

more references to chasing behavior than did some-problem gamblers and slightly more than no-problem gamblers.

It is important to note that in the present study, the sample as a whole made significantly more references to behaviors minimizing losses than to chasing behaviors for all three games. Such references reflect chasing behavior in that individuals increased their bets in order to make up for their losses, without recognizing that by doing so they also stood to lose more. The present study examined references to chasing behavior through participants' verbalizations. Breen and Zuckerman (1996) investigated actual chasing behavior in adults and found that personality and cognitive factors were related to chasing behavior. Their results suggest that individuals who scored high on the Impulsive Sensation Seeking scale of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993) were more likely to chase their losses while gambling than those who scored lower. Further, individuals who scored high on the Gambling Attitude and Beliefs Survey (GABS; Breen & Zuckerman, 1996), indicating that they have strongly endorsed a greater number of cognitive biases, irrational beliefs, greater subjective arousal, and greater importance of social self-presentation with respect to gambling, were more likely to chase losses. Lesieur (1979) reported chasing as being the most crucial element in the development of pathological gambling. The present results confirm that chasing is definitely an observable characteristic associated with pathological gambling, even within a laboratory setting, and is one of the behaviors exhibited by gamblers that propels them to continue despite pervasive losses. Upon losing, these individuals feel compelled to recoup their losses, erroneously believing that they are bound to win and that they can beat the machine or dealer. This belief perpetuates a downward spiral. As losses accrue, the individual becomes more involved and seeks to "get even" (Lesieur, 1984).

A potential limitation of the present study lies in the laboratory setting. The findings indicate that although the probable pathological gambler group made the greatest percentage of references to the unrealistic setting of the laboratory experiment, they were also the most reluctant to stop playing and quit with their winnings or minimize their losses. This addresses a criticism of much experimental research in the field of gambling concerning the artificiality of the setting. This situation resembles the reality of many problem gamblers who experience an inability to stop playing despite losses. Such findings lend support to the validity of this type of laboratory setting as a basis for experimental gambling research. This is important, given that ethical and practical constraints limit the opportunity for observation and manipulation of gambling in naturalistic settings. Nevertheless, the comparability of laboratory settings and naturalistic gambling scenarios still remains.

When divided into the varying levels of gambling involvement, the small sample sizes precluded an adequate comparison of many of the cognitive heuristics

between the games. Future studies should follow in this line of research using a larger population, as many of the findings of the present study highlight the importance of studying differences in cognitions using a variety of games. Many individuals have a propensity to consistently play the same game and thus develop cognitive beliefs specific to their preferred game.

Although measures were taken to ensure that all participants had an equal understanding of the games prior to playing, information concerning participants' previous experience with these three games was not obtained. Future research should ascertain this information in order to determine if experience with games affects cognitions, and whether this variable needs to be controlled for in analyzing results.

Treatment approaches need to consider individuals' underlying cognitions and to be tailored to the presenting problems and unique needs of each person. Bujold, Ladouceur, Sylvain, and Boisvert (1994) outlined a cognitive behavioral treatment program for adult pathological gamblers. For example, their therapeutic intervention takes into account the gambler's preferred game. This is an essential component of cognitive treatment, as gamblers have developed a set of biases associated with a specific gambling activity. Their treatment program consisted of three components: cognitive intervention, problem solving, and relapse prevention. The cognitive-intervention component focused on identifying gamblers' erroneous perceptions and altering them. Participants were provided with information about gambling, such as the distinction between chance and skill. The goal of therapy is to target and correct these specific cognitive distortions.

Another recently developed treatment program involves altering cognitive biases that are associated with roulette; more specifically, the misperception of the independence of chance events. Giroux, Ladouceur, Nouwen, and Jacques (1997) successfully used cognitive restructuring to correct the erroneous perception of the link between events with three gamblers playing roulette. The cognitive correction consisted of a discussion of the principle of independence of events, and the identification and correction of erroneous perceptions. Their results reveal that the cognitive correction decreased the amount of erroneous verbalizations, and an increase in accurate perceptions was noted. However, a follow-up examination indicated that the progress was not maintained. The generalizability of the results of the study is limited because of the small sample size.

The present findings illustrate considerable variability in the amount of verbalizations produced and that individuals endorsed multiple heuristics in each of the three games. With respect to treatment, the question then becomes which cognitive bias is most salient in the maintenance of gambling behavior for a particular individual. In order to achieve success in cognitive restructuring, some element of treatment should focus on the individual's specific erroneous perceptions.

This research provides insight into the study of erroneous cognitions, which are known to promote and maintain gambling behavior. Cognitive restructuring has been shown to be a fundamental component of treatment with pathological adult gamblers. Cognitive interventions are based on the notion that the outcome of the game is chance. The goal is to increase awareness of erroneous verbalizations and to encourage the substitution of such statements with accurate ones (Ladouceur & Walker, 1996). Through the use of various procedures (e.g., role-playing, playback of verbalizations produced while gambling, correction of erroneous perceptions), individuals become aware of their misperception of the independence of chance events, and the motivation to continue playing is decreased (Sylvain & Ladouceur, 1992). Knowledge of the role of erroneous perceptions and beliefs in gambling behavior may be one of a number of important components in guiding preventative measures aimed at teaching individuals objective laws of probabilities, randomness, and elements of chance that are characteristic of most gambling activities.

References

- American Psychiatric Association (1987). *DSM-III-R: Diagnostic and statistical manual* (3rd ed., revised). Washington, DC: American Psychiatric Association.
- Breen, R. B., & Zuckerman, M. (1996). "Chasing" in gambling behavior: *Personality and cognitive determinants*. Unpublished manuscript, University of Delaware, Newark, Delaware.
- Bujold, A., Ladouceur, R., Sylvain, C., & Boisvert, J. M. (1994). Treatment of pathological gamblers: An experimental study. *Journal of Behavior Therapy and Experimental Psychiatry*, 25, 275-282.
- Derevensky, J. L., Gupta, R., & Della Cioppa, G. (1996). A developmental perspective of gambling behavior in children and adolescents. *Journal of Gambling Studies*, 12, 49-66.
- Dickerson, M. (1993). Internal and external determinants of persistent gambling: Problems in generalizing from one form to another. In W. R. Eadington & J. A. Cornelius (Eds.), *Gambling behavior and problem gambling* (pp. 225-245). Reno, NV: Institute for the Study of Gambling and Commercial Gaming.
- Fisher, S. (1993). Gambling and pathological gambling in adolescents. *Journal of Gambling Studies*, 9, 277-288.
- Gilovich, T. (1983). Biased evaluation and persistence in gambling. *Journal of Personality and Social Psychology*, 44, 1110-1126.
- Giroux, I., Ladouceur, R., Nouwen, A., & Jacques, C. (1997, June). *The cognitive restructuring of erroneous links between events in gamblers playing roulette*. Paper presented at the 10th International Conference on Gambling and Risk Taking, Montreal, Quebec, Canada.
- Granger, D. (1991). *Blackjack! Version 2.20D* [Computer software]. Northboro, MA: Glencoe.
- Griffiths, M. (1994). The role of cognitive bias and skill in fruit machine playing. *British Journal of Psychology*, 85, 351-369.
- Gupta, R., & Derevensky, J. L. (1996). The relationship between gambling and video-game playing behavior in children and adolescents. *Journal of Gambling Studies*, 12, 375-394.
- Gupta, R., & Derevensky, J. (1998). An empirical examination of Jacobs' general theory of addictions: Do adolescent gamblers fit the theory? *Journal of Gambling Studies*, 14, 17-50.
- Ladouceur, R., Dubé, D., & Bujold, A. (1994). Prevalence of pathological gambling and related problems among college students in the Quebec metropolitan area. *Canadian Journal of Psychiatry*, 39, 289-293.
- Ladouceur, R., Dubé, D., Giroux, I., Legendre, N., & Gaudet, C. (1996). *Cognitive biases and playing behavior on American roulette and the 6/49 lottery*. Unpublished manuscript, Université de Laval.
- Ladouceur, R., Gaboury, A., Dumont, M., & Rochette, P. (1988). Gambling: Relationship between frequency of wins and irrational thinking. *Journal of Psychology*, 122, 409-414.
- Ladouceur, R., & Walker, M. (1996). A cognitive perspective on gambling. In P. M. Salkovskis (Ed.), *Trends in cognitive behavioral therapies* (pp. 89-120). New York, NY: John Wiley & Sons.
- Langer, E. (1975). The illusion of control. *Journal of Personality and Social Psychology*, 32, 311-328.
- Lesieur, H. R. (1979). The compulsive gambler's spiral of options and involvement. *Psychiatry*, 42, 79-87.
- Lesieur, H. R. (1984). *The chase: Career of the compulsive gambler*. Cambridge, MA: Schenkman.
- Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry*, 144, 1184-1188.
- Lesieur, H. R., Cross, J., Frank, M., Welch, M., White, C. M., Rubenstein, G., Moseley, K., & Mark, M. (1991). Gambling and pathological gambling among university students. *Addictive Behaviors*, 16, 517-527.
- Lesieur, H. R., & Klein, R. (1987). Pathological gambling among high school students. *Addictive Behaviors*, 12, 129-135.
- Masteller, R., & Masteller, B. (1993). *Caesar's Palace for Windows* [Computer software]. Irvine, CA: Virgin Games.
- Stinchfield, R., & Winters, K. C. (1998). Gambling and problem gambling among youth. *Annals of the American Academy of Political and Social Sciences*, 556, 172-185.
- Sylvain, C., & Ladouceur, R. (1992). Correction cognitive et habitudes de jeu chez les joueurs de poker vidéo [The correction of cognitive distortion and

- game-playing habits of videopoker players]. *Revue Canadienne des Sciences du Comportement*, *24*, 479-489.
- Volberg, R. A. (1994). The prevalence and demographics of pathological gamblers: Implications for public health. *American Journal of Public Health*, *84*, 237-241.
- Volberg, R. A., & Steadman, H. J. (1988). Refining prevalence estimates of pathological gambling. *American Journal of Psychiatry*, *145*, 502-505.
- Volberg, R. A., & Steadman, H. J. (1989). Refining prevalence estimates of pathological gambling in New Jersey and Maryland. *American Journal of Psychiatry*, *146*, 1618-1619.
- Wagenaar, W. (1988). *Paradoxes of gambling behaviour*. London, UK: Lawrence Erlbaum.
- Walker, M. (1992). Irrational thinking among slot machine players. *Journal of Gambling Studies*, *8*, 245-261.
- Whitley, B. E., Jr., & Frieze, I. H. (1985). Children's causal attributions for success and failure in achievement settings. A meta-analysis. *Journal of Educational Psychology*, *77*, 608-616.
- Whitley, B. E., Jr., & Frieze, I. H. (1986). Measuring causal attributions for success and failure: A meta-analysis of the effects of question wording style. *Basic and Applied Social Psychology*, *7*, 35-51.
- Wynne, H., Smith, G., & Volberg, R. (1994). *Gambling and problem gambling in Alberta: Final report prepared for Alberta Lotteries and Gaming*. Edmonton, Alberta, Canada: Wynne Resources, Ltd.
- Zuckerman, M., Kuhlman, M., Joireman, J., Teta, P., & Kraft, M. (1993). A comparison of three structural models for personality: The big three, the big five, and the alternative five. *Journal of Personality and Social Psychology*, *65*, 757-768.