Underlying Cognitions in the Selection of Lottery Tickets

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There is evidence that the faulty cognitions underlying an individual's playing behavior maintains and supports their gambling behavior. Sixty undergraduate students completed the South Oaks Gambling Screen (SOGS), a measure to assess pathological gambling, and a questionnaire ascertaining the type and frequency of their gambling activities. Sixteen Loto 6/49 tickets were presented to participants and ranked according to their perceived likelihood of being the winning ticket. The numbers on the tickets were categorized as: long sequences (e.g., 1-2-3-4-5-6), patterns and series in a pseudo-psychological order (e.g., 16-21-26-31-36-41), unbalanced (e.g., six numbers from 1-24 or 25-49), and those appearing to be random (e.g., 11-14-20-29-37-43). Verbal protocols of ticket selections were ranked into eight heuristics. Results revealed that for the entire sample the greatest percentage of tickets chosen for the first four selections were "random" tickets. Further, the most commonly cited reason for selecting and changing a lottery ticket was perceived randomness. The results are discussed with reference to the cognitions used when purchasing lottery tickets. © 2001 John Wiley & Sons, Inc. J Clin Psychol 57: 749-763, 2001.

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Introduction

Research demonstrates that between 2 and 4% of adults are problem gamblers and that approximately 1 to 2% of the adult population are pathological gamblers (Ladouceur, 1996; Volberg, 1996; Wynne, Smith, & Volberg, 1994). With adolescents, results gener-

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ally suggest that 3.5 to 8% of adolescents are pathological gamblers (Gupta & Derevensky, 1998; Lesieur & Klein, 1987; Shaffer & Hall, 1996) with another 10 to 14% being at risk for the development of severe gambling problems (Shaffer & Hall, 1996).

Although gambling is viewed by most individuals as being an entertaining pastime, certain individuals may be prone to develop a pathological gambling addiction. Using the DSM-IV (American Psychiatric Association, 1994) criteria to diagnose pathological gambling, at least five out of ten diagnostic criteria must be met in order to qualify as a pathological gambler. Elevated scores on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), another measure of gambling problems, can help assess "probable pathological gambling." While endorsement of a high number of items on this scale indicates that an individual may be experiencing a pattern of pathological gambling, it should not be misconstrued as a clinical diagnosis. According to Rosenthal (1989), pathological gambling has four primary characteristics, these being:

1. progression;
2. intolerance of losing;
3. preoccupation with gambling; and
4. disregard for consequences.

Individuals with pathological gambling problems often experience serious personal, familial, professional, financial, and legal difficulties (Ladouceur, Boisvert, Pepin, Loranger, & Sylvain, 1994; Lorenz & Shuttlesworth, 1983).

While most individuals are *social gamblers*, individuals who gamble either alone, with friends or family members for a short period of time, and who set predetermined acceptable losses (American Psychiatric Association, 1994), *problem gamblers* is a term reserved for individuals who do not meet the diagnostic criteria for pathological gambling, but who nevertheless experience a number of gambling-related problems. These individuals are often "at risk" for developing a pathological gambling addiction (Wallisch, 1993; Winters, Stinchfield, & Fulkerson, 1993) or may be "in-transition" (i.e., moving toward or away from pathological gambling patterns) (Shaffer, LaBrie, Scanlan, & Cummings, 1994).

State and Provincial lotteries are gambling activities that require a small investment for the possibility of huge financial gains. Lotteries are highly advertised, perceived as socially acceptable, are easily accessible, and generally affordable. In a recent survey of 3502 adults in Canada and the United States, lotteries were reported to be the most popular gaming activity (Angus Reid Group, 1996). Among adolescents (grades 7–11), Gupta and Derevensky (1998) found that 52.3% of students reported having purchased lottery tickets in the past year, with 10.2% doing so once a week or more.

Despite the increasing availability of new and diverse forms of gambling, state and provincial lotteries remain a constant and popular gambling activity (McGowan, 1995). The fact that lotteries represent a consistent venue of gambling activity is worrisome. In addition to being an activity that is highly advertised and highly accessible, research has shown that the lottery plays a significant role in the development of problem gambling (Hraba, Mok, & Huff, 1990).

There has been considerable research with adults that has demonstrated that cognitive biases and distortions promote and maintain an individual's gambling behavior (Griffiths, 1994; Ladouceur & Walker, 1996; Langer, 1975). Regular, problem, and pathological gamblers hold a set of beliefs, many of which are false (irrational thoughts, erroneous cognitions, and misperceptions), that include the illusion of control (Langer, 1975) and the misperception of the independence of chance events (Ladouceur, Dubé, Giroux,

Legendre, & Gaudet, 1996). The underlying assumption is that the motivational component of the gambling activity, namely the intent of overall monetary gain and the desire to beat the game, combines with these erroneous beliefs and propels the individual to engage repeatedly in the activity despite repeated losses (Ladouceur & Walker, 1996). As a result, it has been suggested that efforts aimed at prevention and intervention should make use of cognitive restructuring techniques in which cognitive distortions are targeted and corrected (Gaboury & Ladouceur, 1993; Ladouceur, Boisvert, & Dumont, 1994).

Viewing gambling within the context of a theory of cognition may facilitate an understanding of why individuals persist on gambling in spite of repeated losses. According to Wagenaar (1988), an understanding of one's heuristics and biases employed provides a context for understanding gambling behavior. The heuristics and biases provide the necessary structure in understanding the rules and theories that underlie gambling behavior. In general, with respect to decision making, individuals have a large repertoire of strategies and select specific strategies based on the similarity between a current situation and previous situations in which their behavior was successful. Wagenaar (1988) delineated several heuristics and cognitive biases that are employed in daily problem solving. However, these same successful problem solving strategies and heuristics, when used in gambling situations, often are deemed irrational. Such heuristics include hindsight bias, where, retrospectively, individuals are not surprised about what happened and even believed that they had predicted the outcome; flexible attributions, that is, the tendency to attribute success to one's own skill and failures to external influences; and the availability bias, where probability judgements are affected by examples easily recalled from memory.

Another salient cognitive distortion is the "illusion of control," such that the individual behaves as if the activity contains a perceived element of skill that is instrumental in determining outcomes. When gambling, individuals maintain a disproportionately high expectation of success in a situation (reinforced by advertisements) where the actual probability is quite low. Langer (1975) identified factors that induce the illusion of control, these being competition, the extent to which a player can exercise choice, stimulus or response familiarity with the task, and active and passive involvement. She suggested that in situations of chance, where outcomes are unpredictable, individuals have a tendency to behave as they would in a situation that requires skill and incorrectly perceive that they maintain an element of control over the outcome. A recent study examining children's perceptions of gambling revealed that although 70% believed that gambling behavior involves "a lot of luck," 56% believed that "a lot of skill" is involved as well (Derevensky, Gupta, & Della Cioppa, 1996). Thus, while children acknowledge that luck plays a large role in gambling, they still maintain the illusion that most outcomes are based upon skill.

The inability to apply the principle of independence among chance events is an underlying cognition that has been shown to affect an individual's gambling behavior. Individuals tend to perceive that independent events are linked due to their physical proximity (Ladouceur et al., 1996). Thus, the gambler's current betting patterns often are based on previous experiences and outcomes, when in fact they are completely unrelated. Throughout life, individuals are taught to learn from past experience, yet gambling is one activity in which past experience is completely irrelevant and should be forgotten completely.

Faulty cognitions are not employed exclusively by regular or problem gamblers. Many occasional gamblers engage in a number of cognitive distortions when gambling in a laboratory setting, and thus cognitive biases by themselves do not constitute a sufficient explanation of why individuals continue to gamble, or gamble in excess. Nevertheless, these biases and erroneous perceptions are more prevalent as the level of gambling involve-

ment increases and thus make for continued gambling in the face of consistent and pervasive losses (Ladouceur & Walker, 1996).

In a study investigating the underlying cognitions used in lottery playing, Ladouceur et al. (1996) asked adults to rank preselected lottery 6/49 tickets (individuals select six numbers from a total of 49 numbers they believe will be winning numbers). Four types of tickets were provided: long sequences of numbers (e.g., 1–2–3–4–5–6), patterns of numbers increasing by 5's or 10's (e.g., 5–10–15–20–25–30), nonequilibrated tickets (six numbers from 1–24 or 25–49, clustered at one end of the spectrum of 49 numbers) (e.g., 3–5–9–12–15–17), and pseudorandom, none of the aforementioned characteristics (e.g., 11–14–20–29–37–43). Their results indicated that adults, in general, preferred the pseudorandom tickets, followed by tickets representative of patterns, nonequilibrated series, and long sequences. Although, in actuality, each ticket is just as likely to win as the next, adults selected tickets they perceived as the "most random" as more likely to win than the other choices. Ladouceur and his colleagues concluded that in their preference for pseudorandom tickets, individuals demonstrated an error in misperceiving the independence of chance events. The participants failed to recognize that each number selected on the ticket is independent of the others, possibly due to the tendency to link events that occur in close proximity to one another.

In a similar study using children, Herman, Gupta, and Derevensky (1998) asked children to rank the same preselected lottery tickets as Ladouceur et al. (1996). Results indicated that children preferred lottery ticket numbers that appeared to be presented in a random fashion and disliked those with long sequences of numbers. Similar to the findings obtained by Ladouceur et al. (1996), children aged 10 to 12 maintained the perception that selecting random numbers increases their chances of winning, failing to recognize that each number on the lottery ticket was independent of the next. Interestingly, children 8 years of age appeared to be more rational in their ticket selections than children age 10 and 12, such that they did not appear to implement a specific strategy (i.e., preferring random numbers) when selecting lottery tickets. Rather, they appeared to possess the belief that each ticket has an equal chance of winning. Herman et al. (1998) concluded that children exhibit a lack of knowledge of the independence of chance events when selecting lottery tickets.

On a national level, in both the United States and Canada, there has been a dramatic increase in total purchases and per-capita sales of lottery tickets. While lottery purchases represent only one form of gambling, there is ample research demonstrating that individuals who purchase lottery tickets also are engaged in other forms of gambling behavior. Clinical data also suggest that young problem gamblers frequently were introduced into gambling through lottery playing (Gupta & Derevensky, 1999).

The purpose of this study was to examine differences in cognitive perceptions of lottery tickets. Of interest is whether or not individuals with gambling problems perceive the purchase of lottery tickets in a similar manner as nonproblem gamblers. This research may provide a useful window into understanding differences between recreational and problem gamblers.

Method

Participants

Sixty-three undergraduate students, (32 females; 31 males) attending McGill University in Montreal, aged 19 to 33 ($M = 22.4$, $SD = 3.3$) volunteered to participate. Individuals were recruited from varying departments across the University in an attempt to provide a

representative sample. The research presented here is part of a larger study designed to examine gambling and risk-taking behavior amongst university students. Participants were enlisted on a volunteer basis and no financial incentives were provided for this phase of the study.

Measures. The *South Oaks Gambling Screen* (SOGS) (Lesieur & Blume, 1987) is a 20-item scale used to determine the presence or absence of pathological gambling. This 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; it has been designed to capture a snapshot in time. The SOGS has good internal reliability ($r = 0.97$) and validity ($r = 0.86$). Test–retest correlations were found to be better for out-patients ($r = 1.00$) than in-patients ($r = 0.61$). Further, the SOGS was found to be correlated highly with the DSM-III-R (American Psychiatric Association, 1987) ($r = 0.94$). Although the original classification for probable pathological gambling consists of a score of 5 or more, the present study wished to distinguish between pathological gamblers and those gamblers experiencing only a few gambling-related problems. Thus, a total score was calculated classifying a gambler as having no problems (SOGS = 0), some problems (SOGS = 1–4), or as a being probable pathological gambler (SOGS $\geq$ 5). This categorization is consistent with Lesieur and Blume's (1987) original classification.

The *Gambling Activities Questionnaire* (GAQ) (Gupta & Derevensky, 1996) is a questionnaire ascertaining the frequency and types of gambling activities in which individuals participate.

The *Lottery Task* has 16 original, validated 6/49 lottery tickets that were presented to each participant (the actual numbers were identical to those employed by Ladouceur et al., 1996). The tickets were divided equally into four categories based upon the numbers selected on each ticket; *Long sequences*, a series of five or six consecutive numbers (e.g., 2–3–4–5–6–47); *Patterns*, a series of numbers in a pseudopsychological order (e.g., 16–21–26–31–36–41); *Unbalanced/nonequilibrated* (e.g., six numbers from 1–24 or 25–49); and *Random*, no apparent ordering or sequencing of numbers (e.g., 11–14–20–29–37–43) (see Fig. 1 for all ticket variations). This methodology has been employed previously by Ladouceur et al. (1996) and Herman et al. (1998).

Procedure

All individuals who volunteered signed a consent form agreeing to participate in the study and completed the GAQ. Five individuals (8%) reported having never gambled, while the remaining participants ($n = 58$; 92%) individually completed the SOGS. Those who reported gambling subsequently were classified according to the severity of their gambling problems based upon the number of items endorsed on the SOGS. Of the entire sample, 8% were classified as nongamblers ($n = 5$), 35% as no-problem gamblers (SOGS = 0; $n = 22$), 38% as some-problem gamblers (SOGS = 1–4; $n = 24$), and 18% as probable pathological gamblers (SOGS $\geq$ 5; $n = 11$).

The sample contains a disproportionately large number of individuals in the probable pathological group. This is likely the result of participant recruitment procedures. Volunteers were asked specifically if they would be interested in participating in a gambling research study. A self-selection bias due to personal interest resulted in a large number of problem gamblers volunteering to participate in the study.

Upon completion of the questionnaire, a research assistant individually administered the lottery task (approximately ten minutes) to each participant. The research assistant

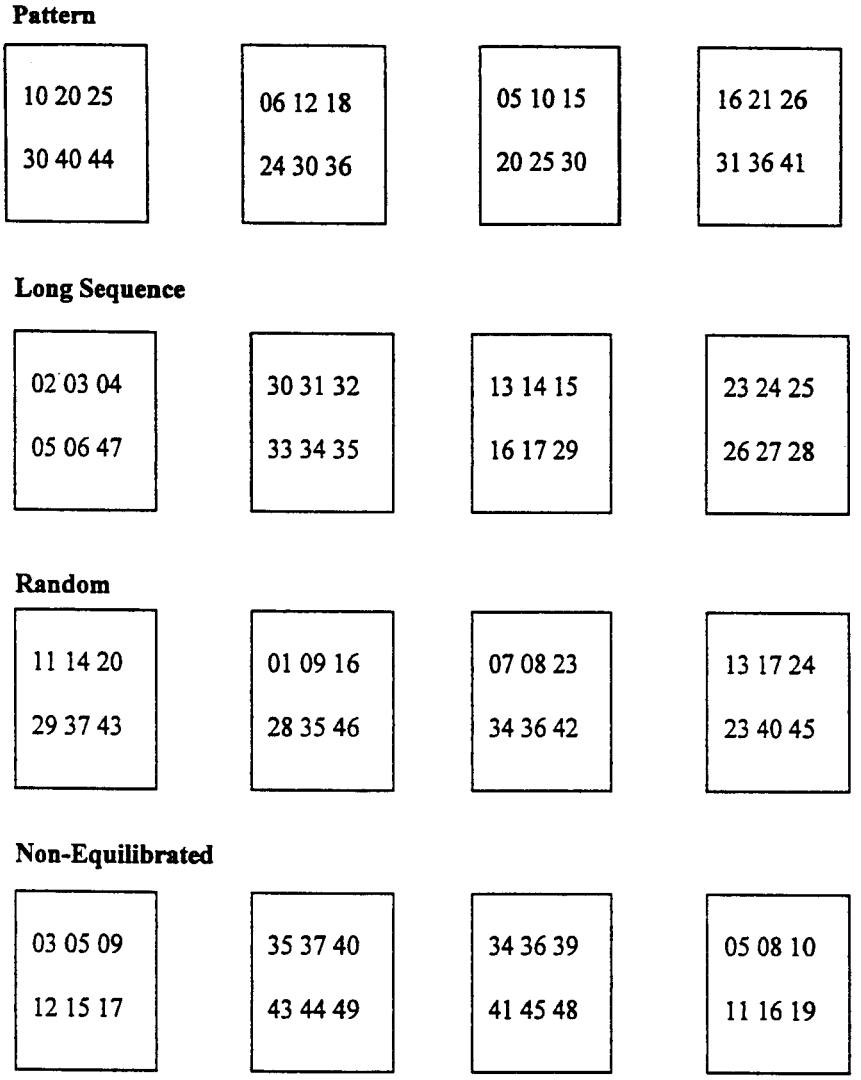

Figure 1. 6/49 lottery tickets.

randomly and simultaneously placed the lottery tickets in front of each participant. This was done in order to ensure that participants would be able to scan the tickets easily and remember the salient sequence and numbers. Participants were asked to rank 12 out of the 16 Lotto 6/49 tickets, in sequential order, from most likely to win to least likely to win. The participants then were asked to change the remaining four tickets in order to "make them more likely to win."

The following standardized instructions were provided:

> Here are 16 6/49 tickets. Look carefully at the numbers on the tickets. If you were to buy a ticket to play in the lottery, which one would you select? Why? ***After the individual chose a ticket, the instructions were repeated:*** Of the 15 tickets remaining, which one would you choose, and why? ***When four tickets remained, they were asked:*** How would you modify these remaining tickets so that they would be among the first chosen? You can make any changes you like.

The order in which the tickets were selected was recorded. The entire interaction was audiotaped and verbal protocols in which participants provided reasons for selecting specific tickets and changing others were transcribed. Verbalizations were divided into two categories based on whether they had been ranked (first 12 selections) or whether they had been both ranked and changed (last 4 selections). The verbalizations then were coded into heuristics based on previous cognitive bias research by Griffiths (1994), Ladouceur et al. (1996), and Wagenaar (1988), and then analyzed. The cognitive heuristics are defined and examples are provided in Table 1.

Two research assistants independently rated verbalizations for the first 30 participants in order to insure reliability. Raters knew which verbalizations were double coded and went over those for which there was a discrepancy. Percentage of agreement between raters was established at 89% (of the 30 participant verbalization).

Results

Due to 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 providing many statements and others making relatively few. As a result, analyzing the total number of statements and examining raw means would distort the findings. Therefore, the percentage of individuals endorsing a particular heuristic was examined (via frequency counts) in order to obtain a more accurate representation. Further, one-way ANOVA's were performed in order to determine if there were any significant between group differences in verbalizations for gamblers and lottery players.

Prevalence Information

Sixty-five percent of the sample reported purchasing lottery tickets during the past year, 54% played the lottery less than once a week, and 11% played once a week or more. Despite the fact that 92% of the population reports gambling, and the lottery remains one of the most popular forms of gambling, 35% of the present sample reported that they never purchased lottery tickets. Perhaps this finding was due to the small and nonrepresentative sample of the present study. Further, the lottery may not be as popular amongst university students as they may be more cognizant of the laws of probability and the extremely low probability of winning a substantial amount of money.

Ticket Selections

The largest percentage of tickets chosen for the first, second, third, and fourth selections were those categorized as random for the entire sample (see Table 2). Furthermore, random tickets represented the greatest percentage of tickets chosen for the first and second selections across levels of gambling involvement (Table 3).

Heuristics

The two most-commonly cited reasons by the entire sample when selecting a lottery ticket were explanations concerning randomness (78%) and significant numbers (69.5%) (e.g., birthdays, favorite numbers, etc.). When asked to change tickets, participants most commonly used the randomness (66%) explanation, indicating that they wished to render

Table 1
Cognitive Heuristics

Heuristic	Explanation
Random:	rationalizations that refer to the numbers being spread out over the entire set of numbers from 1 to 49. e.g. The numbers have a wide range; the numbers are spread out; it has two in the tens, twenty, thirty, forty.
Significant Numbers:	rationalizations that refer to a favorite, lucky, or important number. e.g. Eight has always been a good number for me; twenty-nine is my favorite number; my birthday is the sixth.
Past Experience:	rationalizations that refer to previous lottery draws or previous gambling experience. e.g., The numbers 36 and 41 are chosen often in previous 6/49 drawings; the numbers are all low and sometimes they come out that way; I won with a combination like this before.
Illusion of Control:	statements referring to the fact that participants had an element of control or that the selection influences the outcome or increases the chances of winning. e.g., I would go with my instinct; numbers in the forties are more likely to be chosen; nine is three times three.
Pattern:	rationalizations that refer to a specific pattern of numbers. e.g., I think the pattern is cool; the pattern is going up by five's; twenty-one, thirty-one, forty-one is a neat combination.
Sequence:	rationalizations that refer to the chronological order of the numbers on the ticket. e.g., All the numbers are in the twenties; a lot of the numbers are in the forties; the numbers are consecutive.
Miscellaneous:	rationalizations that do not fit into any other category. e.g., This ticket has more even numbers; it was the first one I put my hands on; the numbers just appeal to me.
No Reason Provided:	when participants offered no rationalization for their selections.
Heuristic (Changes)*	**Explanation**
Make Random:	when participant increases the space between the numbers or eliminates any patterns or sequences from the ticket. e.g., I am trying to make the numbers more spaced; I do not like consecutive numbers, I want to have a wider range; I find this sequence weird, I would change the numbers to mix them.
Significant Numbers:	rationalizations that refer to a favorite, lucky, or important number. e.g., I would change the numbers to my lucky numbers; these numbers are significant to me; I would change the 39 to 6 because it has personal significance to me.
Past Experience:	rationalizations that refer to previous lottery draws or previous gambling experiences. e.g., I would change this one because usually you don't see numbers that are all grouped together; I always go for even . . . so I can get three or four numbers; you need a low number and then one in the teens and 21 usually comes up.
Not Rounded:	rationalizations that refer to making the numbers less rounded out. e.g., I would get rid of the zeros; I would get rid of the 10, 20, 30; the numbers are too round . . . you need to have weird numbers in there.
Miscellaneous:	when participants did not provide an explanation or rationalizations that do not fit into any other category. e.g., I liked these numbers better; I am just making up anything; I would change the first digits.

**Note.* These heuristics occurred when individuals were given the last four 6/49 tickets and asked to make changes to them in order to increase the likelihood of winning.

Table 2
Percentage of Selections for the Total Sample

Selections	Random	Pattern	Nonequilibrated	Long Sequence
Pick 1	53.3	21.7	16.7	8.3
Pick 2	50.0	20.0	16.7	13.3
Pick 3	51.7	15.0	13.3	20.0
Pick 4	55.0	21.7	10.0	13.3

the ticket more "random" (Table 4 provides percentages of the various verbalizations made by the entire sample). Similarly, the identification of significant numbers was endorsed highly.

Gambling Involvement

In order to determine whether the heuristics endorsed differed between problem gamblers, gamblers with some problems, and gamblers with no problems, frequency counts were performed. Probable pathological gamblers were found to have the highest percentage of explanations involving an illusion of control, pattern statements, random statements, sequence statements, and significant numbers statements. Nonproblem gamblers had the greatest number of explanations based upon past experiences. Interestingly, the percentage of endorsement for this heuristic decreased as the level of gambling involvement increased (see Table 5).

With respect to ticket changes, nonproblem gamblers wanted to make the numbers less "round," while probable pathological gamblers made no such statements. However, while changing their tickets, probable pathological gamblers endorsed statements involving past experiences and significant numbers more than the other groups. Interestingly, the results of the ANOVA revealed that gamblers with some problems made significantly

Table 3
Percentage of Selections for Gambling Involvement

	Pick 1				Pick 2			
Gambling Problems	R	P	NE	LS	R	P	NE	LS
No Problems	57.1	23.8	14.3	4.8	38.1	14.3	33.3	14.3
Some Problems	45.8	25.0	20.8	8.3	54.2	29.2	8.3	8.3
Probable Pathological	50.0	10.0	20.0	20.0	70.0	10.0	0.0	25.0
	Pick 3				Pick 4			
Gambling Problems	R	P	NE	LS	R	P	NE	LS
No Problems	38.1	19.0	23.8	19.0	42.9	28.6	14.3	14.3
Some Problems	66.7	4.2	8.3	20.8	62.5	20.8	12.5	4.2
Probable Pathological	50.0	20.0	10.0	20.0	60.0	20.0	0.0	20.0

Note. R = random; P = pattern; NE = nonequilibrated; LS = long sequence

Table 4
*Percentage of Verbalizations Made by the Entire Sample**

	Heuristic	Percentage
Selections	Random	78.0
	Significant Numbers	69.5
	Illusion of Control	49.2
	Past Experiences	30.5
	Sequence	28.8
	Pattern	22.0
	Miscellaneous	54.2
	No Reason Provided	54.2
Changes	Make Random	66.1
	Significant Numbers	39.0
	Make Not Round	13.6
	Past Experiences	6.8
	Miscellaneous	50.8

*The majority of participants verbalized the random heuristic. However, it should be noted that there is an overlap in responses. The same individual verbalized several different heuristics. As a result, the percentages sum exceeds 100%.

more references to changing their tickets in order to make the numbers appear more random ($M = 2.26$, $SD = 1.48$) than nonproblem gamblers ($M = 1.14$, $SD = 1.31$), and probable pathological gamblers ($M = 0.70$, $SD = 0.95$), $F(3,58) = 4.06$, $p < .011$. Nonproblem gamblers ($M = 1.62$, $SD = 1.56$) and probable pathological gamblers ($M = 1.40$, $SD = 1.17$) made significantly more extraneous/miscellaneous explanations for ticket changes than the gamblers with some problem ($M = 0.57$, $SD = 0.90$), $F(3,58) = 3.06$, $p < .04$ (see Table 5).

Table 5
*Percentage of Verbalizations by Gambling Involvement**

	Heuristic	No Problems	Some Problems	Probable Pathological
Selections	Random	76.2	78.3	90.0
	Significant Numbers	71.4	60.9	90.0
	Illusion of Control	57.1	30.4	80.0
	Sequence	33.3	13.0	40.0
	Pattern	19.0	17.4	30.0
	Past Experiences	38.1	26.1	20.0
	Miscellaneous	52.4	47.8	70.0
	No Reason Provided	61.9	47.8	50.0
Changes	Significant Numbers	33.3	30.4	60.0
	Make Random	52.4	87.0	50.0
	Past Experiences	0.0	8.7	20.0
	Make Not Round	19.0	17.4	0.0
	Miscellaneous	66.7	34.8	70.0

*The majority of participants verbalized the random heuristic. However, it should be noted that there is an overlap in responses. The same individual verbalized several different heuristics. As a result, the percentages sum exceeds 100%.

There were no significant differences across levels of gambling involvement for the following selection heuristics: illusion of control, past experience, random, sequence, significant numbers, and for the following change heuristics: not rounded, past experiences, random, and significant numbers.

The primary focus of the present study was to establish whether cognitive distortions or biases of pathological gamblers were significantly greater than those of gamblers with no problems and gamblers with some problems. However, it is interesting to determine whether those who have a propensity to play the lottery have different or specific types of heuristics that they employ. Thus, the following analyses examine the heuristics by frequency of purchasing lottery tickets. Furthermore, while the intent was to examine Lotto 6/49 playing, multiple forms of lottery presently are available, such as scratch tickets and sports lottery, based on the jurisdiction in which an individual resides. An examination of frequent lottery players may provide valuable insight into their cognitive distortions.

Lottery Involvement

Regular players, occasional players, and nonplayers. Regular lottery players provided the fewest endorsements of the pattern heuristic. Further, this group made the greatest percentage of random statements (see Table 6). A one-way ANOVA revealed that participants who purchase lottery tickets occasionally ($M = 4.61$, $SD = 3.77$) and regularly ($M = 4.71$, $SD = 3.59$) gave significantly more random explanations for their ticket selections than those who had never purchased lottery tickets ($M = 2.43$, $SD = 2.13$), $F(2,58) = 3.09$, $p < .05$. When selecting tickets, nonplayers and occasional lottery players endorsed the heuristic of significant numbers much more than regular lottery players.

With respect to making changes to the remaining rickets, individuals playing the lottery regularly (once a week or more) made the greatest percentage of statements involving past experiences with the lottery, with nonplayers not endorsing this strategy. As mentioned previously, individuals who have never played the lottery made reference to changing their tickets in order to make them more random, while regular lottery players made the fewest of such statements. Furthermore, contrary to the heuristics endorsed during ticket selection, regular lottery players were incorporating more "significant numbers" when changing their tickets than occasional and nonplayers (Table 6).

There were no significant differences across levels of lottery playing for the following heuristics: illusion of control, past experience, pattern, sequence, significant numbers, and when changing tickets: not rounded, past experiences, random, and significant numbers.

Gender Differences

Independent samples *t*-tests indicated that there were no significant differences in cognitive heuristics between males and females.

Discussion

The reality is such that the winning numbers on the lottery, if legitimate, are selected on a completely "random" basis. The aim of the present study was to determine whether individuals' cognitive perceptions and behaviors were consistent with this fact. While each ticket is equally likely to win, individuals had no difficulty selecting a ticket that they perceived to be more likely to win, and providing an explanation and rationale as to its likelihood of winning. They maintained specific preferences and strategies for select-

Table 6
*Percentage of Verbalizations Made by Non-, Occasional, and Regular Lottery Players**

	Heuristic	Never	<Once/Week	≥Once/Week
Selections	Random	71.4	80.6	85.7
	Illusion of Control	42.9	54.8	42.9
	Significant Numbers	71.4	74.2	42.9
	Past Experiences	23.8	35.5	28.6
	Sequence	33.3	25.8	28.6
	Pattern	33.3	16.1	14.3
	Miscellaneous	57.1	51.6	57.1
	No Reason Provided	61.9	48.4	57.1
Changes	Significant Numbers	33.3	30.4	60.0
	Make Random	52.4	87.0	50.0
	Past Experiences	0.0	8.7	20.0
	Make Not Round	19.0	17.4	0.0
	Miscellaneous	33.3	58.1	71.4

*The majority of participants verbalized the random heuristic. However, it should be noted that there is an overlap in responses. The same individual verbalized several different heuristics. As a result, the percentages sum exceeds 100%.

ing what they believed to be winning tickets. Furthermore, participants had every opportunity to indicate that it does not matter which ticket is selected, such that they all have an equal chance of winning. While a small number of individuals reported that each ticket was likely to win, the majority continued to endorse their own rationalizations for their ticket selections. When put into an experimental paradigm asking whether they would be willing to sell recently purchased, self-selected lottery tickets (especially those with significant numbers), individuals are extremely reluctant (Ladouceur et al., 1996). The assumption held is that "their numbers," those that they have selected that have some important meaning to the individual, are likely to be the winning numbers, and thus, they are unwilling to relinquish those tickets in spite of being offered more money than they originally paid. In contrast, individuals readily are willing to sell machine, randomly generated tickets (quick picks) (Ladouceur et al., 1996). While the instructions required individuals to rank order the tickets with respect to the probability of winning, and in essence constituted a forced-choice paradigm, individuals had every opportunity to indicate that all tickets had an equal probability of winning.

The results of the present study indicated that, for the entire sample, the most commonly cited reason for selecting a lottery ticket was *perceived* randomness. Furthermore, with respect to actual ticket selections, irrespective of explanation, the greatest percentage of tickets selected by the entire sample for the first four selections were random tickets. These results are consistent with Ladouceur et al. (1996), who found that adults most frequently selected random tickets. The finding that the present sample disliked long sequences of numbers and tickets in which numbers were in a pattern also was consistent with Ladouceur et al. (1996). Adults in their study disliked tickets depicting patterns of numbers as well as long sequences. These findings also are consistent with results reported by Herman et al. (1998) with children. The children in Herman et al.'s (1998) study selected and preferred lottery ticket numbers that appeared to be presented in a random fashion and disliked tickets with long sequences of numbers. The findings of these studies seem to suggest that children and adults perceive tickets with "random" numbers to have a significantly better chance of winning. Further, the results indicated

that the most common heuristic endorsed when changing a ticket was to make the ticket more random. Individuals changed the 6/49 tickets in order to make them appear more dispersed (better range from 1 to 49) or "random." However, these individuals demonstrated the error of misperceiving the independence of chance events. The participants have failed to recognize that each number selected on the ticket is independent of the others, possibly due to the tendency to link events that occur in close proximity to one another (Ladouceur et al., 1996).

Given that the findings of the present study are consistent with other studies of lottery-ticket selections, both with children and adults, it would appear that the preference for random numbers is acquired early and maintains itself. Interestingly, "randomness" in and of itself does not exist. Individuals perceive random tickets to be those with numbers equally dispersed across the range from 1 to 49 in a 6/49 task. Furthermore, both children and adults believe that having a ticket with perceived "random" numbers increases their chances of winning. However, all winning numbers that are machine generated (quick picks), in fact, are generated arbitrarily. Thus, in this situation, the concept of randomness can be viewed as a cognitive distortion. Furthermore, this cognitive belief or distortion that random numbers are more likely to win appears to be established early in life and to be quite pervasive, as it was found with both children and adults. Prevention and intervention efforts should be aimed at children who are just beginning to demonstrate cognitive distortions in the selection of lottery tickets. Herman et al. (1998) reported that when engaged in the lottery task, children in grades 5 and 7 were using specific strategies to select tickets, while children in grade 3 (approximately age 8) did not appear to endorse particular strategies, and thus seemed to be more rational. The older children in their sample, aged 10 to 12, believed that random numbers increased their chances of winning and failed to realize that each number on the lottery ticket is independent of the next. Interestingly, children 8 years old appeared to be more rational in their ticket selections than children at ages 10 and 12, such that they did not appear to implement a specific strategy (i.e., preferring random numbers) when selecting lottery tickets. Rather, they appeared to possess the belief that each ticket had an equal chance of winning. The finding that many compulsive gamblers reported beginning to gamble at the age of 9 or 10 supports the need for early prevention programs (Gupta & Derevensky, 1998; Wynne, Smith, & Jacobs, 1996).

It should be noted that all of the cognitive rationalizations for selecting lottery tickets, in fact, are irrational. In reality, all tickets have an equally likely chance of winning, and it appears that individuals possess cognitive biases when it comes to lottery ticket selections. However, the results of the present study indicate that the notion of perceived "randomness" was the most widely cited rationalization for selecting a lottery ticket.

It is particularly interesting to note that cognitive distortions were more prevalent for regular lottery players and regular gamblers. Thus, it is possible that the past experience of gambling, particularly playing the lottery, enhances these types of cognitive distortions. This again stresses the importance of targeting young children before they are exposed to gambling activities and acquire distorted cognitive beliefs. In Herman et al.'s (1998) study, children, age 8, appeared to be more rational in their ticket selections. Perhaps this is a good age at which to begin intervention, when children's cognitions (for this type of activity) are more rational and before their erroneous beliefs are solidified.

Participants who have purchased lottery tickets (regularly and occasionally) gave significantly more random explanations for ticket selections than individuals who have never purchased lottery tickets. Furthermore, it appears that individuals who play the lottery regularly rely on their past experiences with the lottery when making changes to unfavorable tickets. With respect to gambling involvement, the probable pathological group endorsed the greatest percentage of the following heuristics: an illusion of control,

pattern, random, sequence, and significant numbers. The cognitive distortions for the pathological group were greatest. Perhaps, as an individual increases their frequency and involvement in gambling activities, and thus begins to develop problems associated with gambling, their beliefs (concerning gambling) become more distorted. Additionally, when asked to change their tickets, the probable pathological group made changes based on past experiences and significant numbers. These findings suggest they are relying on both their past gambling experiences and superstitious behavior when selecting and modifying tickets. These results are consistent with research with adults (not having any gambling problems) who have demonstrated that cognitive biases and distortions promote and maintain one's gambling behavior (Griffiths, 1994; Ladouceur & Walker, 1996; Langer, 1975). Regular gamblers maintain a set of beliefs, most of which are false (irrational thoughts, erroneous cognitions, and misperceptions), including the illusion of control (Langer, 1975) and the misperception of the independence of chance events (Ladouceur et al., 1996). The underlying assumption is that the motivational component of the gambling activity, namely the hope of overall monetary gain and the desire to beat the game, combines with these erroneous beliefs and propels the individual to engage repeatedly in the activity despite repeated losses (Ladouceur & Walker, 1996).

The present study provides a unique and interesting way of investigating faulty cognitions that promote and sustain gambling behavior, particularly lottery playing. However, the generalizability of the findings may be limited due to a number of methodological issues and require replication.

The proliferation of gambling opportunities are growing worldwide, with very young children beginning their introduction by purchasing lottery tickets (Gupta & Derevensky, 1998). State and provincial legislatures are reaping the benefits of their mass advertising, giving individuals an illusion of control and the hope to "live the dream."

In light of the present results that illustrate that most individuals hold faulty cognitions regarding the selection of lottery tickets, these perceptions need to be addressed in intervention and prevention programs. While cognitive restructuring of one's erroneous beliefs is important, it is important to note that it is only one component in the treatment of adolescents and adults with gambling problems (Gupta & Derevensky, 1999).

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