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The Relationship Between Gambling and Video-Game Playing Behavior in Children and Adolescents

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It is suggested that commercial video-games (e.g. *Nintendo* & *Sega*) and gambling activities have similar attractive features and intermittent reinforcement schedules. This research seeks to examine the nature of this relationship amongst children. One hundred and four children aged 9 to 14, from grades 4, 6, and 8, participated. A questionnaire exploring issues related to video-game playing and gambling behavior in children and adolescents was completed and a computerized blackjack game was individually administered. High frequency video-game players were compared to low frequency video-game players with respect to their gambling performance on the blackjack gambling task as well as on information gathered from the questionnaire. Of particular concern is the risk-taking strategies used by avid video-game players, whether or not children perceive gambling and video-games as involving similar amounts of skill or whether they realize that gambling is primarily a game of chance. The findings, in general, suggest that high frequency video-game players gamble more than low frequency video-game players, report that gambling makes them feel more

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important, and take greater risks on the blackjack gambling task although no overall differences in success were found. Males exhibited greater risk-taking tendencies on the blackjack task than females. The clinical implications of the findings are addressed.

Gambling which has been primarily thought of as an adult activity has recently been shown to be a popular activity amongst the young (Arcuri, Lester, & Smith, 1985; Ladouceur & Dubé, 1994; Ladouceur, Dubé, & Buyfoid, 1994; Ladouceur & Mireault, 1988; Lesieur & Klein, 1987; Rosenstein & Reutter, 1980). As there are few observable signs of gambling dependence among children and adolescents, such problems frequently go undetected compared to other forms of addiction (e.g. substance abuse) (Arcuri et al., 1985; Lesieur & Klein, 1987). Nevertheless, retrospective studies indicate that adult problem gamblers report the onset of their pathological behaviors to have begun between the ages of 10-19 (Cusier, 1982; Dell, Ruzicka, & Palisi, 1981; Livingston, 1974). Griffiths (1990) has reported that young children, aged 8-10, begin playing fruit machines in video arcade parlors in the U.K. He contends that the younger a child starts playing the machines, the more they are likely to experience problems. Family members of pathological gamblers may also be more susceptible to problems such that 20-25% of their children gamble themselves and/or show other forms of addictions (Kusysyn, 1972; Lesieur & Klein, 1987; Lorenz & Shantlesworth, 1983).

Recently, Ladouceur and Dubé (1994) suggested that an alarmingly high number of children are engaging in gambling behavior. Their survey found that 86% of children in grades 4 through 6 reported gambling in some form and 40% reported gambling a minimum of once a week. A survey conducted in Atlantic City (Arcuri et al., 1985) revealed that 64% of adolescents gambled in casinos with 9% gambling weekly, despite the fact that the legal gambling age in New Jersey was 21. In yet another study, Lesieur and Klein (1987) reported 32% of students surveyed gambled a minimum of once a week. They found that problem gamblers when compared with non-problem gamblers were more likely to be males with low grades, with one or both parents having a gambling problem, and with gambling generally occurring when opportunities presented themselves. Furthermore, 90% of those children reported their parents knew they gambled and only 6% said their parents were opposed to such activities. Similar surveys in the U.K. have noted a high

incidence of gambling amongst young adolescents (Fisher, 1992; Griffiths, 1990; Huxley & Carroll, 1992).

Despite some conflicting findings, there appears to be an overall consensus among researchers that gambling is more popular amongst males than females (Fisher, 1990; Griffiths, 1991a, 1995; Ide-Smith & Lea, 1988; Ladouceur & Dubé, 1994; Ladouceur et al., 1994; Rosenstein & Reutter, 1980; Volberg, 1993). Griffiths (1989) has suggested that it may be more popular among boys because it allows them to display their masculinity in a social environment by exhibiting their "courage and bravery."

GAMBLING AND VIDEO-GAMES

While gambling activities and video-games have many similar properties, little research has examined the possible relationship between these two activities. The present study seeks to examine this relationship amongst children and adolescents.

Using a behavioristic paradigm, the variable ratio schedules found in most gambling activities may result in compulsive behavior. Variable-ratio schedules of reinforcement are very powerful in shaping and maintaining behavior. Under such conditions, individuals respond in a specific manner because a behavior has been reinforced in a subsequently expect that similar consequences will follow in the future. However, in variable-ratio schedules, reinforcement does not present itself at every occurrence of the behavior but rather is intermittently presented. This intermittent reinforcement raises the probability of responding above the value generated when all responses are reinforced and subsequently makes the behavior more resistant to extinction (Skinner, 1969).

The use of video-games is very prevalent in our society. Regardless of socioeconomic status, home entertainment video-game units (e.g. *Nintendo*, *Sega Genesis*, or personal computers which act as video-game devices) remain popular. Like gambling, video-games are reinforcing because they sharpen the contingencies of winning and losing. Some researchers have speculated that commercial video-games make use of similar types of 'addictive' reinforcement schedules as do gambling activities (Koop, 1982) and that video players manifest compulsive tendencies in their play (Egri & Meyers, 1984). Compulsive or excessive

video-game playing shares many properties with other addictions. Individuals report feelings of excitement when playing (similar to an adrenaline rush), it is often engaged in for the purpose of relieving stress, it has a strong learning component, and it is commonly regarded as a form of sensation seeking. In England, video-game playing and fruit machine (slot) playing is widespread amongst adolescents in arcade parlors. Addiction to playing these fruit machines is highly evident (Fisher, 1993; 1995; Griffiths, 1991a), and it has been suggested that video-game playing may be a precursor to fruit machine playing (Brown, 1989). The arcades in England thus incorporate gambling possibilities, since fruit machines are a pure form of gambling, and while incorporating a high visual and auditory component as well as intermittent schedules of reinforcement, are not considered video-games. Nonetheless, it is not surprising that their arcade parlors have paired the potentially addictive video-games with a gambling game of similar, if not more, addictive properties. In the U.K. where slot fruit machines are legally available to children of any age, at least 65% of adolescents are reported to have played these fruit machines sometime during their adolescence, and 5-10% of adolescents play at least once per week (Griffiths, 1991a, b). Gambling opportunities are not as readily accessible in North American arcades, with slot machines and video-poker machines mostly restricted to casinos and adult environments. Nevertheless, confirmatory evidence linking video-game playing and gambling behavior requires further investigation (Fisher & Griffiths, 1995).

Children enjoy the dynamic, interactive, and entertaining nature of video-games. These games employ several reinforcing stimuli such as color, graphics, and music. The games are action filled, fast paced and provide the player with a sense of control. The path through which a game unfolds is not entirely randomly determined but is controlled to a large extent by the child's actions. Video-games remain exciting in that they expose the player to seemingly random events such as unpredictable attacks by the "enemy." Within these action/adventure games, the child, not being fully aware of the contingencies, must avoid extermination. Most video-games involve complex rules, which unfold as the player becomes more skilled and advances to higher levels. But unlike conventional board games, the player must induce the rules through observation and practice rather than have them clearly defined a priori (Greenfield, 1984). Each time the child's skill improves, reinforcement of playing behavior takes place, and the game is understood a little bet-

ter through induction of the rules. The child eventually establishes a sense of mastery as randomness turns into order (i.e. once enough induction of rules has taken place), and continually strives to improve.

Video-games are very appealing because they provide direct feedback to the individual (Greenfield, 1984). The player knows instantly, through visual and auditory feedback, whether his/her response was correct, incorrect, too early, or too late. As the player gains experience, the consequences which contribute to or detract from performance are learned. Familiarity and strategy acquisition are two factors resulting in the inductive process of understanding the nature of the game, thus taking the player one step closer to mastery. Correction and improvement usually occur from the inductive process of the unfolding of the rules. With familiarity comes the increasing ability to anticipate events that are likely to occur, thus permitting the player to develop elaborate strategies. Although a very skilled player perceives the game will eventually be mastered if performance is improved, creators of video-games seek ways of constantly challenging the player. A more difficult situation or level is most often presented after each goal has been achieved while simultaneously reinforcing the player. This never-ending cycle keeps the player striving for mastery but rarely allows perfection to occur (Chaffin, Maxwell, & Thompson, 1982). As such, these games lead one to continually, sometimes compulsively, attempt to improve one's performance.

Video-games and games of chance share several properties. Both are exciting, contain elements of randomness, and operate on schedules of intermittent reinforcement. One major difference is that video-games provide feedback which allows a player to improve performance and have some control whereas many gambling situations allow considerably less room for skill to play a role (e.g. slots, roulette). Video-game players eventually uncover the rules that allow them to transform randomness into order whereas gamblers most often deal with uncertainty and randomness. It is plausible that both video-game players and gamblers continually believe they can exert control over a game, but the reality is that unlike video-game playing, gambling is primarily a game of chance operating on a variable ratio schedule in which the gambler merely has the perception of exerting a significant amount of skill. This is especially true for children who have limited problem solving abilities and have an inability to use sophisticated laws of probability. Due to this false belief of control, the gambler attempts to establish a sense of

mastery while playing. It seems plausible that children who are avid video-game players and who are familiar with controlling their games through skill may have a tendency to develop a false sense of confidence and be greater risk-takers when gambling due to their existing belief that they are able to control games, as they do with video-games. When initially playing a new video-game the rules are unknown and appear random. However, with practice, the rules are understood and no longer appear random but rather follow a logical order. With gambling activities, the games appear random when first encountered, and being games of chance remain random despite how many hours one devotes to understanding the game. If the compulsive behaviors of gamblers and video-game players are the result of similar mechanisms of reinforcement, then one might hypothesize that sophisticated video-game players will transfer their relentless effort to exert control in a video-game over to a gambling situation.

The present study is designed to examine the relationship between video-game playing and gambling behavior and to examine children's perceptions with respect to both activities. It is predicted that high frequency video-game players will take more risks on a blackjack task as well as gamble more frequently in their daily lives than low frequency video-game players. Furthermore, it is hypothesized that males will be greater risk-takers than females and that females who are high frequency video-game players will approximate male gambling behavior.

METHOD

Subjects

Children and adolescents were initially classified into two groups on the basis of frequency and duration of video-game playing behavior. Approximately 500 children, from seven schools, were screened in order to obtain a roughly equal number of high and low frequency video-game players. All children were from regular classrooms, with no apparent psychological or psychiatric disorders. Children with known behavioral disorders or learning disabilities were excluded from the study. As a result of the initial screening, the final sample consisted of one-hundred and four children/adolescents. To qualify as a high frequency player, a child was required to have reported playing video-

games a minimum of 5 days per week, for a minimum of 1.5 hours during each session. Low frequency players were defined as playing video-games 2 days a week or less, and an hour or less during each playing session.

One hundred and four children from grades 4, 6, and 8, ranging in age from 9 to 14 participated. Forty-nine were classified as high frequency and 55 classified as low frequency video-game players. The children (51 males; 53 females) were selected from middle class, public, English elementary and secondary schools in Montreal.

Measures

A questionnaire, specifically designed for this study, containing 30 items inquiring about the nature of both video-game playing and gambling activities (16 pertaining to video-games and 14 to gambling behavior) was completed by each participant. While no direct reliability or validity data exists, the individuals appeared to conscientiously complete the questionnaire which has face validity. The following information was ascertained from the questionnaire: the children's perceptions of the degree of skill and luck involved in playing video-games and gambling activities ("none", "a little" or "a lot"), the frequency of visits to arcades per month, their perceptions of their video-game playing and gambling skills (they rated themselves on a 9 point likert scale); their desired video-game playing and gambling abilities, frequency of gambling involvement, the types of gambling activities in which they engaged, reasons for engaging in video-game playing and gambling behavior, the largest amount of money ever wagered at once, and whether or not gambling makes them feel important. Gambling was defined as using real money for any of the following activities: purchasing lottery tickets, betting on sports pools, playing cards, playing bingo, playing slot machines, betting on video-games or video-poker and betting on other games of skill.

A computerized blackjack game was used to measure risk-taking behavior on a gambling task. Blackjack was selected due its relatively simplistic nature, its inclusion of both elements of randomness and skill, and its familiarity among children. The blackjack task was used to assess actual playing behavior and yielded measures of gross wagers (cumulative amount of money bet), gross winnings (cumulative amount of money won), winning percentage (gross wins/gross wagers), number of

hands played, percentage of accuracy and the final balance for each player. A color Lap Top IBM compatible computer was used in order to render the task as "life-like" and stimulating to the child as well as to maintain the element of color found in both video-games and games of chance. The MS DOS computer software, *Blackjack! Version 2.200D* (Granger, 1991), graphically simulates a casino blackjack game. It was deemed appropriate due to its graphic accuracy and the fact that it adds the cards for each hand, thereby avoiding potential faulty arithmetic errors.

Procedure

All children and adolescents completed the questionnaire in their classrooms. A research assistant explained that all information obtained was confidential and was available for clarification of questions if needed. For the grade 4 students, the research assistant read the questions aloud to eliminate potential comprehension errors. The children required 10-20 minutes to complete the questionnaire depending upon their age. On the basis of their reported frequency of video-game playing, high and low frequency video-game players were selected for further testing on the blackjack task.

High and low frequency video-game players were individually administered the computerized blackjack task. Due to ethical constraints individuals did not play with actual money, but were provided with a bankroll of \$100 and given the incentive of winning movie gift certificates, proportionate to their winnings. More specifically, for every \$5 they won above the initial \$100 at the conclusion of the game, they were given a ticket which was entered in a draw for \$20 worth of movie certificates. Therefore, the greater the number of tickets won and entered into the draw, the greater the chance of winning the certificates. Participants played the game for a 10 minute period or until their bankroll was depleted. No children were omitted on the basis of not being familiar with the task requirements. Each child was provided with the following standardized instructions while being shown on the computer screen certain aspects of the game:

You will be playing a game called blackjack against the computer. The whole objective is to have your cards add up to 21 or as close to 21 as possible without going over. The one whose total is closest to 21 without going over wins the hand.

Don't worry about being able to add up your cards because the computer does that for you. The dealer will first allow you to decide whether or not you want another card and only after you have decided to stop will he play his hand. If you want another card, press the green button (hit) and if you want to stop (stand), press the red button. You should know that it is considered a risk to ask for another card if your cards add up to 17 or more and that it is also considered a risk to stand if your cards add up to 16 or less. But really, it is up to you to decide what to do. You can change your bet at every hand. The minimum you can bet on each hand is \$5 and the maximum amount you can bet is whatever you have remaining in your account. Don't forget that your goal is to end up with an amount greater than the initial \$100 dollars we lent you in order to get as many tickets as possible for the draw. (The research assistant then demonstrated several hands to show how to operate the computer, and the child was then permitted 5 practice trials to ensure they understood the task) Good luck and have fun. You have 10 minutes to play, or until you have run out of money.

RESULTS

No major significant developmental differences were found across grades (Derewensky, Gupta, & Della Cioppa, 1996) for video-game and gambling behaviors. All results presented in this paper are collapsed across grades.

Video-game Playing Behavior

In general, children perceived video-game playing as being more skill driven than luck driven. Forty-two percent believed it involved "a little" element of skill while 51% believed it required "a lot" of skill. Fifty-four percent believed there is "a little" luck involved with only 20% considering it required a "lot of luck". Children with a high video-game playing frequency were significantly more likely to go to arcades than those who rarely play video-games, with respected means of 8.5 and 0.9 visits per month ($t = 4.17$, $df = 102$, $p < .001$). This was not unexpected as the sample was previously selected based upon video-game playing behaviors. Male high frequency video-game players visited arcades significantly more frequently than low frequency males ($M = 13.2$ vs. $M = 9.3$) ($t = 3.58$, $df = 49$, $p < .001$), and similarly, high frequency females visited arcades significantly more often than low frequency females ($M = 2.9$ vs. $M = 0.5$) ($t = 2.06$, $df = 51$, $p < .044$). When comparing males and females it was found that high frequency males ($M = 13.9$)

significantly surpassed the amount of times high frequency females ($M = 2.9$) went to arcades ($t = -2.86$, $df = 47$, $p < .006$), whereas low frequency males ($M = 1.3$) did not significantly differ from low frequency females ($M = 0.5$).

As expected, high frequency video-game players rated themselves as being more skillful at playing video-games ($t = 4.35$, $df = 101$, $p < .001$) than low frequency individuals, and expressed greater desired levels of skill ($t = 4.37$, $df = 100$, $p < .001$). High frequency males rated themselves as possessing more skill ($t = 2.73$, $df = 49$, $p < .001$), and indicated having higher optimal desired levels of skill ($t = 2.74$, $df = 49$, $p < .01$) than their low frequency counterparts. Similarly, high frequency females rated their playing abilities as being greater ($t = 2.37$, $df = 50$, $p < .02$) and indicated higher desired abilities than low frequency females ($t = 3.27$, $df = 49$, $p < .002$). High frequency male video-game players rated themselves significantly higher in terms of skill ($t = 5.50$, $df = 47$, $p < .001$) as well as expressed a higher desired level of playing ability than high frequency females ($t = -2.21$, $df = 47$, $p < .03$). Finally, low frequency males perceived themselves as being better at playing ($t = -2.35$, $df = 52$, $p < .02$), and held higher ideals for their playing ability ($t = -2.56$, $df = 52$, $p < .01$), than low frequency females.

Gambling Behavior

Of the total sample, 70% reported having gambled in the past, and 53% of those individuals reported gambling a minimum of once per week or more. High frequency video-game players were significantly more likely to have gambled in general ($\chi^2 = 13.0$, $df = 1$, $p < .001$) and to have gambled once a week or more ($\chi^2 = 20.5$, $df = 1$, $p < .001$). High frequency males (89%) were not statistically more likely to have gambled in the past than low frequency males (69%) ($\chi^2 = 3.7$, $df = 1$, $p < .054$), yet are almost three times as likely to be gambling once a week or more (63% vs. 25%) ($\chi^2 = 7.4$, $df = 1$, $p < .007$). A similar trend was found for females such that twice as many high frequency females reported having gambled than low frequency female video-game players ($\chi^2 = 8.4$, $df = 1$, $p < .004$). Furthermore, 55% of high frequency females reported gambling once a week or more versus only 10% of low frequency females reporting gambling that often ($\chi^2 = 12.8$, $df = 1$, $p < .001$). Interestingly, high frequency males and females did not differ on whether they have gambled or whether they gamble once a week or

more. Low frequency males and females did not differ statistically with respect to their frequency of gambling behavior, with 10% of low frequency females and 25% of low frequency males indicating their participation in some weekly gambling activity.

Although 70% of children who gamble perceived gambling as involving a "lot of luck", 56% believed that a "lot of skill" is involved as well. If one adds the category of "a little" skill, the percentage of those who believe skill is involved in gambling increases to 87%. This finding reveals that despite their awareness that luck plays a big role, the children and adolescents in this study remain under the illusion that a substantial amount of skill is also involved.

High frequency video-game players did not differ from low frequency players in terms of perceived gambling ability, but indicated higher desired gambling abilities ($t = 2.42$, $df = 69$, $p < .02$). No significant gender differences were found. In addition, 23% of high frequency video-game players who report gambling indicated that these activities make them feel more important whereas less than 7% of low frequency individuals who gamble reported this belief.

No significant differences between high and low frequency video-game players were found for the largest amount of money ever wagered at once, as reported in the questionnaire. Similarly, high and low frequency males did not differ with respect to this behavior, but high and low frequency females differed significantly, with avid video-game players betting greater amounts of money (\$5.00 vs. \$2.00) ($t = 2.09$, $df = 30$, $p < .05$).

The children and adolescents indicated engaging in gambling activities for several reasons, the most popular reason being "for the enjoyment" (74%). The second most indicated reason was "for the excitement" (49%), followed by "to pass the time" (25%), "to win money" (22%), and "to win peer approval" (1%). These reasons were consistent across gender, with the exception of males reporting more excitement than females, these percentages being 30% and 19% respectively. It is also interesting to note the comparisons between the reported reasons why individuals play video-games and why they gamble. It appears as though both activities are primarily engaged in because they provide enjoyment, but that video-game playing is more often used to pass the time than is gambling. Individuals who gamble find video-games more exciting than do non-gamblers, with 47% of gamblers versus 10% of non-gamblers playing video-games for that reason.

Table 1
Means and Standard Deviations of Gambling Behavior on the Blackjack Task for High and Low Frequency Male and Female Video-Game Players

| | Males | | | | Females | | | |
|----------------|----------------|--------|---------------|--------|----------------|--------|---------------|--------|
| | High Frequency | | Low Frequency | | High Frequency | | Low Frequency | |
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| # of Hands | 46.63 | 21.67 | 39.08 | 17.60 | 44.09 | 22.45 | 41.03 | 17.52 |
| Gross Wagers | \$607.07 | 346.64 | \$387.54 | 207.91 | \$355.86 | 148.53 | \$377.13 | 214.60 |
| Gross Winnings | \$292.83 | 202.30 | \$191.35 | 120.81 | \$149.54 | 80.18 | \$176.66 | 131.33 |
| End Balance | \$-27.02 | 91.62 | \$-42.31 | 62.12 | \$-66.00 | 47.32 | \$-32.64 | 71.88 |
| % of Accuracy | 77.15 | 6.73 | 75.75 | 77.22 | 78.41 | 5.65 | 77.42 | 6.64 |
| % of Wins | 46.47 | 9.29 | 42.06 | 13.82 | 39.70 | 11.46 | 42.47 | 13.35 |

With respect to performance on the blackjack task, high frequency video-game players wagered significantly greater amounts of money ($M = \$493.00$) ($t = 2.23$, $df = 102$, $p < .028$) than low frequency video-game players ($M = \$381.20$). High frequency males were found to wager more money ($M = \$607.07$) than did low frequency males ($M = \$387.54$) ($t = 2.70$, $df = 49$, $p < .01$), however a similar trend was not found for females (Table 1). High frequency males had significantly higher gross wagers ($M = \$607.07$) than high frequency females ($M = \$355.86$) ($t = -3.40$, $df = 47$, $p < .003$), while males and females did not differ within the low frequency group.

No significant findings were found for gross winnings or for percentage of winnings between high and low frequency video-game players. However, high frequency males had higher gross winnings ($M = \$292.83$) than low frequency males ($M = \$191.35$) ($t = 2.14$, $df = 49$, $p < .04$). Furthermore, high frequency males had higher gross winnings ($t = 3.12$, $df = 47$, $p < .003$) and a greater percentage of winnings ($t = -2.28$, $df = 47$, $p < .03$) than high frequency females. No significant differences were found between high and low frequency females, nor between low frequency males and females.

Statistically significant findings were not found with respect to frequency and/or gender for the following playing behaviors: number of hands played, percentage of accuracy, or final balance (see Table 1). Although males were found to place greater wagers, and experience greater total gross winnings, their final balances at the completion of the task were not statistically higher than any other group. It is interesting to note that the high frequency males, in general, had the lowest mean loss for all groups. This was opposite for females (Table 1). All significant findings pertaining to the blackjack task are presented in Table 2.

DISCUSSION

This research was an exploratory study attempting to establishing a link between video-game playing and gambling behavior. Of interest was the finding that a higher proportion of individuals who are high frequency video-game players reported having gambled, and both high frequency male and female video-game players were significantly more likely to be gambling once a week or more. High and low female video-

Table 2
Significant Findings on the Blackjack Task

| <i>HF* males > LF* males</i> | <i>Results</i> |
|---------------------------------|--------------------------------------|
| # Hands Played | $t = 2.70$, $df = 49$, $p < .01$ |
| Gross Winnings | $t = 2.14$, $df = 49$, $p < .04$ |
| <i>HF males > HF females</i> | |
| Gross Wagers | $t = -3.40$, $df = 47$, $p < .003$ |
| Gross Winnings | $t = -3.12$, $df = 47$, $p < .003$ |
| Percentage of Wins | $t = -2.28$, $df = 47$, $p < .003$ |

*HF=High Frequency Video-Game Players

*LF=Low Frequency Video-Game Players

game players differ more dramatically than did high and low frequency video-game playing males, possibly suggesting that engaging in video-game playing has a greater effect upon females in terms of gambling behavior. However, it is more likely that predisposing and constitutional factors which are important determinants of why certain individuals engage in video-game playing also may predispose them to take greater risks and engage in gambling behavior. Such factors likely include physiological levels of arousal, social influences, emotional states, etc.

A more interesting finding was that high frequency female video-game players were more likely to have gambled, and to gamble once a week or more, than low frequency males. It has been clearly established in the literature that males, in general, engage in gambling activities more so than females. The fact that a greater percentage of high frequency video-game playing females were found to be gamblers than the males who do not play video-games very often, suggests that video-game playing is an activity which attracts individuals who are more likely to gamble as well, thus magnifying the link between video-game playing and gambling. In other words, by seeking out high frequency video-game playing females, the researchers inevitably sought out females who are more likely to gamble as well. Furthermore, these high frequency females reported wagering larger amounts of money at one time than their low frequency counterparts. The results indicate that children, regardless of their gender, engage in gambling activities at a

young age. Nonetheless, high frequency video-game playing males appear to be the individuals who are most attracted to gambling activities, a finding consistent with the literature on gender differences (Fisher, 1990; Griffiths, 1990; Ide-Smith & Lea, 1988; Ladouceur et al., 1994; Rosenstein & Reuter, 1980).

High frequency video-game players were found to wager more money on the blackjack task suggesting that frequency of video-game play is related with greater risk-taking behavior. High frequency males in particular, appear to be taking the greatest amounts of risk on this task. Despite their higher wagering and overall greater gross winnings, they fail to generate a higher end balance indicating that they are being less cautious in their playing decisions. It is not surprising that high frequency individuals take greater risks since they likely view gambling as an activity which involves a large amount of skill. Their tendency to wager greater amounts of money could be viewed as an indication of a false sense of security and confidence that they are exerting control over the gambling situation. This illusion of control suggests that the players' cognitions may be driven by the intermittent schedules of reinforcement in the game, similar to those found in video-games. More specifically, since the players are expecting reinforcement to occur at any time, when it finally does occur, they believe it has something to do with their ability to control outcomes, despite the number of times reinforcement did not take place. It appears as though they get so caught up in the excitement of the game (physiological arousal) that their ability to think rationally is lost. These behaviors in children are consistent with research on adult cognitions such that when they are asked about the "controllability" of outcomes of independent events in interviews or surveys, they tend not to endorse an illusion of control. However, when engaged in gambling, they claim to be able to predict when a machine is about to "pay off" (Dickerson, 1993).

It is noteworthy that the children and adolescents indicated that a great degree of both skill and luck are involved in gambling activities. Children thus differ from adults in terms of their rationality such that despite their awareness of the role of chance in gambling activities, they are nevertheless irrational in their belief that skill also plays a significant part. It may be that they are not yet cognitively sophisticated enough to realize that chance precludes skill and as such respond in a manner consistent with an illusion of control. Since high frequency video-game players are more likely to experience this false sense of control, it is plausible

ble to postulate that they are relating their gambling experiences to their ability to exert control when playing video-games, an activity which is mostly skill driven despite employing reinforcement schedules similar to those used in gambling activities. If this indeed is a transfer of skill from video-game playing to the blackjack task, it would be interesting to see whether such a transfer would occur on a gambling task which does not necessitate any skill whatsoever, such as roulette or slots. Brown (1989) has hypothesised that engaging in video-game activities is a precursor to fruit machine playing.

The fact that high frequency video-game playing children reported that gambling generates within them feelings of importance is of concern, since this will likely lead them to pursue these activities. Children in general, and males in particular, look positively upon risk-taking, viewing it as a display of bravery and courage. As well, the false sense of control (and thus empowerment) which the players experience generates a sense of mastery. These phenomena coupled with the excitement, reinforcement, and arousal from gambling may result in these feelings of self importance.

This study presents an initial examination of children's gambling behaviors with the use of an actual gambling task. Although interesting findings were yielded in terms of gross wagers and gross winnings for these youths, the existing software was not sensitive enough to measure their percentage of accuracy, a measure which would provide greater insight into risk-taking behavior. Percentage of accuracy refers to the number of times the player draws a card (hits) and refused a card (stands) when they should, over the number of times they hit or stand when the laws of probability suggest they should not. However, the blackjack software also factored in "double-downs", a notion judged as being too complex for our young subjects to grasp. As such, obtained percentages of accuracy are not a true reflection of the players' performance, and thus may account for the lack of any meaningful findings. One would assume that the greater the risk, the lower the accuracy (lower gross winnings). Studies utilizing more sophisticated measures would provide better insight into children's gambling behaviors.

It has been suggested that laboratory confined studies of gambling have several limitations, mainly being that bringing real life situations into a controlled unrealistic setting changes the nature of the task as well as excludes "hidden interactions" which take place in real life situations (Anderson & Brown, 1984). However, considering that the focus

of this study centered upon the intermittent schedules of reinforcement present in gambling tasks, and since no attempt was made to fabricate an unrealistic "social scenario" or to measure levels of arousal, the nature of the task was not compromised. Furthermore, survey information about their gambling activities were gathered to lend support to our findings. The fact that the children and adolescents in this research were not using their actual money to gamble with represents a limitation, although it appears as though the incentives provided were sufficiently motivating. Ethical considerations make it difficult to have children engage in gambling activities involving risking their own money.

It should be noted that causality can not be established from this study, such that it still remains unclear whether experience with video-games leads one to gamble, or whether both activities attract the same children due to their shared properties. It may be that children who are avid video-game players are drawn to activities which employ intermittent schedules of reinforcement. Gambling may be viewed by these children as being similar and perhaps even more interesting than video-games due to the added excitement of winning money or prizes. It is also plausible that gambling behavior is influenced by exposure to arcades rather than by video-games themselves since high frequency video-game players visit them more frequently even when no direct gambling opportunities present themselves. Only longitudinal studies can address such issues. Research on gambling behavior in England has found that adolescents are in fact exposed to gambling activities in the arcades (e.g. fruit machines) and the similarities between arcade video-game playing and slots (fruit machines) have been suggested (Brown, 1989; Fisher & Griffiths, 1995). However, these findings need to be interpreted with great caution when applying them to North America considering that gambling opportunities, such as fruit machines, are not readily available to children and adolescents in our arcades. It is not known whether information yielded from the blackjack task is generalizable to other forms of gambling. Further studies employing different gambling tasks with children are necessary.

Within the present sample, selected on the basis of high and low frequency of video-game playing, 70% of children and adolescents reported having gambled. Of those, 53% reported gambling a minimum of once a week. These percentages are in accordance with findings from other recent survey studies (Ladouceur & Dubé, 1994; Ladouceur et al., 1994; Ladouceur & Mirreault, 1988). Of considerable concern is the

rising prevalence of gambling behavior amongst teenagers (see Jacobs, 1989 for a review), and the dramatic increase in reported revenues by legalized gambling establishments (The WAGGER, 1996). In fact, many "instant win" lotteries appear aimed at a young audience, a population anxious for immediate rewards. These lottery tickets of low cost, have high pay-out rates, but with small payoffs. This intermittent reinforcement schedule maintains the interest of children and adolescents. The use of sports related betting and lotteries are particularly attractive to young males. Revenues of lottery ticket sales within the United States in particular have risen from \$2.17 billion in 1982 to \$14.126 billion in 1994 (The WAGGER, 1996).

Gambling in youth has been associated with criminal involvement, delinquency, truancy, and poor academic achievement (Fisher, 1993; Griffiths, 1990; Ladouceur & Mirreault, 1988; Lesieur, Cross, Frank, Welch, Rubenstein, Moseley, & Mark, 1991; Lesieur & Klein, 1987), and retrospective research has shown that the majority of pathological gamblers started gambling at a young age (Custer, 1982; Dell et al., 1981; Livingston, 1974). This study lends further support to the widely held belief that gambling commences at a very young age, and has found that young high frequency video-game players, both male and female, are more prone to be engaging in gambling related activities.

High frequency male video-game players appear to be the group most "at risk" for developing problematic gambling habits, and this trend is already established at the elementary school level. Relatively little is known concerning the potential harmful or beneficial effects of video-game playing. The same remains true for young occasional gamblers. Jacobs (1989) argues that as many as 7 million juveniles in the U.S. were gambling for money, many with the knowledge and approval of their parents. He further reports that more than 1 million of these youths have serious gambling-related problems. Treatment programs designed for adult pathological gamblers, or Gamblers Anonymous, may not provide an optimal intervention strategy for children and young adolescents.

It is not suggested that we inhibit children's video-game playing per se (although there may be other educational and psychological reasons for suggesting this) nor are we suggesting that all gambling will lead to addictive pathological behavior. Nevertheless, the results of this research suggest that excessive video-game players appear to be drawn to gambling activities more so than low frequency video-game players.

More specifically, high frequency male video-game players appeared to be the group most attracted to gambling activities and displayed greater risk-taking tendencies on the blackjack task. It remains incumbent upon us to have a better understanding of the underlying cognitive, personality, social, environmental, and societal factors that influence individuals to become at-risk for severe gambling-related problems.

With many of our youths succumbing to other forms of addiction (e.g. drug abuse, alcoholism), little attention is being paid to therapeutic and/or preventative programs aimed at decreasing children's and adolescents' gambling behavior. The present research has only identified one potential predictor. More research is needed to understand the underlying processes and etiologies of gambling behavior, to establish which populations are at greatest risk, to determine which factors play a role in leading children to gamble, and to create and systematically evaluate prevention and intervention programs. The potential negative consequences to our society remain obvious. It is now time to address these issues.

REFERENCES

- Anderson, G., & Brown, R.I.E. (1984). Real and laboratory gambling: sensation seeking and arousal. *British Journal of Psychology*, *75*, 401-410.
- Arctur, A.F., Lester, D., & Smith, E.O. (1985). Shaping adolescent gambling behavior. *Addiction*, *20*, 935-938.
- Brown, R.I.E. (1989). Gambling, risk taking, addictions and a developmental model of man-machine relationships. In J. Kubberg, D. Crowell, H. de Jong, & W. Schaper (Eds.), *Simulation gaming* (p. 368). Oxford: Pergamon.
- Chaffin, J.D., Maxwell, R., & Thompson, B. (1982). ARC:ED Curriculum: The application of video game formats to educational software. *Exceptional Children*, *49*, 173-178.
- Custer, R.E. (1982). An overview of compulsive gambling. In F. Carone, S. Yoles, S. Keitler and L. Krinsky (Eds.), *Addictive disorders update* (pp. 107-124). New York: Human Sciences Press.
- Dell, L.J., Rozicka, M.E., & Palisi, A.T. (1981). Personality and other factors associated with the behavior in children and adolescents. *Journal of Abnormal Psychology*, *90*, 149-156.
- Derevensky, J.L., Gupta, R., & Della-Guerra, G. (1996). A developmental perspective of gambling behavior in children and external determinants of persistent gambling. *Problems in Gambling*, *12*.
- Dickerson, M. (1993). Internal and external determinants of persistent gambling. *Problems in Gambling*, *9*, E.A. & Meyers, L.S. (1984). The role of video-game playing in adolescent life: Is there a reason to be concerned? *Indian of the Psychological Society*, *22*, 309-312.
- Fisher, S. (1990). Juvenile gambling: The pull of the fruit machine. Paper presented at the English International Conference on Risk and Gambling, London.
- Fisher, S. (1992). Measuring pathological gambling in children. *The case of fruit machines in the UK*. *Journal of Gambling Studies*, *8*, 263-286.
- Fisher, S. (1993). Gambling and pathological gambling in adolescence. *Journal of Gambling Studies*, *9*, 545-553.
- Fisher, S. (1995). Gambling in children and adolescents. Report for Channel Four News. London.

- Fisher, S. & Griffiths, M. (1995). Current trends in slot machine gambling: Research and policy issues. *Journal of Gambling Studies, 11*, 230-247.
- Granger, D. (1991). *Blackjack: Vietnam 2000*. New Jersey: Science Publishing Co.
- Greenfield, P.M. (1984). *Mind and media: The effects of television, video games, and computers*. Cambridge, Massachusetts: Harvard University Press.
- Griffiths, M.D. (1989). Gambling in children and adolescents. *Journal of Gambling Studies, 5*, 66-83.
- Griffiths, M.D. (1990). The acquisition, development, and maintenance of fruit machine gambling in adolescents. *Journal of Gambling Studies, 6*, 193-204.
- Griffiths, M.D. (1991a). Amusement machine playing in childhood and adolescence: A comparative analysis of video games and fruit machines. *Journal of Adolescence, 14*, 53-73.
- Griffiths, M.D. (1991b). Adolescent fruit machine use: A review of current issues and trends. *UK Forum on Young People and Gambling Newsletter, 4*, 2-3.
- Griffiths, M.D. (1995). Towards a risk factor model of fruit machine addiction. *Abstract note, Journal of Gambling Studies, 11*, 343-364.
- Hoxley, J. & Carroll, D. (1992). A survey of fruit machine gambling in adolescents. *Journal of Gambling Studies, 8*, 167-179.
- Ide-Smith, S. & Lea, S.E.G. (1988). Gambling in young adolescents. *Journal of Gambling Behaviour, 4*, 110-119.
- Jacobs, D.E. (1989). Illegal and undocumented: A review of teenage gambling and the plight of children of problem gamblers in America. In H.J. Shaffer, S.A. Stein, & B. Gambino (Eds.), *Compulsive gambling: Theory, research, and practice*. Toronto: Lexington Books.
- Koop, C.E. (1982). Sontag on General sees danger in video-games. *The New York Times*, Nov. 10, A-16.
- Kossovyn, I. (1972). The gambling addict vs. the gambling professional. *International Journal of the Addictions, 7*, 387-393.
- Ladouceur, R. & Dube, D. (1994). Gambling among primary school students in the Quebec metropolitan area. *Journal of Gambling Studies, 10*, 363-370.
- Ladouceur, R., Dube, D. & Bujold, A. (1994). Prevalence of pathological gamblers and related problems among college students in the Quebec metropolitan area. *Canadian Journal of Psychology, 39*, 289-293.
- Ladouceur, R. & Mirreault, (1988). Gambling behaviors among high school students in the Quebec area. *Journal of Gambling Behaviour, 4*, 3-12.
- Lesieur, H., Gross, J., Frank, M., Welch, C., Rubenstein, G., Moseley, K., & Mark, M. (1991). Gambling and pathological gambling among college students. *Addictive Behaviors, 16*, 517-527.
- Lesieur, H.R. & Klein, R. (1987). Pathological gambling among high school students. *Addictive Behaviors, 12*, 129-135.
- Livingston, J. (1974). *Compulsive gamblers: Observations on action and abstinence*. New York: Harper and Row.
- Lorenz, V.C. & Shuttlesworth, D.E. (1983). The impact of pathological gambling on the spouse of the gambler. *Journal of Community Psychology, 11*, 67-76.
- Rosenstein, J. & Reutter, R. (1980). Gambling: An adolescent activity. *Journal of Adolescent Health Care, 1*, 180.
- Skinner, B.F. (1969). *Contingencies of reinforcement: A theoretical analysis*. New York: Meredith Corporation.
- The WAGER (1986). Growth in U.S. gambling industry. *The Weekly Addiction (Gambling Educational Report, 10*, (1), 1. Source: Hunter Interests, Inc. (November, 1995). *Casino Economic Impact Report: State of Maryland and Baltimore Area, Inc. The Joint Executive Legislative Task Force to Study Commercial Gaming Activities in Maryland*, (December, 1995). Final Report of The Joint Executive-Legislative Task Force to Study Commercial Gaming Activities in Maryland. Annapolis, MD: Author.
- Walberg, R. (1993). *Gambling and problem gambling among adolescents in Washington State* (Report to the Washington State Lottery). Albany, New York: Crainin Research.