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Risk Factors in Adolescence: The Case of Gambling, Videogame Playing, and the Internet

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It has been noted that adolescents may be more susceptible to pathological gambling. Not only is it usually illegal, but it appears to be related to high levels of problem gambling and other delinquent activities such as illicit drug taking and alcohol abuse. This paper examines risk factors not only in adolescent gambling but also in videogame playing (which shares many similarities with gambling). There appear to be three main forms of adolescent gambling that have been widely researched. Adolescent gambling activities and general risk factors in adolescent gambling are provided. As well, the influence of technology on adolescents in the form of both videogames and the Internet are examined. It is argued that technologically advanced forms of gambling may be highly appealing to adolescents.

KEY WORDS: Adolescence; gambling; videogames; Internet; addiction.

PROBLEM ADOLESCENT GAMBLING

Adolescent gambling is a major problem in society today. Not only is it usually illegal, but it appears to be related to high levels of problem gambling and other delinquent activities such as illicit drug taking

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and alcohol abuse (Stinchfield, Cassuto, Winters & Latimer, 1997; Giacopassi, Stitt & Vandiver, 1998; Griffiths & Sutherland, 1998; Gupta & Derevensky, 1998a). A number of studies in Europe, the USA, Canada and Australia have noted high levels of gambling among adolescents. In some cases this is legal such as fruit machine gambling in the UK (Fisher, 1993; Griffiths, 1995a) whereas other forms are illegal for youth such as casino gambling, VLT, and lottery purchases in most jurisdictions (Giacopassi et al., 1998; Jacobs, 1989; Stinchfield et al., 1997; Winters, Stinchfield & Fulkerson, 1993).

It has been noted that adolescents may be more susceptible to pathological gambling (Fisher, 1993; Lesieur & Klein, 1987). For instance, Steinberg (1988) found that 7% of US high school pupils could be classified as pathological gamblers. In the UK, Fisher (1993) identified a similar figure of 6% level of pathological gamblers among adolescent fruit machine gamblers. Further studies in the UK, Canada and USA have revealed a general pathological gambling rate of five to six percent amongst the under 18 years of age group. This figure is twice that identified in the adult population (Fisher, 1993; Griffiths, 1995a; Shaffer, LaBrie, Scanlon & Cummings, 1993), and it appears that young people may be more vulnerable to the negative consequences of gambling than adults.

A typical finding of many adolescent gambling studies has been that problem or pathological gambling appears to be a primarily male phenomenon (Griffiths, 1991a, 1991b; Ide-Smith & Lea, 1988; Stinchfield et al., 1997). It also appears that adults may to some extent be fostering adolescent gambling. For example, a strong correlation has been found between adolescent gambling and parental gambling (Browne & Brown, 1994; Fisher, 1993; Griffiths, 1995; Gupta & Derevensky, 1997; Wood & Griffiths, 1998). Several studies in the UK have found that young people whilst not actually purchasing lottery tickets themselves are given lottery tickets or scratchcards by their parents (Fisher & Balding, 1998; Wood & Griffiths, 1998). This is particularly worrying because a number of studies have shown that when people gamble as adolescents, they are then more likely to become problem gamblers as adults (Fisher, 1993; Griffiths, 1995a; Gupta & Derevensky, 1998a; Huxley & Carroll, 1992; Winters et al., 1993).

Similarly, many studies have indicated a strong link between adult problem gamblers and later problem gambling amongst their children (Dell, Ruzicka & Palisi, 1981; Fisher, 1993; Griffiths, 1995a; Ide-Smith

& Lea, 1988; Lesieur & Klein, 1987; Winters et al., 1993). Other factors that have been linked with adolescent problem gambling include working class youth culture, delinquency, alcohol and substance abuse, poor school performance, theft and truancy (Fisher, 1993; Griffiths, 1994a, 1995a; Griffiths & Sutherland, 1998; Gupta & Derevensky, 1997, 1998a, 1998b; Winters et al., 1993; Yeoman & Griffiths, 1996). However, many of the research findings have not differentiated between gambling type. There appear to be three main forms of adolescent gambling that have been widely researched (particularly in the UK). These are lottery gambling, scratchcard gambling and slot machine gambling.

ADOLESCENT LOTTERY GAMBLING

Lotteries have traditionally been researched as "low impact" forms of gambling. However, there is a growing body of evidence that indicates lottery playing may be part of a first step in learning how to gamble. The social acceptance of lotteries means that they are often not perceived as bona fide forms of gambling. Children and adolescents are often introduced to these activities at an early age as part of their family social entertainment. Lottery gambling has been found to be one of the most popular forms of adolescent gambling in the US (e.g., Jacobs, 1989; Winters, Stinchfield & Fulkerson, 1993), Canada (e.g., Gupta & Derevensky, 1998a; Ladouceur & Mireault, 1988) and the UK (e.g., Fisher & Balding 1996, 1998; Moran, 1995; Wood & Griffiths, 1998). However, there has been little research examining whether lottery gambling in itself may be problematic for adolescents—except in the UK.

The UK National Lottery has only been operating since November 1994 and was the first government-sanctioned form of gambling. It was also backed by television advertising and associated lottery programs. As such, studies examining the psychological impact of lottery playing offer a unique insight into the effect on youth. In a recent study, Fisher and Balding (1998) reported that playing the UK National Lottery was a popular form of adolescent gambling with 40% of the sample of 12- to 15-year olds ($n = 9774$) playing. The study also found that over half (56%) of the attempts by underage people to buy National Lottery products were successful. Wood and Griffiths (1998)

in a similar study involving 11- to 15-year olds ($n = 1195$) found that 48% of their sample regularly took part in the National Lottery. Most of these adolescents (64%) played the lottery occasionally, although 16% played most weeks and 14% played every week. There were no gender differences in frequency of play. A large minority of the participants bought their own lottery tickets illegally (17%). The study also found a strong correlation between parental and child participation on the National Lottery. In fact, of the participants who took part in these activities most had their lottery tickets bought for them by their parents (71%).

The study by Wood and Griffiths (1998) is the only study in the UK to attempt any measurement of adolescent problem gambling on the UK lottery. Levels of problem gambling were examined using the DSM-IV-J adapted from the American Psychiatric Association diagnostic criteria (Fisher, 1992). It was found that 6% of players may have developed patterns of problem gambling on the lottery. Furthermore a large number of the participants responded that they were in fact worried about how much they spent on the lottery (17%).

It appears that television may play a critical role in influencing adolescent lottery play in the UK. For instance, in the UK, the Independent Television Commission (1995) reported that the televised lottery draw program was the second most popular program watched by children 10- to 15-years with 38% watching. More recently, this figure appears to have drastically escalated, as Fisher and Balding (1998) found that the televised draw was watched by 84% of their sample of 12- to 15-year olds on Saturdays, and 62% on Wednesdays. The explanations provided center upon the early schedule of the programs (before the 9pm "watershed") and the combination of celebrities and pop stars who contribute to the overall 'glitz and glamour' of the shows. Furthermore, the advertising for both the National Lottery and scratchcards is fast persuading viewers that gambling is normal and widely acceptable (Griffiths, 1997a, 1997b). This remains an important area in need of further empirical work.

ADOLESCENT SCRATCHCARD GAMBLING

The rapid event frequency of scratchcards and the instant payout define scratchcards as a "hard" form of gambling. They have been

compared to slot machines (Griffiths, 1997b) and appear to carry similar risks. In an American study carried out in Minnesota, Winters, Stinchfield and Fulkerson (1993) found that 37% of adolescents had bought scratchtabs, and that 35% had done so in the last year. These figures were more than double the lottery participation rates. Out of the 61 problem gamblers identified, 30% were found to have played scratchtabs on a weekly basis. The higher rates for scratchtabs suggest further evidence that this type of gambling is a "harder" form of gambling when compared to lotteries. Scratchtabs and scratchcards have a high event frequency coupled with a fast payout. This is unlike weekly or bi-weekly lotteries where the gambler must wait until the draw is performed and hence these factors are not as prominent.

In the UK, Fisher and Balding (1996) studied 12 to 15-year old boys and girls ($n = 7200$) from eight southern regions in the UK, and found that 37% of the participants had played scratchcards during the last year. Regular scratchcard players were found to be significantly more likely to be male, have a weekly income of at least £5, and to come from an ethnic minority group. Three percent ($n = 189$) of the adolescents reported playing lottery scratchcards at least twice a week. Regular scratchcard players were more likely to smoke cigarettes, drink alcohol, take illegal drugs and play fruit machines regularly. In a further study, Fisher and Balding (1998) noted that National Lottery scratchcards were played by 47% of youth. Using the diagnostic screening tool DSM-IV-MR-J to identify problem gamblers, the results suggest a 1% level of possible problem gambling for National Lottery scratchcards. Problem gamblers were identified as predominantly male and to have a weekly income of £5 or more per week. It was found that the parents of the problem gamblers were more than twice as likely to have gambled on each of nine different forms of commercial gambling activities compared to the parents of non-problem gamblers. Problem gamblers were more than three times as likely as the other adolescents to report that they thought their parents gambled too much. The problem gamblers' parents appeared less likely to disapprove of adolescent gambling than the other parents. The most common companions overall for lottery and scratchcard gambling were the adolescents' parents, although problem gamblers were more likely to play on their own or with friends.

The study by Wood and Griffiths (1998) showed that 30% of adolescents played scratchcards. Most of the adolescents who played

scratchcards played once a month (44%), although 27% a played a few times a month, 12% once a week, 13% a few times a week and 4% played everyday. There were no gender differences in frequency of play. A large minority of the participants bought their own scratchcards illegally (26%). Wood and Griffiths (1998) identified 6% adolescent problem scratchcard gambling. Furthermore a large minority of the participants answered that they were in fact worried about how much they spent on scratchcards (17%).

ADOLESCENT SLOT MACHINE GAMBLING

There is no doubt slot machines are potentially addictive and there is now a large body of research world-wide supporting this contention (see Griffiths, 1995a for a comprehensive overview). In the past ten years, slot machines have been the predominant form of gambling by pathological gamblers treated in self-help groups and professional treatment centres across Europe (see Griffiths & Wood, 1999 for comprehensive review of the European literature). There are many reasons why this is the case. Slot machines are fast, aurally and visually stimulating and rewarding, require a low initial stake, provide frequent wins, require no preknowledge to commence play, and may be played alone. Clearly decisions to play slot machines and to continue playing them to excess are contingent upon the player's biological and psychological constitution and situational variables. However, structural characteristics of slot machines are designed to induce the player to play and/or to continue playing. It has further been argued (Griffiths, 1991c, 1993a, 1995a) that a combination of the technological aspects of structural characteristics (event frequency, the near miss, symbol ratio proportions, light and sound effects, the suspension of judgment, etc.) may contribute towards habitual and repetitive play in some individuals.

Most research on slot machine gambling in youth has been undertaken in the UK where they are legally available to children of any age. The most recent UK study by Fisher and Balding (1998) found that slot machines were the most popular form of adolescent gambling with 75% of their sample ($n = 9774$) participating. A more thorough examination of the literature (Griffiths, 1991d, 1995a; Fisher, 1992; Fisher & Balding, 1998) indicates that:

- At least two-thirds of adolescents play slot machines at some point in their adolescent lives,
- One third of adolescents report having played slot machines in the past month,
- That 10–20% of adolescents are regular slot machine players (playing at least once a week), and
- That 0.5–6% of adolescents are probable pathological gamblers and/or have severe gambling-related difficulties.

All studies have reported that boys play on slot machines more than girls and that as slot machine playing becomes more regular it is more likely to be a predominantly male activity. Research has indicated that very few female adolescents have gambling problems on slot machines.

So why do adolescents play slot machines? This again is not easy to answer as there are a host of possible reasons. However, research (see Griffiths, 1995a for a detailed overview) does suggest that irregular ("social") gamblers play for different reasons than the excessive ("pathological") gamblers. Social gamblers usually play for fun, because their friends or parents do, to win money and/or for excitement. Pathological gamblers appear to play for other reasons such as mood modification and as a means of escape. As already highlighted, young males seem to be particularly susceptible to slot machine addiction with up to 6% of adolescents in the UK experiencing problems with their slot machine playing at any one time using DSM criteria (Fisher, 1993; Griffiths, 1995a). This does not mean that everyone who plays slot machines will become addicted (in the same way that not everyone who drinks alcohol will become an alcoholic). What it does mean is that given a cluster of factors (genetic and/or biological predisposition, social upbringing, psychological constitution, situational and structural characteristics) a small proportion of individuals will unfortunately experience severe problems.

Like other potentially addictive behaviors, slot machine addiction causes the individual to engage in negative behaviors such as school truancy in order to play the machines (Fisher & Balding, 1998; Griffiths, 1990a, 1990b, 1995a), stealing to fund machine playing (Fisher & Balding, 1998; Griffiths, 1990a, 1993b, 1993c; Yeoman & Griffiths, 1996), getting into trouble with teachers and/or parents over their machine playing (Griffiths, 1990a, 1993b, 1995a), borrowing or the

using of lunch money to play the machines (Fisher & Balding, 1998; Griffiths, 1990a, 1995a), poor schoolwork (Griffiths, 1990a, 1995a) and in some cases aggressive behaviour (Griffiths, 1990a, 1995a). These behaviors are not related to slot machine playing only but are experienced adolescent problem gamblers in general.

As has been extensively pointed out elsewhere (e.g., Griffiths, 1993d, 1995a, 1995c, 1996a), slot machine addicts also display bona fide signs of addiction including withdrawal effects, tolerance, salience, mood modification, conflict and relapse. It is also worth noting that these types of negative consequences associated with slot machine addiction have also been identified in other more general studies on adolescent gambling addiction in the US, Canada and Australia (e.g., Giacomassi et al., 1998; Gupta & Derevensky, 1997, 1998a; Langewisch & Frisch, 1998; Lesieur, Cross, Frank, Welch, Rubenstein, Moseley & Mark, 1991; Moore & Ohtsuka, 1997; Stinchfield, Cassuto, Winters, & Latimer, 1997; Winters et al., 1993).

RISK FACTORS IN ADOLESCENT GAMBLING

Griffiths (in press) has noted there is no precise frequency level of a gambling game at which people become addicted since addiction will be an integrated mix of factors in which frequency is just one factor in the overall equation. Other factors and dimensions (external to the person themselves) which have been reported in the general gambling literature and which were summarized by Griffiths (1999) include:

- stake size (including issues around affordability, perceived value for money)
- event frequency (time gap between each gamble)
- amount of money lost in a given time period (important in chasing)
- prize structures (number and value of prizes)
- probability of winning (e.g., 1 in 14 million on the lottery)
- size of jackpot (e.g., over £1 million on the lottery)
- skill and pseudo-skill elements (actual or perceived)
- "near miss" opportunities (number of near winning situations)
- light and color effects (e.g., use of red lights on slot machines)

- sound effects (e.g., use of buzzers or musical tunes to indicate winning)
- social or asocial nature of the game (individual and/or group activity)
- accessibility (e.g., opening times, membership rules)
- accessibility (e.g., number of outlets)
- location of gambling establishment (out of town, next to work-place, etc.)
- type of gambling establishment (e.g., betting shop, amusement arcade, etc.)
- advertising (e.g., television commercials)
- the rules of the game

Each of these differences may have implications for the gambler's motivations and as a consequence the social impact of gambling. Although many of these gambling-inducing structural characteristics are dependent on individual psychological factors (e.g., reinforcement), they are a direct result of the structural characteristics and could not have influenced gambling behaviour independently. It is for this reason, above all others, that a structural approach could be potentially useful.

One consequence of the recent upsurge in research into adolescent gambling is that we can now start to put together a "risk factor model" of those individuals who might be at the most risk of developing pathological gambling tendencies. Based on the preceding overview and previous summaries of the empirical research literature by Griffiths (1991a, 1995a, 1995b), a number of clear risk factors in the development of problem adolescent gambling emerge. Adolescent problem gamblers are more likely to:

- be male (16–25 years)
- have begun gambling at an early age (as young as 8 years of age)
- have had a big win earlier in their gambling careers
- to consistently chase losses
- have begun gambling with their parents or alone
- be depressed before gambling
- to be excited and aroused during gambling

- be irrational (i.e., have erroneous perceptions) during gambling
- have poor grades at school
- engage in other addictive behaviors (smoking, drinking alcohol, illegal drug use)
- come from the lower social classes
- have parents who have a gambling (or other addiction) problem
- have a history of delinquency
- have a history of delinquency steal money to fund their gambling
- truant from school to go gambling

This list is probably not exhaustive but incorporates what is known empirically and anecdotally about adolescent problem gambling. As research into the area grows, new items to such a list will be added while factors, signs and symptoms already on these lists will be adapted and modified.

There is, of course, a problem with the identification of adolescent problem gamblers in that there is no observable sign or symptom like other addictions (e.g., alcoholism, heroin addiction etc.). Although there have been some reports of a personality change in young gamblers (e.g., Griffiths, 1989), many parents may attribute the change to adolescence itself (i.e., evasive behaviour, mood swings etc. are commonly associated with adolescence). It is quite often the case that many parents do not even realize they have a problem until their son or daughter are in trouble with the police. Griffiths (1995a) reports there are a number of possible warning signs to look for although individually, many of these signs could be put down to adolescence. However, if several of them apply to a child or adolescent it could be that they will have a gambling problem. The signs include:

- a sudden drop in the standard of schoolwork
- going out each evening and being evasive about where they have been
- personality changes such as becoming sullen, moody, or constantly on the defensive
- money missing from home
- selling expensive possessions and not being able to account for the money

- loss of interest in activities they used to enjoy
- lack of concentration
- a "couldn't care less" attitude
- not taking care of their appearance or hygiene

However, many of these "warning signs" are not necessarily unique to gambling addictions and can also be indicative of other addictions (e.g. alcohol and other drugs).

VIDEOGAME PLAYING IN ADOLESCENCE

Although there are different licensing laws for different types of machine gaming in the UK, both videogame machines and slot machines tend to be located in amusement arcades and other single site premises (e.g., public houses, cafes, fish and chip shops, cinemas, etc.). It should also be pointed out that videogames can be delivered via other hardware systems (handheld, personal computer, home video console, internet) in addition to the arcade (Nawrocki & Winner, 1983).

Both videogame machines and slot machines may be considered under the generic label of "amusement machines" (Griffiths, 1991a). The main difference between videogame machines and slot machines are that videogames are played to accumulate as many points as possible whereas slot machines are played (i.e., gambled upon) to accumulate money. Griffiths (1991a) has suggested that playing a videogame could be considered as a non-financial form of gambling. Both types of machines require insertion of a coin to play although the playing time on a slot machine is usually much less than on a videogame machine. This is primarily because on videogames the outcome is almost solely due to skill, whereas on slot machines the outcome is more likely to be a product of chance. However, the general playing philosophy of both slot machine players and videogame players is to stay on the machine for as long as possible using the least amount of money (Griffiths, 1990a, 1990b). Griffiths has argued that regular slot machine players play *with* money rather than *for* it and that winning money is a means to an end (i.e. to stay on the machine as long as possible).

Besides the generic labeling, their geographical juxtaposition, and the philosophy for playing, it could be argued that on both a psycho-

logical and behavioral level, slot machine gambling and videogame playing share many similarities (e.g., similar demographic differences such as age and gender breakdown, similar reinforcement schedules, similar potential for 'near miss' opportunities, similar structural characteristics involving the use of light and sound effects, similarities in perception of skill, similarities in the effects of excessive play, etc.). The most probable reason the two forms have rarely been seen as conceptually similar is because videogame playing does not involve the winning of money (or something of financial value) and therefore cannot be classed as a form of gambling.

However, the next generation of slot machines are starting to use videogame graphics and technology. While many of these relate to traditional gambling games (e.g., roulette, poker, blackjack etc.) there are plans for developing video gambling games in which people would win money based on their game scores (J. Derevensky, personal communication, January 2000). This obviously gives an idea of the direction that slot machines and the gaming industry are heading.

Furthermore, there are a growing number of researchers who suggest that arcade videogames share some common ground with slot (gambling) machines including the potential for dependency (e.g., Brown & Robertson, 1993; Fisher, 1994; Griffiths, 1991a, 1993e, 1997c; Gupta & Derevensky, 1996). As Fisher and Griffiths (1995) point out, arcade videogames and slot machines share some important structural characteristics, these being:

- The requirement of response to stimuli which are predictable and governed by the software loop.
- The requirement of total concentration and hand-eye coordination.
- Rapid span of play negotiable to some extent by the skill of the player (more marked in videogames).
- The provision of aural and visual rewards for a winning move (e.g. flashing lights, electronic jingles).
- The provision of an incremental reward for a winning move (points or cash) which reinforce 'correct' behaviour.
- Digitally displayed scores of 'correct behaviour' (in the form of points or cash accumulated).
- The opportunity for peer group attention and approval through competition.

As with excessive slot machine playing, excessive videogame playing partly comes about by the partial reinforcement effect (PRE) (Wanner, 1982). This is a critical psychological ingredient of videogame addiction whereby the reinforcement is intermittent, i.e., people keep responding in the absence of reinforcement hoping that another reward is just around the corner. Knowledge about the PRE gives the videogame designer an edge in designing appealing games. Magnitude of reinforcement is also important. Large rewards lead to fast responding and greater resistance to extinction—in short to more "addiction." Instant reinforcement is also satisfying.

Videogames rely on multiple reinforcements (i.e., the "kitchen sink" approach) in that different features might be differently rewarding to different people. Success on videogames comes from a variety of sources and the reinforcement might be intrinsic (e.g., improving your highest score, beating your friend's high score, getting your name on the "hall of fame", mastering the machine) or extrinsic (e.g., peer admiration). Malone (1981) has also reported that videogames are positively correlated to (i) a presence or absence of goals, (ii) the availability of automatic computer scores, (iii) the presence of audio effects, (iv) the random quality of the games, and (v) the degree to which rapid reaction times enhance game scores

The Down Side of Videogames

There have been a number of case studies in the medical literature reporting some of the adverse effects of playing excessive videogame playing. These have included auditory hallucinations (Spence, 1993), enuresis (Schink, 1991), encopresis (Corkery, 1990), wrist pain (McCowan, 1981), neck pain (Miller, 1991), elbow pain (Miller, 1991), tenosynovitis—also called "nintendinitis" (Brasington, 1990; Casanova & Casanova, 1991; Reinstein, 1983; Siegal, 1991), peripheral neuropathy (Friedland & St. John, 1984), obesity (Deheger, Rolland-Cachera & Fontvielle, 1997; Shimai, Yamada, Masuda & Tada, 1993), physical inactivity (Johnson & Hackett, 1997) and photosensitive epilepsy (e.g., Graf, Chatrian, Glass & Knauss, 1994; Harding & Jeavons, 1994; Maeda, Kurokawa, Sakamoto, Kitamoto, Kohji & Tashima, 1990; Millett et al., 1997; Quirk, Fish, Smith, Sander, Shorvon & Allen, 1995). Admittedly, some of these adverse effects are quite rare and "treatment" simply involved non-playing of the games in question.

However, the most popular health argument against excessive videogame playing is that it is potentially addictive (Anderson & Ford, 1986). According to Soper and Miller (1983) "videogame addiction" is like any other behavioral addiction and consists of a compulsive behavioral involvement, a lack of interest in other activities, association mainly with other addicts, and physical and mental symptoms when attempting to stop the behaviour (e.g., the shakes). Shotton (1989) carried out a study specifically on "computer addiction" using a sample of 127 people (half being children, half adult; 96% male) who had been self-reportedly "hooked" on home videogames for at least five years. Seventy-five of these were measured against two control groups and it was reported that the computer dependent individuals were highly intelligent, motivated and achievement-oriented individuals but often misunderstood. After a five year follow up, Shotton found that the younger cohort had done well educationally, attended university and then ascertained high ranking jobs. However, Shotton's research involved people who were familiar with the older generation of videogames, popular in the early 1980s. The videogames of the 1990s may in some way be more psychologically rewarding than 1980s games in that they require more complex skills, improved dexterity, and feature socially relevant topics and better graphics. Anecdotal accounts of greater psychological rewards could mean that the newer games are more 'addiction inducing' although such an assertion needs empirical backing. Few empirical studies of the addictive nature of videogames have been carried out although limited evidence by Griffiths and Dancaster (1995) suggests that videogame addiction is a function of the game's effects on arousal level.

A recent study examining the videogame playing behaviour of nearly 400 adolescents (12-16 years) (Griffiths & Hunt, 1995, 1998) found that all but five children had played videogames, that almost a third of them played daily and that 7% of them played for at least 30 hours a week. Videogame playing appears to begin at an early age (7- to 8-years being about the average starting age) and for most children is a fairly harmless activity which takes up little time in their lives and is played purely for fun and enjoyment. However, there does appear to be a small minority of children who play videogames to excess and who could be called "addicts." The statistic suggesting that some children may be playing for at least 30 hours a week indicates that anyone interested in the healthy social and educational development of chil-

dren should be concerned. Similar results have been found in other studies (e.g., Griffiths, 1997d; Phillips, Rouse & Griffiths, 1995).

Furthermore, there have been other reports of behavioral signs of videogame dependency (many which are similar to gambling dependency). These have included stealing money to play arcade games (Keepers, 1990; Klein, 1984), stealing money to buy new games cartridges (Griffiths & Hunt, 1998), engaging in minor delinquent acts (Kestenbaum & Weinstein, 1985), using lunch money to play (McClure & Mears, 1984), truancy in order to play (Keepers, 1990; Griffiths & Hunt, 1998), not doing homework/getting poor grades (Griffiths & Hunt, 1998; Phillips et al., 1995), sacrificing social activities to play (Egli & Meyers, 1984; Griffiths & Hunt, 1998), irritability and annoyance when unable to play (Griffiths & Hunt, 1998; Rutkowska & Carlton, 1994), playing longer than intended (Griffiths & Hunt, 1995, 1998; Phillips et al., 1995) and an increase in self-reported levels of aggression (Griffiths & Hunt, 1995, 1998).

There appears little doubt that for a minority of children and adolescents, videogames can take up considerable time and that some individuals appear "addicted" to them. However, the prevalence of such an addiction amongst adolescents is still of great controversy. Whether videogames are inherently "good" or "bad" is not the relevant question. The question we should be asking ourselves is what the longitudinal effects of any activity (not just videogame playing) that takes up 30 hours of leisure time a week has on the educational, health and social development of children and adolescents.

It is clear that the negative consequences of videogame playing arise in those individuals who play videogames most excessively. From prevalence studies in this area, there is little evidence of serious acute adverse effects on health from moderate play. Adverse effects are likely to be relatively minor, and temporary, resolving spontaneously with decreased frequency of play, or to affect only a small subgroup of players. Excessive players are the most at-risk from developing health problems although more research appears to be much needed. The need to establish the incidence and prevalence of clinically significant problems associated with videogame play is of paramount importance as is a more detailed empirical analysis of the conceptual similarities between videogames and gambling and their impact on the lives of adolescents.

ADOLESCENCE, INTERNET USE, AND INTERNET GAMBLING

As Griffiths (1999) has asserted, the field of gambling is not immune to the technological revolution taking place elsewhere in other fields. On the contrary, technology will continue to provide new market opportunities not only in the shape of internet gambling but also in the shape of more technologically advanced slot machines, video lottery terminals, interactive lottery games, interactive television gambling and telephone wagering. In addition, other established gambling forms will become more technologically driven (e.g., bingo, keno). These are all forms of gambling which may prove to be highly appealing to adolescents.

Gambling is undergoing mass expansion all over the world. The global growth of gambling coupled with the increased popularity of the internet and various digital technologies, has led the gambling industry to invest heavily in internet gambling. The scope for new and extended business in this area is potentially very large as more people gain access to this technology. As personal computers and television technology become more integrated (e.g., internet access being offered as part of cable television packages), "Web TV" will be cheaper and easier to use—particularly for people who are not familiar with computers.

Further to this, it has been alleged that social pathologies are beginning to surface in cyberspace in the form of "technological addictions" (e.g., Griffiths, 1995d, 1995e, 1996b, 1996c, 1998). The growth of the internet raises interesting questions particularly when it comes to adolescent gambling. Perhaps one way to think of this is to see the internet as providing a medium for other addictions to intensify through easy accessibility. For instance, it has been argued (Griffiths, 1996c) that the internet could easily be to focus of obsessive and/or compulsive behaviors. One thing that may intensify this focus are the vast resources on the internet available to feed or fuel other addictions or compulsions.

For example, to a gambling addict, the internet could potentially be a very dangerous medium. In fact, some observers (e.g., O'Neill, 1998) have argued that internet gambling provides "a natural fit" for compulsive gamblers. Although there are some still some technical and regulatory problems, over time, the internet is becoming technologically more sophisticated allowing faster speeds, better graphics,

and issues surrounding security and marketing are being tightened up. It would appear that internet gambling will take off for several reasons. Firstly, it is easy to access and participate in an activity which comes into the home via television. Secondly, internet gambling has the potential to offer visually exciting effects similar to slot machines and VLTs (two of the most problematic forms of gambling). Furthermore, the event frequency can be very rapid, particularly if the gambler is subscribed to several sites. There are also issues which need to be addressed. The major ones appear to be:

Underage gambling—How can one be sure that adolescents do not have access to internet gambling by using a parent's credit card?

Gambling while intoxicated—How can one be sure that a person (adult or adolescent) does not have access to internet gambling while they are under the influence of alcohol?

Opening hours—The internet never closes so it is possible to gamble all day, every day. This also means there is the potential for very high event frequencies.

Electronic cash—It is very likely that the psychological value of electronic cash will be less than "real" cash (and similar to the use of chips or tokens in other gambling situations). This may lead to some kind of "suspension of judgment."

Another factor relating to internet gambling is its impact on the changing nature of family entertainment. The increase in and development of home entertainment systems is changing the pattern of many families' leisure activities. The need to seek entertainment outside the home is greatly reduced as digital television and home cinema systems offer a multitude of interactive entertainment services and information. The result of this is that many families adopt a leisure pattern known as "cocooning" where the family or individual concentrates their leisure time around in-house entertainment systems. Rather than going out, the entertainment comes to them direct via digital television, satellite, and internet services. In the not-to-distant future, part of this entertainment for many families may well be internet gambling.

So should we be concerned about adolescents gambling on the internet? Recent surveys have revealed that the majority of internet

users are male although the number of female internet users is rising (Morahan-Martin, 1998). Recent studies have begun to examine excessive internet use among student populations (Morahan-Martin & Schumacher, 1997; Scherer & Bost, 1997). Although unrepresentative of the general public, college students are considered high-risk for internet problems because of ready access, technological sophistication, ample financial resources and flexible time schedules (Moore, 1995). A survey by Pitkow and Kehoe (1996) indicated that 32% of internet users access the internet through education providers and that 28% of internet users are college students.

Two recent studies have suggested that young regular internet users are more likely to gamble on the internet. Morahan-Martin and Schumacher (1997) found that pathological internet users were more likely to be male and were more likely to use the internet to meet new people, for emotional support, to talk to others with the same interest, to play interactive games (e.g., videogames, fantasy role playing games), to gamble and to engage in net-sex. They were also reported to be more lonely as measured on the UCLA Loneliness Scale (Russell, 1986).

Scherer and Bost (1997) surveyed students about their internet use and developed a checklist of ten clinical symptoms to parallel the symptoms of substance abuse and dependency. Results also showed that those defined as internet dependent used less popular services on the internet (games, bulletin boards, chat rooms, gambling), and that they were more likely to have on-line relationships. Both Griffiths (1995e, 1998) and Bromberg (1996) have argued that the internet provides an alternative reality to the user and allows them feelings of immersion and anonymity which may be psychologically rewarding. Such immersion may actually lead to an altered state of consciousness, which in itself may be highly psychologically, and/or physiologically rewarding.

None of the surveys to date (including the two outlined above) show that internet addiction exists mainly because the criteria chosen appear to be only peripheral to the core concepts of addiction. However, they do at least indicate that excessive users (whether they have problems or not) are more likely to engage in internet gambling. Some may argue that gambling is a social activity and that therefore internet gambling will not increase. However, problematic gambling often involves asocial forms (e.g., slot machines) and that technology

essentially turns gambling from a social pastime to an asocial one. This in itself may make gambling more problematic (see Griffiths, 1999).

CONCLUSIONS

It is clear that excessive involvement with gambling, videogames and the internet may bring problems to the individual concerned and that these problems appear to be intensified when the individual is an adolescent. The technologies involved in gambling, videogame playing and internet use are slowly merging and adolescents already living and interacting in a multi-media world are discovering that leisure opportunities are becoming more easily accessible and widespread. The risk factors involved in problem adolescent gambling are beginning to become established although more research is needed to identify risk factors for both excessive videogame playing and excessive internet use. Jacobs (1997) has made the point that without early and appropriate prevention, intervention and treatment, adolescents will become high-risk candidates for developing a variety of dysfunctional behaviors including a range of addictive behaviour patterns.

Through analysis of both the situational and structural characteristics in gambling, videogame and internet activities, it would appear that situational characteristics impact most on acquisition of the behaviour and that structural characteristics impact most on development and maintenance of it. Furthermore, the most important of these factors appear to be accessibility of the activity and event frequency (both of which are critical to the success of gambling, videogames and the internet). It is when these two characteristics combine that the greatest problems could occur. This is well demonstrated by the worldwide proliferation in slot machines (and the associated problems that go with them). As Griffiths (1999) points out, it could be that slot machine gambling has more "gambling inducing" structural characteristics (as a result of the inherent technology) than other forms of gambling, and could be why a relatively large minority of gamblers in the UK are "addicted" to slot machines (many of whom are adolescents). With their integrated mix of conditioning effects, rapid event frequency, short pay out intervals and psychological rewards, it is not hard to see how slot machine gambling (and psychologically similar activities like scratchcard gambling) can become a re-

petitive habit. It may also give us an insight to the possible problems created by the spread of internet gambling as interactive gaming has many of the characteristics of slot machine gambling.

Steps need to be taken to minimize problem behaviors on gambling activities as research has shown: that the younger a child starts to gamble, the more likely they are to develop problems. Possible measures include the:

- immediate raising of the minimum age of all forms of commercial gambling to 18 years.
- imposition of much stricter penalties for shopkeepers and gaming operators who sell scratchcards/lottery tickets to children and/or allow children to gamble illegally.
- restriction or prohibition of television gambling advertising until after the 9pm watershed (including the screening of lottery-related programs—in themselves a form of advertising).
- geographically locating gambling establishments (e.g., amusement arcades, bookmakers) away from sites where more vulnerable members of the population are found (e.g. schools, colleges).
- capping of lottery jackpots and no rollover jackpots.
- creation of gambling tax levies (out of taxes raised from gambling revenue) given to charities and organizations who provide advice, counselling, treatment and rehabilitation for people with gambling problems.
- creation of single government departments to oversee all gambling legislation and to provide a coherent and comprehensive framework for gambling activities.
- significant strengthening of the powers of the gambling regulatory authorities.

The single most important measure would be to raise the legal age of gambling. This would significantly reduce the age at which children start to gamble and would also help gaming operators and shopkeepers prevent underage gambling. At present, many young adolescents as young as 11 and 12 years of age can pass for being sixteen. An age rise to 18 years would stop a lot of the very young adolescents gambling in the first place. Often the most simple solution has the most far-reaching consequences.

Furthermore, Griffiths (1995a) asserts that knowledge about structural characteristics also provides information which may help in decreasing "addictiveness" potential of gambling activities. For instance on slot machines, possible *a priori* steps include:

- limited use of arousing lighting on the machine.
- plastic payout trays instead of metal ones.
- notices on the machine which clearly state the payout rate, the win probability and a statement indicating that the machine is on the whole chance determined.
- a monitoring device which lets gamblers have a running total of how much they have put into the machine (actual amount rather than turnover).
- equal numbers of winning symbols on each machine reel.
- all pay outs to be in money rather than tokens.
- "neutral" names for machines and less choice in initial gambling stakes.

This list is by no means exhaustive and only suggests possible mechanisms for decreasing the number of people who experience problems with gambling by correcting cognitive distortions, false beliefs and false expectations.

Further work is needed in a number of areas relating to risk factors. Following the recommendations of (and building on) the US National Research Council (1999; pp. 142–143), these could potentially include:

- Longitudinal research that explores the changing nature of risk factors from childhood to adolescence and into adulthood.
- Research that controls for important socio-demographic variables in the study of the acquisition, development and maintenance of risk factors.
- Family and twin studies to determine familial risk factors for problem gambling and game-playing.
- Studies that use adequate and diverse samples (racial or ethnic minorities, females, rural/urban etc.).
- Further research among individuals and communities that examines the effect of access and availability on gambling and gaming behaviors.

- Studies on co-morbid gambling and gaming disorders (substance abuse disorders, mood disorders, anti-social personality disorders etc.).
- Studies which identify both the similarities and differences between traditional forms of gambling/gaming and technologically sophisticated forms.
- Research on risk-taking and other dimensions of impulse control among gamblers and gamers—using adequate controls.
- Studies to determine whether factors are risk factors or consequences of gambling.
- Studies which examine people's perceptions of different gambling and gaming activities (as these may affect acquisition, development and/or maintenance of the behaviour).
- Further research to examine which structural characteristics are more likely to affect "addictiveness" potential in particular forms of gambling. For instance, it may be that light, color and sound effects are integral to increasing baseline levels of gambling among slot machine gamblers but not in other gambling forms (e.g., lotteries, horse racing etc.).
- Research that identifies whether certain games may be gateways to subsequent gambling problems, just as previous research indicates there are gateway drugs (e.g., marijuana) that precede the use of hard drugs (e.g., heroin).
- Research that encompasses multiple techniques obtaining data from the same participant (e.g., face-to-face interviews, genetic/neurobiological testing, ethnographic methods etc.).

At the moment the laws relating to internet gambling vary from country to country and are often difficult to apply. For example, if a gaming operator runs an internet gambling site from the Dominican Republic, then how can another country's laws be applied? The need for effective legislation (although difficult to administer and police) still needs urgent attention in numerous countries. Some internet gaming operators appear to be trying to overcome the problem of adolescent and/or problem gamblers by introducing security and monitoring initiatives. For instance, some companies have developed internet gaming sites which require an account to be set up in advance, use passwords to inhibit minors, and monitor spending levels to discourage excessive gambling. However, it is difficult to define what is

"excessive" (as this will largely depend on the person's income), and there is no control over how many other internet gambling sites to which a gambler can subscribe. The challenge for researchers is to examine the impact of these systems and devise ways of minimizing their harm.

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