©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):3-38

An international perspective on youth gambling prevalence studies

Rachel A Volberg, PhD[1], Rina Gupta, PhD[2], Mark D Griffiths, PhD[3], Daniel T Ólason, DPhil[4] and Paul Delfabbro, PhD[5]

[1]*Gemini Research, Northampton, Massachusetts, United States of America;* [2]*International Center for Youth Gambling Problems and High-Risk Behaviors, McGill University, Montreal, Canada;* [3]*International Gaming Research Unit, Nottingham Trent University, Nottingham, United Kingdom;* [4]*University of Iceland, Reykjavik, Iceland; and* [5]*University of Adelaide, Adelaide, Australia*

Abstract: In the wake of rapid expansion of legal gambling internationally, studies of adolescent gambling involvement and problem gambling prevalence have been carried out in numerous jurisdictions. This paper reviews adolescent gambling prevalence studies that have been carried out in North America, Europe, and Oceania. Based on this review, work is clearly needed to assess the impact of survey methods on identified prevalence rates and to improve the measurement of problem gambling among adolescents. From a substantive perspective, several clear demographic and behavioral characteristics are associated with gambling involvement and problem gambling among youth. However, early assumptions about youth gambling and problem gambling must give way to more nuanced understandings of how these phenomena change in response to changes in the social and cultural environment. We may have traveled some distance down the road toward understanding the determinants as well as the distribution of youth gambling and problem gambling, but we still have a long way to go.

Keywords: Adolescence, gambling, prevalence, behavior

Correspondence: Rachel Volberg, PhD, Gemini Research, Ltd., PO Box 1390, Northampton, MA 01061 USA. E-mail: rvolberg@geminiresearch.com

Submitted: June 01, 2009. ***Revised:*** August 27, 2009. ***Accepted:*** September 12, 2009.

INTRODUCTION

Few people regard gambling as a serious issue for adolescents, although many researchers have noted that an entire generation has now grown up in an era when lottery and casino gambling is widely available and heavily advertised (1-4). Concern among researchers and clinicians who treat people with gambling problems is that the increased availability of legal gambling and decreased stigma has led to increases in adolescent gambling and the prevalence and severity of gambling problems among adolescents and young adults.

There are many other reasons to be concerned about adolescent gambling. Research among adults has shown that individuals with severe gambling-related difficulties begin gambling much earlier than those without gambling problems (5,6). Another reason for concern is that adolescents tend to begin gambling before they begin experimenting with tobacco, alcohol, drugs, and/or sexual behavior (7-9). A third, related concern is that gambling often co-occurs with

other risky behaviors and mental health problems and if unaddressed, could affect adolescents' success in overcoming other difficulties in their lives (10-12). Finally, although access to most legal forms of gambling is age-restricted, the evidence suggests that large numbers of high school and underage college students are able to gamble in casinos and buy lottery tickets (13,14).

The impact on adolescents of the widespread availability, heavy advertising and sanctioning of multiple forms of legal gambling are an increasing concern in the fields of public health and addictions. Nevertheless, a significant lack of consensus remains around the question of what constitutes problem gambling among adolescents and how to measure the disorder. Although well-accepted methods for identifying pathological gambling in the adult population have emerged (15), there are good reasons to hesitate in applying such methods to adolescents. The psychiatric criteria for identifying pathological gambling among adults were developed based on adult life experiences, and younger individuals have not yet had time to develop the same depth of experience. Another concern is that the psychiatric criteria for pathological gambling have never been clinically tested among adolescents, and little information has emerged about their validity in this subgroup of the population.

The few instruments developed to measure adolescent problem gambling are primarily derived from instruments developed to assess adults. The majority of adolescent studies have used either an adaptation for adolescents of the widely-used South Oaks Gambling Screen (SOGS-RA) (16) or an adaptation of the adult psychiatric criteria for pathological gambling (DSM-IV-J and DSM-IV-MR-J) (17,18). In a study comparing these two screens and one other measure of problem gambling (Gamblers Anonymous (GA) 20 Questions), Derevensky and Gupta (19) found substantial agreement among all three instruments, although the DSM-IV-J yielded a lower prevalence estimate than either the SOGS-RA or the GA 20 Questions. The three measures identified between 3.4% and 5.8% of participants in the study as probable pathological gamblers. However, only 1.1% of the participants in the study classified themselves as such (20).

Despite uncertainty about precisely what adolescent problem gambling screens measure, work has been carried out to identify the patterns of gambling and problem gambling among adolescents in many jurisdictions. Given the amount of research that has been done, there is value in taking a comparative look at what these studies can tell us about youth gambling and problem gambling from an international perspective. In this paper, we review the methods and results of adolescent prevalence surveys that have been carried out in North America (the United States and Canada), Europe and the Nordic countries, and Oceania (Australia and New Zealand). We conclude by reviewing some of the consistent findings across these studies and drawing some important lessons for the future. A synopsis of the key features of all of these surveys is provided in Table 1.

UNITED STATES OF AMERICA

The development of adolescent gambling prevalence research in the United States (US) spans three distinct periods. The early period (1984 to 1989) coincided with the growth of state-run lotteries. The middle period (1990 to 1999) coincided with a rapid expansion of casino gambling in the wake of the passage of the Indian Gaming Regulatory Act of 1988.

The past decade (2000 to 2009) saw changes in strategies for collecting data about adolescent gambling and problem gambling, increased analytic sophistication, and growing interest in the links between adolescent gambling and other risky behaviors.

Early period (1984-1989)

In an early review of adolescent prevalence surveys, Jacobs (21) identified six studies that were completed before 1990 (22-27). Carried out in California, Connecticut, New Jersey, and Virginia, all the studies were conducted in high schools using self-completed questionnaires. The students participating in these studies were probably not representative of their schools or of adolescents in their states because as Jacobs noted, "*...none of these independent unsponsored investigators had the resources to employ formal stratified sampling procedures*" (21:433). Sample sizes were relatively small, ranging from 147 to 892, and different instruments were used in each study. In California and Virginia, separate surveys were carried out before and after state lotteries were introduced. In the wake of the introduction of lotteries, Jacobs (21) reported that past-year gambling participation among high school students rose from 20% to 45% in California and from 40% to 58% in Virginia.

In a subsequent analysis that included these six studies along with nine additional surveys carried out between 1989 and 1999, Jacobs (1:120) concluded that the rise in the median level of gambling participation from 45% before 1990 to 66% "*...leaves little doubt that juvenile gambling throughout the US has increased significantly*". Jacobs (1:134) further concluded that, "*...the dominant long term trend has been a progressive increase in the amount of serious gambling-related problems reported by juveniles in the US.*" This view is in contrast to the conclusion reached by other researchers (3,28,29) that rates of youth gambling and problem gambling tend to be quite stable over time.

Middle period (1990-1999)

In the US, the period between 1990 and 1999 saw rapid growth in the number and quality of adolescent gambling prevalence surveys. Although some states funded only one such survey during the decade, several states funded two or more surveys.

Single surveys. During the 1990s, single school-based or telephone surveys were completed in several states, including Georgia, Louisiana, New York, and Vermont. The reasons for funding these studies varied. In Georgia, there was concern about the impact of a new state lottery on adolescent gambling and in New York concern about the impact of a single new lottery game, five-minute keno. In Louisiana, the State Health Department desired information on which to base a youth gambling prevention program.

In 1995, Vermont was the first state to add a gambling module to the Youth Risk Behavior Survey conducted annually by the Centers for Disease Control and Prevention (30). The survey was administered to 8th to 12th grade students (n=21,297) in public and private schools across the state. Two questions related to gambling were included in the survey, one assessing past-year gambling participation and the other assessing problems caused by gambling. Apart from gambling, the risk behaviors assessed in this survey included drug and alcohol use, seatbelt use, violence, and sexual activity. Among the 16,948 students who answered both gambling questions, problem gamblers reported significantly more risky behaviors than gamblers, and gamblers reported significantly more risky behaviors

than did non-gamblers. The Vermont researchers recommended that gambling be included as a regular part of health assessments of adolescents and used to identify youth at risk of developing other risk behaviors.

In 1996, the Georgia Department of Human Resources funded an adolescent prevalence survey (31). Telephone interviews with a sample of 1,007 Georgia adolescents aged 13 to 17 years used the SOGS-RA to assess problem gambling. A modified scoring method was used to classify respondents in this survey as non-problem, at-risk and problem gamblers. Based on this multi-factor method (also used in surveys in Texas and Washington State), 2.8% of the Georgia adolescents surveyed were classified as problem gamblers. A multiple regression analysis showed that male adolescents with high weekly incomes but low self-esteem were more likely to be classified as problem gamblers than were other adolescents in the study. A similar adolescent survey was carried out in 1997 in New York State (32). The sample in New York included 1,103 adolescents aged 13 to 17 years and the SOGS-RA was used to assess problem gambling. Based on the multi-factor method, 2.4% of the adolescent respondents were classified as problem gamblers.

In 1998, Westphal and colleagues (33) conducted a large school-based prevalence survey in Louisiana. The study included a random sample of 11,736 students in grades 6 through 12 attending both public and private schools throughout the state. One third (34%) of the final sample was African-American. Based on the SOGS-RA, 5.8% of students were classified as problem gamblers. The researchers noted that the age of onset for gambling participation was significantly younger than smoking tobacco and use of marijuana and alcohol.

Repeat cross-sectional surveys. In the 1990s, several states funded multiple adolescent prevalence surveys (e.g., Oregon, Texas, and Washington State). In all these states, the surveys used methods very similar to those employed in the surveys in Georgia and New York. The major difference across these states was the interval between the baseline and replication surveys. In Texas, the gap was 3 years (34,35); in Washington State, the gap was 6 years (36,37); and in Oregon, the gap was 9 years (38,39).

In Texas, Wallisch (34,35) found that whereas lifetime gambling participation among adolescents aged 14 to 17 years increased in the wake of the introduction of a state lottery, past-year gambling participation remained stable. The prevalence of problem gambling, assessed using the SOGS-RA, declined from 5.0% in 1992 to 2.3% in 1995. In Washington State, Volberg, and Moore (37) found that past-year gambling participation declined slightly from 70% to 65%, whereas the prevalence of problem gambling, using the SOGS-RA, was unchanged at 0.9%.

Finally, Volberg et al (39) found a significant decline in gambling participation among adolescents in Oregon over a 9-year period, from 66% in 1998 to 46% in 2007, with no change in the prevalence of problem gambling. Volberg et al (39) hypothesized that the substantial drop, particularly in age-restricted gambling activities, could be due to several factors, including sampling error, lifelong exposure to gambling, changes in attitudes toward youth gambling, and extensive efforts undertaken by the State of Oregon to educate youth, parents, and teachers about the risks of adolescent gambling.

The presence in Minnesota of a well-established research center in adolescent risk behavior and the introduction of a state lottery

combined to support an extensive program of research into adolescent gambling. In 1990, Winters, Stinchfield, and Fulkerson (40) conducted a telephone survey of 702 Minnesota youth aged 15 to 18 years to obtain a baseline measure of youth gambling before the introduction of the state lottery. One year later, 532 participants from the baseline survey (76%) were re-interviewed by telephone (41). Although no statistically significant changes were found in regular participation in specific gambling activities, a shift from informal private games to legal gambling activities over the one year interval was observed. This report was the first instance of a prospective study of gambling behavior.

A series of three school-based prevalence surveys were subsequently carried out in Minnesota in 1992, 1995, and 1998 (29,42). In each year, two items (feeling bad about gambling and wanting to stop gambling) were added to the Minnesota Student Survey, a self-administered questionnaire that inquires about multiple behavioral domains and is administered every 3 years to nearly all 9th and 12th graders in Minnesota. Between 1995 and 1998, the researchers found that although fewer youth gambled, the proportion of youth who gambled frequently increased. The researchers also found that the proportion of youth self-reporting gambling problems based on these two items remained relatively stable between 1992 and 1998.

Native American youth. In the 1990s, Class III (casino) gambling on Native American reservations expanded rapidly. In the wake of this development, two small prevalence studies were carried out among Native American adolescents (43,44). One of these two school-based surveys was carried out on a Northern Plains reservation (n=227 students, ages 12-19) and the other was completed on a Great Lakes reservation (n=185 students, ages 12-19). The two surveys used identical methods, and the results focused on comparisons of American Indian and non-Indian adolescents living on or near the reservations. The self-administered questionnaire included a combination of SOGS, 20 Questions, and DSM-III-R items.

Both studies found that the majority of Native American youth gambled and that Native American youth started gambling at an earlier age than non-Indian youth. Zitzow (44) reported that 5.6% of the non- Native American youth scored as "pathological gamblers" compared with 9.6% of Native American youth. Peacock et al (43) did not report on the proportion of youth in their sample that scored as problem or pathological gamblers. However, these researchers concluded that Native American youth were at greater risk for developing gambling problems because of extremely high rates of loss of important people in their lives and the widespread belief that money would solve their problems.

Interestingly, in considering the impact of the introduction of casino gambling in Indian country, Zitzow concluded that "*...the recent introduction of a large stakes casino within this reservation community may not be the most significant event in promoting gambling ... The most significant events appear to have already occurred within the last 15 years due to the onset of bingo, pulltabs, state-supported scratch tabs, and the state lottery*" (44: 25).

Present period (2000-2009)

Since 2000, the number of surveys designed specifically to measure adolescent gambling prevalence has declined in the US. Instead, researchers are finding new ways to obtain information about adolescent gambling and

are focusing more on risk and protective factors associated with problem gambling.

Adding gambling modules to other surveys of youth. Ten years ago, the National Gambling Impact Study Commission (45) recommended adding gambling components to existing research panels. Although this recommendation was never implemented at the national level, several states (e.g., Arizona, Louisiana, New York) added gambling modules to existing surveys of youth (46-48). Unfortunately, only the New York survey included any questions about gambling-related problems.

Because the focus of these surveys is on risk and protective factors for a range of behaviors, all include large samples of students. Adding questions that assess past-year involvement in a range of gambling activities enables an examination of gambling involvement in relation to gender and age, as well as in relation to other risk behaviors, such as alcohol and substance use, anti-social behavior, and school performance. One interesting finding from the surveys in Arizona and Louisiana is that, in contrast to many other adolescent gambling prevalence studies, older youth in these states were less likely than younger youth to say that they gambled.

Another advantage to adding gambling modules to youth risk behavior surveillance surveys is that changes in gambling participation can be tracked over time. In Arizona, where gambling questions were asked in 2006 and 2008, significant increases in gambling participation were identified among 8th, 10th, and 12th graders (46). In New York, where gambling questions were included in the 1998 and 2006 annual School Survey of the Office of Alcoholism and Substance Abuse Services, students were 15% more likely to have played card games for money and 43% more likely to have played lottery games in 2006 compared with 1998 (48). The 2006 survey in New York was the only one that included a problem gambling screen; notably, 28% of the students in New York who were deemed to be in need of chemical dependence treatment services had experienced gambling problems in the past year.

The national picture. As part of the national Gambling Impact and Behavior Study, Gerstein et al (49) completed a survey of 534 youths aged 16 to 17 via a randomized telephone survey of US households. Youth were interviewed with the same questionnaire used in an accompanying adult survey and screened for gambling problems using the NODS, a screen derived from the DSM-IV criteria for pathological gambling and designed specifically for telephone survey administration. The most striking finding relates to the different pattern of youth gambling compared with adults. Adolescent gambling was predominantly composed of private betting on games of skill, particularly card games. Over one-quarter of youths (28%) compared with just 11% of adults had bet on such games in the past year. The other most prominent youth games were betting in sports pools and buying lottery tickets. Another interesting finding was that the prevalence of at-risk, problem, and pathological gambling among the adolescent respondents was substantially lower than among adults, if the same cutpoints were used.

Between 2005 and 2007, a nationally representative survey of youth gambling and problem gambling was carried out with funding from the National Institutes of Health (4,10). Telephone interviews were completed with 2,274 youths and young adults aged 14 to 21 years in all 50 states and the District of Columbia. The data were weighted to adjust

for household size and to match the gender, age, and race distributions of the US Census. The primary measure of problem gambling was the SOGS-RA although the researchers also included a 13-item module from the Diagnostic Interview Schedule that was used to assess pathological gambling in an earlier adult survey (50). The study found that 68% of the youth and young adult respondents had gambled in the past year. Males were much more likely than females to gamble regularly, as were older adolescents. African Americans were less likely than youth of other races to have gambled in the past year but, if they gambled, they were more likely to do so regularly. As with the earlier national survey, this study found that rates of problem and pathological gambling were lower than those in the adult sample assessed by the same research team and with the same questionnaire. A separate analysis of the data found a close relationship between the mean number of gambling activities engaged in by youth and problem gambling (51). After controlling for involvement in other games, the researchers found that card games, games of skill and gambling at casinos were the activities most closely associated with an increased risk of gambling-related problems among adolescents and young adults.

Since 2002, the Adolescent Risk Communication Institute (created by the Annenberg Foundation) has funded an annual telephone survey of youth aged 14 to 22 years. The sample size was 900 in each year except for 2004 and 2008. Respondents are asked questions about a range of risky activities, including frequency of engaging in specific gambling activities in an "average" month. Respondents who have engaged in one or more activities in an average month are asked four questions about difficulties related to their gambling that assess the DSM-IV criteria of preoccupation, tolerance, loss of control, and withdrawal. In 2008, the Institute reported that monthly rates of card playing, particularly on the Internet, had spiked in 2005 and 2006 in the wake of a "card playing (poker) fad" and had since declined and stabilized. The researchers reported that sports betting increased among male youth in 2008 but that the long-term trend in overall weekly gambling since 2002 had been downward for both male and female youth (52).

CANADA

Whereas numerous studies of adolescent gambling have been conducted in Canada, relatively few prevalence surveys have been completed. Most studies consist of convenience samples, assessing adolescents within the school system and usually include only youth living close to major city centers. Nonetheless, such studies have proved useful in understanding gambling patterns, preferences, and trends, as well as a sense of the proportion of youth who experience gambling-related problems.

Early investigations (1988-1995)

Early surveys, completed in Nova Scotia in 1993, in Ontario in 1994, and in Alberta in 1996, included the adult SOGS rather than a problem gambling screen specifically designed for adolescents (53-55). Wynne Resources reports that the Alberta youth survey was carried out by telephone, but the modality used in the Nova Scotia and Ontario adolescent surveys is unclear. Two early surveys in Quebec City, Quebec, and Windsor, Ontario were classroom-based but included different problem gambling screens. The Quebec City survey was based on the "pathological gambling signs index" used in

another early youth survey in New Jersey (26,56). The Windsor survey used the SOGS-RA to assess the extent of problem gambling (57). Both past-year gambling and the rate of patho-logical gambling were lower in Quebec City than in New Jersey; the Windsor survey found higher rates of both past-year gambling and problem gambling than reported in other provinces.

Across the board, these early investigations found that Canadian youth participated in a multitude of gambling activities, usually self-organized forms of wagering (e.g., card games for money, betting on games of skill including video games) although lottery products were also popular among adolescents (7).

Recent period (1999-2009)

The national survey. The Canada-wide mental health survey (Canadian Community Health Survey: Mental Health and Well-Being 1.2) is the largest nationally representative data set assessing gambling participation and problem gambling prevalence among individuals aged 15 years and older. The youth data consist of a subset of 5,666 Canadian residents aged 15 to 24 years. Respondents were interviewed face-to-face, and the Canadian Problem Gambling Index (CPGI) was used to measure gambling and problem gambling. Although minor regional differences were seen, overall 61% of youth reported gambling in the previous year, 56% ranked as non-problem gamblers, 3.5% scored as being at slight risk for gambling problems, and 2.2% ranked as being moderately at risk for and/or meeting the criteria for problem gambling. Those at greatest risk were young, male, and living in the Prairie region (58).

The rates of problem gambling identified among adolescents in the national prevalence survey in Canada were substantially lower than rates identified in provincial prevalence surveys conducted in roughly the same period. This finding is particularly true for British Columbia and the Prairie provinces of Alberta, Saskatchewan, and Manitoba. Also noteworthy is that the national survey included individuals to age 24 years who were interviewed in person, whereas provincial surveys have focused primarily on those under the age of 18 or 19 years and have been completed in classrooms or by telephone. Accordingly, differences between the provincial surveys and the national survey must be interpreted with caution.

British Columbia. Aside from the national prevalence study, little research on adolescent gambling has been carried out in British Columbia. One small study, conducted in Langley in 2001-2002 among 454 students aged 15 to 19 years, included completion of the SOGS-RA. Ninety percent of the participants in this study reported gambling in the previous year and five percent met the narrow criteria for serious gambling-related problems (59).

The Prairie provinces. Based on recent studies in all three provinces (Alberta, Saskatchewan, and Manitoba), the rates of adolescent gambling participation appear lower in Alberta than in the other two provinces. In 2002 and 2005, the Alberta Youth Experience Survey included questions about gambling participation and problem gambling in classroom surveys completed with students in grades 7 through 12 (60,61). In 2002, 41% of the students reported gambling in the past year. The most popular gambling activities included scratch tabs (31%), playing cards for money (23%), and betting on sports events (21%). Alberta adolescents held favorable attitudes toward gambling and perceived it as a socially

acceptable activity. Based on the SOGS-RA, 3.8% of Alberta students were considered problem gamblers, of which the majority were male, in high school, Aboriginal, and from larger cities. Three years later, a repeat survey found that past-year gambling participation had increased to 63% with scratch tabs replaced by card playing as the most frequent activity (41%). The prevalence of problem gambling based on the SOGS-RA remained almost unchanged at 3.6%; but the prevalence of at-risk gambling increased from 5.7% to 8.8% (61).

A study commissioned by Saskatchewan Health in 2003 included a sample of 1,884 students aged 15 to 18 years (62). The majority of youth (81%) reported gambling with scratch tickets, games of skill, and self-organized poker games being among the most popular activities. Although problem gambling was not assessed, the authors concluded that Saskatchewan youth were actively involved in gambling, and that gambling represented a significant proportion of their monthly expenditures.

The Addictions Foundation of Manitoba conducted a prevalence study of youth in 1999. One thousand youth, aged 12 to 17 years, were interviewed by telephone and administered the SOGS-RA. The majority of the adolescents (78%) reported gambling in the previous year, with the most popular activities being the purchase of raffle tickets, playing cards for money, and betting on dice or games of skill. Based on the SOGS-RA, 8% of these adolescents were at-risk gamblers and 3% were problem gamblers (63). Three years later, a follow-up study was completed with 410 individuals from the 1999 cohort, now aged 15 to 20 years (64). Looking only at the 32% of the sample still under 18 years of age, the study found that the overall rate of gambling participation had not changed. However, respondents were more likely to participate in legal forms of gambling, such as casinos and VLTs, and less likely to gamble in home or school settings. The at-risk and problem gambling rates decreased slightly from 1999, but the authors concluded that these changes were not statistically significant.

In 2004, a study conducted in Manitoba included 6,673 students aged 12-18 years from across the province. The sample included more rural schools than in previous surveys in Manitoba and was more representative of the youth population of Manitoba. Using the DSM-IV-MR-J the results differed significantly from previous adolescent surveys in Manitoba, with only 35% of the students reporting having gambled in the previous 12 months. However, the rate of problem gambling (2.3%) is very similar to rates previously reported in Manitoba (65). These results suggest that youth in rural areas are less likely than urban youth to gamble.

Ontario. The Centre for Addiction and Mental Health's Ontario Student Drug Use Survey (OSDUS) is the longest ongoing school survey of adolescents in Canada, having been conducted every two years since 1977. Beginning in 1999, the OSDUS included questions about gambling and gambling problems in these surveys, which encompass students in grades 7 to 12 (ages 12-18 years). Although the SOGS-RA was used until 2003, the 12-item screen was reduced to 6 items in the 2005 survey. In 2005, 33% of the students acknowledged playing cards for money in the past year; 18% purchased lottery tickets, and 17% bet money in sports pools. The least prevalent activity was casino gambling (1%), followed by Internet gambling (2%). Among all the students, 6% were identified as heavy gamblers and 4.5% were classified as problem gamblers.

Developmentally, heavy gambling rates were found to vary significantly by grade, peaking in grade 12 at 8.5%. Although the researchers identified a sharp decrease in the rate of problem gambling between 1999 and 2003 (from 6.2% to 3.5%), between 2003 and 2005 they found a slight increase in problem gambling prevalence (from 3.5% to 4.5%), a change that was not statistically significant (66,67).

Quebec. Quebec is a unique province with meaningful cultural differences between Francophones (French-speaking), Anglophones (English-speaking), and Allophones (neither English- nor French-speaking). Whereas Quebec's population is predominantly Francophone, significant numbers of Anglophones and Allophones live around the major city centers, primarily Montreal. Problem gambling rates in Quebec have been shown to vary according to these cultural differences. In 2006, a province-wide, representative sample of 4,571 students in grades 7 to 11 was surveyed using the DSM-IV-J to assess problem gambling (68). The results showed that 36% of high-school students had gambled in the past 12 months with participation rates being higher among Allophone students (42% vs. 35%). Thirty percent of students were classified as occasional gamblers and 6% were classified as habitual gamblers (i.e., gambling at least once per week). The rate of habitual gambling was higher among Anglophone and Allophone students compared to Francophone youth (9% vs. 5%). The most popular forms of gambling among Quebec high-school students included card games (21%), instant lotteries (17%), games of skill (14%), and private sports gambling (13%). Approximately 4% of these high school students were at-risk gamblers and 2% were problem gamblers. The prevalence of problem gambling was twice as high among students who spoke a language other than French at home (Anglophones/Allophones) compared with Francophones (4% vs. 2%) (68).

The Atlantic provinces. In 1998, a survey was conducted across all four Atlantic Provinces: Nova Scotia, New Brunswick, Newfoundland and Labrador, and Prince Edward Island. A total of 13,549 students from grades 7 through 12 in the public school systems completed a questionnaire that included the SOGS-RA. Overall, 70% of the students reported gambling in the previous year; the most popular gambling activities were scratch tabs (60%), playing cards for money (35%) and betting on sports (30%). The prevalence of at-risk gambling among these adolescents was 3.8% and the prevalence of problem gambling was 2.2%. The prevalence of problem gambling did not vary on the basis of age (69).

EUROPE

Recent reviews of gambling participation across many European countries suggest that research into adolescent gambling is comparatively rare in this part of the world. In this section, research conducted in the Baltic and Balkan countries, Germany and Belgium, the Latin European countries of Italy and Spain, and Great Britain is reviewed. This is followed by a review of research conducted in the Nordic countries of Denmark, Finland, Iceland, Norway and Sweden.

Baltic and Balkan States

Central and Eastern European countries in which some adolescent gambling research has been completed include Estonia, Lithuania, Romania, and Slovakia. In Estonia, two prevalence surveys have been carried out

among residents aged 15 to 74 years (70,71). The 2004 survey included 1,000 respondents and the 2006 survey 2,005 respondents. The SOGS was translated into Estonian and used to assess problem and pathological gambling (72). The results were not presented separately by age groups. In 2004, 61% of the participants had gambled and 2.4% were classified as probable pathological gamblers, whereas in 2006, 75% of the participants had gambled and 3.4% were classified as probable pathological gamblers. In comparing the results of the two surveys, Laansoo and Niit (73) observed that younger respondents in these surveys were more likely to gamble and more likely to be classified as probable pathological gamblers.

A youth gambling study was recently completed in Kaunas, Lithuania's second largest city (74). The sample comprised 835 randomly selected adolescents between the ages of 9 and 16 years from all of the Kaunas secondary schools (47% male, 53% female). Two problem gambling screens, the SOGS-RA and the DSM-IV-MR-J, were translated into Lithuanian (75,76). Males were significantly more likely than females to be both occasional and regular gamblers. Based on the DSM-IV-MR-J, 4% of the study participants were identified as pathological gamblers; based on the SOGS-RA, 5% of participants were defined as pathological gamblers. The DSM-lV-MR-J was used as the main screen because of its conservative nature and because of its similarity to the DSM-IV criteria. Compared with other gamblers, the pathological gamblers in this study were significantly more likely to gamble on slot machines (51% vs. 8%), cards (17% vs. 7%), and SMS gambling (27% vs. 9%). Male adoles-cents were three times more likely to be pathological gamblers (6% vs. 2%). Being male, having cognitive distortions regarding gambling, having parents who gambled, having parents who gambled to excess, using alcohol regularly, and smoking regularly all contributed independently to pathological gambling status.

As in Lithuania, some research on adolescent gambling has been conducted in Romania (77). Lupu, Onaca and Lupu (78) examined the prevalence of problem gambling using the GA 20 Questions in three Romanian counties. Based on a sample of 500 high-school students (57% female and 43% male) between the ages of 14 and 19, the games most frequently played by Romanian teenagers were: football pools (56%), poker (35%) and bingo (32%). Two-thirds of the sample (64%) gambled frequently and 82% indicated that they gambled in groups. The mean age at which these Romanian youth began gambling was 14 years. Among the 7% of participants identified as problem gamblers, 82% were male. Analysis showed that 18% of the problem gamblers had fathers who were alcoholics and 12% had fathers who were problem gamblers. No significant differences were found between problem and non-problem gamblers in relation to family income or social status.

In a separate study, Lupu and colleagues (79) examined the risk factors for problem gambling among 231 Romanian adolescents aged 14 to 18 years. Using the GA 20 Questions, the researchers categorized the participants into three groups based on their level of gambling and problem gambling severity. Among these youth, 54% endorsed between two and six of the GA-20 questions and another 12% endorsed seven or more items. Risk factors for the most severe problem group included: parental divorce, serious physical illness in a family member,

death of a family member, family break-up, psychological illness in a family member, sexual abuse, and being in a severe accident. Based on the data, Lupu et al (79) identified two distinct types of problem gambler:

- adolescents from unfavorable family and social environments who were dealing with stress and trauma (e.g., neglect, physical, and/or sexual abuse), and
- adolescents from favorable family and social environments, where parents neglected the child because of work involvement.

Among the first group, gambling was a coping mechanism to deal with chronic stress; among the second group, gambling was a way to spend time and/or attract a parent's attention.

Finally, a recent overview by Zivny and Okruhlica (80) made reference to a study that examined the comorbidity of gambling and psychoactive substance use in primary and secondary schools in Slovakia (81). In this survey of 1,142 primary and secondary students, 12% of primary school children reported they had gambled occasionally and 1.5% admitted gambling regularly. Among secondary school children, 15.5% gambled occasionally whereas 1.6% played regularly.

Germany and Belgium

The sole study examining the prevalence of adolescent problem gambling in Germany was carried out by Hurrelmann, Schmidt and Kähnert (82). Comprising 5,000 youth aged 13 to 19 years from the Federal State of North Rhine-Westphalia, the results showed that 62% of the respondents had gambled for money in the past year. Scratch cards (36%) and private card games for money (29%) were the most popular activities. Other popular activities included state-run sports betting (18%), amusement-with-prizes machines (17%), private games of skill (17%) and private dice games (15%). The prevalence rate of problem gambling using the DSM-IV-MR-J was 3% among all participants. However, boys were five times more likely than girls to be problem gamblers. Problem gamblers reported significantly more stressful life events than non-problem gamblers, consumed psychoactive substances more frequently, and were dissatisfied with their life situation. The researchers concluded that these adolescent problem gamblers lacked coping skills for handling day-to-day demands.

The only study of adolescent gambling in Belgium was part of a larger study of youth risk habits (83). This survey of 38,357 youth aged 12 to 18 examined participation in four gambling activities (slot machines, lotteries, card games, and betting). Results showed that 40% of these adolescents had gambled on one or more of the four activities in their lifetime, reflecting a decrease from 53% in 2001 and 42% in 2005.

Latin Europe

Very little research has been done on adolescent gambling in any of the Latin European countries. In Italy, Capitanucci, Biganzoli and Smaniotto (84) examined youth gambling in a student sample from of a technical college in Northern Italy (520 males and 59 females; aged between 13 and 20 years). Using a translated version of the SOGS-RA to assess problem gambling, the most popular form of gambling among these Italian youth was sports betting (14% of the respondents bet on sports once a week or more often), and 6% of the respondents were classified as problem gamblers. Pathological gambling strongly correlated with being male, gambling out of habit or for relaxation, and

believing chance games to be skilful (e.g., erroneous cognitions). A separate study by Baiocco, Couyoumdjian, Langellotti and Del Miglio (85) examined aspects of pathological gambling among adolescents living in Rome. The sample comprised 300 adolescents (118 boys, 182 girls; aged between 14 and 20 years). The results showed that Roman adolescents preferred games of skill to games of chance or card games, with just over 2% of the sample being classified as problem gamblers. These adolescent problem gamblers had greater difficulties in terms of school performance and discipline. Problem gamblers also had higher scores on impulsiveness, aggressiveness, and resentment toward their parents. Finally, problem gambling was associated with parental gambling in this sample.

In contrast to other Latin European countries, substantial research has been done on problem gambling in Spain. A number of studies have been carried out on adolescent gamblers, although most have been on small local samples (e.g., 86-90). Two extensive studies have been carried out among primary and secondary school children in Galicia (89). In the first study, the DSM-IV-J and the SOGS-RA were used to assess problem gambling among children aged 11 to 16 years. The researchers found that 0.8% of their respondents scored as severe problem gamblers on the DSM-IV-J, whereas 4.6% of their respondents scored as problem gamblers on the SOGS-RA. In a separate study of youth aged 14 to 21 years, Becoña et al (89) found that 4.6% scored as problem gamblers based on the SOGS-RA. Finally, in a study with a large sample of university students from Madrid (aged 17 to 35 years), Viloria (91) found 4.5% scored as probable pathological gamblers and 6.6% scored as problem gamblers based on the SOGS.

Great Britain

More research into adolescent gambling has been completed in Britain than in any other European country. This achievement is likely due to the widespread availability and accessibility of fruit (slot) machines. Early large-scale studies carried out by local councils and voluntary organizations in the United Kingdom (UK) did not investigate problem gambling. However, these studies did show that the majority of British children gambled occasionally and nearly 20% gambled weekly (92). In the wake of the introduction of a National Lottery, a study of 4,516 adolescents aged between 11 and 16 years found that 24% of respondents reported gambling on the lottery or buying scratch cards once a week or more (93). In the same period, a school-based study of approximately 1,000 adolescents aged 11 to 15 years found that 6% of respondents met the DSM-IV-J criteria for problem gambling (94), whereas another small-scale study of 204 boys aged 11 to 16 years found 5% who met these criteria (95).

National youth prevalence surveys in Britain were conducted in 1996, 1997, 1999, 2000, 2006, and 2009 under the aegis of the Office of the National Lottery (later the National Lottery Commission) (96-101). The 1996 survey included 7,200 pupils aged 12 to 15 drawn from 48 schools around the country. The survey found that 15% of a representative subsample of 3,724 pupils had spent their own money on the National Lottery in the preceding week, with the majority of these purchases (60%) made legally by a parent. Past-week lottery purchases were significantly associated with being male and having a higher level of spending money (96). The most recent wave of this ongoing youth-tracking study found that slot machines were

the most popular form of commercial gambling among adolescents, with 9% of the sample of 8,598 adolescent participants having pla yed these machines in the past week (down from 17% in 2006 (101). A review of over 30 British studies of youth gambling (102) indicated that:

- At least two-thirds of adolescents have ever played slot machines;
- One third of adolescents have played slot machines in the last month;
- Up to 20% of adolescents are regular slot machine players (playing at least once a week) (9% in the latest 2009 national prevalence survey);
- Up to 6% of adolescents are probable pathological gamblers and/ or have severe gambling-related difficulties (2% in 2009, down from 3.5% in 2006, 4.9% in 2000 and 5.4% in 1999 (98-101).

In some areas of Britain (e.g., Scotland), adolescent problem gambling prevalence rates that are two to four times higher than those identified in the adult British population have been reported (103).

Research in the UK has found that very few female adolescents have gambling problems on slot machines. A strong correlation between adolescent gambling and parental gambling (94, 104) suggests that adults may to some extent foster adolescent gambling in Britain. Other factors that have been linked with adolescent problem gambling in Britain include working class youth culture, delinquency, alcohol and substance abuse, poor school performance, theft, and truancy (e.g., 93,105,106).

Nordic Countries

All of the Nordic countries have conducted one or more epidemiologic studies of adult gambling and problem gambling in the past five years. Research on adolescent gambling is less extensive and differs widely between countries (107,108).

Denmark

A prevalence survey of adolescent gambling in Denmark was recently completed, using a sample of 5,096 adolescents aged 12 to 17 years randomly selected from the national register (109,110). A total of 3,814 youth participated in the study (representing 75% of the drawn sample), with results showing that 51% of youth had gambled at least once and 7.2% had gambled in the past month. Boys were more likely to gamble than girls and older adolescents (16 to 17) were more likely to gamble than younger adolescents. The most popular gambling activities among Danish youth were scratch tickets, slot machines, and Lotto.

Problem gambling was assessed using a modified version of the NODS. A total of 7.5% of the adolescents endorsed one or more of the 5-item abbreviated NODS, with 0.8% endorsing three or more items. Boys were more likely to have gambling problems than girls and prevalence was higher in the oldest age group (16 to 17 years) than in the younger age groups. Further analysis suggested that problematic gamblers played mostly scratch tickets, slot machines and poker (110).

Finland

Only one study of adolescent gambling has been carried out in Finland (111). This study, using a random sample of adolescents aged 12 to 17 years from the personal register, included 5,000 adolescents interviewed by telephone (112). The results showed that 52% of the adolescents had gambled in the past year and 18% in the past week. Gambling was more common among boys than girls and among adolescents aged 15 to 17 years compared with younger age groups. The most

popular gambling activity was slot machines, followed by scratch cards and the Lotto (111,112). A Finnish version of the SOGS-RA was administered to adolescents who gambled at least twice a month. Overall, 2.3% of Finnish adolescents were classified as problem gamblers. Boys were three times more likely than girls to score as problem gamblers. Further analysis showed that adolescent problem gamblers were most likely to gamble on slot machines, scratch cards, Internet poker, and sports betting (111).

Iceland

In Iceland, four school surveys have been carried out in the capital of Reykjavik or in surrounding towns. The first survey, completed in 2003, included 750 students aged 16 to 18 years from 12 upper secondary and comprehensive schools in the greater Reykjavik area and Akureyri. Some differences were found in problem gambling rates between the two instruments used; the DSM-IV-MR-J identified 2.0% of the sample as problem gamblers (score 4+) with another 3.2% at risk for gambling problems. Based on the SOGS-RA, 2.7% were classified as problem gamblers and 4.4% were classified as at risk (113).

In 2004, a larger study was completed with 3,511 students aged 13 to 15 in Reykjavik (114). The results showed that about 70% of the participants had gambled in the past 12 months and 8% gambled weekly. Using the DSM-IV-MR-J, 1.9% of the students were classified as problem gamblers and another 3.7% were deemed at risk for gambling problems. Based on the SOGS-RA, 2.8% were classified as problem gamblers and 4.1% were classified as at-risk.

Two more recent studies on adolescent gambling and problem gambling in the greater Reykjavik area found similar results. In 2007, a sample consisting of 1,513 students aged 16 to 18 was surveyed (115). In this study, 62% acknowledged gambling in the past year, with 11% gambling on a weekly basis. Using the DSM-IV-MR-J, the study found that 3.0% scored as problem gamblers and 3.8% as at-risk gamblers. Also in 2007, a study was conducted in Hafnarfjörður, a neighboring town to Reykjavik. From the total population aged 13 to 18 years in Hafnarfjörður, 1,537 participated in the study (a response rate of 81%). The results showed that 57% of the adolescents had gambled in the preceding year and 8% gambled weekly. Based on the DSM-IV-MR-J, 2.2% were classified as problem gamblers with another 2.7% classified as at-risk gamblers (116). In all four Icelandic studies, boys were more likely to gamble than girls and were more likely to be classified as having gambling problems.

In all these studies, potential risk factors of problem gambling were systematically evaluated. In general, problem gambling among adolescents in Iceland is strongly related to illicit drug taking and alcohol abuse, cognitive distortions, emotional and conduct problems, attention deficit hyperactivity disorder, poor attendance at school, and poorer grades. Gambling on slot machines, poker, and on the Internet are the favorite gambling activities among problem gamblers (107,113-116).

Norway

Three adolescent prevalence studies have been completed in Norway since 1999. The first Norwegian study of youth aged 12 to 18 years included both telephone interviews and a postal survey. The telephone survey was based on a representative sample of 10,000 telephone numbers drawn from households likely to include adolescents. The sample for the postal survey was based on 3,000

participants aged 12 to 18 years drawn from the Norwegian central register (117,118). The overall response rate for the study was 45%. Gambling participation rates were high, with about 82% of the participants having gambled in the past 12 months and 25% having gambled weekly. Boys were more likely to gamble than girls. Problem gambling was assessed using a 10-item version of the DSM-IV that was administered only to those who gambled weekly or more often. The study found that 1.8% of the total sample scored as potential pathological gamblers (answering yes to at least 5 criteria), and an additional 3.5% were denoted as "at risk" gamblers (3 or 4 DSM-IV criteria). Boys were four times more likely than girls to be classified as potential pathological gamblers. One interesting finding was that the prevalence of potential pathological gambling was two times higher among the adolescents interviewed by telephone compared with those who answered the postal survey (117).

The second and third Norwegian studies share a number of similarities (119,120). Both studies were school-based surveys of students aged 13 to 19 years. The second study was conducted in 2002 and included about 13,000 adolescents from 72 schools, with a response rate of 92% (119). The third study was carried out in 2004 and included all primary and secondary schools in Norway. A total of 20,703 Norwegian adolescents participated in the study, resulting in a response rate of 80% (120). Past-year gambling participation declined slightly from 78% in 2002 to 74% in 2004, and weekly gambling declined from 14% in 2002 to 11% in 2004. In both studies, boys gambled more than girls, and scratch cards and slot machines were the most popular activities.

In 2002, problem gambling was estimated using the two-item Lie/Bet screen (121) and an additional item assessing chasing behavior. Respondents were classified as problem gamblers if they endorsed all three items. The rate of problem gambling was 3.2% using this cutoff. If problem gambling was defined as endorsing the two Lie/Bet questions, the prevalence rate increased to 6%. Regardless of the scoring method, boys were much more likely than girls to be classified as problem gamblers (119). In 2004, problem gambling was estimated using both the Lie/Bet screen and the SOGS-RA (120). Problem gambling prevalence based on the Lie/Bet (lifetime) was 3.5%, whereas problem gambling prevalence based on the SOGS-RA (past year and 4+) was 2.5%. Based on the SOGS-RA, an additional 6% of the respondents were classified as at-risk gamblers. Boys were more likely than girls to be classified with gambling problems, regardless of the screen used.

Further analysis, comparing the classification rates between instruments, suggested only moderate congruence between the two problem-gambling screens, but this result may be due to the different time frames of the instruments, with Lie/Bet estimating lifetime prevalence and SOGS-RA 12-month prevalence (120). It is interesting that problem gambling prevalence, based on the Lie/Bet screen was considerably lower in 2004 (3.5%) than in 2002 (6.0%).

Sweden

Studies on gambling and problem gambling among Swedish adolescents are scarce, and no recent studies of adolescent gambling appear to have been done. In 1997, however, a large-scale epidemiologic study on gambling and problem gambling was conducted that included a sample of 9,917 individuals aged 15 to 74 randomly selected from the Swedish

personal register (122,123). The survey included an over-sample of 1,000 adolescents aged 15 to 17 years. Specific analysis of youth showed that 76% had gambled in the past year and 16% gambled weekly or more often. Youth were most likely to have gambled on fast lottery games, slot machines, and local lottery games. Using a Swedish translation of the SOGS-R (124), this study found 0.9% of the Swedish youth sample to be probable pathological gamblers (≥ 5) with another 4.2% scoring as problem gamblers (scores 3-4) (122). Two years after the original survey, follow-up interviews were completed with 93 adolescents from the study. Based on the SOGS-R, two-thirds of the adolescents classified as problem gamblers in 1997 scored as non-problem gamblers in the follow-up. Among those youth classified as probable pathological gamblers in 1997, about half were classified as problem gamblers two years later. However, several youth classified as problem gamblers in 1997 were classified as probable pathological gamblers in 1999 (125). As in other longitudinal studies, these findings support the notion that problem gambling is a highly transitional state among adolescents and young adults (126,127).

AUSTRALIA AND NEW ZEALAND

In both Australia and New Zealand, empirical evidence derived from large-scale population surveys has consistently shown that the highest rates of problem gambling tend to be observed in the 18 to 24 age-range and particularly amongst males (e.g., 128-135). The results from these studies suggest that gambling may often have its origins in adolescence so that problems observed during early adulthood reflect patterns of involvement that extend back several years.

Survey studies in Australia and New Zealand

Although most adolescent gambling studies in Australia and New Zealand have been undertaken with very similar purposes, there have been some differences in the methodologies employed. Some studies have been entirely confined to individuals under the age of 18 years, whereas others have included young adults. The data have been collected from both school-based surveys and through telephone interviews. The studies have also differed in terms of the measures used to capture the frequency of gambling, as well as the prevalence of problem and pathological gambling.

The first major study of youth gambling in Australia was undertaken by Moore and Ohtsuka (136,137) in the State of Victoria. Over 1,000 school and university students aged 14 to 25 completed a questionnaire about their gambling habits, gambling attitudes, the role of family and social influences, and a modified 10-item version of the original SOGS (138). The researchers found that 3.1% scored in the pathological range, and regular gambling was found to be associated with having more positive attitudes towards gambling and having friends and family members who approved of gambling. A similar study involving 769 individuals from Melbourne under the age of 18 found that 3.8% of students scored in the pathological range (139). Other relevant Victorian research conducted during this period was undertaken in 1997, although the full results were not published until quite recently (140). In this study, 2,788 secondary school students aged 13 were asked if they had participated in the last year in five gambling activities. Problem gambling was not assessed, although a distinction was made between students who

had gambled at all in the past year and those who had gambled on three or more activities. Overall, 41% of the students had gambled in the past year and 8% had gambled on three or more activities. Multivariate analyses indicated that significant independent predictors of greater involvement in gambling for males were drinking, marijuana use, and antisocial behavior. For females, greater involvement in gambling was predicted by dissatisfaction with peer relationships and low perceived rewards at school.

Since the late 1990s, five studies to examine the prevalence of gambling and pathological gambling among youth using instruments validated for use in this population have been carried out in Australia and New Zealand (135,141-145). Although not all of these studies were entirely confined to under-aged populations (some of Rossen's New Zealand sample were aged 18 to 21), the results are unlikely to have been significantly influenced by these sampling differences. Almost all of these studies used the DSM-IV-J or DSM-IV-MR-J as developed and validated by Fisher (17,18). All but one study was based on the complete school population or a random sampling of students from classrooms in secondary level schools (high schools and colleges).

Some consistency was found in the overall participation rates across these studies, all of which are based on classroom samples (mean past-year gambling - 64%). With the exception of the South Australian Department for Families and Communities (135) telephone survey in South Australia, the prevalence rates for pathological gambling clustered around 3.5%. Notably, the prevalence rate obtained in the only randomized telephone survey of adolescents is significantly lower than in the other studies.

Variations in activity preferences and individual differences

Across these five surveys, the most popular activities amongst young people have tended to be scratch tickets, lotteries, card games, and betting on sports. In the two South Australian classroom surveys, approxi-mately 40% of students gambled on scratch tickets, approximately 25% gambled on card games, and 15% to 20% gambled on sports; relatively few gambled on gaming machines (only 5% in the most recent South Australian survey). In all these studies, boys were found to gamble on a wider range of activities than girls, with the largest differences observed for card games, racing, and sports. Boys were also significantly more likely than girls to be classified as pathological gamblers (e.g., 7.8% vs. 2.7% in South Australia; 3.5% vs. 1.2% in the ACT) (141,143). Pathological gambling rates have also been found to be higher in specific ethnic groups. For example, the two largest classroom studies in Australia found that indigenous students were much more likely than non-indigenous students to be classified as pathological gamblers (28% vs. 4.1% in the ACT, 141; 9% vs. 2.2% in South Australia, 143). In New Zealand, Pacific Island students were 11.5 times more likely than other students to be pathological gamblers (144).

Another consistent finding has been the strong link between gambling and other risk-taking behavior, as well as various measures of psychosocial adjustment. For example, in the ACT study (146), three-quarters of pathological gamblers reported drinking alcohol on a weekly basis as compared with only 50% of the rest of the sample. Cigarette-smoking rates among pathological gamblers were four times higher than among non-problem gamblers, marijuana rates were six

times higher, and hard drug involvement was 10 to 20 times higher, depending upon the type of drug. The ACT study also showed that young pathological gamblers scored poorly on measures of self-esteem, negative mood, and general health, and had poorer family adjustment. Similar findings were reported by Rossen (144) in New Zealand. Young pathological gamblers in that country were more likely to have been suspended from school and to feel alienated, and were more likely to report having poorer attachments to their parents.

Links between adolescent and adult gambling

Australian research has also provided insight into the association between adolescent gambling and gambling during early adulthood. A South Australian study conducted by Delfabbro, Winefield, and Anderson (147) investigated the gambling habits of 578 young people who were tracked for four years from mid-adolescence (age 15 years) into adulthood (18-19 years). Each year, the same participants were administered standardized measures of gambling participation. The results showed that, although mid-adolescent gambling was positively associated with later gambling as adults, considerable individual variability in gambling patterns from one year to the next was observed. Only one in four young people who gambled at the age of 15 years continued gambling yearly, and it was rare to find young people whose participation in specific activities was consistent from one year to the next. Using logistic regression models, participation data obtained from young people closer to the time they left school were found more predictive of adult gambling patterns than those obtained at a younger age. The findings highlighted the importance of using longitudinal analyses to study the stability of gambling patterns over time.

CONCLUSIONS

Several conclusions can be drawn from this extended review of adolescent prevalence studies. First, from a methodological perspective, this review has shown that school-based surveys and telephone surveys are the primary modalities used in adolescent prevalence surveys. In Australia, the one survey conducted by telephone obtained a significantly lower prevalence rate than in the classroom studies. Similarly in the US, surveys conducted by telephone obtained somewhat lower prevalence rates than those conducted in classrooms. In Canada, the prevalence rates obtained in classroom and telephone surveys were generally higher than the prevalence rate obtained (using a different problem gambling screen) using face-to-face interviews. In Norway, problem gambling prevalence was two times higher among adolescents interviewed by telephone compared with those who answered a postal survey. Clearly, work is needed to assess the impact of survey modality on identified prevalence rates among adolescents, as has recently been done among adults (148).

Another important methodological trend is that the sample sizes for adolescent surveys have increased over time. Early stand-alone adolescent gambling surveys tended to include samples of only a few hundred participants, as in the period 1984 to 1989 in the US, in the mid-1990s in Canada, and in recent studies in the Balkan and Baltic countries. In cases in which gambling modules are added to larger health surveys of adolescents, the sample sizes can be extremely large, as in Louisiana and Minnesota in the US and the national survey in Canada. These studies, along with surveys in

Britain, the Nordic countries, and Australia and New Zealand, have been valuable in docu-menting the links between gambling and other risk behaviors (e.g., drug and alcohol use, seatbelt use, poor school performance, conduct problems, truancy, delinquency, violence and sexual activity). Except in cases like Britain, where the focus of the study is primarily on gambling, an important limitation in large school-based studies is the trade-off between the size and focus of the overall study and the number of gambling items that can be added. An important direction for future research will be assessing the relation between reduced sets of gambling items (particularly problem gambling screens) and their full-length versions.

A particular measurement concern is that the most widely used problem gambling instruments used with adolescents are derived from adult problem gambling screens and may not be suited to assessing gambling-related problems in younger people. Questions have been raised regarding the validity of both SOGS-RA and DSM-IV-MR-J (e.g., 19,149-155). However, pending a better-validated problem gambling instrument for adolescents, these two instruments are likely to continue to be viewed as the best approximations for the measurement of problem gambling among adolescents. Their use is certainly preferable to the use of either full-length or shortened versions of adult instruments.

From a substantive perspective, some generalizations can be made with regard to the demographic characteristics of adolescent gamblers and problem gamblers. Across the board, boys are more likely to gamble than girls and more likely to experience problems. It also appears that while ethnic and indigenous youth are less likely than other youth to gamble, the former are more likely to gamble regularly when they do gamble and to experience problems (e.g. Native American and African American youth in North America, non-Francophone youth in Quebec, indigenous youth in Australia and Pacific Island youth in New Zealand). There are other clear demographic patterns. For example, the most popular youth gambling activities tend to be private, peer-related activities, such as card games and betting on sports. Older youth are more likely to engage in accessible forms of age-restricted gambling, such as lotteries. However, studies that have compared gambling patterns of youth with those of adults in the same jurisdiction found that older youth tend to migrate towards age-restricted gambling activities, such as casino gambling, only as they near the age when they would be legally able to participate. Other common demographic characteristics are that youth problem gamblers are more likely to start gambling at a younger age and to have parents who gamble.

Also from a substantive perspective, the information from this review suggests that early assumptions about youth gambling and problem gambling must give way to a more nuanced understanding of how these phenomena change in response to changes in the social and cultural environment. For example, it has been widely assumed that gambling participation among youth in jurisdictions where legal gambling is widespread will be higher than in jurisdictions where legal gambling is restricted. It has also been widely assumed that large numbers of underage youth will be able to participate in age-restricted gambling activities when these become available. Finally, it has been widely assumed that problem gambling prevalence rates will be much higher among youth in jurisdictions where legal gambling is broadly available compared with youth in jurisdictions where legal gambling is both less visible and less available. Instead, as a recent study of

youth in Nevada as well as several of the surveys reviewed here have shown, the rates of gambling participation can be substantially lower among youth in mature gambling jurisdictions; access by underage youth to some (but not all) age-restricted forms of gambling can be very low; and problem gambling prevalence rates can be significantly lower among adolescents in such jurisdictions compared with others where gambling is less available (156).

An emerging concern is the recent explosion of Internet and mobile gambling, although, as yet, little research has been done (157,158). Since its inception in 1996, online gambling has become one of the most popular Internet activities and while base rates are still low, gambling on the Internet has increased (159). Strong links between online gambling and non-gambling fantasy games, role-playing games, board games, and card games are an additional cause for concern as youth migrate from free gaming sites to online gambling sites. The most recent survey of adolescents in Oregon found that gambling for free on the Internet was now the most popular gambling activity, although only a few of these youth had gambled on the Internet using money (39).

Perhaps most significantly, this review underscores the value of conducting repeated studies of adolescent gambling within jurisdictions to improve our understanding of how youth gambling patterns change over time and in relation to lifelong exposure, changes in attitudes toward youth gambling, and efforts at prevention. Repeat studies in Minnesota, Oregon, Washington State, and Manitoba in North America as well as in Belgium, Britain, and Norway in Europe, clearly demonstrate that since the early 1990s, adolescent gambling participation has remained stable or has decreased substantially in those jurisdictions. Similarly, repeat studies in North America and in Europe have shown that since the early 1990s, adolescent problem gambling prevalence rates have remained stable or decreased. More frequent surveys have the added value of helping to monitor trends in adolescent participation in specific activities. For example, in the wake of extensive media coverage of professional poker tournaments in the first half of the decade, in 2005 and 2006 the ARCI surveys documented a spike in card playing among youth and young adults. After 2006, the ARCI surveys showed that the monthly rate of card playing declined and then stabilized. Subsequently, the surveys showed that following the "poker" spike, sports betting increased and card playing declined (52).

As with adults, prospective longitudinal studies of adolescent gambling yield vital information about how gambling and problem gambling status can change at the individual level over time. The few studies that have been carried out, beginning with the first early study in Minnesota (41) and continuing through more recent studies in Sweden (125) and Australia (147), all point to the highly transitional nature of gambling and problem gambling among youth. Although we have learned a great deal over the last 25 years, research on adolescent gambling and problem gambling to date has been largely descriptive. We may have traveled some distance down the road toward understanding the determinants as well as the distribution of youth gambling and problem gambling (28), but we still have a long way to go.

REFERENCES

1. Jacobs DF. Juvenile gambling in North America: An analysis of long-term trends and future prospects. J Gambl Stud 2000;16(2/3):119-52.

Table 1. *Summary of adolescent prevalence surveys carried out internationally*

Location	Author	Year Data Collected	Sample Size & Ages	Method	Measure	Gambling Participation (past year)	Problem/ Pathological Gambling
UNITED STATES							
Early Period (1984-1989)							
California	Jacobs et al	1985	843 14 – 18	Classroom	GA 20 Questions	20	4
California	Jacobs et al	1987	257 14 – 18	Classroom	GA 20 Questions	45	4
Connecticut	Steinberg	1988	573 14 – 18	Classroom	SOGS	60	5
New Jersey	Lesieur & Klein	1984	892 16 – 18	Classroom	PGSI	86	5.7
Virginia	Kuley & Jacobs	1987	212 14 – 18	Classroom	GA 20 Questions	40	Not reported
Virginia	Kuley & Jacobs	1989	147	Classroom	GA 20 Questions	58	Not reported
Middle Period (1990-1999)							
Georgia	Volberg	1996	1,007 13 – 17	Telephone	SOGS-RA MFM	52	2.8
New York	Volberg	1997	1,103 13 – 17	Telephone	SOGS-RA MFM	75	2.4
Oregon	Volberg	1998	997 13 – 17	Telephone	SOGS-RA	66	1.4
Texas	Wallisch	1992	924 14 – 17	Telephone	SOGS-RA MFM	66	5.0
Texas	Wallisch	1995	3,079 14 – 17	Telephone	SOGS-RA MFM	67	2.3
Washington	Volberg	1993	1,045 13 – 17	Telephone	SOGS-RA MFM	70	0.9

Location	Author	Year Data Collected	Sample Size & Ages	Method	Measure	Gambling Participation (past year)		Problem/ Pathological Gambling	
Washington	Volberg & Moore	1999	1,000 13 – 17	Telephone	SOGS-RA MFM	65		0.9	
Louisiana	Westphal, Rush & Stevens	1998	11,736 6th – 12th grades	Classroom	SOGS-RA	86		5.8	
Vermont	Proimos et al	1995	16,948 8th – 12th graders	Classroom	Single item	53		7.0	
Minnesota	Winters, Stinchfield & Fulkerson	1992	75,806 9th & 12th graders	Classroom	2-item screen	M9=83	F9=60	2.4	0.7
						M12=86	F12=63	2.6	0.6
Minnesota	Winters, Stinchfield & Kim	1995	73,897 9th & 12th graders	Classroom	2-item screen	M9=77	F9=50	2.3	0.5
						M12=82	F12=59	2.9	0.4
Minnesota	Stinchfield	1998	78,564 9th & 12th graders	Classroom	2-item screen	M9=70	F9=38	2.3	0.5
						M12=81	F12=54	2.9	0.6
Recent Period (2000-2009)									
Nevada	Volberg	2002	1,004 13 – 17	Telephone	SOGS-RA DSM-IV-MR-J	66		1.9	
New York	Rainone & Gallati	2006	5,844	Classroom	DSM-IV-MR-J	72		3.0	
Oregon	Volberg, Hedberg & Moore	2007	1,555 12 - 17	Telephone	SOGS-RA DSM-IV-MR-J	46		1.3	
National	Welte et al.	2005-2007	2,274 14 – 21	Telephone	SOGS-RA DIS	67		1.3	

Notes:
MFM = Multi-Factor Method for scoring the SOGS-RA; PGSI = Pathological Gambling Signs Index

Table 1. *Summary of adolescent prevalence surveys carried out internationally* (continued)

Location	Author	Year Data Collected	Sample Size & Ages	Method	Measure	Gambling Participation (past year)	Problem/ Pathological Gambling
CANADA							
Early Investigations (1988-1995)							
Alberta	Wynne Resources	1995	972 12 – 17	Telephone	SOGS-R	67	7.9
Windsor, Ontario	Govoni et al.	1994	935 14 – 19	Classroom	SOGS-RA	90	8.1
Ontario	Insight Canada Research	1994	400 12 – 19	Not reported	SOGS-R	65	4
Quebec City, Quebec	Ladouceur & Mireault	1988	1,612 14 – 19	Classroom	PGSI	65	3.6
Nova Scotia	Omnifacts Research	1993	300 13 – 17	Not reported	SOGS	60	3
Recent Period (1998-2009)							
Canada	Huang & Boyer	2002	5,666 15 – 24	Face-to-face	CPGI/PGSI	61	2.2
British Columbia	Gregg	2001/2	454 15 – 19	Classroom	SOGS-RA	90	5
Alberta	AADAC	2002	3,394 Grades 7-12	Classroom	SOGS-RA	41	3.8
Alberta	AADAC	2005	3,915 Grades 7-12	Classroom	SOGS-RA	63	3.6
Saskatchewan	Dickinson & Schissel	2003	1,884 15 – 18	Classroom	Not assessed	81	Not assessed
Manitoba	Wiebe	1999	1,000 12 – 17	Telephone	SOGS-RA	78	3
Manitoba	Lemaire	2002/3	410 15 – 20	Telephone	SOGS-RA	78	3
Manitoba	Mackay, Patton, & Broszeit	2004	6,673 Grades 7-12	Classroom	DSM-IV-MR-J	35	2.3

Location	Author	Year Data Collected	Sample Size & Ages	Method	Measure	Gambling Participation (past year)	Problem/ Pathological Gambling
Ontario	Adlaf et. al.	2005	7,726 Grades 7-12	Classroom	SOGS-RA6	33	4.5
Quebec	Martin, Gupta, & Derevensky	2006	4,571 Grades 7-11	Classroom	DSM-IV-J	*French 35 Other 42 Total 36	French 2 Other 4 Total 2
Atlantic Provinces	Poulin	1998	13,549 Grades 7-12	Classroom	SOGS-RA	70	2.2
Notes: * French = French mother tongue, Other = Mother tongue other than French.							
EUROPE							
Belgium	Kinable	2006	38,357 12 – 18	Classroom	Not assessed	40 (lifetime)	Not assessed
Estonia	Laansoo	2006	2,005 15 – 74	Telephone	SOGS	75 (lifetime)	3.4 (lifetime)*
Germany***	Hurrelmann et al.	2003	5,000 13 - 19	Not reported	DSM-IV-MR-J	62	3
Great Britain	Fisher & Balding	1996	3,724 12 – 15	Classroom	DSM-IV-J	15 (7 day lottery)	Not reported
Great Britain	Fisher	1997	9,774 12 – 15	Classroom	DSM-IV-MR-J	19 (7 day fruit machines)	5.6
Great Britain	Ashworth & Doyle	1999	9,529 12 – 15	Classroom	DSM-IV-MR-J	75	5.4
Great Britain	Ashworth et al.	2000	11,581 12 - 15	Classroom	DSM-IV-MR-J	70	4.9
Great Britain	MORI/ IGRU	2006	8.017 12 – 15	Classroom	DSM-IV-MR-J	54	3.5
Great Britain	Ipsos MORI	2009	8,598 12 – 15	Classroom	DSM-IV-MR-J	21 (7 day all activities)	2.0**

Notes:
* Problem gambling prevalence for adolescents and adults combined.
** Scoring requirement that all problem gambling questions be answered was dropped in 2009.
*** Used regional (not national) samples.

Table 1. *Summary of adolescent prevalence surveys carried out internationally* (continued)

Location	Author	Year Data Collected	Sample Size & Ages	Method	Measure	Gambling Participation (past year)	Problem/ Pathological Gambling
EUROPE (cont'd)							
Italy***	Capitanucci et al.	2006	579 13 – 20	Classroom	SOGS-RA	Not reported	6
Lithuania***	Skokauskas et al.	2007	835 9 – 16	Classroom	DSM-IV-MR-J SOGS-RA	83 (lifetime)	4 5
Romania***	Lupu et al.	2002	500 14 – 19	Classroom	GA-20	82 (lifetime)	7 (lifetime)
Slovakia***	Kotrc	2006	1,142	Classroom	Not assessed	27.5 (lifetime)	Not assessed
Spain***	Becona et al.	2001	11 – 16	Classroom	DSM-IV-J SOGS-RA	Not reported	0.8 4.6
Notes: * Problem gambling prevalence for adolescents and adults combined. ** Scoring requirement that all screener questions be answered was dropped in 2009. *** Used regional (not national) samples.							
NORDIC COUNTRIES							
Denmark	Sörensen et al.	2007	3,814 12 – 17	Telephone	Five item NODS	51 (lifetime)	0.8
Finland	Ilkas & Aho	2006	5,000 12 – 17	Telephone	SOGS-RA	52	2.3
Iceland*	Ólason et al.	2003	750 16 – 18	Classroom	DSM-IV-MR-J SOGS-RA	Not reported	2.0 2.7
Iceland*	Ólason et al	2004	3.511 13 – 15	Classroom	DSM-IV-MR-J SOGS-RA	70	1.9 2.8
Iceland*	Baldursdottir et al	2005	1.513 16 – 18	Classroom	DSM-IV-MR-J	62	3.0

Location	Author	Year Data Collected	Sample Size & Ages	Method	Measure	Gambling Participation (past year)	Problem/ Pathological Gambling
Iceland*	Kristjansdottir	2007	1,537 13 – 18	Classroom	DSM-IV-MR-J	57	2.2
Norway	Johansson & Götestam	1999	3,237 12 – 18	Telephone Postal	10-item DSM-IV	82	1.8
Norway	Rossow & Hansen	2002	13,000 13 – 19	Classroom	Lie/Bet + Chasing	78	3.2
Norway	Rossow & Molde	2004	20,703 13 - 19	Classroom	SOGS-RA	74	2.5
Sweden	Rönnberg et al	1997	1,000 15 - 17	Telephone Postal	SOGS-R	76	0.9
Notes: * Used regional (not national) samples.							
AUSTRALIA & NEW ZEALAND							
Australian Capital Territory	Delfabbro, Lahn & Grabosky	2003	926	Classroom	DSM-IV-J	70	4.4
South Australia	Delfabbro & Thrupp	2000-2001	505	Classroom	DSM-IV-J	62	3.5
South Australia	S. A. Dept for Families & Communities	2005	605	Telephone	DSM-IV-J	43	1.0
South Australia	Lambos et al.	2007	2,669	Classroom	DSM-IV-J	56	2.4
Victoria	Moore & Ohtsuka	1997	1.017 14 – 25	Classroom	10-item SOGS	75 (lifetime)	3.1
Victoria	Moore & Ohtsuka	1998	796 13 – 17	Classroom	10-item SOGS	89 (lifetime)	3.8
Victoria	Jackson	1997	2,788 13	Classroom	Not assessed	41	Not assessed
New Zealand	Sullivan	2001	547	Classroom	DSM-IV-J	65	13.0
New Zealand	Rossen	2008	2,005	Classroom	DSM-IV-MR-J	68	3.8

2. Shaffer HJ, Hall MN. Estimating preva-lence of adolescent gambling disorders: A quantitative synthesis and guide toward standard gambling nomenclature. J Gambl Stud 1996;12: 193-214.
3. Stinchfield R, Winters KC. Gambling and problem gambling among youths. Ann Am Acad Political Soc Sci 1998; 556:172-85.
4. Welte JW, Barnes GM, Tidwell MC, Hoffman JH. The prevalence of problem gambling among U.S. adolescents and young adults: Results from a national survey. J Gambl Stud 2008;24(2):119-33.
5. Burge AN, Pietrzak RH, Petry NM. Pre/early adolescent onset of gambling and psychosocial problems in treatment-seeking pathological gamblers. J Gambl Stud 2006;22(3):263-74.
6. Kessler RC, Hwang I, LaBrie RA, et al. DSM-IV pathological gambling in the National Comorbidity Survey Replication. Psychol Med 2008;38:1351-60.
7. Gupta R, Derevensky JL. Adolescent gambling behavior: A prevalence study and examination of the correlates associated with problem gambling. J Gambl Stud 1998;14(4):319-45.
8. Jacobs DF. Illegal and undocumented: A review of teenage gambling and the plight of children of problem gamblers in America. In: Shaffer HJ, Stein SA, Gambino B, Cummings TN, eds. Compulsive Gambling: Theory, Research, and Practice. Lexington, MA: Lexington Books, 1989:249-92.
9. Westphal JR, Rush B, Stevens L, Johnson LJ. Pathological gambling among Louisiana students: Grades six through twelve. Paper presented at the Am Psychiatr Assoc Ann Meet, Toronto, 1998.
10. Barnes GM, Welte JW, Hoffman JH, Dintcheff BA. Shared predictors of youthful gambling, substance use and delinquency. Psychol Addict Behav 2005;19:165-74.
11. Vitaro F, Brendgen M, Ladouceur R, Tremblay RE. Gambling, delinquency, and drug use during adolescence: Mutual influences and common risk factors. J Gambl Stud 2001;17(3):171-90.
12. Winters KC, Anderson N. Gambling involvement and drug use among adolescents. J Gambl Stud 2000;16(2-3):175-98.
13. Arc uri AF, Lester D, Smith FO. Shaping adolescent gambling behavior. Adolescence 1985;20:935-8.
14. Fels her JR, Derevensky JL, Gupta R. Lottery playing amongst youth: Implications for prevention and social policy. J Gambl Stud 2004;20(2):127-54.
15. Abbott MW, Volberg RA. The measurement of adult problem and pathological gambling. Int Gambl Stud 2006;6(2):175-200.
16. Winters KC, Stinchfield R, Fulkerson J. Toward the development of an adolescent gambling problem severity scale. J Gambl Stud 1993;9:63-84.
17. Fis her SE. Measuring pathological gambling in children: The case of fruit machines in the UK. J Gambl Stud 1992;8:263-85.
18. Fis her SE. Developing the DSM-IV-MR-J criteria to identify adolescent problem gambling in non-clinical populations. J Gambl Stud 2000;16 (2/3):253-73.
19. Dereven sky JL, Gupta R. Prevalence estimates of adolescent gambling: A comparison of the SOGS-RA, DSM-IV-J, and the GA 20 Questions. J Gambl Stud 2000;16(2/3):227-51.
20. Hardoon KK, Derevensky JL, Gupta

R. Empirical measures vs. perceived gambling severity among youth. Addict Behav 2003;28(5):933-46.
21. Jacobs DF. A review of teenage gambling in the US. In: Eadington WR, Cornelius JA (eds). Gambling Behavior and Problem Gambling. Reno, NV: Institute for the Study of Gambling and Commercial Gaming, 1993:431-41.
22. Jacobs DF, Marston AR, Singer RD. Study of gambling and other health-threatening behaviors among high school students. Loma Linda, CA: Jerry L. Pettis Memorial Veterans Hospital, 1985.
23. Jacobs DF, Marston AR, Singer RD. A post-lottery study of gambling behaviors among high school students. Loma Linda, CA: Jeffrey L. Pettis Memorial Veterans Hospital, 1987.
24. Kule y N, Jacobs DF. A pre-lottery benchmark study of teenage gambling in Virginia. Loma Linda, CA: Loma Linda University, Department of Psychiatry, 1987.
25. Kule y N, Jacobs DF. A post-lottery impact study of effects on teenage gambling behaviors. Loma Linda, CA: Loma Linda University, Department of Psychiatry, 1989.
26. Lesie ur HR, Klein R. Pathological gambling among high school students. Addict Behav 1987;12:129-35.
27. Steinberg M. Gambling behavior among high school students in Connecticut. Paper presented at the Third National Conference on Gambling, New London, CT, 1988.
28. Sha ffer HJ, LaBrie R, LaPlante DA, Nelson S, Stanton M. The road less travelled: Moving from distribution to determinants in the study of gambling epidemiology. Can J Psychiatry 2004; 49:504-16.
29. Stinchfield R. A comparison of gambling among Minnesota public school students in 1992, 1995 and 1998. J Gambl Stud 2001;17(4):273-96.
30. Proimos J, DuRant RH, Dwyer Pierce J, Goodman E. Gambling and other risk behaviors among 8th to 12th grade students. Pediatrics 1998;102(2):e23.
31. Volberg RA. Gambling and problem gambling among adolescents in Georgia. Atlanta, GA: Georgia Department of Human Resources, 1996.
32. Volberg RA. Gambling and problem gambling among adolescents in New York. Albany, NY: New York State Council on Problem Gambling, 1998.
33. Westphal JR, Rush JA, Stevens L, Johnson LJ. Gambling behavior of Louisiana students in grades 6 through 12. Psychiatr Serv 2000;51(1):96-9.
34. Wallisch L. Gambling in Texas: The 1992 Texas survey of adolescent gambling behavior. Austin, TX: Texas Commission on Alcohol and Drug Abuse, 1993.
35. Wallisch L. Gambling in Texas: The 1995 Texas survey of adolescent gambling behavior. Austin, TX: Texas Commission on Alcohol and Drug Abuse, 1995.
36. Volberg RA. Gambling and problem gambling among adolescents in Washington State. Olympia, WA: Washington State Lottery, 1993.
37. Volberg RA, Moore WL. Gambling and problem gambling among Washington State adolescents: A replication study, 1993 to 1999. Olympia, WA: Washington State Lottery, 1999.
38. Carlson MJ, Moore TL. Adolescent gambling in Oregon. Salem, OR: Oregon Gambling Addiction Treatment Foundation, 1998.
39. Volberg RA, Hedberg EC, Moore TL.

Oregon youth and their parents: Gambling and problem gambling prevalence and attitudes. Salem, OR: Oregon Department of Human Services, 2008.
40. W inters KC, Stinchfield R, Fulkerson J. Patterns and characteristics of adolescent gambling. J Gambl Stud 1993; 9(4):371-86.
41. Winters KC, Stinchfield R, Kim LG. Monitoring adolescent gambling in Minnesota. J Gambl Stud 1995;11(2): 165-83.
42. Sti nchfield R, Cassuto N, Winters KC, Lassiter W. Prevalence of gambling among Minnesota public school students in 1992 and 1995. J Gambl Stud 1997;13(1):25-48.
43. Peacock P, Day A, Peacock TD. Adolescent gambling on a Great Lakes Indian reservation. J Hum Behav Soc Environ 1999;2:5-17.
44. Zitzo w D. Comparative study of problematic gambling behaviors between American Indian and non-Indian adolescents within and near a Northern Plains reservation. Am Indian Alsk Native Ment Health Res 1996;7(2):14-26.
45. National Gambling Impact Study Commission. Final report. Washington, DC: National Gambling Impact Study Commission, 1999.
46. Arizona Criminal Justice Commission. 2008 Arizona Youth Survey: Shining light on Arizona youth. Phoenix, AZ: Arizona Criminal Justice Commission, 2008.
47. Esters I, Biggar R, Lacour J, Reyes M. 2008 Louisiana study on problem gambling. Lafayette, LA: Cecil. J. Picard Center for Child Development, University of Louisiana at Lafayette, 2008.
48. Raino ne G, Gallati RJ. Gambling behaviors and problem gambling among adolescents in New York State: Initial findings from the 2006 OASAS school survey. New York, NY: NYS Office of Alcoholism and Substance Abuse Services, 2007.
49. Gerstein DR, Volberg RA, Harwood H, Christiansen EM, et al. Gambling impact and behavior study: Report to the National Gambling Impact Study Commission. Chicago, IL: National Opinion Research Center at the University of Chicago, 1999.
50. Welte JW, Barnes G, Wieczorek WF, Tidwell M-C, Parker J. Alcohol and gambling among U.S. adults: Prevalence, demographic patterns and comorbidity. J Stud Alcohol 2001;62(5):706-12.
51. Welte JW, Barnes GM, Tidwell M, Hoffman J. The association of form of gambling with problem gambling among American youth. Psychol Addict Behav 2009;23(1):105-12.
52. Adolesce nt Risk Communication Institute. Internet gambling stays low among youth ages 14 to 22 but access to gambling sites continues; sports gambling makes resurgence. Philadelphia, PA: Annenberg Public Policy Center, 2008.
53. Insi ght Canada Research. An exploration of the prevalence and pathological gambling behaviour among adolescents in Ontario. Report to the Canadian Foundation on Compulsive Gambling, 1994.
54. O mnifacts Research. An examination of the prevalence of gambling in Nova Scotia. Halifax: Nova Scotia Department of Health, 1993.
55. Wy nne Resources. Adolescent gambling and problem gambling in Alberta. Report to the Alberta Alcohol and Drug Abuse Commission, 1996.

56. Ladouce ur R, Mireault C. Gambling behaviors among high school students in the Quebec area. J Gambl Beh 1988;4(1):3-12.
57. Govoni R, Rupcich N, Frisch GR. Gambling behaviour of adolescent gamblers. J Gambl Stud 1996;12(3): 305-17.
58. Hua ng JH, Boyer R. Epidemiology of youth gambling problems in Canada: A national prevalence study. Can J Psychiatry 2007;52(10):657-65.
59. Gregg JD. Youth gambling in British Columbia. Master's thesis. Langley: Trinity Western Univ, 2003.
60. Alberta Alcohol and Drug Abuse Commission. The Alberta youth experience survey 2002. Edmonton: Alberta Alcohol and Drug Abuse Commission, 2003.
61. Al berta Alcohol and Drug Abuse Commission. Gambling among Alberta youth: The Alberta youth experience survey 2005. Edmonton: Alberta Alcohol and Drug Abuse Commission, 2007.
62. Dicki nson H, Schissel B. University of Saskatchewan survey—youth gambling in Saskatchewan: Perceptions, behaviours, and youth culture. Regina: Saskatchewan Ministry of Health, 2003.
63. Wiebe J. Manitoba youth gambling prevalence study: Summary of findings 1999. Winnipeg: Addictions Foundation of Manitoba, 1999.
64. Le maire J. Manitoba youth gambling behaviour: Follow-up to the 1999 AFM report. Winnipeg: Addictions Foundation of Manitoba, 2004.
65. Macka y TL, Patton D, Broszeit B. Student gambling report 2005. Winnipeg: Addictions Foundation of Manitoba, 2005.
66. Adla f EM, Ialomiteanu A. Prevalence of problem gambling in adolescents: Findings from the 1999 Ontario Student Drug Survey. Can J Psychiatry 2000;45(8):752-5.
67. Adla f EM, Paglia-Boak A, Beichman JH, Wolfe D. The mental health and well-being of Ontario students 1991-2005: Detailed OSDUS findings. Toronto: Centre for Addiction and Mental Health, 2006.
68. Martin I, Gupta R, Derevensky JL. Participation aux jeux de hasard et d'argent. In: Dubé G (ed). Enquête québécoise sur le tabac, l'alcool, la drogue et le jeu chez les élèves du secondaire, 2006. Montreal: Institut de la statistique du Québec, 2007:125-44.
69. Poulin C. Problem gambling among adolescent students in the Atlantic provinces of Canada. J Gambl Stud 2000;16(1):53-78.
70. Faktum Uuringukeskus. Elanike kokkupuuted hasart-ja õnnemängudega [Gambling prevalence in Estonia]. Tallinn, 2004.
71. Laa nsoo S. Patoloogiline hasartmängimine: ulatus Eestis ning seosed käitumuslike ja isiksuslike riskifaktoritega (Pathological gambling in Estonia and the relationships with behavioral and personal risk factors). Master's thesis. Talinn: Tallinna Ülikool Eesti, 2006.
72. Laa nsoo S, Niit T. South Oaks Mängurisõel (South Oaks Gambling Screen). Talinn: Tallinna Ülikool Eesti, 2004.
73. Laa nsoo S, Niit T. Estonia. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gaming in Europe: Challenges, Prevention, and Interventions. New York, NY: Springer, 2009.
74. Skokauskas N. Lithuania. In: Meyer G, Hayer T, Griffiths MD. eds. Problem

Gaming in Europe: Challenges, prevention, and interventions. New York, NY: Springer, 2009.
75. Skoka uskas N, Satkeviciute R. Adolescent pathological gambling in Kaunas, Lithuania. Nord Psykiatr Tidsskr 2007;61(2):86-91.
76. Skoka uskas N, Satkeviciute R, Burba B, Rutkauskiene I. Gambling among adolescents in Kaunas. Lithuanian Gen Pract 2005;5(9):11-5.
77. L upu V. Romania. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gaming in Europe: Challenges, Prevention, and Interventions. New York, NY: Springer, 2009.
78. L upu V, Onaca E, Lupu D. The prevalence of pathological gambling in Romanian teenagers. Minerva Med 2002;93:413-8.
79. L upu V, Boros S, Miu A, Iftene F, Geru A. Factori de risc pentru jocul patologic de noroc la adolescenţii români [Risk factors in pathological gambling in Romanian adolescents]. Revista SNPCAR 2001;4(4):33-8.
80. Zi vny H, Okruhlica L. Slovakia. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gaming in Europe: Challenges, Prevention, and Interventions. New York, NY: Springer, 2009.
81. Kotrc D. Uzívanie psychoaktívnych látok a patolokické hrácstvo na základnych a strednych skolách v obvode Kysucké Nové Mesto [Using drugs and gambling in elementary and high school in the Kysucké Nové Mesto region]. Alkoholizmus a drogové závislosti 2005;40:223-39.
82. Hurrel mann K, Schmidt L, Kähnert H. Konsum von Glücksspielen bei Kindern und Jugendlichen—Verbreitung und Prävention [Participation in gambling of children and adolescents—Prevalence and prevention]. Düsseldorf: Ministerium für Gesundheit, Soziales, Frauen und Familie des Landes Nordrhein-Westfalen, 2003.
83. Kinable H. Bevraging van Vlaamse leerlingen in het kader van een Drugbeleid Op School. Syntheserapport schooljaar 2005-2006. [Inquiry of Flemish students within the framework of a School Drug Policy. Summary report school year 2005-2006]. Brussels: VAD, 2006.
84. Capitan ucci D, Biganzoli A, Smaniotto R (eds). Reti d'azzardo [Gambling networks]. Varese: Edizioni And-In-Carta; 2006.
85. Baiocco R, Couyoumdjian A, Langellotti M, Del Miglio C. Gioco d'azzardo problematico, tratti di personalità e attaccamento in adolescenza. [Problematic gambling, personality traits and adolescence attachment]. Età Evolutiva 2005;1:56-65.
86. Arbina ga F. Conductas de juego con apuestas y uso de drogas en una muestra de adolescentes de la ciudad de Huelva [Game of chance behavior and drug consumption in a sample of adolescent of the city of Huelva]. Análisis y Modificación de Conducta 1996;22:577-601.
87. Becoña E. Pathological gambling in Spanish children and adolescents: An emerging problem. Psychol Rep 1997; 81:275-87.
88. Becoña E, Gestal C. El juego patológico en niños del 2° ciclo de E.G.B [Pathological gambling in children of primary school]. Psicothema 1996; 8:13-23.
89. Becoña E, Míguez MC, Vázquez FL. El juego problema en los niños de Galicia [Problem gambling in the children of Galicia]. Madrid: Sociedad

Española de Psicopatología Clínica, Legal y Forense, 2001.
90. Villa A, Becoña E, Vázquez FL. Juego patológico con máquinas tragaperras en una muestra de escolares de Gijón [Pathological gambling with slot machines in a sample of Gijon' scholars]. Adicciones 1997;9:195-208.
91. Viloria C. El juego patológico en los estudiantes universitarios de la Comunidad de Madrid [Pathological gambling in university students of the region of Madrid]. Clínica y Salud 2003;14:43-65.
92. Abbott MW, Volberg RA, Bellringer M, Reith G. A review of research on aspects of problem gambling. London: Responsibility in Gambling Trust, 2004.
93. G riffiths MD, Sutherland I. Adolescent gambling and drug use. J Community Appl Soc Psychol 1998;8:423-7.
94. Wood RTA, Griffiths MD. The acquisition, development and maintenance of lottery and scratchcard gambling in adolescence. J Adolesc 1998;21:265-73.
95. Grif fiths MD. Scratchcard gambling among adolescent males. J Gambl Stud 2000;16(1):79-91.
96. Fis her SE, Balding J. Under sixteen's find the Lottery a good gamble. Educ Health 1996;13(5):5-7.
97. Fis her SE. Gambling and problem gambling among young people in England and Wales. Plymouth: Centre for Research Into the Social Impact of Gambling, University of Plymouth, 1998.
98. A shworth J, Doyle N. Under 16s and the National Lottery 1999. London: BMRB Social Research, 2000.
99. A shworth J, Doyle N, Howat N. Under 16s and the National Lottery: Tracking survey July 2000. London: BMRB Social Research, 2000.
100. MORI. Under 16s and the National Lottery: Final report. London: National Lottery Commission, 2006.
101. Ipsos MORI. British survey of children, the National Lottery and gambling 2008-09: Report of a quantitative survey. London: National Lottery Commission, 2009.
102. Griffiths MD. Great Britain. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gaming in Europe: Challenges, Prevention, and Interventions. New York, NY: Springer, 2009.
103. Moodie C, Finnigan F. Prevalence and correlates of youth gambling in Scotland. Addict Res Theory 2006; 14:365-85.
104. Wood RTA, Griffiths MD. Adolescent lottery and scratchcard players: Do their attitudes influence their gambling behaviour? J Adolesc 2004;27:467-75.
105. Griffiths MD. Adolescent gambling. London: Routledge; 1995.
106. Yeoman T, Griffiths MD. Adolescent machine gambling and crime. J Adolesc 1996;19:183-8.
107. Ólason DT. Youth gambling in the Nordic countries. Sixth Nordic Conference on Gambling Studies and Policy Issues. Copenhagen, 2007.
108. Ólason DT. Gambling and problem gambling studies among Nordic adults: Are they comparable? Seventh Nordic Conference on Problem Gambling, Treatment and Prevention. Helsinki, 2009.
109. Nielsen C, Heideman J. Pengespil blandt unge: En rapport om 12-17 åriges spillevaner [Gambling among youth: A report on gambling habits among 12 -17 years old]. Copenhagen: SFI – Det Nationale Forskningscenter For Velfærd, 2008.

110. Sørensen NU, Nielsen JC, Wittendorff N. Unge og Gambling: 12-17 åriges pengespiladfærd i et risiko- og trivselperspektiv [Young and gambling: 12 to 17 years old gambling habits within a risk perspective]. Copenhagen: Aarhus University, Center for Ungdomsforskning, 2008.
111. Jaakkola T. Finland. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gambling in Europe: Challenges, Prevention, and Intervention. New York, NY: Springer, 2009.
112. Ilkas H, Aho P. Nuorten Rahapelaaminen. 12–17 vuotiaiden nuorten rahapelaaminen ja peliongelmat—puhelinhaastattelu [Youth gambling. Youth of 12–17 years gambling and gambling problems—telephone survey]. Helsinki: Taloustutkimus Ltd., 2006.
113. Ólason DT, Sigurdardottir KJ, Smari J. Prevalence estimates of gambling participation and problem gambling among 16-18-year old students in Iceland: A comparison of the SOGS-RA and DSM-IV-MR-J. J Gambl Stud 2006;22(1):23-39.
114. Ólason DT, Skarphedinsson GA, Jonsdottir JE, Mikaelsson M, Gretarsson SJ. Prevalence estimates of gambling and problem gambling among 13- to 15-year-old adolescents in Reykjavík: An examination of correlates of problem gambling and different accessibility to electronic gambling machines in Iceland. J Gambl Issues. 2006;18:39-56.
115. Baldursdottir K, Ólason DT, Gretarsson SJ, Davidsdottir ÁR, Sigurjonsdottir AM. Peningaspil og algengi spilavanda meðal 16 til 18 ára framhaldsskólanemenda: Mat á áhættuþáttum [Gambling and problem gambling prevalence among 16 to 18 year old adolescent in comprehensive schools: Evaluation on risk factors]. Sálfræðiritið [Icelandic J Psychol] 2008;13:27-46.
116. Kristjansdottir E. Þátttaka í peningaspilum, spilavandi og tengsl við áhættuþætti hjá 13-18 ára nemendum í Hafnarfirði [Gambling participation, problem gambling and association with risk factors among 13-18 year old students in Hafnarfjörður]. Dissertation. Reykjavik: University of Iceland, 2008.
117. Götestam KG, Johansson A. Norway. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gambling in Europe: Challenges, Prevention, and Intervention. New York, NY: Springer, 2009.
118. Johansson A, Götestam KG. Gambling and problematic gambling with money among Norwegian youth (12-18 years). Nord Psykiatr Tidsskr 2003;57:317-21.
119. Rossow I, Hansen M. Underholdning med bismak: Ungdom og pengespill [Entertainment with a smack: Youth and gambling]. Oslo: NOVA—Norwegian Social Research, 2003.
120. Rossow I, Molde H. Chasing the criteria: Comparing SOGS-RA and the Lie/Bet screen to assess prevalence of problem gambling and 'at-risk' gambling among adolescents. J Gambl Issues 2006;18:57-71.
121. Johnson EE, Hamer R, Nora RM, Tan B, Eisenstein N, Engelhart C. The lie/bet questionnaire for screening pathological gamblers. Psychol Rep 1997;80:83-8.
122. Rönnberg S, Volberg RA, Abbott MW, et al. Gambling and problem gambling in Sweden. Stockholm: National Institute of Public Health, 1999.
123. Volberg RA, Abbott MW, Rönnberg

S, Munck IM. Prevalence and risks of pathological gambling in Sweden. Acta Psychiatr Scand 2001;104(4): 250-6.
124. Abbott MW, Volberg RA. The New Zealand National Survey of problem and pathological gambling. J Gambl Stud 1996;12(2):143-60.
125. Jonsson J, Rönnberg S. Sweden. In: Meyer G, Hayer T, Griffiths MD (eds). Problem Gambling in Europe: Challenges, Prevention, and Intervention. New York, NY: Springer, 2009.
126. Slutske WS, Jackson KM, Sher KJ. The natural history of problem gambling from age 18 to 29. J Abnorm Psychol 2003;112(2):263-74.
127. Winters KC, Stinchfield RD, Botzet A, Slutske WS. Pathways of youth gambling problem severity. Psychol Addict Behav 2005;19(1):104-7.
128. Abbott MW, Volberg RA. Frequent and problem gambling in New Zealand. Wellington: Department of Internal Affairs, 1992.
129. Dickerson M, Maddern R. The extent and impact of gambling in Tasmania with particular reference to problem gambling: A follow up to the baseline study conducted in 1994. Sydney: Australian Institute for Gambling Research, 1997.
130. McMillen J, Marshall D, Ahmed E, Wenzel M. 2003 Victorian longitudinal community attitudes survey. Melbourne: Gambling Research Panel, 2003.
131. Productivity Commission. Australia's Gambling Industries. Canberra: Aus Info, 1999.
132. Queensland Treasury. Queensland household gambling survey 2001. Brisbane: Queensland Government, 2001.
133. Queensland Treasury. Queensland household gambling survey 2003-04. Brisbane: Queensland Government, 2005.
134. Roy Morgan Research. The third study into the extent and impact of gambling in Tasmania with particular reference to problem gambling. Hobart: Department of Health and Human Services, 2001.
135. South Australia Department for Families and Communities. Gambling prevalence in South Australia. Adelaide: Government of South Australia, 2007.
136. Moore S, Ohtsuka K. Gambling activities of young Australians: Developing a model of behavior. J Gambl Stud 1997;13:201-36.
137. Moore S, Ohtsuka K. Beliefs about control over gambling among young people, and their relation to problem gambling. Psychol Addict Behav 1999;13:339-47.
138. Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. Am J Psychiatry 1987;144:1184-8.
139. Moore S, Ohtsuka K. Youth gambling in Melbourne's West: Changes between 1996 and 1998 for Anglo-European background and Asian background school-based youth. Int Gambl Stud 2001;1:87-102.
140. Jackson AC, Dowling N, Thomas SA, Bond L, Patton G. Adolescent gambling behaviour and attitudes: A prevalence study and correlates in an Australian population. Int J Ment Health Addict 2008;6(3):325-52.
141. Delfabbro PH, Lahn J, Grabosky P. Further evidence concerning the prevalence of adolescent gambling and problem gambling in Australia: A

study of the ACT. Int Gambl Stud 2005;5:209-28.
142. Delfabbro PH, Thrupp L. Youth gambling in South Australia: The role of attitudes and economic socialization. J Adolesc 2003;26:313-30.
143. Lambos C, Delfabbro PH, Pulgies S, DECS. Adolescent gambling in South Australia. Adelaide: Independent Gambling Authority of South Australia, 2007.
144. Rossen F. Adolescent gambling in New Zealand: an examination of protective and risk factors. Dissertation. Auckland: University of Auckland, 2008.
145. Sullivan S. Gambling amongst New Zealand high school students. In: Blaszcynski A (ed). Proceedings of the 11th annual conference of the National Association for Gambling Studies. Sydney: National Assoc. for Gambling Studies, 2001:345-9.
146. Delfabbro PH, Lahn J, Grabosky P. Psychosocial correlates of problem gambling among adolescents. Aust NZ J Psychiatry. 2006;40:587-95.
147. Delfabbro PH, Winefield AH, Anderson S. Once a gambler- always a gambler: Longitudinal analysis of adolescent gambling patterns. Int Gambl Stud 2009;9:151-63.
148. Williams RJ, Volberg RA. Impact of survey description, administration format, and exclusionary criteria on population prevalence rates of problem gambling. Int Gambl Stud 2009;9:101-17.
149. Derevensky JL, Gupta R. Measuring gambling problems among adolescents: Current status and future directions. Int Gambl Stud 2006;6: 201-15.
150. Derevensky JL, Gupta R, Winters KC. Prevalence rates of youth gambling problems: Are the current rates inflated? J Gambl Stud 2003; 19:405-25.
151. Jacques C, Ladouceur R. DSM-IV-J Criteria: A scoring error that may be modifying the estimates of pathological gambling among youths. J Gambl Stud 2003;19:427-31.
152. Ladouceur R, Bouchard C, Rhéaume N, et al. Is the SOGS an accurate measure of pathological gambling among children, adolescents and adults? J Gambl Stud 2000;16(1):1-24.
153. Langhinrichsen-Rohling J, Rohling ML, Rohde P, Seeley JR. The SOGS-RA vs. the MAGS-7: Prevalence estimates and classification congruence. J Gambl Stud 2004;20:259-81.
154. Pelletier A, Ladouceur R, Fortin J, Ferland F. Assessment of high school students' understanding of DSM-IV-MR-J items. J Adolesc Res 2004;19: 224-32.
155. Poulin C. An assessment of the validity and reliability of the SOGS-RA. J Gambl Stud 2002;18:67-93.
156. Volberg RA. Gambling and problem gambling among adolescents in Nevada. Carson City, NV: Department of Human Resources, 2002.
157. Derevensky JL, Gupta R. Internet gambling amongst adolescents: A growing concern. Int J Ment Health Addict 2007;5(2):93-101.
158. Griffiths MD, Wood RTA. Adolescent Internet gambling: Preliminary results of a national survey. Educ Health 2007; 25:23-7.
159. Wood RT, Williams RJ. Internet gambling: Past, present, and future. In: Smith G, Hodgins DC, Williams RJ (eds). Research and Measurement Issues in Gambling Studies. London: Elsevier, 2007:491-514.

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):39-58

Risk and protective factors associated with youth problem gambling

N Will Shead, PhD, Jeffrey L Derevensky, PhD and Rina Gupta, PhD

International Centre for Youth Gambling Problems, McGill University, Montreal, Quebec, Canada

Abstract: Risk factors for youth gambling problems are best understood within an ecological model recognizing the interwoven relationship that exists between the individual and their environment. Empirical studies covering individual, relationship, community, and societal factors associated with adolescent gambling problems are reviewed. The cumulative body of research suggests that males who are exposed to gambling at an earlier age are at greater risk of developing gambling problems. Individuals who report poor family cohesion, have family members or friends who also gamble, and those exposed to and engaged in a wider variety of gambling options are at greater risk. Adolescents with impulsive, high sensation-seeking personalities and exhibit emotion-focused coping styles are more likely to experience gambling problems. Anxiety, depression, ADHD, poor academic performance, substance use, and delinquency are also strong predictors. Many of these risk factors appear to predict a general behavior syndrome encompassed by overall mental health problems, substance abuse, delinquency, and problem gambling. Increased exposure to gambling opportunities and marketing of gambling is recognized as a potential risk factor at a community level while gambling-permissive cultures may instill positive attitudes and beliefs toward gambling. A call is made for more research that can identify the causal risk factors that lead to gambling problems among youth which will ultimately improve our prevention efforts.

Keywords: Youth, adolescents, gambling problems, risk factors

Correspondence: N Will Shead, PhD, Post-doctoral Fellow, International Centre for Youth Gambling Problems, 3724 McTavish Street, Montreal, Quebec, Canada H3A 1Y2. Tel:514-398-4374 ; Fax: 514-398-3401 ; E-mail: nathaniel.shead@mcgill.ca

Submitted: July 15, 2009. ***Revised:*** September 05, 2009. ***Accepted:*** September 18, 2009.

INTRODUCTION

The field of gambling research has grown enormously over the past two decades but there remains a paucity of research on risk factors associated with problem gamblers (1). While there is a growing body of literature, there remains a lack of consensus regarding the risk factors and their relative weight in contributing to problem gambling among youth. Studying the risk factors among youth is particularly important given that severe gambling problems often originate in childhood and adolescence (2). A better understanding of the factors contributing to the acquisition and the development of disordered gambling behavior among youth will ultimately help clarify the etiology of gambling problems in the general population.

Some strides have been made to foster a better understanding of the onset and developmental course of gambling problems

that form the basis of this review. This growing body of research focuses upon identification of the biopsychosocial mechanisms underlying excessive gambling behavior among youth. As risk factors that contribute to gambling problems are better elucidated, the information can be used to improve assessment, treatment, and prevention programs. With more knowledge about which youth are at the highest risk of becoming problem gamblers, these programs will be able to better target specific types of youth with the goals of stopping or minimizing gambling problems before they occur and improving the effectiveness of treatment for those who suffer from gambling problems.

Examination of the factors associated with youth gambling problems provides a more complete description of the nature of these problems, their onset, and how they are maintained. Knowledge about these risk factors is also critical for identifying the potential warning signs of gambling problems. This information can be used to develop prevention initiatives geared toward youth with gambling problems. For example, public service announcements aimed at youth gambling prevention can incorporate aspects that appeal to youth who are at greatest risk of becoming heavily involved in gambling activities. Such an approach has been taken by developers of anti-drug media campaigns in designing public service announcements with high sensation value to appeal to high sensation-seeking youth who are at greater risk for substance use problems (3).

As risk factors become better understood, a complementary understanding of resiliency can be achieved. Risk factors tend to represent extremes on certain biopsychosocial dimensions such that opposing ends of the same dimensions may represent important protective factors. For instance, if lack of family cohesion is associated with gambling problems, greater family connectedness should lower the risk of developing a gambling problem. Thus, risk factors can help to extrapolate significant protective factors that offset their impact and increase resiliency.

In addition, raising public awareness of the factors that contribute to the development and maintenance of problem gambling among youth will ultimately bolster the advancement of services for young problem gamblers (4). The more society at large understands about disordered gambling, the more likely it will be viewed as an important public health concern. Parents, teachers, health professionals, policy makers, and the public in general need to stay informed about risk factors in order to help youth avoid and overcome gambling problems.

This review outlines existing research on risk factors associated with child and adolescent problem gambling. Empirical studies covering several categories of risk factors are examined. These categories of risk factors are presented using an ecological model to recognize the multiple interacting contexts in which gambling problems occur. The ecological model addresses individual risk factors as well as overlapping inter-personal, community, and societal systems that create the conditions for youth to develop gambling problems (5). At an individual level, personal attributes that increase the likelihood of gambling problems are examined. Interpersonal level influences address the potential of close others to shape an individual's gambling behavior including risk factors related to relationships with family and friends. Community level factors encompass the influences of the greater environment in which the individual lives and interacts with others. When considering youth

gambling behavior, the availability and marketing of gambling within a community are the most relevant community level factors. Finally, at the societal level, the influence of broad, macro-level factors are examined. These risk factors address the cultural beliefs, societal norms, and world-wide trends that can potentially lead to gambling problems among children and adolescents. The ecological model provides an appropriate framework for understanding the multitude of risk factors that contribute to youth gambling problems and the complex interactions that exist between factors nested within different ecological systems.

DEMOGRAPHIC FACTORS

Adolescent problem gamblers are more likely to have reported gambling for the first time at a younger age (approximately 10 years of age) compared with their peers who report gambling but experience few gambling-related problems (6-8). Similarly, adults with gambling problems report having been introduced to gambling earlier in their childhood compared with adults who do not experience problems (9). Together, these findings suggest that youth who are exposed to their first gambling experience at an earlier age are at increased risk of developing problems which makes intuitive sense given that children who initiate gambling when they are 10 years of age will likely have more opportunity to become involved in further gambling activities compared with children who do not initiate gambling until they are in later adolescence. In addition, older children without gambling experience have more opportunity to develop more mature, realistic perspectives about gambling before initiating gambling compared with younger children. Delaying the onset of gambling exposure as long as possible appears to be an important protective factor, especially given the fact that, among adolescents, the transition between social gambler and problem gamblers is more rapid compared with adults (10).

GENDER

The cumulative body of gambling research clearly shows that gambling is more popular amongst males than females and males are more likely to experience problem or pathological gambling behaviors (11,12). This gender difference has been found in adolescents as well (8,13-15). More frequent gambling among boys compared with girls has also been shown in a sample of primary school children (16). In a recent study of middle and high school students, males were found to be almost six times more likely than females to be identified as having a gambling problem and twice as likely to be classified as at-risk gamblers, endorsing a number of criteria for gambling problems but not meeting the clinical cut-off for pathological gamblers (17).

A study by Gupta and Derevensky (7), testing Jacobs' General Theory of Addictions (18), which proposed that disordered gambling is a habitual coping response to abnormal physiological resting states, revealed that male and female adolescents may be differentially predisposed to gambling problems. Among males, high excitability and total dissociation while gambling predicted categorization as problem or pathological gamblers, whereas among females, depressed mood, dissociation, and stimulant drug use were strong predictors. These findings suggest that among adolescents who gamble to relieve chronic stress conditions, males and females generally differ in terms of how they experience and manifest abnormal resting states.

RACIAL AND ETHNIC GROUPS

There is mounting evidence that adult members of racial/ethnic minority groups and lower socioeconomic classes are at a significantly greater risk of developing gambling problems (19), a finding that has been replicated in adolescent studies (20,21). In a sample of United States (U.S.) adults, gambling problems were significantly more common among minority groups, with Blacks, Hispanics, Asians, and Native Americans being 3 to 5 times more likely to experience at least some gambling problems compared with Whites when holding gender, age, and socioeconomic status (SES) constant (19). However, a study of adolescents showed contradictory results (13). After controlling for socioeconomic status, Black youth actually reported gambling less frequently than White youth. A study of youth in Montreal, Canada (22) revealed that a group comprised of Allophone adolescents (neither French nor English being the primary language) had the highest proportion of youth who reported weekly gambling and experienced self-reported gambling problems, followed by Anglophones and Francophones. Overall, the paucity of research and the lack of consensus regarding the potential influence of minority status on youth gambling, racial/ethnic group cannot necessarily be considered a strong, overriding risk factor for youth gambling problems. Further research is necessary to determine the impact on youth of racial/ethnic group, socioeconomic status, and their interaction.

PERSONALITY

Research has pointed toward the presence of dispositional attributes of problem gamblers (23-25). The suggestion is that certain personality characteristics, most of which emerge at a young age and are fairly stable over the lifespan, likely contribute to problem gambling. Examining personality traits associated with problem gambling among youth is particularly useful in terms of determining the direction of the relationship between gambling problems and personality traits. As gambling behavior is relatively new among youth, it is unlikely to have significantly impacted their personalities. Thus, if certain personality traits are found to be over-represented in youth with gambling problems, they are likely to be underlying traits that lead to gambling problems rather than having been caused by a pattern of excessive gambling.

Whereas most studies on personality risk factors have focused on specific personality variables, a recent study examined a multitude of personality factors to identify those most highly associated with gambling problems in youth (26). High school students in the Montreal region with moderate to severe gambling-related problems obtained scores that deviated significantly from the normative means on four personality traits—excitability, conformity, self-discipline, and cheerfulness. These findings suggest that adolescents with gambling problems exhibit less self-regulatory behavior (i.e., impulsivity, distractibility, over-activity, self-indulgence, difficulty conforming to group norms) while exuding the impression of being carefree, sociable, and happy. The adolescents with the most severe gambling problems reported the highest levels of frustration, impulsivity, anxiety, impatience, and irritability. In addition, adolescents with gambling problems obtained higher scores on the Disinhibition and Boredom Susceptibility subscales of the Sensation Seeking Scale, indicating that they have higher risk-taking tendencies.

IMPULSIVITY

It has been proposed that gambling among youth is the product of an impulsive personality type (27-30). Impulsivity can be described as behavior carried out in a spontaneous or unintentional manner without thought or self-control. This definition describes many of the features of disordered gambling; accordingly, pathological gambling is currently classified as a disorder of impulse control in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition-Text Revision (DSM-IV-TR) (31). Indeed, research has consistently shown that adults with gambling problems exhibit higher scores on both self-report and behavioral measures of impulsivity (23,25).

Studies have shown that the relationship between impulsivity and problem gambling has direct implications for youth as well (29,30,32,33). A study of 754 adolescent boys from low socioeconomic environments investigated the relationship between impulsivity and problem gambling severity (27). Self-report and teacher ratings of impulsivity when the boys were 13 years old were compared with problem gambling status in later adolescence at the age of 17 years. Non-gamblers had the lowest impulsivity scores followed by recreational gamblers, low problem gamblers, and high problem gamblers.

Vitaro and his colleagues reported findings in two papers based on a sample of young low SES boys who were assessed on various personality variables when they were 12 to 14 years old and again at age 17. Disinhibition and response modulation deficits in early adolescence predicted gambling problems at a later age (28). In addition, problem gamblers with substance use problems were more likely to have high self-reports of impulsivity and exhibit impulsivity-related behaviors at a younger age compared with those with only gambling problems (30). Together, the findings of these prospective studies emphasize the significance of impulsivity as a personality trait among youth that is highly predictive of gambling problems at a later age. It also raises the possibility that impulsivity may be an important focal point of treatment for youth with gambling problems. For example, treatment for adolescents might aim to help them develop skills for delaying immediate gratification and placing more weight on the long-term consequences of their behavior.

RISK BEHAVIOR

Risk-taking is an intrinsic element of gambling. Problem gamblers tend to take more risks in general and on gambling tasks in particular (23). Both gambling and problem gambling have been shown to be associated with high sensation-seeking behavior (23) as indicated by a high degree of seeking out novel, exciting experiences with an element of risk. A study of middle- and high school students found that risk propensity was a particularly strong predictor of being at-risk or having a gambling problem, even after controlling for other predictors (17). Youth who perceive their involvement in risky activities as highly positive while not appreciating the costs and negative consequences of such activities are at greater risk of developing gambling problems. Accordingly, adolescents who exhibit "devil-may-care" attitudes should be viewed as a high-risk group and youth gambling prevention efforts will likely benefit from targeting this audience.

COPING STYLES

The way in which people deal with life circumstances is a function of both personality and experience. Some individuals use

gambling as a form of maladaptive coping in response to problems in their lives (34). Problem gamblers commonly report 'gambling to escape', achieved through mood modification as a means of coping with stressful life events and negative mood states. Accordingly, problem gamblers are hypothesized to face more life challenges and use less-effective coping styles that employ avoidance or mood modification tactics rather than dealing with the cause of the problem. Indeed, adolescents with gambling problems report more stress, daily hassles, and major traumatic life events (35) and have poor general coping skills (10,17,32).

A pattern of more stressful life events and ineffective coping among adolescent problem gamblers was also demonstrated in a study that examined stress, coping, and gambling severity in a sample of 11- to 20-year-olds (36). Adolescents with gambling problems reported more negative life events and major life events compared with social and non-gamblers. In addition, adolescents with gambling problems used less task-focused coping and more avoidance-focused coping. Males with gambling problems reported using more emotion-focused coping strategies but there were no differences among females in terms of emotion-focused coping. A study of gambling and childhood maltreatment showed that, among adolescents and young adults, reports of maltreatment increased as gambling severity increased (35). At-risk and pathological gamblers reported childhood maltreatment of all types (physical, and verbal abuse and neglect) and that the effects of their maltreatment had negatively impacted their daily behavior suggesting that they may be gambling as a means to cope with psychological problems and "escape" from past experiences. In sum, youth who experience more stressful life events with a tendency to use ineffective coping strategies, particularly emotion-focused strategies among males, are at greater risk of turning to gambling as a maladaptive outlet to deal with their problems.

The existing body of research on personality variables and youth gambling problems suggests that there are qualitative differences in personality traits across adolescents with varying severity of gambling behavior. Adolescents who generally exhibit less self-regulatory behavior, higher risk-taking tendencies, and ineffective coping styles are more susceptible than others to developing gambling problems.

MENTAL HEALTH FACTORS

As described, some individuals engage in gambling in order to modify undesirable mood states (32,34). For these individuals, gambling becomes a form of negative reinforcement by alleviating unwanted emotions such as anxiety and depression. Consistent with the Pathways Model of problem gambling (37) and Jacobs' General Theory of Addictions (18) that some problem gamblers engage in the activity to cope with abnormal physiological resting states, adolescents with severe gambling problems experience higher levels of state and trait anxiety (7,8,35,38). For these adolescents, the experience of anxiety may be diminished as gambling provides an "escape" allowing individuals to disengage from stressful life events or problems. This hypothesis is supported by findings that adolescent problem gamblers score higher on measures of dissociation and are more likely to report gambling in order to achieve feelings of dissociation (10).

In addition to increased anxiety levels, adolescent problem gamblers report lower self esteem and greater depressive sympto-

matology compared with non-gambling and social gambling adolescents (7,8,10, 26,35,39). Likewise, older adolescents with serious gambling problems are at a heightened risk for suicide ideation and suicide attempts (7). For these youth, gambling may provide emotional relief from symptoms of depression by inducing positive feelings of well-being. Indeed, youth with gambling problems report that they gamble for excitement, to escape problems, and alleviate depression (7,35,38). Another adolescent study showed that probable pathological gamblers and at-risk gamblers more heavily anticipated pleasure and excitement from gambling and expected to feel good about themselves as a result of gambling compared with social and non-gamblers (40).

ADHD

There has been a great deal of research interest in the possible association between Attention Deficit Hyperactivity Disorder (ADHD) and pathological gambling. Given that ADHD is normally diagnosed during childhood, the potential link between these two psychiatric conditions is particularly important for understanding risk factors for problem gambling among youth. Notably, existing knowledge about the progression of ADHD can provide a developmental framework for understanding risk factors for gambling problems among youth.

Studies have reported a relationship between gambling problems and ADHD (41,42), and more recently, a study by Hardoon, Gupta, and Dervensky (43) has shown that there are similar traits that underlie ADHD and gambling problems. Adolescent problem gamblers in high school were found to be similar to those adolescents with ADHD on several dimensions (26). Youth with gambling problems tended to score high on the Excitability factor of the High School Personality Questionnaire, comprised of items that query the extent to which respondents are easily distracted, frustrated, annoyed, overactive, and impulsive. These characteristics match up to the criteria for ADHD, as outlined in the DSM-IV-TR (31).

A prospective study examined a sample of children diagnosed with ADHD at two points in time—initially between the ages of 7 and 11 and later between the ages of 18 and 24 (33). At the follow-up assessment, participants were identified as either still meeting the criteria for a diagnosis of ADHD or no longer meeting the criteria. No differences were found between the participants with persistent ADHD, non-persistent ADHD, and a group of controls in terms of gambling participation or frequency. However, those with persistent ADHD were significantly more likely to be classified as pathological gamblers when compared with those with non-persistent ADHD or no ADHD. The findings suggest that symptoms of ADHD that persist into young adulthood are particularly significant risk factors for gambling problems among youth.

ACADEMIC ACHIEVEMENT

Among adults, a negative consequence commonly associated with gambling problems is poor performance at work. Apart from absences and lateness due to gambling, the quality of work can suffer as individuals become preoccupied with gambling, thinking about their next gambling activities and experiencing negative emotional consequences in response to losses. Similarly, children and adolescents are subject to poor school performance as a result of excessive gambling. Dickson et al (17) found in a sample of adolescents that the report of school problems predicted at-risk and

probable pathological gambling with a large proportion of probable pathological gamblers (43.5%) experiencing significant school problems. Likewise, the proportion of students with below average self-perceived grades increased linearly as gambling severity increased with almost one quarter of probable pathological gamblers perceiving that they performed worse than other students at school compared with only 6.5% of non-gamblers. Meanwhile, feeling welcome and integrated into the school environment was a protective factor such that lower school-connectedness was associated with adolescent problem gambling. A link between gambling problems and poor school performance has been demonstrated in several studies (8,15,43).

Given that the above findings are correlational in nature, it is not possible to determine whether school problems arise as a result of gambling problems or if problems in school tend to lead to gambling problems. It has been shown that a high proportion of youth with gambling problems report having a learning disability (43) suggesting that innate academic difficulties may precede gambling problems. However, the relationship is most likely reciprocal with excessive gambling activity leading to poorer performance in school which, in turn, contributes to increased gambling involvement. The extent to which one causes the other cannot be determined without prospective data that examines the sequential nature of these problems.

SUBSTANCE ABUSE

Problem gambling is often conceptualized as a non-pharmacological "addiction" because, although one does not ingest a substance with chemically addictive properties when gambling, it shares several defining features with substance use disorders. For example, in the DSM-IV-TR (31), substance dependence and pathological gambling are both characterized by preoccupation, a need to increase the behavior to achieve the desired effect, symptoms of withdrawal, loss of important social, occupational, or recreational activities, and continuation despite knowledge of its negative consequences. Among adults, there is a high co-occurrence between substance use disorders and gambling disorders (44), which is not surprising given the striking similarities in their defining features, suggesting that common variables contribute to the development of both disorders.

Research on adolescents mirrors the finding of a significant association between substance abuse and gambling problems in adults. A number of studies have shown that adolescent problem gamblers are at increased risk for the development of multiple addictions (7,10,15,19). In a sample of Minnesota youth, those with greater gambling involvement were more likely to be regular drug users (15). Similarly, among New York State adolescents, heavy drinking males were significantly more likely than non-drinkers or moderate drinkers to gamble at least weekly (13). As well, studies assessing alcohol, tobacco, illicit drug, and marijuana use among Minnesota youth showed them to be reliable predictors of gambling frequency (14,45) as did a study of Washington State youth demonstrating a positive association between tobacco, alcohol, and drug use and both gambling frequency and gambling problems (46). Clearly, data on adolescent substance use and gambling indicate that these behaviors tend to co-occur in youth suggesting that substance use should be viewed as a warning sign for comorbid gambling problems and vice versa.

DELINQUENCY

Despite prohibitions against youth gambling, prevalence data indicate that the majority of youth have gambled (8,10,14, 15), suggesting that many youth view gambling as a normative activity. Notwithstanding the high rates of gambling participation among youth, government restrictions tend to categorize underage gambling along with underage drinking, deeming them both adult activities that pose a significant risk to youth. Disordered gambling among youth is delinquent behavior, not only in the sense that it normally involves repeated violation of the law, but also because many of the associated problems relate to other delinquent activity to fulfill gambling intentions. In fact, when one overlaps the typical personality features of problem gambling over norms for delinquent behaviors on the High School Personality Questionnaire, the profiles look remarkably similar (26).

One of the DSM-IV-TR criteria for pathological gambling is the commission of illegal acts to finance gambling including forgery, fraud, theft, or embezzlement (31). Adolescent research has likewise demonstrated a strong association between delinquency and gambling problems (8,10, 15). For some youth, gambling may be an outgrowth of a more general behavior problem syndrome. Youth who have difficulty following rules and behaving in socially acceptable ways are more likely to engage in delinquent activities that include gambling (13). Antisocial tendencies among youth are characteristic of conduct disorder representing a persistent pattern of behaviors that violate age-appropriate social norms (31). A recent study showed a strong co-morbidity between conduct disorder and gambling problems, particularly among younger respondents in a sample of 14- to 21-year-olds (47). Further evidence of a relationship between youth gambling and antisocial behavior was found in an analysis of Minnesota public school students which revealed that antisocial behavior—including vandalism, physical fights, stealing, and getting thrills from dangerous activities—was the strongest predictor of gambling frequency (14). Stinchfield and his colleagues posited that frequent gambling may be a part of a collection of deviant behaviors including violence, vandalism, shoplifting, and substance use. This type of young gambler fits with Blaszczynski and Nower's (37) "anti-social impulsivist" pathway of problem gambling. Youth who are prone to "acting-out" behaviors, violence, deceitfulness, and consistent violation of rules may be at risk for gambling problems.

RELATIONSHIPS

Children and adolescents spend a large portion of their lives with their immediate family with behaviors being modeled by family members having a strong impact on the future behavior of young people. Consequently, gambling by family members contributes to the gambling behavior of youth. For example, most youths become exposed to gambling by their parents (43). Gupta and Derevensky (6) administered questionnaires to children between the ages of 9 and 14 to assess their gambling activities, including where and with whom the gambling occurs. A large majority (86%) of those who gambled regularly reported gambling with family members. Other studies have also reported that youth with greater gambling involve-ment are more likely to have parents or family members that gamble (8,15,21).

In another study, a sample of adolescents from middle and high school were examined to test the extent to which various protective factors increased resilience to adolescent problem gambling (17). Problem

gamblers were less likely to report feeling connected to their families compared to at-risk gamblers, social gamblers, and non-gamblers. Self-reported ratings of family cohesion decreased from non-gamblers across each level of gambling severity group. Family cohesion remained a significant predictor when tested along with other protective factors in their ability to predict participant classification as either non-problem gamblers (i.e., non-gamblers and social gamblers) or problem gamblers (i.e., at-risk and probable pathological gamblers). These results support previous findings in which youth with gambling problems were more likely to report having poor family connectedness, family dysfunction, low perceived social support, and low parental supervision (8,43,29).

In the same study (17), several family-related risk factors were also examined. Probable pathological adolescent gamblers were more likely to report having family members with gambling problems compared with other adolescents, and the proportions generally decreased as severity of problems diminished. When tested with other risk factors to predict problem gambling status, only having a sibling with a gambling problem remained a significant predictor. Other family factors related to stressful life events were examined for their ability to differentiate between gambling severity groups but were not tested in the overall prediction models. The death of a friend or close family member and the arrest of a family member differed across groups with probable pathological gamblers having generally higher rates. Parental divorce and/or remarriage of parents, moving to a new town/city, loss of a parent's job, and a close family member having a serious illness did not differentiate between gambling severity groups.

Poor caregiving can also contribute to future gambling of youth. In a study of childhood maltreatment and youth gambling, pathological gamblers reported significantly higher emotional and physical neglect as children compared with at-risk, social, and non-gamblers (35). Living in a non-nurturing family environment appears to be an additional risk factor for gambling problems among youth.

PEERS

Friends play an important role in shaping the risky activities of young people. Before adolescents are allowed to participate in regulated forms of gambling (e.g., casinos, lotteries, machine gambling), they often begin gambling amongst friends. When gambling becomes a regular activity among friends, it may become viewed as a normative activity that is both desirable and safe. Indeed, one study found that only 10% of students aged 13 to 14 years feared being caught for gambling by parents suggesting that gambling is generally regarded as a socially acceptable activity among adolescents (6). As such, having friends who gamble makes gambling less likely to be perceived as a high-risk activity and adolescents may exhibit less caution when considering their involvement in future gambling behavior. In the same study (6), 75% of 9- to 14-year olds who regularly gambled reported that they gambled with their friends and the tendency to gamble more at a friend's home and at school increased with age. Not only does having friends who gamble increase the likelihood of gambling involvement, clinical testimony suggests that adolescents who develop gambling problems tend to lose their non-gambling friends as they spend more time with gambling associates (48). This pattern has the potential to be particularly harmful

given the protective factor of high-quality friendships is replaced with a friendship milieu in which gambling is both socially acceptable and the predominant extra-curricular activity.

Having a friend with a gambling problem has also been found to differentiate youth based upon their gambling severity groups in that over 40% of probable pathological gamblers and over one third of at-risk gamblers had a friend with a gambling problem compared with only 10% of social gamblers and 6% of non-gamblers (17). In addition, it was a significant predictor of problem gambler status over and above all other risk and protective factors. Also of note was the finding that having friends with substance use problems increased with increasing problem gambling severity, suggesting that having friends who engage in any addictive behavior, and not just gambling, poses a significant risk factor. Similarly, having friends who engage in delinquent behaviors is predictive of gambling problems among youth (13,29).

The general quality of peer relationships also appears to predict problem gambling severity among youth. A study of Australian adolescents revealed that problem gamblers have poorer relationships with non-friend peers in their class, despite reporting having as many close friends as non-problem gamblers (39). Problem gamblers indicated that they dislike twice as many classmates as non-problem gamblers and also reported that significantly more classmates dislike them. Among various measures of psychological well being, social alienation was the strongest predictor of gambling severity with adolescent problem gamblers being significantly more disillusioned with society. Regardless of the quality of close friendships, it appears that poor relationships with peers, in general, is a risk factor for youth problem gambling.

COMMUNITY

At a community level, the most obvious risk factor for problem gambling is the presence of gambling opportunities that are accessible to community members. Research is currently inconclusive regarding the impact of gambling availability on the prevalence of gambling problems. While conventional wisdom predicts that more gambling opportunities within communities lead to higher incidences of gambling problems, findings are mixed in this regard and it has been suggested that the relationship between exposure to gambling and the prevalence of gambling-related problems is non-linear, varying across people, place, and time (49). Accordingly, it is difficult to determine whether youth who are exposed to more gambling opportunities in their communities are at greater risk of developing problems. However, among young people who gamble, there is evidence suggesting that specific types of gambling activities pose a greater risk than others (50).

A national sample of U.S. youth between the ages of 14 and 21 were interviewed to assess their gambling activities and severity of gambling problems. Youth who have had experience with more types of gambling over the previous year were more likely to have gambling problems (50). When involvement in other games was controlled, card playing, games of skill, and casino gambling were highly associated with increased risk of gambling problems. These data merely examine the association between specific forms of gambling and gambling-related problems among youth, making it difficult to determine whether exposure itself leads to more problems or if youth with gambling problems are more likely to participate in multiple forms of gambling, which is likely the case. Nonetheless, the results suggest that certain gambling

activities and overall level of gambling engagement can be useful predictors of gambling problems among youth. High gambling versatility appears to be a particularly salient risk factor for youth problem gambling (39). When youth are presented with and have access to more gambling options they may be more likely to find a preferred form of gambling which can increase the risk of developing a problem.

MARKETING

Related to the availability of gambling within communities is the way gambling is marketed toward community members. Although most jurisdictions have laws that prohibit minors from participating in regulated forms of gambling, youth are exposed to the same messages advertising gambling opportunities as adults. A broad range of marketing strategies are typically used to promote gambling opportunities to the public. Television and radio commercials, billboards and other signage, point-of-sale advertisements, sponsorship deals, and promotional products are examples of marketing efforts that use various forms of media to endorse gambling opportunities (51). These advertisements tend to focus on the fun, entertainment, and possibility of "winning big" with no mention of the potential consequences of gambling. Adolescents report that these advertisements portray gambling as a rewarding and enriching activity that leads to a happier lifestyle (52).

Not only do these advertisements increase the availability of gambling within communities by providing information about local gambling opportunities, they normalize gambling by portraying it as an acceptable and harmless form of entertainment. As youth are exposed to more and more gambling advertisements, they are more likely to perceive it as a normative activity within their respective communities. In addition, the central message of these advertisements, that gambling is a thrilling and worry-free activity, is more likely to be accepted and pursued by children and adolescents. Derevensky et al (52) found that 47% of adolescent males and 38% of adolescent females reported that gambling advertisements made them want to try gambling. In addition, problem gamblers were much more likely to report "sometimes" or "often" gambling after seeing an advertisement (32%) compared with social (3%) or non-gamblers (0%). Such findings have led researchers to suggest that the presence of gambling advertisements is a strong risk factor for youth gambling involvement (51). Accordingly, community-level regulation of these advertisements that reduces exposure to youth and prohibits overly positive portrayals of gambling should reduce the normalization of gambling and lead to subsequent reductions in gambling problems among youth.

SOCIETY

Beyond individual-, interpersonal-, and community-level factors that have an impact on youth gambling behavior, there are macro-level risk factors that reflect the wider culture and society. Throughout history, cultural norms have dictated the legality and availability of gambling opportunities. At several points in time, widespread belief that gambling is sinful led to its prohibition in many parts of the world. To this day, gambling remains outlawed in most Muslim countries and public opposition, often from religious organizations, has lead to the removal of gambling machines in certain jurisdictions. However, as gambling revenues have been shown to be lucrative sources of funds for governments, charities, and businesses,

gambling opportunities have expanded. Coinciding with this expansion, conservative attitudes toward gambling have loosened, and gambling continues to gain acceptance in society as a socially acceptable, even charitable, form of entertainment. Consequently, this prevailing attitude poses a serious risk for youth. Children and adolescents who identify strongly with the ideological, social, economic, and political values of a gambling-permissive society will be more likely to see it as a normative activity themselves, and thus something they may choose to pursue.

As outlined in the previous section, the availability and marketing of gambling are important determinants of youth gambling within communities. However, differences in gambling rates across communities can also be attributed to cultural differences of geographic regions (53). In addition, differences between cultural groups within the same geographic region can at least partially explain variations in gambling attitudes and behaviors. Thus far, the majority of the review has consisted of Western studies. Although few non-Western studies have specifically examined risk factors for youth gambling problems, it is instructive to examine some of the cultural factors known to impact the initiation and maintenance of gambling.

Existing research suggests relatively high rates of gambling among certain cultural groups including Jewish, Chinese, and Indigenous peoples (53). And as outlined previously, there is some evidence that racial/ethnic minority groups are at greater risk of developing gambling problems. While these higher gambling rates may be caused to some extent by non-cultural factors such as low socioeconomic status, there is evidence that cultural issues also play a unique role. For example, Zitzow (54) found that American Indian adolescents reported more gambling involvement and gambling-related problems compared with non-American Indian adolescents, which was partially attributed to cultural acceptance of magical thinking among American Indians. Thus, cultural beliefs that emphasize an external locus of control and a reliance on 'fate' or 'luck' may encourage more gambling among youth.

Traditional family configurations may also influence gambling behavior. For example, Raylu and Oei (53) suggested that children in Chinese families with a traditional patriarchal family system have increased exposure to and parental approval of gambling. Certain cultures also pass on general attitudes toward gambling to its members. Whereas gambling is perceived as part of the lifestyle, history, and tradition of Chinese people, it has been met with steadfast disapproval in Muslim cultures. Clearly, children growing up in a Chinese culture will be more likely to develop positive attitudes and have increased exposure to gambling compared with Muslim children.

Whereas cultural issues represent important macro-level factors that influence youth gambling, global trends in gambling are another significant consideration. Most notably, the Internet gambling industry has experienced large-scale expansion which some researchers posit will lead to higher rates of gambling and related problems among youth (55). While the presence of more gambling venues represents a potential risk factor at a community level, the emergence of Internet-based gambling circumvents the accessibility issue and allows access to gambling to virtually anyone, virtually anywhere in the world. The high accessibility of Internet gambling presents new societal concerns, particularly for youth who may engage in Internet gambling despite being prohibited from

land-based gambling opportunities.

Although no empirical studies have tested the causal relationship between the availability of Internet gambling and gambling problems among youth, the results of at least two correlational studies suggest that youth who gamble on the Internet are much more likely to experience significant gambling problems (56,57). These findings are alarming given that youth continue to have increased exposure to the Internet and its evolving set of applications. The academic and extra-curricular activities of youth have become well integrated into advancing technologies. As the popularity and accessibility of Internet gambling has increased, so has Internet usage and computer access among youth. These combined elements make Internet gambling a potentially high-risk form of gambling with its own set of unique risk factors worthy of increased scrutiny among researchers. In addition, much of the appeal of Internet gambling appears to be related to the game of poker which has garnered an incredible amount of international attention as a "sport" that anyone can pursue. As global interest in poker continues to grow in the form of increased television exposure, multi-million dollar tournaments, and the creation of pseudo-celebrity poker professionals, children and adolescents are more likely to seek out Internet gambling sites as an opportunity to test their own poker skills. Societal acceptance of poker as a legitimate and harmless past time poses a risk for youth gambling.

DISCUSSION

A myriad of factors are implicated in the development of gambling problems among children and adolescents. Individual, relationship, community, and societal factors all play a role in the cause and maintenance of youth gambling problems. However, variables at each of these levels cannot be considered in isolation. Rather, all risk factors should be examined in the context of other risk factors that could potentially lead to over-involvement with gambling. At the individual level, demographic, personality, and psychological factors influence youth's susceptibility to developing gambling problems. Relationship-level factors encompass family and friends, whereas community-level factors include availability and marketing within the community where the child lives. Finally, at a societal level, cultural factors and worldwide trends in gambling (i.e., Internet gambling) are considered important large-scale forces that can impact the level of risk. Although these risk factors cover a wide range of variables, it is far from being a comprehensive review of factors that are relevant to youth gambling prevention.

The current review highlights research studies on risk factors that, for the most part, focus on examining the negative factors associated with gambling problems among youth. However, efforts to prevent tobacco, alcohol, and drug use among youth have focused on not only decreasing risk factors but also increasing protective factors (58). The success of these initiatives in preventing high-risk behaviors highlight the importance of designing youth gambling prevention efforts to enhance resiliency. Although the results of one study suggested that the absence of risk factors contributes more significantly to the prediction of gambling problems among youth than the presence of protective factors (17), another study demonstrated that risk and protective factors each contribute uniquely to the prediction of youth gambling problems (59). Accordingly, youth gambling research should go beyond a basic risk prevention framework to one that fosters protective

factors when helping develop youth gambling prevention initiatives. One category of potentially instructive protective factors is positive development constructs. Current evidence is limited on the extent to which such constructs, including cognitive and emotional competencies, serve as protective factors for youth gambling. Parker et al (60) found that higher emotional intelligence among youth was associated with lower scores on a problem gambling measure. Among the different components of emotional intelligence, interpersonal abilities had the highest negative correlation with problem gambling severity, suggesting that youth with better interpersonal skills are less likely to spend considerable amounts of time gambling.

However, the direction of this relationship was undetermined. Cognitive competencies and their relation to youth problem gambling have been left unexplored for the most part as well. One study showed that a higher score on knowledge of randomness, self-monitoring, and coping skills among older adolescents was associated with lower scores on a problem gambling measure (61). In addition, an intervention designed to improve these competencies was shown to result in significant increases in scores on randomness, self-monitoring, and coping skills knowledge compared with a control group. In sum, preliminary evidence suggests that positive development constructs warrant further investigation as potential protective factors for youth gambling problems.

Much of the research reviewed tended to examine the factors that co-occur with gambling problems among youth. That is, most existing research on risk factors provides an account of the characteristics and situational factors observed in youth who already exhibit signs of disordered gambling. While these correlational findings are useful for secondary prevention measures, they are less helpful for primary prevention efforts aimed at preventing the onset of gambling problems. More prospective research is needed to establish the antecedents of problem gambling among youth. Such studies should take a longitudinal approach to determine which factors are present before gambling problems emerge. Although more costly and difficult to undertake, such research would provide valuable knowledge about how gambling problems develop in youth and the resiliency factors that can help make children more resistant to gambling problems before they are initiated to gambling activities.

Most existing research on risk factors has focused on demographic and behavioral correlates of youth gambling. Much less work has been devoted to examining the unique thoughts and attitudes that are prevalent among youth with gambling problems. These factors represent a crucial area of study given that thoughts and attitudes encompass the motivation to gamble. Current evidence suggests that children and adolescents with positive attitudes toward gambling are more likely to develop gambling problems (21). In addition, adolescent problem gamblers hold more irrational beliefs about gambling, often failing to understand the true risks associated with gambling and believing that they have more control over gambling outcomes than chance dictates (62,63). Future research on risk factors should closely examine the thoughts and attitudes that contribute to gambling problems among youth. By revealing how gambling-related thoughts and attitudes develop, such studies will ultimately improve prevention efforts that aim to counter these beliefs before they become more firmly entrenched with age.

Another area of inquiry that warrants further exploration is Internet gambling and its unique set of risk factors. The daily lives of children and adolescents are becoming increasingly immersed in technology, particularly the Internet, bringing into question the extent to which Internet usage poses a risk factor for youth gambling. With the rapid expansion of Internet gambling over the past 10 years, these concerns have become a reality. Qualitative data suggests that young people are the fastest growing segment of Internet gamblers (64). Yet, the risk factors associated with Internet gambling among youth remain largely unexplored. Video game playing —an activity that has become more technologically advanced and interactive—may also be related to problem gambling among youth. One study found that adolescents in grades 7 to 11 who experienced gambling problems were more likely to spend excessive amounts of time playing video games compared with non-problem and social gamblers (65). Future studies should investigate the risk factors that have emerged with advancing technology, such as video games and Internet gambling.

It is noteworthy that many of the risk and protective factors associated with problem gambling are predictive of multiple other problem behaviors, including substance abuse and delinquency, suggesting that gambling may be part of a larger constellation of high-risk behaviors that is caused by common underlying factors. Studies on risk factors for gambling problems, delinquency, and substance use among youth suggest that all three high-risk behaviors are well predicted by a common set of risk factors, supporting the notion of a general problem behavior syndrome (13,29,39). Prevention efforts will benefit most from research that focuses on identifying risk factors that contribute to this general problem behavior syndrome, which will ultimately have a positive impact on the overall development of youth (17).

Improving youth gambling prevention efforts will require the involvement of parents to consider their own children's level of risk and to develop open and honest communication with their children about gambling. But before parents can engage in frank discussions about gambling with their children they need to become aware of the seriousness of gambling as an issue among teens. Unfortunately, research suggests that parents are in much need of further education about youth gambling. Parents tend to underestimate the probability that their own children have gambled or have a gambling problem (66), and gambling remains very low (in fact, the lowest concern among 13 potential adolescent risk behaviors) on their priority list of teen concerns (67). It is hoped that prevention can begin with a better understanding of the risk factors for gambling problems among youth. New directions in research and the application of corresponding findings to prevention efforts will help achieve the overall goal of minimizing or reducing problems associated with gambling among youth.

Gambling behavior among youth reflects an ongoing trend in society which could be best understood within an ecological model recognizing the interwoven relationship that exists between the individual and their environment. While it is true that individuals are responsible for instituting and maintaining a healthy lifestyle necessary to reduce risk and improve health (thus the need for prevention and education), individual behavior is also largely determined by one's social environment in regard to interpersonal relationships in addition to

community and cultural norms, values, regulations, and policies. The mosaic and opportunities for gambling in general, and youth gambling in particular, are rapidly changing. Governments throughout the world are entering a phase of expansion to offset the economic downturn. Youth gambling will no doubt represent an important social policy issue.

REFERENCES

1. Johansson A, Grant JE, Kim SW, Odlaug BL, Gotestam, KG. Risk factors for problematic gambling: a critical literature review. J Gambl Stud 2009;25(1):67-92.
2. Griffiths MD. The acquisition, development, and maintenance of fruit machine gambling in adolescents. J Gambl Stud 1990;6(3):193-204.
3. Stephenson MT, Morgan SE, Lorch EP, Palmgreen P, Donohew L, Hoyle RH. Predictors of exposure from an anti-marijuana media campaign: out-come research assessing sensation seeking targeting. Health Commun 2002;14(1): 23-43.
4. Volberg RA, Dickerson MG, Ladouceur R, Abbott MW. Prevalence studies and the development of services for problem gamblers and their families. J Gambl Stud 1996;12(2):215-31.
5. Bronfenbrenner U. The ecology of human development: experiments by nature and design. Cambridge, MA: Harvard Univ Press, 1979.
6. Gupta R, Derevensky, JL. Familial and social influences on juvenile gambling. J Gambl Stud 1997;13 (3): 179-92.
7. Gupta R, Derevensky, JL. An empirical examination of Jacobs' General Theory of Addictions: do adolescent gamblers fit the theory? J Gambl Stud 1998;14(1):17-49.
8. Wynne H, Smith G, Jacobs D. Adolescent gambling and problem gambling in Alberta. Alberta Alcohol and Drug Abuse Commission, 1996.
9. Productivity Commission, Australia. Australia's gambling industries. Australian Government. Report number: 10, 1999.
10. Gupta R., Derevensky, JL. Adolescent gambling behavior: a prevalence study and examination of the correlates associated with problem gambling. J Gambl Stud 1998;14(4):319-45.
11. Volberg RA. The prevalence and demographics of pathological gamblers: implications for public health. Am J Health Promot 1994:84 (2):237-41.
12. Welte JB, Barnes GM, Wieczorek WF, Tidwell MC, Parker J. Gambling participation in the U.S.—results from a national survey. J Gambl Stud 2002; 18 (4):313-37.
13. Barnes GM, Welte JW, Hoffman JH, Dintcheff BA. Gambling and alcohol use among youth: influences of demographic, socialization, and individual factors. Addict Behav 1999; 24(6):749-67.
14. Stinc hfield R, Cassuto N, Winters K, Latimer W. Prevalence of gambling among Minnesota public school students in 1992 and 1995. J Gambl Stud 1997; 13(1):24-48.
15. Winters KC, Stinchfield R, Fulkerson J. Patterns and characteristics of adolescent gambling. J Gambl Stud 1993;9(4):371-86.
16. L adouceur R, Dubé D, Bujold A. Gambling among primary school students. J Gambl Stud 1994;10(4): 363-70.
17. Dickson LM, Derevensky JL, Gupta R. Youth gambling problems: examining risk and protective factors. Int Gambl Stud 2008;8(1):25-47.

18. Jacobs DF. A general theory of addictions: a new theoretical model. J Gambl Stud 1986;2(1):15-31.
19. Welte JB, Barnes GM, Wieczorek WF, Tidwell MC, Parker J. Alcohol and gambling pathology among U.S. Adults: prevalence, demographic patterns and comorbidity. J Stud Alcohol 2001;62(5): 706-12.
20. Stinc hfield R, Winters KC. Gambling and problem gambling among youths. Ann Am Acad Pol Soc Sci 1998; 556(1):172-85.
21. Wallisch L. Gambling in Texas: 1995 Texas survey of adolescent gambling behavior. Austin, TX: Texas Commission Alcohol Drug Abuse, 1996.
22. Ellenboge n S, Gupta R, Derevensky JL. A cross-cultural study of gambling behavior among adoles-cents. J Gambl Stud 2007;23(1):25-39.
23. Breen RB, Zuckerman M. Chasing' in gambling behavior: personality and cognitive determinants. Pers Individ Dif 1999;27(6):1097-111.
24. C yders MA, Smith GT. Clarifying the role of personality dispositions in risk for increased gambling behavior. Pers Individ Dif 2008;45 (6):503-08.
25. Steel Z, Blaszczynski A. Impul-sivity, personality disorders and pathological gambling severity. Addiction 1998;93 (6): 895-905.
26. Gupta R, Derevensky JL, Ellen-bogen S. Personality characteristics and risk-taking tendencies among adolescent gamblers. Can J Behav Sci 2006;38 (3):201-13.
27. Vitaro F, Arseneault L, Tremblay RE. Dispositional predictors of problem gambling in male adoles-cents. Am J Psychiatry 1997;154 (12):1769-70.
28. Vitaro F, Arseneault L, Tremblay RE. Impulsivity predicts problem gambling in low SES adolescent males. Addiction 1999;94(4):565-75.
29. Vitaro F, Brendgen M, Ladouceur R, Tremblay RE. Gambling, delinquency, and drug use during adolescence: mutual influences and common risk factors. J Gambl Stud 2001;17 (3):171-90.
30. Vitaro F, Ferland F, Jacques C, Ladouceur R. Gambling, substance use, and impulsivity during adolescence. Psychol Addict Behav 1998; 12(3):185-94.
31. A merican Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed, text rev. Washington, DC: Author, 2000.
32. No wer L, Derevensky J, Gupta R. The relationship of impulsivity, sensation seeking, coping and substance use in youth gamblers. Psychol Addict Behav 2004;18(1):49-55.
33. Breyer JL, Botzet, AM, Winters KC, Stinchfield RD, August G, Realmuto G. Young adult gambling behaviors and their relationship with the persistence of ADHD. J Gambl Stud. 2009;25(2):227-38. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2775442/?tool=pubmed
34. Wood RT, Griffiths MD. A qualitative investigation of problem gambling as an escape-based coping strategy. Psychol Psychother 2007;80(1):107-25.
35. Felsher JR, Derevensky JL, Gupta R. Young adults with gambling problems: the impact of childhood maltreatment. Int J Ment Health Addiction. Available at: http://dx.doi. org/10.1007/s11469-009-9230-4.
36. Bergevin T, Gupta R, Derevensky J, Kaufman F. Adolescent gambling: Understanding the role of stress and coping. J Gambl Stud 2006;22(2),195-208.
37. Blaszcz ynski A, Nower L. A pathways

model of problem and pathological gambling. Addiction 2002;97(5):487-99.
38. Ste -Marie C, Gupta R, Derevensky J. Anxiety and social stress related to adolescent gambling behavior and substance use. J Child Adolesc Subst Abuse 2006;15(4):55-74.
39. Delfabbro P, Lahn J, Grabosky P. Psychosocial correlates of problem gambling in Australian students. Aust NZ J Psychiatry 2006;40(6-7):587-95.
40. Gillespie MA, Derevensky JL, Gupta R. The utility of outcome expectancies in the prediction of adolescent gambling behavior. J Gambl Issues 2007;19:69-85. Available at: http://www.camh.net/egambling/issue19/pdfs/gillespie2.pdf
41. Carlton PL, Manowitz P. Behavioral restraint and symptoms of attention deficit disorder in alcoholics and pathological gamblers. Neuropsychology 1992;25(1):44-48.
42. Carlton PL, Manowitz P, McBride H, Nora R, Swartzburg M, Goldstein L. Attention deficit disorder and pathological disorder. J Clin Psychiatry 1987;48(12):487-88.
43. Hardoon K, Gupta R, Derevensky JL. Psychosocial variables associated with adolescent gambling. Psychol Addict Behav 2004;18(2):170-79.
44. Ste wart SH, Kushner, MG. Recent research on the comorbidity of alcoholism and pathological gambling. Alcohol Clin Exp Res 2003;27(2):285-91.
45. Stinchfield R. A comparison of Gambling among Minnesota Public School Students in 1992, 1995 and 1998. J Gambl Stud 2001;17(4):273-96.
46. Volberg RA. Gambling and problem gambling among adolescents in Washington State. Olympia, WA: Washington State Lottery, 1993.
47. Welte JW, Barnes GM, Tidwell MC, Hoffman JH. Association between problem gambling and conduct disorder in a national survey of adolescents and young adults in the United States. J Adolesc Health [in press]. Available from doi:10.1016/j.jadohealth.2009.02.002
48. Gupta R, Derevensky JL. Adolescents with gambling problems: from research to treatment. J Gambl Stud 2000;16 (2/3):315-42.
49. LaPlante DA, Shaffer HJ. Understanding the influence of gambling opportunities: expanding exposure models to include adaptation. Am J Orthopsychiatry 2007; 77(4):616-23.
50. Welte J, Barnes GM, Tidwell M, Hoffman J. The association of form of gambling with problem gambling among American youth. Psychol Addict Behav 2009;23(1):105-12.
51. Monag han S, Derevensky J, Sklar A. Impact of gambling advertisements and marketing on children and adolescents: policy recommendations to minimize harm. J Gambl Issues 2008;22:252-74. Available at: http://www.camh.net/egambling/issue22
52. Dereven sky J, Sklar A, Gupta R, Messerlian C. An empirical study examining the impact of gambling advertisements on adolescent gambling attitudes and behaviors. Int J Ment Health Addiction [published online]. Available from doi:10.1007/ s11469-009-9211-7.
53. Ra ylu N, Oei TP. Role of culture in gambling and problem gambling. Clin Psychol Rev 2004;23(8):1087-1114.
54. Zitzo w D. Comparative study of problematic gambling behaviors between American Indian and non-Indian adolescents within and near a northern plains reservation. Am Indian Alsk Native Ment Health Res 1996;7

(2):14-26.
55. Dereven sky JL, Gupta R. Internet gambling amongst adolescents: a growing concern. Int J Ment Health Addiction 2007;5(2):93-101.
56. Byr ne A. An exploratory study of Internet gambling among youth. Montreal, QC: McGill University, 2004, [MA thesis]
57. McBride J, Derevensky J. Internet gambling behavior in a sample of online gamblers. Int J Ment Health Addiction 2009;7(1):149-67.
58. Brounstei n PJ, Zweig JM, Gardner SE. Understanding substance abuse prevention: Toward the 21st century - A primer on effective programs. Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Prevention, Division of Knowledge Develop-ment and Evaluation, 1999.
59. L ussier I, Derevensky JL, Gupta R, Bergevin T, Ellenbogen S. Youth gambling behaviors: An examination of the role of resilience. Psychol Addict Behav 2007;21(2):165-73.
60. Parker JD, Taylor RN, Eastabrook JM, Schell SL, Wood LM. Problem gambling in adolescence: relationships with internet misuse, gaming abuse and emotional intelligence. Pers Individ Dif 2008;45(2):174-80.
61. Turner NE, Macdonald J, Somerset M. Life skills, mathematical reasoning and critical thinking: a curriculum for the prevention of problem gambling. J Gambl Stud 2008;24(3):367-80.
62. D elfabbro P, Lahn J, Grabosky P. It's not what you know, but how you use it: statistical knowledge and adolescent problem gambling. J Gambl Stud 2006; 22(2):179-93.
63. Moore SM, Ohtsuka K. Beliefs about control over gambling among young people, and their relation to problem gambling. Psychol Addict Behav 1999; 13(4):339-47.
64. Brow n SJ. The surge in online gambling on college campuses. New Directions for Student Services 2006; 113:53-61.
65. Wood RT, Gupta R, Derevensky JL, Griffiths M . Video game playing and gambling in adolescents: common risk factors. J Child Adolesc Subst Abuse 2004;14(1):77-100.
66. Ladouce ur R, Vitaro F, Côté M. Parents' attitudes, knowledge, and behavior toward youth gambling: a five-year follow-up. J Gambl Stud 2001;17(2):101-16.
67. Ca mpbell CA. Parents' perceptions of adolescent gambling behavior: a Canadian national study. MA thesis. Montreal, QC: McGill Univ, 2009.

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):59-75

Adolescent gambling on the internet: A review

Mark D Griffiths, PhD[1] and Jonathan Parke, PhD[2]

[1]International Gaming Research Unit, Nottingham Trent University and [2]Centre for the Study of Gambling, University of Salford, United Kingdom

Abstract: Internet gambling is a relatively under-researched area. While our current knowledge remains in its infancy and the prevalence rates are relatively low, researchers and clinicians are predicting greater involvement among youth. A comprehensive search of the relevant literature was undertaken. The resulting relevant literature was classified into four areas. These were (a) the empirical studies on adolescent internet gambling, (b) online gambling-like experiences in adolescence, (c) adolescent gambling via social networking sites, and (d) adolescent gambling via online penny auction sites. Age verification in relation to prevention and regulation is also examined. It is concluded that young people appear to be very proficient in using and accessing new media and are likely to be increasingly exposed to remote gambling opportunities. These young people will therefore require education and guidance to enable them to cope with the challenges of convenience gambling in all its guises.

Keywords: Adolescence, gambling, problem gambling, internet

Correspondence: Mark Griffiths, PhD, Professor of Gambling Studies, International Gaming Research Unit, Psychology Division, Department of Social Sciences, Nottingham Trent University, Burton Street, Nottingham, NG1 4BU, United Kingdom. E-mail: mark.griffiths@ntu.ac.uk

Submitted: May 15, 2009. ***Revised:*** August 10, 2009. ***Accepted:*** August 11, 2009.

INTRODUCTION

Gambling is not immune to technological advance and many new forms of gambling are continually evolving (1). Furthermore, it has been argued that many of these new forms of gambling are likely to appeal to techno-savvy youth given the relative ease with which online gambling sites can be accessed (2). Early studies indicated that many online gambling sites failed to provide stringent age checks and/or age verification procedures (3), although the current situation has improved considerably. Nevertheless, gambling opportunities for adolescents are ever growing. It has been noted that the distinction between gambling and video gaming is becoming ever more blurred and that gaming convergence is widespread (4-6). For example, many gaming sites offer rewards in the form of 'tokens' or 'credits' where gamblers can swap the tokens or credits for a monetary prize.

A national internet gambling prevalence survey of 2098 people in the UK by Griffiths (7) included data from 119 adolescents (aged 15 to 19 years). Although at that time no teenagers reported gambling on the internet, 4% of teenage respondents said they would like to try online gambling. Another study in Canada suggested at least a quarter of young people with serious gambling problems may be gambling on the internet using 'free play' sites (for 'practice' and 'demonstration' purposes) (8). It could be the case that the internet presents a particular danger for those who already

have gambling problems as such findings have been found in nationally representative adult surveys (9), and children are commonly thought to be more susceptible and vulnerable in terms of developing a gambling problem (10). While our current knowledge remains in its infancy and the prevalence rates are relatively low, researchers and clinicians are predicting greater involvement among youth as well as other high-risk groups including seniors and pathological gamblers.

METHODS

In order to fulfill the specifications of this review, a comprehensive search of the relevant literature was undertaken. The collection of this literature was carried out in two concurrent phases, comprising a search of online electronic databases and a search of specialist web-based libraries.

Online databases: A search of the following online databases was conducted to find any potentially relevant literature: *Academic Search Elite; Business Source Premier; Ingentaconnect; ISI Web of Knowledge; PsycArticles; PsycInfo, Science Direct.* The searches were performed during July 2009 using the following key words:

- (Adolescent) and (gambling or gaming) and (internet)
- (Adolescent) and (gambling or gaming) and (online)
- (Youth) and (gambling or gaming) and (internet)
- (Youth) and (gambling or gaming) and (online)

Each search on each database produced varying numbers of titles and abstracts, with varying degrees of overlap between each database. Full lists of titles and abstracts were viewed, and for those articles that appeared relevant to this review, full texts were accessed and downloaded.

Specialist libraries: A search of the following online libraries was conducted during July 2009, using the same search terms as outlined above. These libraries are specialist collections put together by governments from jurisdictions worldwide, and by gambling-related organizations. Any material that appeared relevant to this review was accessed and downloaded.

- Electronic Journal of Gambling Issues: www.camh.net/egambling/
- Gambling Research Australia Secretariat: www.gamblingresearch.org.au
- New Zealand Ministry of Health: www.moh.govt.nz
- Ontario Problem Gambling Research Centre: www.gamblingresearch.org
- Responsible Gambling Council: www.responsiblegambling.org

The resulting relevant literature was classified into four areas: (a) the empirical studies on adolescent internet gambling, (b) online gambling-like experiences in adolescence, (c) adolescent gambling via social networking sites, and (d) adolescent gambling via online penny auction sites. Age verification in relation to prevention and regulation is also examined.

EMPIRICAL STUDIES

Gendron and her colleagues (11-14) carried out a study comparing the profiles of young non-gamblers, gamblers, and internet gamblers in relation to severity of substances use in Quebec (using the DEP-ADO (15) and impulsiveness/risk taking. The authors surveyed 1,876 high-school students (46% male; 54% female) aged 14 to 18 years (mean = 15.4 years), and reported that 93.5% of participants (95% male;92% female) had gambled in the previous 12 months, and that 8% (13% males; 3% females) had gambled on the internet in the previous 12

Table 1. *Substance use by gamblers, internet gamblers and non-gamblers (n=1,876) adapted from Brunelle et al (12)*

Type of substance use	Non-gambler (%)	Gambler (%)	Lifetime Internet gambler (%)
Alcohol**	76.9	91.3	96.3
Tobacco**	26.3	42.6	51.5
Cannabis**	26.8	40.6	55.1
Hallucinogens**	5.4	10.0	12.5
Speed	6.3	13.1	19.9
Cocaine**	1.0	3.8	5.9
Solvents	0.2	1.0	1.5
Heroin*	0.6	1.0	3.7

(Comparison between gamblers and non-gamblers: * $p < .05$; ** $p < .001$)

months. Gendron also reported that 35% of youth (49% males; 21% females) had played on the 'free play'/'demo' mode on internet gambling sites. Males were significantly more likely than females to gamble in general, gamble on the internet, and play the 'free play' modes on internet gambling sites. Using the DSM-IV-J, the investigators reported that 3% of their participants were problem gamblers and also found that significantly more internet gamblers (11%) were likely to be problem gamblers than those who did not gamble on the internet (1.5%). However, there were no gender differences for any type of problem gambling. Further findings revealed that nearly 7% of the participants had a substance use problem and that those with problematic substance use were also more likely to be internet gamblers (4% non-gamblers; 8% gamblers; 18% internet gamblers) (see table 1). In relation to impulsivity, internet gamblers and non-internet gamblers had significantly higher impulsivity and risk-taking scores than non-gamblers. Problem gamblers also had significantly higher scores on impulsivity and risk taking than non-problem gamblers.

Using the same data set, Brunelle and colleagues (14) examined some of the contextual elements surrounding internet gambling among adolescents. The authors examined the types of games played on the internet, internet gambling initiation contexts, and internet gambling contexts in general (e.g., when, where, with whom, how long, etc.). Of the 137 internet gamblers identified in the sample of 1,876 high school students, only 0.8% had regularly played for money at an online casino and only 1.9% had regularly played for money in online poker (see table 2). The 'play for free' modes were played more regularly in both online casinos (8.9%) and online poker (13.8%) (see table 2). The results also showed that 37% of online gambling was done mainly with friends, 34% with the immediate family, 23% with other family members, 2% alone, and 4% with others.

Brunelle and colleagues (11) also interviewed 37 adolescent online gamblers, and reported that the main types of online gambling carried out were poker, blackjack electronic gambling (slot) machines, bingo and sports betting. Most of this activity was

Table 2. *Types of internet games played in the last 12 months (n=137) adapted from Brunelle et al* (11)

Type of game	Never (%)	Once (%)	Occasionally (%)	Regularly (%)
Internet Casino (for money)	95.4	2.3	1.5	0.8
Internet casino ('free play' mode)	75.2	8.5	7.4	8.9
Internet poker (for money)	94.7	1.7	1.7	1.9
Internet poker ('free play mode')	71.9	8.0	8.0	13.8

carried out either at home or in school, although most played in the evening so it is unlikely that playing at school was highly prevalent. Those who played for more than two hours at a time were most likely to do this on their own whereas playing socially with others was more likely to be done for much less time per session. Most online gamblers found the atmosphere exciting and pleasant (rather than stressful or serious). Brunelle et al (11) concluded that (a) poker was the most popular form of online gambling, (b) adolescent online gamblers were more likely to be problem gamblers than those who did not gamble online, (c) most initiation of online gambling took place with family members, (d) most adolescent online gamblers began by playing in the 'free play' mode, and (e) for many adolescents, online gambling was a way to make money, occupied them when they had nothing else to do, and allowed them to socialize.

Olason (16) reported two studies examining gambling behavior among Icelandic adolescents that included questions relating to internet gambling. The first study carried out in school classes comprised 1,513 adolescents aged 16 to 18 years (730 males; 783 females). The second study carried also carried out in school classes comprised 1,537 adolescents aged 13 to 18 years (768 males; 747 females). The surveys included questions relating to gambling on Icelandic internet websites (lotto, sports pools, sports betting) and on foreign websites (poker, casino games, sports betting, and 'free play' modes). Students also completed the DSM-IV-MR-J (17), a gambling screen assessing severity of gambling and gambling-related problems.

In relation to participation, Olason reported that in the first study, 62% of the participants had gambled, 11% were regular gamblers, 20% had gambled on the internet, and just under 4% were regular internet gamblers. In the second study, 57% of the participants had gambled, 8% were regular gamblers, 24% had gambled on the internet, and just over 4% were regular internet gamblers. Table 3 outlines in more detail the findings in relation to internet gambling more specifically. In both studies, males were significantly more likely than females to gamble on the internet (32% boys vs. 9% girls in study I; 37% boys vs. 11.5% girls in

Table 3. *Types of games played on the internet by Icelandic adolescents adapted from Olason (16)*

Type of game	Study 1: (*n = 1513*)		Study 2: *(n=1537)*	
	Regular Gamblers	Total Gamblers	Regular Gamblers	Total Gamblers
Icelandic websites				
Lotto	0.6	2.4	0.5	8.7
Sports pools	0.7	3.4	0.9	8.5
Sports betting	0.8	2.9	1.2	6.2
Foreign websites				
Online poker	0.6	1.9	1.8	6.5
Casino games	2.2	15.8	1.8	12.3
Sports betting	-	-	0.5	1.9
'Free play' Modes	3.3	28	-	-

study II). The results in relation to problem gambling showed that the prevalence of problem gambling among gamblers was 3% in the first study and 2.2% in the second study. However, among those who had gambled on the internet, the respective problem gambling prevalence rates were significantly higher at 10.1% and 7.5%. Results also revealed that 11.5% had used their own credit card, 23.1% had used their own debit card, 15.4% had used one of the parents' credit cards, and 50% had used some other method (e.g., brother's credit card, friends paying and then paying them back, electronic cash, PayPal, Neteller, with bonus money, etc.).

Griffiths and Wood (18), in the United Kingdom, surveyed 8,017 young people aged between 12 and 15 years of age about their internet gambling behavior. Like the Olason studies, their survey used the DSM-IV-MR-J screen to identify whether respondents who gambled were problem or social gamblers. The study examined remote gambling in relation to use of the National Lottery products online. In order to ascertain their experience of gambling on the internet, adolescents were asked 'Have you ever played any National Lottery game on the internet?' Those who had done so were also asked 'Which, if any, of the following games have you played in the past 7 days?' and were presented with the following options: (i) instant win games for money, (ii) free instant win games, (iii) lotto, and (iv) one of the other lottery draw games. Those who had experience of gambling online were also asked how they played National Lottery games on the internet, and presented with the options: (i) the system let me register, (ii) I played along with my parents, (iii) another adult let me play, (v) I used my parent's/guardian's online National Lottery account with their permission, (v) I used my parent's/guardian's online National Lottery account without their permission, and (vi) played free games.

The results showed that approximately one in twelve young people aged 12 to 15 years (8%) said they had played a National Lottery game on the internet. Boys were

more likely than girls to say they have played National Lottery games on the internet (10% vs. 6%), as were young people who were Asian and black. Not surprisingly, young people identified as 'problem gamblers' were more likely than 'social gamblers' to have played a National Lottery game on the internet (37% compared with 9%). Of those who had gambled on the internet, a quarter of the adolescents said they had played free instant win games on the internet (24%), nearly one in five had played instant win games for money (19%) or Lotto (18%), and 10% had played one of the other draw games. Problem gamblers were more likely to have played every game in the past week, compared with social gamblers who were less likely to remember what games they had played in the last week. Young people with parents who approve of young people gambling were more likely to have played online instant win games for money, Lotto, or other draw games (35% compared with 19%; 40% compared with 15%; 22% compared 6% respectively). The results suggest parental consent or help in gaining access to the games via the internet.

When asked which of a series of statements best describes how they played National Lottery games on the internet, nearly three in ten adolescents who played online reported playing free games (29%), one in six reported that the system let them register (18%), slightly fewer played along with their parents (16%), and one in ten used their parent's online National Lottery account either with their permission (10%) or without it (7%). However, it should be noted that a third of online players said they 'couldn't remember' (35%). Overall, among all young people (and not just players), 2% played National Lottery games online with their parents or with their permission and 2% have played independently or without their parents. Those who had played independently were most likely to have played free games, with just 0.3% of young people having played National Lottery games on their own for money.

Welte, Barnes, Tidwell and Hoffman (19) assessed the relationship between specific types of gambling and the extent of problem gambling reported by American adolescents and young adults using data from the National Survey of Youth and Gambling, with 2,274 youth aged 14 to 21 years. The study found that 2% of respondents (3% males; 0% females) reported gambling online in the twelve months preceding the interview. The authors also reported that these respondents gambled online an average of 48 days per year, the highest average of any kind of gambling reported in the survey. The study also found that 65% of respondents who gambled on the internet reported having at least one symptom of the South Oaks Gambling Screen Revised for Adolescents (SOGS-RA) (20), which again was the highest of the 15 forms of gambling being considered. Statistical analyses revealed that when participation in other forms of gambling were controlled for, the link between internet gambling and problem gambling among youth was no longer significant. In other words, they concluded that young internet gamblers were likely to experience more problem gambling symptoms by virtue of gambling on more forms of gambling, as opposed to the properties of internet gambling itself. Indeed, this was supported in part by the data, with internet gamblers engaging with an average of 6.9 different types of gambling within the last 12 months, the highest level of gambling versatility reported by players of any of the 15 gambling activities.

Ipsos MORI (21) in the United Kingdom surveyed 8,598 pupils (4,466 males; 4,447 females; 45 not stated), from

201 schools. Two different class levels (curriculum years 8 and 10) were surveyed within each school which resulted in the sample consisting of 11-15-year olds. The questionnaires included items relating demographic and socioeconomic information; gambling attitudes and behavior (online and offline) and a youth-adapted problem gambling screen (DSM-IV-MR-J)(17). Overall, 1% reported gambling on the internet for money in the seven days prior to the survey. The children reported that they were most likely to spend their money on the internet during this time frame on clothes, music, video games and DVDs (10%, 9% 8% and 5%, respectively) with 68% not spending any of their own money online within that period. Children were also asked about 'gambling-like experiences' which included play-for free or practice modes of real gambling sites and gambling-type games for play money or points on social networking sites. As demonstrated in figure 1, just over a quarter of adolescents had played in 'money-free mode' in the week preceding the survey, with opportunities on the social networking sites four or five times more popular than those presented on real gambling sites.

Using statistical modeling to further examine the same data, Forrest, McHale and Parke (22) reported that gambling in money-free mode was the single most important predictor of whether the child had gambled for money and one of the most important predictors of children's problem gambling. However, it should be noted that this relationship is correlational and not causal. The possibility and extent to which money-free gambling is responsible for real gambling participation and gambling-related risk and harm could only be confirmed using longitudinal data.

A study by Byrne [23; cited by Derevensky & Gupta (24)] in Canada of 2,087 adolescents and young adults (43%

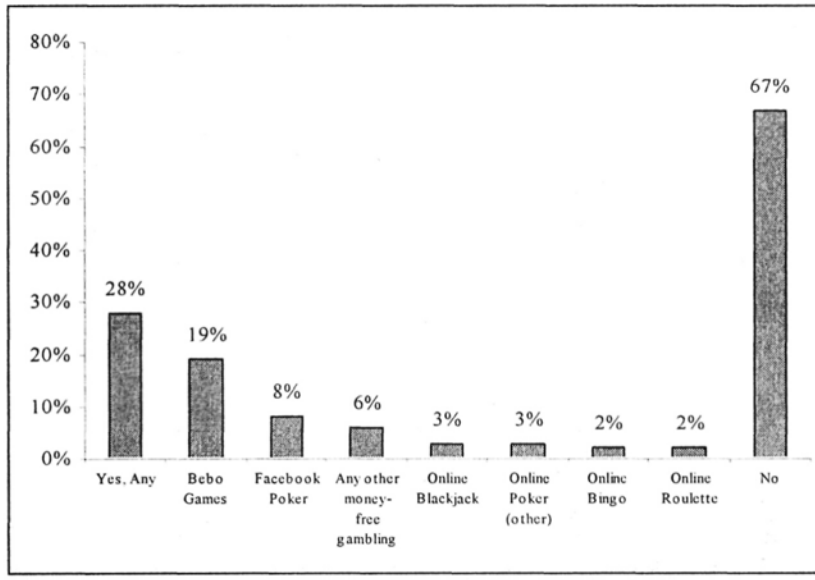

Fig. 1: Money-free gambling in the last 7 days (n=8,598) adapted from Ipsos MORI (21)

males; 57% females) reported some data on youth internet gambling. The study found that more individuals under the age of 18 years than 18 to 24 years played 'free play' games on internet gambling sites (43% vs. 33% for males; 42% vs. 29% for females). The most popular form of 'free play' activity for those both under and over the age of 18 years was card playing (poker and blackjack), with less frequent gamblers (i.e., those gambling less than once per month) playing slot machines or other forms of online gambling machines.

Over the past year, almost one in twenty (4.6%) of the participants (7.8% males; 2.3% females) had gambled online with their own money. When examined by age, those under 18 years were more likely to be male (8.6%; over 18 years 6.8%) than female (3.2%; over 18 years 1.3%). The two most popular forms of internet gambling for both those under 18 years and over 18 years were card playing (online poker) and sports betting. For those who gambled online for money, Byrne reported that many did so with a family member (i.e., parent or older sibling). For those who gambled on the internet, the prevalence rate of problem gambling was almost 19%. Although very high, similar rates of problem gambling prevalence among self-selected samples have been reported by other research studies on student gambling (25-28). Byrne reported no significant gender differences but did note that the younger the person gambling online, the more likely they were to exhibit problem gambling.

In addition to the study of Byrne, there have also been some smaller more locally based studies done in various parts of Canada. For instance, Meerkamper (29) reported that more than one in twenty teenagers in Nova Scotia aged 15 to 17 years reported playing online poker for money. Poulin and Elliot (30) reported that in the past year, 4.2% of adolescents had gambled for money online in Atlantic Canada, and in Montreal, almost one in ten teenagers (9%) reported as having gambled online for money (24).

ONLINE GAMBLING-LIKE EXPERIENCES

Over the last decade, a number of papers have been published examining gambling-like experiences engaged in by adolescents including instant win games in children's snacks like crisps and chocolate (31) and money-free gambling which could include 'free play', 'practice' and 'demo' games on internet gambling sites (18). As noted above, Ipsos MORI (21) reported that 28% of their sample of 8,598 children had participated in money-free gambling of some description in the week preceding the survey. The study also found that those children who reported: being male; having a black or white ethnic background; earning or receiving £30 in the last week; and that their parents were gamblers were all significantly more likely to have gambled in money-free mode in the specified time period.

Some clinical researchers have asserted that youth gambling in money-free mode may be a cause for concern (18,24,32-34). For example, a number of North American studies have reported that anywhere between 25% to 50% of teenagers have played 'free play' games via internet gambling sites (24,30,35). It has been alleged that such opportunities encourage teenagers to practice before 'graduating' to playing for money games at online casinos (36) and that a 'precautionary principle' should be applied which prevents adolescents from being exposed to gambling-like experiences. However, the specific impact of money-free play remains unclear. Despite the strong correlation of

money-free play with both gambling participation and problem gambling (22) and there is currently no conclusive evidence to suggest that money-free play causes individuals to start gambling for actual money or to be more at risk of experiencing gambling related harm, although there is a growing body of correlational evidence.

The use of 'free play' sites is not the only type of online gambling-like experience that adolescents can now engage in. Griffiths, King and Delfabbro (37) identified other types of gambling-like experience including (i) gambling via social networking sites and (ii) gambling via online penny auction sites. These are briefly examined below.

GAMLING VIA SOCIAL NETWORK SITES

Across the world, the social networking phenomenon has spread rapidly. Despite the minimum age for most major social networking sites usually being 13 years (and 14 years on MySpace), a study by the Office of Communications (38) in the United Kingdom reported that just over a quarter (27%) of 8 to 11 year olds who are aware of social networking sites said that they had a profile on a social networking site. The most popular social networking site used by children was *Bebo* (63%). Recently, Downs (39) noted that content-generated risks from this new leisure activity have not been investigated in any detail, yet young people using these sites are able to gain access to gambling.

Downs claimed that the potential of social networking sites to 'normalize' gambling behaviors may change social understandings of the role of gambling amongst young people. For example, while socially responsible gambling emphasizes that money spent gambling may not offer a return other than the pleasure gained from the game the social networking utilities can present gambling as a viable route for the acquisition of scarce virtual goods. According to Downs' pilot research there were 25 Poker applications on *Bebo* (and over 500 separate poker groups) and in excess of 100 poker applications on *Facebook* (and over 1,000 separate poker groups). These poker sites featured some with real prizes, some with cash-play options, and all easily downloadable by those under 18 years along with many free trial games. The largest of these poker groups had over several thousand members and in one group surveyed, 15% of those in the group declared they were under the age of 18 years. Furthermore, gambling applications typically contain sidebar advertisements and hyperlinks to real gambling sites.

Downs also reported a type of pseudo-gambling among *'Fluff Friends'* that has over 100,000 active users per month. In this social networking forum, users (typically young girls) create *'Fluff' Art.* To do this they have to earn 'munny' (sic)—a type of virtual money through pet racing. Pet racing costs 1-point per race and winnings can be up to 4000 points. Clearly no money is changing hands, but young children are learning the mechanics of gambling and Downs asserts there are serious questions about whether gambling with virtual money encourages positive attitudes toward gambling in young people. For instance, does gambling with virtual money lead to an increased prevalence of actual gambling? She also asks to what extent are gambling-related groups on social networking sites being used by those under 18 years of age, and whether membership of such a groups facilitates access to commercial gambling sites? It also seems natural for youth to question whether they should game on internet sites if they are winning 'play money'.

GAMBLING VIA ONLINE PENNY AUCTION SITES

Another gambling-like activity is the participation in online penny auctions such as *'Madbid'*, *'Swoopo'*, *Bid Boogie'*, *'Rapid Bargain'* and *'Budson'* (40). In order to participate in an online penny auction, the person needs to place a bid in an ongoing auction. Bids can be made only in one penny (or one Euro cent) increments. The participants can do this by (a) placing a bid by sending a text message from their mobile phone (at £1.50 or €1.50 a bid plus operator's costs) or (b) placing a bid through the creation of an online account where the person purchases a 'bundle' of bids (at 75 pence/75 cents to £1.40/€1.40 a bid, depending on how big a bundle they buy in advance). To bid by text message, a person sends a message with the code for the specific product that they want to bid on. There is no limit to how many bids that can be submitted on the same auction product or on how many different products can be bid on at any one time

For example, here is an example of a real winning bid outlined by Griffiths (40). A *PlayStation* videogame console (retail price of £310) was won in a penny auction for £8.34. To the winner of the auction this was won at a hugely discounted price. However, what this really means is that there were 834 separate bids for this item all costing up to £1.50 per bid (depending whether it was done online or via mobile phone). Looking at the 'bid history', most of the final 50 bids were made by just two individuals who at a minimum spent at least £30 in those final bids trying to secure the item. Although one person won the console, the other person spent a considerable amount of money and received nothing in return. Griffiths (40) has argued that this is internet gambling under another name. Anyone with a mobile phone (e.g., the vast majority of teenagers) can participate in such and activity and it could be argued that many of the items in the auctions appeal particularly to teenage audiences (video game consoles, MP3 players, laptops, etc.). To what extent this very new form of online activity with gambling-like experiences is affecting the youth population is as yet undetermined but this is one area where further research is needed.

AGE VERIFICATION: PREVENTION AND REGULATION

Given the cross-border nature of internet gambling, the conceptualization and evaluation of regulatory issues regarding underage internet gambling is a difficult task. Age verification can take a variety of forms with cross-referencing with official data sources (e.g., electoral register) fast becoming one of the most common. Additionally, operators may ask for the initial deposit to be made using a credit card (given that credit can only be enforced for individuals aged 18 years and over) in order to verify age and then permit the customer to revert to debit card as a payment method on subsequent transactions.

The British Gambling Commission (41) recently reported the findings of an online mystery shopping exercise which was designed to assess the effectiveness of underage gambling prevention protocols of internet gambling operators who are licensed in the United Kingdom, and those operators who may be regulated overseas, but who advertise their products to the United Kingdom market. The Gambling Commission used 16-year old volunteers (with parental consent) and a category of bank account which is available to customers under the age of 18 years. Volunteers registered their details and a false date of birth and continued to try to gamble and withdraw funds. Of the 37

license holders tested, 13 (accounting for 2.2% of active customer accounts) were identified as having weaknesses which could permit underage internet gambling. In other words, while just over one in three were identified as having problems with underage prevention protocols, these were operators with a relatively small customer base (together accounting for just over 2% of active player population).

Although these results represent a potential cause for concern, they compare favorably with an offline mystery shopping exercise undertaken by the Gambling Commission testing all major betting operators in Great Britain. Initial findings indicate that an underage individual was permitted to place a bet in 98 out of the 100 betting shops visited (42). Of course, the circumstances and protocols for age verification and prevention of underage gambling are different between offline and online operations (e.g., checks may be limited to the first visit in an online environment, but must be attempted on every visit to an offline operator). Nevertheless, these findings do suggest that access to online relative to offline gambling opportunities is more difficult to gain for would-be underage customers.

DISCUSSION

Although there is some variation in the participation rates reported in the studies considered in this review, the small number of surveys showed that a small but significant minority of adolescents can and do gamble on the internet. Several studies reported a past year internet gambling prevalence rate of around 4% (23,29,30). However, some reported a lower figure (19) and others report the rate as being considerably higher (12,24) e.g., 8% (12), 9% (24) and 20%-24% (16). Interestingly, lower rates of participation were found for the United States and English speaking Canadian provinces, with higher rates being reported for Quebec and Europe.

Adolescent internet gamblers were also found significantly more likely to be problem gamblers (12,16). Possibly, problem gamblers are more susceptible and/or vulnerable to gambling online, and because the internet provides convenience gambling it is a cause for concern in this particular sub-group of gamblers. However, it may also be that adolescent problem gamblers gravitate to the internet, adding it as an additional mode of gambling to their general repertoire of gambling behaviors (as suggested by Wood and Williams (46) in relation to their large sample of adult gamblers). Consistent with findings reported in this review, Wood and Williams reported (46) a higher rate of problem gambling among the internet gamblers compared with non-internet gamblers. Importantly, the authors noted that as other modes of gambling (other than internet) were reported by participants as the main cause of their gambling problems, it was most likely that internet gamblers were already heavy gamblers to begin with and this was simply a new mode of play to compliment their existing gambling activities. This is also consistent with initial conclusions by Welte and colleagues (19) who suggested the increased risk to be the consequence of wide-ranging participation in gambling activities rather than a direct causal link between internet gambling and problem gambling.

Given the complexity of the available evidence, the role of internet gambling in creating adolescent problem gamblers should be treated with caution. However, it is clear that research that can help to identify the impact of internet gambling on either creating or facilitating gambling-related harm among adolescents should be made a research priority. Such research

should consider the potentially different roles that internet gambling may play in creating new forms of harm and in exacerbating current forms of harm.

Another interesting theme to emerge from this review was that friends and family were reported to play an important role in the online gambling experience among adolescents. For example, Brunelle et al (12) reported that only 2% of internet gambling was done with the adolescent playing alone. That 57% of the gambling was done with a family member and 37% done with friends emphasizes the social nature of internet gambling among adolescents, an activity that has been traditionally noted as being an asocial activity. Similar findings were also reported by Griffiths and Wood (18). These figures appear to be significantly different to trends among adults with one study reporting that 59% of adult respondents reported that they always gambled alone (45). There are two potential implications of these findings. Firstly, future research must explore the nature and the specific impact of the social processes in adolescent internet gambling. The role of family may be particularly important in this regard. Secondly, parents need to be educated about gambling (and its potential problems) in the same way as other potentially addictive behaviors (for example, drinking, smoking, drug taking, etc.).

In terms of regulation, there seem to be significant developments in preventing underage individuals gambling online with clear licensing conditions and codes of practice being implemented and regular compliance checks being performed (for example, see guidelines by the *Global Gambling Guidance Group* [*G4*; http://www.gx4.com/], or *e-Commerce Online Gaming Regulation and Assurance* [*eCOGRA*; http://www.ecogra.org/}). Yet, with at least one in three regulated sites still permitting access to underage players it is clear that there is still much work to do. Some operations must tighten their age verification systems by using more cross-referencing options and stricter criteria, even at the risk of losing customers aged 18 years and over. Also, even though there is some evidence, at least in the United Kingdom, that access to gambling online may prove more difficult relative to securing offline access, underage internet gamblers may only need to get through the hurdles once. In other words, once an adolescent has managed to get through age verification systems and register, they can gamble again repeatedly. This differs from offline facilities, where adolescents would have to deceive the 'gatekeepers' on each separate visit.

We should emphasize that regulatory performance and compliance is only one aspect of preventing underage internet gambling. It seems that with only 23% of underage internet gamblers using their own debit cards to register and pay for their gambling, most are being assisted in some way with their payment (i.e. using friends, family or sponsored credit cards). In one survey (18), 17% of those that had played the lottery on the internet had accessed their parents' accounts (either with or without their permission). This places a significant level of responsibility with older friends and family members, either in terms of refusing assistance in accessing real gambling opportunities or in closely monitoring the use of credit cards for which they have ultimate responsibility.

There appears to be two challenges here in relation to parents preventing underage internet gambling. Firstly, parents must have the appropriate attitudes, awareness, and intentions to prevent underage gambling. Although parents may have the ability to prevent underage gambling

online, they may permit or assist their child as result of viewing such behavior as harmless and/or as a fun activity. Secondly, even if parents are motivated to prevent underage internet gambling, they must be prepared to monitor their child's behavior, and where made available, children's spending on credit and debit cards and other forms of account should be monitored. Educating parents should be one of the key components of any strategy aimed at preventing or minimizing underage internet gambling. Innovative anti-gambling software has been developed and in some jurisdictions has been offered without costs (for example, the *BetStopper* program in Nova Scotia).

The issue of payment is perhaps one of the most important areas for further research. More work is needed to explore the relationship between underage payment mechanisms and the development of problem gambling. For example, if an adolescent is gambling using someone else's credit or debit card, and they are not winning or losing their own money, will this have the same implications for developing or facilitating problem gambling? Factors the have been linked to the development and facilitation of problem gambling (e.g., the big win; chasing; arousal) could be argued to be dependent on the extent to which a gambler is winning or losing their own money.

Finally, evidence suggests that 'money free' gambling plays an important role for adolescents in conceptualizing and experiencing internet gambling. Over one in three adolescents have been reported to gamble in money-free mode (12,23) with Ipsos MORI (21) reporting that 28% of 11- to 15-year olds in a United Kingdom sample had done so within the last week. It is argued that it is through money-free gambling (using social networking sites or 'demo' modes of real gambling sites) that children are being introduced to the principles and excitement of gambling without experiencing the consequences of losing money. Early research has shown it is significantly more commonplace to win while "gambling" on the first few goes on a 'demo' or 'free play' game (43), although this is not the case for all games (e.g., UK National Lottery games). The same study also reported that it was commonplace for gamblers to have extended winning streaks during prolonged periods while playing in the 'demo' modes. However, there have been significant regulatory developments in recent years with improved codes of practice requiring that age verification also applies to 'demo modes' and that such modes should be an accurate representation of the real playing experience including the chances of winning and the rate of return to the player (for an example, see Gambling Commission) (44).

Based on the available literature, it may be important to distinguish between the different types of money-free gambling being made available—namely social networking modes and 'demo' or 'free play' modes. Initial considerations suggest that these may be different both in nature and in impact. For example, as Downs (39) argues, players gambling in social networking modes may experience a different type and level of reinforcement than those gambling in 'demo' mode. For example, on some social networking sites the accumulation of 'play money' or 'points' may have implications for buying virtual goods or services or being eligible for certain privileges. This may increase the value and meaning of the gambling event to the individual. Secondly, when considering the 'flow' and intention of individuals accessing such sites, it could be argued that individuals accessing money free gambling

through social networking sites may be more likely to be induced or persuaded to play given that these web-site visitors' primary intention may have been social interaction (i.e., the primary function of the website) as opposed to those playing in 'demo' mode where gambling is the primary function of the website. Interestingly, four or five times more children reporting money free gambling on social networking sites compared to 'demo' or 'free play' modes on gambling websites. It is suggested that nature and impact of various forms of money free gambling should be the subject of further research and empirical investigation.

Some experts claim that "the exposure of children to gambling-like activities, games of chance with fake money, and play with materials of potential financial value should be seen as risks that need to be controlled" (p. 203; 47). However, to date, such individuals have failed to give an adequate explanation for the underlying reasons. No evidence or speculation are provided regarding the process by which gambling-like experiences may increase risk as opposed to moderating the risk or having no effect on potential risk.

CONCLUSIONS

In conclusion, the rise and challenges of internet gambling cannot be seen in isolation, particularly as there is ever-increasing multi-media integration between the internet, mobile phones, and interactive television. Furthermore, young people appear to be very proficient in using and accessing these media and are likely to be increasingly exposed to remote gambling opportunities. These young people will therefore require education and guidance to enable them to cope with the challenges of convenience gambling in all its guises. The same information also must be made aware to parents, teachers, health professionals and other practitioners.

REFERENCES

1. Griffiths MD. Gambling technologies: Prospects for problem gambling. J Gambl Stud 1999;15:265-83.
2. Griffiths MD, Wood RTA. Risk factors in adolescence: The case of gambling, video-game playing and the internet. J Gambl Stud 2000;16:199-225.
3. Smeaton M, Griffiths MD. (2004). Internet gambling and social responsibility: An exploratory study. Cyberpsychol Behav 2004;7: 49-57.
4. Griffiths MD. Digital impact, crossover technologies and gambling practices. Casino Gaming Intl 2008;4 (3):37-42.
5. Griffiths MD. (2008b). Convergence of gambling and computer game playing: Implications. E-Commerce Law Policy 2008;10(2):12-3.
6. de Freitas S, Griffiths MD. The convergence of gaming practices with other media forms: what potential for learning? A review of the literature. Learn Media Technol 2008;33:11-20.
7. Griffiths MD. Internet gambling: Preliminary results of the first UK prevalence study. J Gamb Issues, 2001;5. Accessed 2009 July 09. URL: http://www.camh.net/egambling/issue5/research/griffiths_article.html
8. Hardoon K, Derevensky J, Gupta R. An examination of the influence of familial, emotional, conduct and cognitive problems, and hyperactivity upon youth risk-taking and adolescent gambling problems. Ontario, CAN: Ontario Problem Gambling Research Centre, Ontario, 2002
9. Griffiths MD, Wardle J, Orford J, Sproston K, Erens B. Sociodemographic correlates of internet gambling: findings from the 2007 British Gambling

Prevalence Survey. Cyberpsychol Behav 2009;12:199-202.
10. Ha yer T, Meyer G, Griffiths MD. Problem gaming in Europe: Challenges, prevention and interventions. New York: Springer, 2009.
11. Brunelle N, Cousineau, M-M, Dufour M, Gendron A, Leclerc D. A look at the contextual elements surrounding Internet gambling among adolescents. 8th Ann Conf Alberta Gaming Res Inst, Banff Center, Alberta, March 2009.
12. Brunelle N, Gendron A, Leclerc D, Cousineau M-M, Dufour M. Gambling, Internet gambling and substance use among Quebec youth. 9th Ann Natl Council Responsible Gambl Conf Gambl Addict, Mandalay Bay Hotel and Casino Resort, Las Vegas, Nevada, November 2008.
13. Brunelle N, Gendron A, Dufour M, Leclerc D, Cousineau M-M. Gambling among youth in relation with alcohol and drug use, delinquency and psychological distress. Montreal, Quebec: Int Center Youth Gambl Probl High-Risk Behav, McGill University, 2009.
14. Gendron A, Brunelle N, Leclerc D, Dufour M, Cousineau M-M. Comparison of the profiles of young non-gamblers, gamblers and Internet gamblers relative to psychological distress, severity of substances use and impulsiveness/risk taking. 8th Ann Conf Alberta Gaming Res Inst, Banff Center, Alberta, March 2009.
15. Ger main M, Guyon L, Landry M, Tremblay J, Brunelle N, Bergeron J. DEP-ADO. Detection of alcohol and drug prevention in adolescents (Ver. 3.2). Recherche et intervention sur les substances psychoactives. Quebec: RISQ, 2007.
16. Olason D. Internet gambling and problem gambling among 13-18 year adolescents in Iceland. 7th SNSUS Conf (The Big Picture: Gambling in Perspective), Helsinki, Finland, April 2009.
17. Fis her S. Developing the DSM-IV Criteria to identify adolescent problem gambling in non-clinical populations. J Gambl Stud 2000:16;253-73.
18. Grif fiths MD, Wood RTA. Adolescent internet gambling: Preliminary results of a national survey. Educ Health 2007;25:23-7.
19. Welte JW, Barnes GM, Tidwell MO, Hoffman JH. The association of form of gambling with problem gambling among American youth. Psychol Addict Behav 2007;23:105-12.
20. Winters KC, Stinchfield RD, Fulkerson J. Toward the development of an adolescent gambling problem severity scale. J Gambl Stud 2003; 9:63-84.
21. Ipsos MORI. British survey of children, the National Lottery and Gambling 2008-09: Report of a quantitative survey. London, National Lottery Commission, 2009.
22. Forrest DK, McHale I, Parke J. Appendix 5: Full report of statistical regression analysis. In: Ipsos MORI, British Survey of Children, the National Lottery and Gambling 2008-09: Report of a quantitative survey. London, National Lottery Commission, 2009.
23. Byr ne A. An exploratory study of internet gambling among youth. Montreal: McGill Univ, 2004. [Dissertation]
24. Dereven sky J, Gupta R. Internet gambling amongst adolescents: A growing concern. Int J Ment Health Addict 2007;5:93-101.
25. Grif fiths MD, Barnes A. Internet gambling: An online empirical study

among student gamblers. Int J Ment Health Addict 2008;6:194-204.
26. Griffiths MD, Parke J, Wood RTA, Rigbye, J. Online poker gambling in university students: Further findings from an online survey. Int J Ment Health Addict 2010;8:82-9.
27. Matthews N, Farnsworth WF, Griffiths MD. A pilot study of problem gambling among student online gamblers: Mood states as predictors of problematic behavior. CyberPsychol Behav 2009;12 (6):741-5.
28. Wood RTA, Griffiths MD, Parke J. The acquisition, development, and maintenance of online poker playing in a student sample. CyberPsychol Behav 2007;10:354-61.
29. Meerkamper E. Decoding risk: Gambling attitudes and behaviors amongst youth in Nova Scotia. Nova Scotia, Nova Scotia Gaming Corp, 2006.
30. Poulin C, Elliot D. Student drug use survey in the Atlantic provinces: Atlantic technical report. Halifax, Dalhousie Univ, 2007.
31. Griffiths MD. Instant-win promotions: Part of the gambling environment? Educ Health 1997;15:62-3.
32. Griffiths MD. Internet gambling: Issues, concerns and recommendations. CyberPsychol Behav 2003;6:557-68.
33. Messerlian C, Byrne AM, Derevensky JL. Gambling, youth and the Internet: Should we be concerned? Can Child Adolesc Psychiatr Rev 2004;13(1):3-6.
34. Mitka M. Win or lose, Internet gambling stakes are high. JAMA 2001;285(8):1005.
35. McBride J, Derevensky J. Internet gambling behavior in a sample of online gamblers. Int J Ment Health Addict 2009;7:149-67.
36. Kelley R, Todosichuk P, Azmier J.J. Gambling@home: Internet gambling in Canada. Gambling in Canada Res Report No. 15. Calgary, AB: Canada West Foundation, 2001.
37. Griffiths MD, King D, Delfabbro P. Adolescent gambling-like experiences: Are they a cause for concern? Educ Health 2009; 27:27-30.
38. Office of Communications. Social Networking: A quantitative and qualitative research report into attitudes, behaviors and use 2008. Accessed 2009 July 09. URL: www.ofcom.org.uk.
39. Downs C. The Facebook phenomenon: Social networking and gambling. Gambling Social Responsibility Forum Conf, Manchester Metropolitan Univ, Manchester, Sep 2008.
40. Griffiths MD. Online 'penny auction' sites: Regulation needed E-Finance Payments Law Policy 2008;2(12):14-6.
41. Gambling Commission. Online mystery shopping programme. Information Note 2009. Accessed 09 Jul 2009. available at: http://www.gamblingcommission.gov.uk/UploadDocs/publications/Document/Online%20mystery%20shopping%20programme%20July%2009.pdf
42. Gambling Commission. Underage gambling 2009. Accessed 09 Jul 2009. Available at: http://www.gamblingcommission.gov.uk/UploadDocs/publications/Document/Under-age%20gambling%20-%20press%20release%20-%20May%20200 9.pdf.
43. Sevigny S, Cloutier M, Pelletier M, Ladouceur R. Internet gambling: Misleading payout rates during the "demo" period. Computers Hum Behav 2005;21:153-8.
44. Gambling Commission. Remote gambling and software technical standards. Technical standards paper 2007. Accessed 09 Jul 2009. Available at: http://www.gamblingcommission.gov.uk/UploadDocs/publications/Docu

ment/Remote%20Gambling%20and%20Software%20Technical%20Standards.pdf.
45. Valenti ne G, Hughes K. New forms of gambling participation: problem internet gambling and the role of the family. London, Responsibility in Gambling Trust, 2008.
46. Wood RT, Williams RJ. Internet gambling: Prevalence, patterns, problems, and policy options. Guelph, Ontario: Ontario Problem Gambling Research Centre, 2009.
47. H yder AA, Juul NH. Games, gambling, and children: Applying the precautionary principle for child health. J Child Adolesc Psychiatr Nurs 2008; 21:202-4.

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):77-93

A critical review of adolescent problem gambling assessment instruments

Randy Stinchfield, PhD

Department of Psychiatry, University of Minnesota Medical School, Minneapolis, Minnesota, United States of America

Abstract: The field of youth gambling assessment is in its infancy. Currently four youth problem gambling instruments have been used to identify adolescent problem gamblers: a) South Oaks Gambling Screen-Revised for Adolescents (SOGS-RA); b) DSM-IV-Juvenile (DSM-IV-J) and the related DSM-IV-Multiple Response-Juvenile (DSM-IV-MR-J); c) Massachusetts Gambling Screen (MAGS) and d) Canadian Adolescent Gambling Inventory (CAGI). Three of the four instruments are adaptations of adult instruments, and none of the four have undergone rigorous psychometric evaluation. While these instruments are used with varying populations in divergent settings, the psychometric properties for their use in these populations and settings are unknown. This review provides information about the instruments and makes suggestions for further instrument development and refinement. Each instrument is described in terms of its development, content, intended purpose, psychometric properties, administration method, scoring instructions, and interpretation. Strengths and limitations of each instrument are compared for both research and clinical purposes. Existing instruments are used to make clinical, scientific, and public policy decisions, and therefore, it is critical that these instruments demonstrate evidence of reliability, validity and accuracy. It is recommended that the field adopt testing standards for the development and use of adolescent problem gambling scales, and generate a body of rigorous psychometric research that demonstrates reliability, validity, and classification accuracy. Ultimately, the goal is to improve measurement precision in identifying youth problem gamblers.

Keywords: Adolescent gambling assessment instruments; youth gambling assessment instruments

Correspondence: Randy Stinchfield, PhD, Department of Psychiatry, University of Minnesota Medical School, 689 Fairmount Avenue, Saint Paul, MN 55105, United States. E-mail: stinc001@umn.edu

Submitted: July 15, 2009. ***Revised:*** September 01, 2009. ***Accepted:*** September 17, 2009.

INTRODUCTION

This paper describes the instruments currently used to identify adolescent problem gamblers, compares the advantages and disadvantages of existing instruments, and makes recommendations for future instrument refinement and development. Three instruments are commonly used to measure adolescent problem gambling. All three are adaptations of adult instruments: 1) South Oaks Gambling Screen–Revised for Adolescents (SOGS-RA); 2) DSM-IV-Juvenile (DSM-IV-J) and its revision, DSM-IV-Multiple Response-Juvenile (DSM- IV-MR-J); and 3) Massachusetts Gambling Screen (MAGS). A fourth instrument currently under development is the Canadian Adolescent Gambling Inventory (CAGI).

The South Oaks Gambling Screen (SOGS) is the most commonly used adult

problem gambling screening instrument. The SOGS is a 20-item instrument developed to screen for probable pathological gambling in adult clinical samples that has demonstrated satisfactory reliability, validity, and classification accuracy (1-3). Winters, Stinchfield and Fulkerson (4,5) adapted the SOGS for an adolescent gambling survey in Minnesota in 1990. The DSM-IV (6) lists 10 diagnostic criteria for Pathological Gambling (PG), with 5 or more of these criteria being present to diagnose PG. Fisher (7) adapted the DSM-IV diagnostic criteria for adolescent surveys in the UK and developed two forms, one with a yes/no response option, DSM-IV-J (7) and one with a multiple response option, DSM-IV-MR-J (8). Shaffer, LaBrie, Scanlon, and Cummings (9) attempted to improve upon the existing instruments and developed the MAGS. While not specifically an adolescent instrument, the MAGS was developed on an adolescent sample and adapted items from the Short Michigan Alcoholism Screening Test (SMAST), an adult alcoholism screen (10). A fourth instrument, currently under development, is the Canadian Adolescent Gambling Inventory (CAGI) (11,12).

This review serves as a resource for investigators and mental health professionals who are involved in the screening and assessing of adolescent problem gambling. Most adolescent problem gambling instruments have not undergone rigorous reliability, validity, and classification accuracy evaluation (13). The assessment of adolescent problem gambling has been conducted either by assuming that existing adult instruments are appropriate for adolescents (which is a questionable assumption) or by making revisions to adult instruments in order to make them developmentally appropriate. The literature on adolescent development would suggest that the phenomenology of problem gambling has a different appearance in youth than among adults and therefore neither of these approaches seem ideal. Both investigators studying problem gambling and mental health professionals need to select from among existing instruments, which have little, if any, psychometric information for the adolescent population or the settings in which they are administered.

The primary aim of evaluating any instrument (see table 1 for the description of each instrument) is to determine whether it measures accurately the characteristics of interest (14). Therefore, the instrument is considered satisfactory if the scores are shown to reflect important features of gambling behavior. Instrument evaluations are dependent upon the adequacy of their psychometric properties, including reliability, validity, and classification accuracy. Reliability is often defined as consistency, repeatability, and stability (15). Reliability can be influenced by factors such as the number of items in the scale, number of respondents used in the evaluation and the types of respondents utilized in the development and evaluation of the instrument. There are two types of reliability—temporal stability and internal consistency. Temporal stability measured by test-retest procedures and reported as correlation coefficients, involve administering the test to the same individual at two points in time, typically within a fairly short time period of a few days or a week (It is assumed that the characteristics of interest have not changed over this brief time period). This mathematical construct, usually shown as "*r*" expresses the extent of correspondence or magnitude of the relationship between two scores. It ranges from 0, indicating no relationship, to 1, indicating perfect correspondence between the two scores. In order to demonstrate

Table 1. *Descriptions of Instruments*

Name of Instrument (year)	Content Areas	Number of items; response options; time frame	Administration Time and Method	Scoring instructions, score range, cut-scores, interpretation of scores
SOGS-RA (1990)	signs and symptoms of problem gambling; negative consequences	12 items; yes/no; past year	10 minute paper and pencil questionnaire	Each item is one point; score range 0-12; 0-1 = no problem; 2-3 = at risk gambling; 4+ I = problem gambling;
DSM-IV-J and DSM-IV-MR-J (1992; 2000)	DSM-IV diagnostic criteria	9 criteria measured by 12 items; yes/no (DSM-IV-J) and multiple response options (DSM-IV-MR-J); past year	5-10 minute paper and pencil questionnaire	each item is one point; score range is 0-9; score of 4 or more is classified as a problem gambler
MAGS (1994)	psychological and social problems associated with gambling	14-items; 7 items are scored in a scale based on item weights from a discriminant function analysis; yes/no; past year time frame	5-10 minute interview or paper and pencil questionnaire	Each item is scored 0 for no and 1 for yes. Each item score is multiplied by a weight and then summed along with a constant using a weighted scoring algorithm derived from a discriminant function analysis. The MAGS classifies respondents into non-pathological gambling, transitional gambling, or pathological gambling
CAGI (2007)	gambling frequency; time spent gambling; money spent gambling; gambling problem severity (behaviors and consequences)	45 items measuring five domains: (a) gambling problem severity; (b) psychological consequences; (c) social consequences; (d) financial consequences; and (e) loss of control; four-point multiple response options, past three months time frame	20 minutes; paper and pencil questionnaire	9 item gambling problem severity subscale has a score range of 0 to 27

Table 1. *Descriptions of Instruments* (continued)

	Psychometrics		Classification Accuracy Indices
Name of Instrument	Reliability	Validity	Sample characteristics, criterion, base rate, sensitivity, specificity, and hit rate
SOGS-RA	*alpha* = .80; Two week test-retest *kappa* = .57 and *alpha* of .81 and .76 for males and females respectively (Poulin, 2000); *alpha* of .74 (Welte, et al, 2008)	gambling activity (*r* = .39), gambling frequency (*r* =.54) and amount of money gambled in past year (*r* =.42)	using a criterion of DSM-IV-J, 97% true positive; 0.5% false negative; and 2.4% false positives (Derevensky & Gupta, 2000); using two criteria of self-identified need for help and receipt of help, 96% were correctly classified, however, sensitivity was about 60% and specificity was 96% for both proxies (Boudreau & Poulin, 2007).
DSM-IV-J and DSM-IV-MR-J	*alpha* = .75	significantly different mean scores between regular and non-regular gamblers and between problem and social gamblers. DSM-IV-MR-J problem gamblers also tended to play more games regularly, spend more money, borrow to fund their gambling, and sell their possessions to fund their gambling; DSM-IV-J related to the SOGS-RA (*r* = .67) and GA 20 (*r* = .68) (Derevensky & Gupta, 2000)	NA
MAGS (1994)	*alpha* = .83	MAGS score obtained a high correlation (*r* = .76) with DSM-IV score.	Sample was 589 Boston, MA high school students who reported gambling in the past year. Criterion was DSM-IV diagnostic criteria as measured by a 12 item instrument. See development article for classification accuracy indices. Note that these classification accuracy indices are based on a discriminant function analysis computed on the development sample and therefore other MAGS users are not likely to obtain as high an accuracy.
(CAGI) (2007)	alphas range from .74 to .88; test-retest ranged from r = .60 to .91	Correlated with gambling frequency (r = .32 to r = .55) and money spent gambling (r = .12 to r = .50).	NA

satisfactory temporal stability, a test-retest correlation of r =.70 or higher typically needs to be obtained.

Reliability is also measured by looking at the internal consistency of the test items. Internal consistency is the concept that a set of items are all measuring the same construct. One way of measuring internal consistency is by comparing the score on half of the items to the score on the other half of the items. This split-half reliability is measured in terms of the correlation coefficient r. Another approach to measuring internal consistency is to utilize statistical techniques that measure the homogeneity of the scale, commonly measured by Cronbach's (16) *alpha*, a coefficient that ranges from 0 to 1. The higher the *alpha*, the greater the internal consistency of the scale. As a criterion, Nunnally (15) recommends that an *alpha* of .90 be used as the minimum standard and an *alpha* of .95 is desirable in applied settings where a test score is used to make important decisions.

Validity is defined as whether the instrument measures the construct it purports to measure (14). One type of validity is content validity, that is, do the scale items cover the various features of the construct being measured. A second type of validity is criterion-related validity. Criterion-related validity is commonly assessed by measuring correlations between the scale of interest and other scales that measure the same construct. In order to demonstrate validity, a new scale should be correlated with existing scales of the same construct that have already demonstrated satisfactory psychometric properties. For example, a new scale to measure problem gambling may be correlated with the SOGS, an instrument with demonstrated satisfactory psychometric properties.

Nunnally (15) and Cicchetti (17) suggested that validity correlations greater than r = .30, provide support for convergent validity. Finally, another validity indicator is how well the instrument is able to discriminate between two target samples. For example, a new measure of problem gambling should obtain high scores when administered to a sample of gambling treatment clients and low scores when administered to a sample from the general population.

Another measure of an instrument's utility and performance is referred to as classification accuracy (18,19). That is, how well does the instrument identify those with and without the disorder. The classification accuracy is typically assessed with a number of coefficients, including *sensitivity, specificity, false positive rate, false negative rate, positive predictive power, and negative predictive power. Sensitivity* is the true positive rate, that is, the rate of positive test results among those with the disorder, and *specificity* is the true negative rate, that is, the rate of negative test results among those without the disorder. *False positive rates* represent the percent of positive test results among individuals without the disorder and *false negative rate* is the percent of negative test results among those with the disorder. *Positive predictive power* is the rate of true-positive results among all positive test results. *Negative predictive power* is the rate of true-negative results among all negative test results.

South Oaks Gambling Screen—Revised for Adolescents (SOGS-RA)

Given the widespread use of the SOGS, Winters, Stinchfield, and Fulkerson (4) revised the adult SOGS for an adolescent problem gambling survey in Minnesota. At

the time, 1989, there was no instrument to identify adolescent problem gamblers. Jacobs (20) had used the Gamblers Anonymous 20 questions in a youth study and Lesieur and Klein (21) had used DSM-III-based questions for their adolescent survey, but neither study reported detailed psychometric information on either instrument. As a result, Winters, Stinchfield and Fulkerson (4) adapted the most commonly used adult instrument, the SOGS, for adolescents and referred to it as the SOGS-Revised for Adolescents (SOGS-RA). The investigators revised the original SOGS by changing the lifetime time frame to a past 12-months time frame which seemed more developmentally appropriate for adolescents as they do not have as much life experience as adults and they tend to live more in the present than adults. Other revisions included changing the wording of items and response options to better reflect adolescent gambling behavior and youth reading levels, eliminating two items that were viewed as having poor content validity for adolescents; and retaining only one item for sources of borrowed money rather than nine items as is done with the SOGS. The SOGS-RA consists of 12 items and a copy of the SOGS-RA as well as a detailed description of the revisions can be found in Winters, Stinchfield, and Fulkerson (4). Reliability and validity coefficients were computed on 460 males aged 15-18 years, and the internal consistency reliability was *alpha* = .80. In terms of validity, the SOGS-RA was correlated with gambling activity (r = .39), gambling frequency (r = .54) and amount of money gambled in past year (r =.42) (4). The SOGS-RA was able to discriminate between youth who gambled regularly and those who did not. Since its development, the SOGS-RA has been used in a wide number of adolescent-gambling surveys (13,22).

Two scoring procedures have been used with the SOGS-RA, yet neither system has received extensive psychometric and classification accuracy analyses. These two scoring systems have come to be referred to as the SOGS-RA "broad" and "narrow" criteria (23). The broad criteria are based on a combination of gambling frequency and SOGS-RA score. To be classified as a problem gambler under the broad criteria, the respondent has to gamble at least weekly and obtain a SOGS-RA score of two or more; or gamble daily, regardless of SOGS-RA score (5). Under the SOGS-RA narrow criteria a cut score of four or more indicates a problem gambler, a score of 2-3 indicates an at-risk gambler, and a score of 0-1 is a non-problem gambler (23).

Because these two sets of SOGS-RA scoring criteria have caused some confusion, the problems associated with the broad criteria will be addressed. The SOGS-RA broad criteria are problematic for a number of reasons. First, Winters and Stinchfield (23) moved from the broad criteria in 1993 to the more narrow criteria in 1995 because of the low threshold for problem gambling of the broad criteria; and re-analyzed the original 1990 Minnesota data using the narrow criteria. Second, the broad criteria are not exhaustive of all patterns of gambling problem severity because not all patterns were present in the original data and that the response options for gambling frequency items were limited to either daily, weekly, monthly, less than monthly, and not at all. Gambling more often than weekly and less often than daily is missing from the broad criteria (i.e., gambling between two and six days per week). Third, most recent studies that have used the SOGS-RA have used the narrow criteria and there appears to be a consensus among most users of the SOGS-RA that the

narrow criteria are preferred over the broad criteria.

Fourth, the broad criteria are probably "too broad". The SOGS-RA broad criteria define problem gambling as daily gambling and this is a questionable criterion for problem gambling—it is not found in either the SOGS or the DSM criteria. Does daily gambling indicate problem or pathological gambling? Not necessarily. The broad criteria considers a score of 2 as problem gambling and given that it is fairly easy to endorse two SOGS-RA items, particularly the subjective items, this also seems to be too low a threshold for problem gambling. The narrow criteria cut-score of 4 is similar to the SOGS and DSM-IV cut-scores of five. Fifth, the SOGS was originally intended to correlate with diagnostic criteria for pathological gambling, and this is how most users interpret a SOGS cut-score, whereas, the SOGS-RA broad criteria are not close to that level of problem severity. Sixth, although some convergent validity information was reported for the broad criteria in the original SOGS-RA study, it did not provide any classification accuracy information. Seventh, a minor additional point about the SOGS-RA broad criteria is that the category "no problem gambling" is misleading as it suggests that all cases in this category are gamblers when in fact this category includes non-gamblers. For these reasons, it is recommended that the SOGS-RA narrow criteria be used rather than the broad criteria for identifying adolescent problem gamblers, at least until further research on the classification accuracy of the SOGS-RA is conducted.

A few studies have examined the psychometric properties and cut score of the SOGS-RA. In terms of the cut score, some investigators have chosen to raise it above four. Govoni, Rupcich and Frisch (24) rejected the broad criteria as yielding "unreasonable estimates of problem and at risk gambling" and raised the cut score to 5 or more to reflect the same cut score that is used with the adult SOGS, however, they did not have a criterion to compare against and they gave no classification accuracy information for this new cut score.

Derevensky and Gupta (25) compared the SOGS-RA with the DSM-IV-J and GA 20. The authors noted some item content differences between these scales and found the DSM-IV-J to have obtained the more conservative estimate of problem gambling prevalence (3.4%) as compared to the SOGS-RA (5.3%). There was a fairly high degree of classification agreement between the SOGS-RA and DSM-IV-J. The SOGS-RA when compared to the DSM-IV-J as the criterion, yielded 97% True Positive; 0.5% False Negative; and 2.4% False Positives.

Ladouceur et al (26) raised the question as to whether adolescents understand SOGS-RA items. It should be noted that there are some errors in their description of the SOGS-RA. Ladouceur et al describe the SOGS-RA as having 19 scored items when it is only 12 items, however, the Table provided indicated they only scored 12 items. The authors indicated that the cut score is 5 and this indicates Probable Pathological Gambling, when the published cut score is 4 indicating problem gambling. They found that adolescents misunderstood SOGS-RA items and that after clarification their SOGS-RA score was lower on retest. The authors conclude that this misunderstanding of item content could cause inflated prevalence rates (See Derevensky, Gupta, and Winters (27) for a critical review of this study).

Wiebe, Cox and Mehmel (28) examined the psychometric properties of the SOGS-RA in a community sample of adolescents. The authors found over- and under-endorsement of some items by problem

gamblers versus at risk gamblers, suggesting that item weighting, deleting items or rewriting items may improve the classification accuracy of the SOGS-RA. They also found a two factor solution that was interpretable as gambling consequences and lack of control over gambling.

Poulin (29) used the SOGS-RA in a survey of adolescents in the Atlantic provinces of Canada and found the broad criteria to be "complex and ambiguous"... and not "exhaustive and mutually exclusive". She also found the narrow criteria to be problematic because of the lack of an adequate rationale for a cut score of 4 or more to define problem gambling. Poulin (30) also used this same survey data to conduct a psychometric study of the SOGS-RA and found three factors, which she labeled "self-awareness of one's problem gambling, insight into others' assessment of one's problem gambling, and expedient measures to address the negative financial consequences of problem gambling." Two week test-retest stability showed fair to good agreement, with a *kappa* for the narrow criteria of .57. Internal consistency was satisfactory with a Cronbach's alpha of .81 and .76 for males and females respectively. She also notes that the cut point may be too high because it only classified 26% of male daily gamblers and 9% of female daily gamblers as problem gamblers. However, I would contend that there is not a perfect relationship between gambling frequency and problem gambling and therefore, this failure to classify daily gamblers as non-problem gamblers should not be a concern.

Derevensky, Gupta and Winters (27) addressed the issue of high prevalence rates, the arguments that they are inflated, and the role of the SOGS-RA in this debate. The authors concluded that most arguments against the high prevalence rates, some of which are measured with the SOGS-RA, do not hold up, but more psychometric research is needed.

Langhinrichsen-Rohling, Rohling, Rohde, and Seeley (31) examined the SOGS-RA cut score as it compares to the MAGS. The author found a lack of congruence between the SOGS-RA and the MAGS for classifying problem gamblers. The SOGS-RA classified 80 of 1,395 high school students who had gambled in the past year as problem gamblers using a cut score of 4 or more, and the MAGS classified only 26 as problem gamblers. The authors concluded that the prevalence estimates of adolescent problem gambling vary as a function of the instrument used. In response to this disparity, they suggested creating a fourth category for the SOGS-RA, using a cut score of 6 or more to indicate Probable Pathological Gambling, which improved the agreement rate between the SOGS-RA and MAGS. This study exhibited some limitations, including the use of different time frames for SOGS-RA (past 12 months) versus the MAGS (lifetime), however, the MAGS development article used a past 12 months time-frame (9). The authors report that the MAGS item "arrested for gambling" was the best item for discriminating the "probable pathological gamblers from all the other groups", however, this raises a question as to the validity of this response. How many high school students get arrested for gambling?

Ladouceur et al (32) compared the SOGS-RA to DSM-IV criteria in a sample of 631 adolescents. The SOGS-RA identified 93 adolescents as Problem Gamblers. Of those 93, only 7 were confirmed as Pathological Gamblers through clinical interview conducted 1 or 2 weeks later. While this study shows evidence of the likely discordant results obtained from the SOGS-RA versus DSM-IV diagnostic criteria, numerous weaknesses limit the

validity of the results. One of the weaknesses is the 1- to 2-week time delay between the administration of the SOGS-RA and the clinical interview, which itself can lead to disagreement. Another weakness is that the two measures were administered by different methods (self-administered paper-and-pencil questionnaire in a classroom setting versus face-to-face interview), therefore the method of test administration becomes a confound and possible alternative explanation for the discordant results. Another weakness is the lack of details about the clinical interview content, reliability, validity and classification accuracy. The clinical interview was deemed the criterion or gold standard for this study, however, no information about the reliability, validity, or classification accuracy of this "gold standard" was provided. Still further, the investigators failed to score the DSM-IV criteria, but rather used another party who listened to the recorded interviews and made a diagnosis. This diagnostician was not the interviewer and therefore could not probe or clarify any criteria that may have been vague or ambiguous. While the authors' provide a Cohen's *kappa* of .74, it is not clear which two classifications are being compared and it is not clear how discrepancies between diagnosticians were resolved, since the classifications were not in perfect agreement. The authors call for a consensus on a definition of adolescent pathological gambling. So, while this study raises questions about the classification accuracy of the SOGS-RA, it is in no way a conclusive study. The SOGS-RA is not likely to match up perfectly with DSM-IV criteria, but this study does not rigorously demonstrate that likelihood.

Olason, Sigurdardottir and Smari (33) compared the SOGS-RA with the DSM-IV-MR-J in a prevalence survey of 750 adolescents in Iceland. The authors computed a Principal Components Analysis and reported a one-factor solution accounting for 37% of the variance and a coefficient alpha of .81. The correlation between the SOGS-RA and DSM-IV-MR-J was $r = .79$. They reported that the SOGS-RA identified 2.7% with problem gambling which was slightly more than the 2% identified by the DSM-IV-MR-J and a concordance rate of *kappa* = .62.

Boudreau and Poulin (34) compared the SOGS-RA cut score of 4 or more to indicate problem gambling to two gold standard proxies of self-identified need for help with their gambling and receipt of help for gambling. This was a very creative study in its use of criteria other than DSM-IV, however, the criteria items are of unknown validity. The investigators found the SOGS-RA, using a cut score of four, correctly classified 96% of these two proxies, however, the SOGS-RA demonstrated poor sensitivity at about 60% for both proxies. The SOGS-RA identified 59% of those 80 youth who self-identified as needing help (0.9%) and 62% of those 54 youth who received help (0.7%). In other words, the SOGS-RA did not identify 41% of those youth who self-identified as needing help; and did not identify 38% of those youth who reported receiving help. Specificity was 96% for both proxies. To improve sensitivity, the authors suggest that the cut score should be lowered; however, this study was the only one that suggested lowering the SOGS-RA cut score to improve accuracy.

Welte et al (35) used the SOGS-RA in a national survey of 2,274 United States (US) respondents who were 14-21 year olds and found the SOGS-RA had a Cronbach's *alpha* of .74, indicating satisfactory internal consistency. Using the SOGS-RA and a cut score of 4 or more they reported a 2.1% rate

of problem gambling. The authors also measured DSM-IV diagnostic criteria by administering the Diagnostic Interview Schedule (DIS) and reported a 0.4% rate of pathological gambling. They did not directly compare the SOGS-RA to the DIS, but the SOGS-RA obtained a higher rate of problem gambling than the DSM-IV rate of pathological gambling.

DSM-IV-J and DSM-IV-MR-J (J=Juvenile) (MR=Multiple Response)

Fisher (7) developed a 12-item questionnaire to measure 9 of 10 DSM-IV diagnostic criteria of PG in juvenile fruit machine players in the UK and it was the first adaptation of DSM-IV criteria for youth. The DSM-IV-J response options are 'yes' or 'no'. The DSM-IV-J has been used in a number of studies around the world to measure problem gambling among adolescents, including the UK (36-41). The DSM-IV-J has been revised by changing the phrase "playing fruit machines" to "gambling" and by using multiple response options into the DSM-IV-MR-J (8).

The DSM-IV-MR-J also has 12 items to measure 9 of the 10 DSM-IV criteria, and the items are adapted from the DSM-IV criteria to reflect the developmental stage of youth. Fisher simplified the language and omitted details that were less relevant for youth. She excluded criterion 10, because "young problem gamblers tend to resolve desperate financial situations caused by gambling by illegal methods (incorporated in item 8)" (8). Eleven of the twelve items have four response options: 1) never; 2) once or twice; 3) sometimes and 4) often. Fisher (8) has a scoring system for the set of response options for each item to match the nine DSM-IV criteria. The score range is from 0 to 9, and a score of 4 or more is classified as a problem gambler. A factor analysis indicated a unidimensional scale with satisfactory internal consistency reliability (*alpha* = .75). In terms of validity, the DSM-IV-MR-J had significantly different mean scores between regular and non-regular gamblers and between problem and social gamblers. Respondents classified as problem gamblers by the DSM-IV-MR-J also tended to play more games regularly, spend more money, borrow to fund their gambling, and sell their possessions to fund their gambling; no correlation coefficients were provided however. The readability of the DSM-IV-MR-J test questions were at grade level 4.8, using the Fleisch-Kincaid Grade Level Test.

The DSM-IV-J does not match up identically with the DSM-IV-MR-J in that the DSM-IV-J is missing an item to measure the DSM-IV criterion for loss of control, that is, making repeatedly unsuccessful efforts to control, to cut back, or to stop gambling. Furthermore, the DSM-IV-J measures the criterion for financial bailout while the DSM-IV-MR-J does not. So, the DSM-IV-J and DSM-IV-MR-J measure somewhat different DSM-IV criteria. As such, neither scale measures all 10 DSM-IV criteria and the scales are not identical, which causes confusion by test users. Jacques and Ladouceur (43) report that this limitation may have occurred because Fisher was not working from the official DSM-IV criteria but rather a pre-DSM-IV version outlined by Lesieur and Rosenthal (43). While this was true for the DSM-IV-J published in 1992, Fisher did have the official criteria when the DSM-IV-MR-J article was published in 2000.

There are four concerns about the DSM-IV-MR-J. First, item #3 does not appear to match or concur with the DSM-IV criterion it is intended to measure. The DSM-IV criterion is "*Made repeated unsuccessful efforts to control, cut back, or stop gambling*"; and the item to measure this

criterion is "*In the past year have you ever spent much more than you planned to on gambling?*" This item appears to be more closely aligned to the earlier DSM-III-R criterion #2, "*frequent gambling with larger amounts of money or over a longer period of time than intended.*" Second, the exclusion of criterion 10 seems premature, given that clinicians and the media have reported that parents have paid the gambling debts of their children. Criterion 10 seems relevant for youth and until proven otherwise, it should not be excluded from an instrument intended to measure DSM-IV diagnostic criteria. Therefore, the DSM-IV-MR-J appears to measure 8 of the 10 DSM-IV criteria and lacks items to measure criteria 3 and 10. Third, multiple response options were included in the DSM-IV-MR-J, but these multiple response options appear to be ignored when it comes to scoring. The scoring instructions collapses the multiple response options into a dichotomous scoring of 0 or 1 for each item and therefore does not use the multiple response options in the scoring system (8). Why provide multiple response options if they will not be used to score the scale? Fourth, there is a lack of evidence of validity and no estimates of classification accuracy are provided by Fisher. The developer states that there is evidence of validity (significant differences between groups), however, insufficient detail is provided to judge the value of this evidence. For example, we do not know how the groups (problem gamblers versus social gamblers) were selected or identified or what criteria were used to classify them as problem gamblers versus social gamblers.

Derevensky and Gupta (25) compared the DSM-IV-J with the SOGS-RA and GA 20. The authors found the DSM-IV-J to yield the lowest estimate of problem gambling of the three measures. In terms of convergent validity, they found the DSM-IV-J to be related to the SOGS-RA (r = .67) and GA 20 (r = .68). No classification accuracy information was reported because the DSM-IV-J was used as the criterion to test the classification accuracy of the SOGS-RA and GA 20; however, there was a fairly high degree of agreement between the instruments.

Jacques and Ladouceur (42) examined the confusion regarding the scoring of the DSM-IV-J. The nine DSM-IV-J criteria are measured by 12 items and some investigators have made the error of computing the cut score from all 12 items rather than from the nine criteria. This error can make a difference in the reported prevalence rate and therefore investigators are urged to follow the scoring instructions for nine criteria.

Olason, Sigurdardottir and Smari (33) compared the DSM-IV-MR-J with the SOGS-RA in a prevalence survey of 750 adolescents in Iceland. The authors computed a Principal Components Analysis and reported a one-factor solution accounting for 41% of the variance and a coefficient alpha of .78. The correlation between the DSM-IV-MR-J and SOGS-RA was $r = .79$. They reported that the DSM-IV-MR-J identified 2% with problem gambling that was slightly less than the 2.7% identified by the SOGS-RA and a concordance rate of *kappa* = .62.

Massachusetts Gambling Screen (MAGS)

Shaffer et al (9) developed the Massachusetts Gambling Screen (MAGS), a 7-item screening instrument designed to measure the gambling problems of excessive gamblers and to obtain an estimate of the prevalence of problem gambling. The MAGS was developed in 1993 on a sample of 589 Boston high school students who had gambled in the past year. The MAGS was not developed exclusively for adolescents, but because the development sample

comprised high school students and also because the "A" in the acronym MAGS has oftentimes mistakenly been referred to as Adolescent, rather than MA for Massachusetts, the MAGS is erroneously referred to as an adolescent instrument. Nevertheless, Shaffer and colleagues indicate that the instrument was developed for both adolescents and adults. The MAGS inquires about behavior during the past year. The MAGS includes 14 items adapted from the Short Michigan Alcoholism Screening Test (SMAST), an alcoholism screen developed by Selzer, Vonokur, and van Rooijen (10). Of these 14 items, 7 were selected as the best discriminators in a discriminant function analysis, and the MAGS comprises these 7 items. In the MAGS development study, a measure of DSM-IV diagnostic criteria for PG was also developed, consisting of 12 items, which served as the criterion. Each item is assigned a 0 for a 'no' response and a 1 for a 'yes' response. Scoring is based on item weights that are multiplied by each item score and summed, along with a constant. The MAGS classifies respondents into three categories: a) non-pathological gambling, b) transitional gambling, or c) pathological gambling. Cut scores are based on a weighted scoring equation derived from a discriminant function analysis. The 7-item MAGS scale had an internal consistency reliability coefficient *alpha* of .83. In terms of validity, the MAGS total discriminant score obtained a high correlation (r =.76) with total DSM-IV score.

The brevity of the MAGS is one of its strong points. However, one concern is the use of item weights for scoring that were derived from the development sample of a limited number of high school students. While item weights may have provided excellent classification accuracy in the development sample, it is unlikely that this same level of accuracy will be maintained when administered to other samples. Item weights can be unique to a given sample and therefore may not generalize to other samples. This issue requires further research.

The MAGS was compared with the SOGS-RA by Langhinrichsen-Rohling, et al. (31) in a survey of high school students. The MAGS and SOGS-RA were found to have little concordance in their classifications and the MAGS yielded much more conservative estimates than the SOGS-RA. The MAGS only classified 26 as probable pathological gamblers of the 1,395 high school students who had gambled in the past year as problem gamblers while the SOGS-RA classified 80 as problem gamblers. The authors concluded that the prevalence estimates of adolescent problem gambling vary as a function of the instrument used. This study exhibited some limitations, including the use of different time frames for SOGS-RA (past 12 months) versus the MAGS (lifetime), however, the MAGS development article used a past-12-months time frame (9). As noted above, the authors report that the MAGS item "arrested for gambling" was the best item for discriminating the "probable pathological gamblers from all the other groups", however, this raises a question as to the validity of this response. How many high school students get arrested for gambling?

Canadian Adolescent Gambling Inventory (CAGI)

The most recent adolescent instrument to be developed is the Canadian Adolescent Gambling Inventory (CAGI) (11,12). This adolescent instrument is not the typical adaptation of an adult instrument, but rather followed an instrument development process of defining the behaviors of interest, creating an item pool, pilot testing items with adolescent focus groups, and

conducting procedures to obtain initial estimates of reliability, validity, and classification accuracy. The goal of the CAGI was to develop a scale specifically for adolescents, rather than revise an adult instrument. The intent was to develop a scale that represents a continuum of gambling problem severity from low to high problem severity, rather than items that tap into high problem severity alone, as is done with adult scales that have been adapted for youth, such as the DSM-IV-J. The CAGI moves beyond a single, simple scale to the measurement of more complex, multiple domains of gambling problem severity. The CAGI measures the two main elements of youth gambling, gambling behavior itself, and gambling problem severity, including preoccupation and negative consequences. The development of the CAGI included defining the behaviors of interest, creating an item pool, pilot testing items with adolescent focus groups, psychometric analyses of items and scales, and procedures to obtain estimates of reliability, validity, and classification accuracy.

The CAGI has a past three months time frame and measures five areas: a) types of gambling activities played; b) frequency of participation for each gambling activity; c) time spent gambling for each activity; d) money spent gambling, and e) gambling problem severity. The CAGI is available in both English and French language versions. The gambling activities section includes a fake gambling item to test for validity of self-report. The gambling problem severity items have four-point response options. While it is still under development, there is a working draft of the instrument and preliminary psychometric estimates.

Temporal stability was measured with a test-retest procedure 7-14 days apart and test-retest correlations ranged from acceptable (r = .60) to excellent (r = .91). Internal consistency measured with Cronbach's *alpha* ranged from .74 to .88. In terms of convergent validity, the CAGI scales were correlated with gambling frequency (r = .32 to r = .55) and money spent gambling (r = .12 to r = .50).

CONCLUSIONS

In response to the need for instruments to measure problem gambling among adolescents, a small number of instruments have been developed. Most of these instruments have been developed by adapting adult instruments for adolescents and this is a questionable practice given that problem gambling among adolescents is believed to have somewhat different characteristics than among adults. Developers who have adapted adult scales for adolescents have also tended to use a lower cut score to indicate problem gambling in adolescents than is used to indicate problem gambling for adults. For example, the cut score on the SOGS is five, but the cut score on the SOGS-RA is four; and the cut score on the DSM-IV is five and the cut score on the DSM-IV-MR-J is four.

Large differences have been reported in prevalence rates in epidemiological studies of adolescent problem gambling, from as low as 0.3% to as high as 10% (13,22,44), and at least part of this discrepancy is likely attributable to imprecision in existing adolescent assessment tools. As this review has shown, these instruments have little information on their psychometric properties and in particular, there has been a lack of rigorous research on the classification accuracy of these instruments. This may, in part, explain the wide range of prevalence estimates reported in gambling surveys. The adult instruments from which the adolescent instruments were adapted were developed for clinical purposes but

have often been used for other purposes and populations. The psychometric properties of an instrument must be investigated for the different settings and the populations for which it is applied. The classification accuracy of an instrument is affected by the base rate of the disorder within the population to which it is being applied, and therefore an instrument developed to measure PG in a clinical sample where the base rate is fairly high will have weaker classification accuracy when applied to the general population where the base rate is extremely low. The current state of adolescent problem gambling assessment makes it difficult for a clinician or researcher to select a psychometrically sound instrument that will measure problem gambling in a population of interest. A number of steps must be taken to address these issues.

First, existing instruments have to be put to rigorous psychometric evaluation, and this research will build a body of evidence for (or against) the reliability, validity, and classification accuracy of existing adolescent problem gambling instruments. Research on the psychometric properties of these instruments has to be conducted for the settings and populations in which they are used, such as students in a school setting. This research will justify the continued use of those instruments found to exhibit satisfactory reliability, validity, and classification accuracy, and will serve to encourage the revision and refinement of those instruments found lacking.

Second, for the assessment of adolescent problem gambling, new instruments must be developed that take into account the developmental issues of youth at different ages. This effort should include refining the definition of problem gambling for youth with a focus on describing the phenomenon of problem gambling among youth. Is adolescent problem gambling the same as or different from adult problem gambling? Is youth problem gambling the same or different at varying ages and developmental stages? Gambling is exhibited by 8- and 9-year old children as well as young adults. How does problem gambling display itself in youth of varying ages and developmental stages? Can the same instrument be used for youth of varying ages and developmental stages? Can the same cut score be used for youth of varying ages and developmental stages?

Third, investigators must use scientific standards for test development. It is recommended that investigators and test users follow the standards for testing set forth by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (45). These guidelines describe technical standards for test construction and evaluation, including reliability and validity. The use of these guidelines will facilitate the development of psychometrically sound instruments that will be recognized as standards in the field.

Fourth, DSM-IV diagnostic criteria for PG are used to make clinical, scientific, and public policy decisions. The DSM-IV diagnostic criteria are the accepted standard for the identification of PG but some (or all) of the criteria may not be relevant for youth. Debate continues about the adequacy of definitions and diagnostic criteria of pathological gambling, particularly as it applies to youth (11,12,13,44). Therefore, one of the most pressing questions in the field of adolescent problem gambling is: What criteria should be used to diagnose adolescent PG?

Psychometric research on measures of adolescent PG will lead to refinement of measurement tools and greater precision, which is the mark of good science. After a

body of research has been generated, the goal of a "gold standard" instrument(s) to measure adolescent PG, or at least one that receives favorable consensus, will be achieved.

REFERENCES

1. Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. Am J Psychiatry 1987;144:1184-8.
2. Lesieur HR, Blume SB. Revising the South Oaks Gambling Screen in different settings. J Gambl Stud 1993; 9:213-23.
3. Stinchfield R.Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). Addict Behav 2001;27:1-19.
4. Winters KC, Stinchfield R, Fulkerson J. Towards the development of an adolescent gambling problem severity scale. J Gambl Stud 1993; 9:63-84.
5. Winters KC, Stinchfield R, Fulkerson J. Patterns and characteristics of adoles-cent gambling. J Gambl Stud 1993;9: 371-86.
6. American Psychiatric Association. Diagnostic and statistical manual of Mental Disorders. Fourth Edition. Washington, DC: Author, 1994.
7. Fisher SE. Measuring pathological gambling in children: The case of fruit machines in the UK. J Gambl Stud 1992;8:263-85.
8. Fisher S. Developing the DSM-IV-MR-J criteria to identify adolescent problem gambling in non-clinical populations. J Gambl Stud 2000;16: 253-73.
9. Shaffer HJ, LaBrie R, Scanlon KM, Cummings TN. Pathological gambling among adolescents: Massachusetts Gambling Screen (MAGS). J Gambl Stud 1994;10:339-62.
10. Selzer ML, Vonokur A, van Rooijen L. A self-administered short Michigan alcoholism screening test (SMAST). J Stud Alcohol 1975;36:117-26.
11. Wiebe J, Wynne H, Stinchfield R, Tremblay J. Measuring problem gambling in adolescent populations: Phase I report. Canadian Centre on Substance Abuse, 2005.
12. Wiebe J, Wynne H, Stinchfield R, Tremblay J. The Canadian Adolescent Gambling Inventory (CAGI): Phase II Final Report. Canadian Centre on Substance Abuse, 2007. Available at: http://www. gamblingresearch.org
13. National Research Council. Pathological gambling: A critical review. Washington, DC: Natl Acad Press, 1999.
14. Alle n MJ, Yen WM. Introduction to measurement theory. Monterey, CA: Brooks/Cole, 1979.
15. Nu nnally JC. Psychometric theory (2nd Ed.). New York: McGraw-Hill, 1978.
16. Cronbach L. Coefficient alpha and the internal structure of tests. Psychometrika 1951;16:297-334.
17. Cicche tti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychol Assess 1994;6:284-90.
18. Baldess arini RJ, Finklestein S, Arana GW. The predictive power of diagnostic tests and the effect of prevalence of illness. Arch Gen Psychiatry 1983;40: 569-73.
19. Fleis s JL. Statistical methods for rates and proportions (2nd ed.). New York: Wiley, 1981.
20. Jacobs DF. Illegal and undocumented: A review of teenage gamblers in America. In: Shaffer HJ, Stein SA, Gambino B, Cummings TN, eds.

Compulsive gambling: Theory, research and practice. Lexington, MA: Lexington Books, 1989:249-92.
21. Lesieur HR, Klein R. Pathological gambling among high school students. Addict Behav 1987;12:129-35.
22. Shaffer HJ, Hall MN. Estimating the prevalence of adolescent gambling disorders: A quantitative synthesis and guide toward standard gambling nomenclature. J Gambl Stud 1996;12 (2): 193-214.
23. Winters KC, Stinchfield R Kim L. Monitoring adolescent gambling in Minnesota. J Gambl Stud 1995;11: 165-83.
24. Govoni R, Rupcich N, Frisch GR. Gambling behavior of adolescent gamblers. J Gambl Stud 1996;12: 305-17.
25. Dereven sky JL, Gupta R. Preva-lence estimates of adolescent gambling: A comparison of the SOGS-RA, DSM-IV-J, and the GA 20 questions. J Gambl Stud 2000; 16:227-51.
26. Ladouceur R, Bouchard C, Rheaume N, Jacques C, Ferland F, Leblond J, Walker M. Is the SOGS an accurate measure of pathological gambling among children, adolescents and adults? J Gambl Stud 2000;16:1-24.
27. Dereven sky JL, Gupta R, Winters K. Prevalence rates of youth gambling problems: Are the current rates inflated? J Gambl Stud 2003;19(4): 405-25.
28. Wiebe J, Cox BJ, Mehmel BG. The South Oaks Gambling Screen Revised for Adolescents (SOGS-RA): Further psychometric findings from a community sample. J Gambl Stud 2000;16:275-88.
29. Poulin C. Problem gambling among adolescent students in the Atlantic provinces of Canada. J Gambl Stud 2000;16:53-78.
30. Poulin C. An assessment of the validity and reliability of the SOGS-RA. J Gambl Stud 2002;18 (1):67-93.
31. Langhinrichsen-Rohling J, Rohling ML, Rohde P, Seeley JR. The SOGS-RA vs. the MAGS-7: Prevalence estimates and classification congruence. J Gambl Stud 2004;20(3): 259-81.
32. Ladouceur R, Ferland F, Poulin C, Vitaro F, Wiebe J. Concordance between the SOGS-RA and the DSM-IV criteria for pathological gambling among youth. Psychol Addict Behav 2005;19(3):271-6.
33. Olason DT, Sigurdardottir KJ, Smari J. Prevalence estimates of gambling participation and problem gambling among 16-18 year old students in Iceland: A comparison of the SOGS-RA and DSM-IV-MR-J. J Gambl Stud 2006;22(1):23-39.
34. Boudreau B, Poulin C. The South Oaks Gambling Screen-revised Adolescent (SOGS-RA) revisited: A cut-point analysis. J Gambl Stud 2007;23:299-308.
35. Welte JW, Barnes GM, Tidwell MO, Hoffman JH. The prevalence of problem gambling among U.S. adolescents and young adults: Results from a national survey. J Gambl Stud 2008;24:119-33.
36. Fisher SE. Gambling and pathological gambling in adolescents. J Gambl Stud 1993;9:277-87.
37. Fisher SE. The amusement arcade as a social space for adolescents. J Adolesc 1995;18:71-86.
38. Fisher SE. A prevalence study of gambling and problem gambling in British adolescents. Addict Res 1999;7:509-38.
39. Wood RTA, Griffiths MD. The acquisition, development and maintenance

of lottery and scratchcard gambling in adolescence. J Adolesc 1998;21:265-73.
40. Becona E. Pathological gambling in Spanish children and adolescents: An emerging problem. Psychol Rep 1997; 81:275-87.
41. Gupta R, Derevensky J. Adolescent gambling behaviour: A prevalence study and examination of the correlates associated with excessive gambling. J Gambl Stud 1998; 14:319-45.
42. Jacques C, Ladouceur R. DSM-IV-J criteria: A scoring error that may be modifying the estimates of pathological gambling among youths. J Gambl Stud 2003;19(4):427-31.
43. Lesieur HR, Rosenthal RJ. Pathological gambling: A review of the literature (Prepared for the American Psychiatric Association Task Force on DSM-IV Committee on Disorders of Impulse Control Not Elsewhere Classified). J Gambl Stud 1991;7:5-39.
44. Shaffer HJ, Hall MN, Vander Bilt J. Estimating the prevalence of disordered gambling behavior in the United States and Canada: A meta-analysis. Boston: Harvard Med School, Div Addict, 1997.
45. American Educational Research Association, American Psychological Association and National Council on Measurement in Education. Standards for educational and psychological testing. Washington, DC: Am Psychol Assoc, 1985.

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):95-111

Adolescent gambling: Current trends in treatment and future directions

Becky L Nastally, MS and Mark R Dixon, PhD

Behavior Analysis and Therapy Program, Rehabilitation Institute, Southern Illinois University, Carbondale, Illinois, United States of America

Abstract: Adolescent problem gambling is a growing cultural concern and this paper reviews the various research findings and treatment options that are available. Scientists have discovered a number of biological factors that may contribute to the development of adolescent gambling, including specific brain states, neurochemical levels, physiological arousal tendencies, and genetic predispositions. Additionally, a number of psychological processes have been revealed, including the need to escape from psychological stress, the possession of certain cognitive fallacies, and the construction of incorrect rules about the gambling event itself. Effective treatment can be developed through the incorporation of empirically-based research into the clinical approach. Current treatment options include pharmaceutical prescriptions, changing cultural practices, and the delivery of psychodynamic, cognitive, and behavioral therapy models. An analysis of the gap between science and practice is described, and possible solutions to bridge this gap are provided.

Keywords: Childhood gambling, pathological gambling, gambling treatment, gambling research, acceptance and commitment therapy

Correspondence: Mark R Dixon, PhD, Behavior Analysis and Therapy Program, Rehabilitation Institute, Southern Illinois University, Carbondale, IL 62901, United States. E-mail: mdixon@siu.edu

Submitted: September 05, 2009. ***Revised:*** October 10, 2009. ***Accepted:*** October 18, 2009.

INTRODUCTION

The imagination of a boy is healthy, and the mature imagination of a man is healthy; but there is a space of life between, in which the soul is in a ferment, the character undecided, the way of life uncertain, the ambition thick-sighted: thence proceeds mawkishness.

John Keats (1795-1821)

Musings about adolescence often involve recalling a time of self-discovery and freedom. Maybe teenage trials of alcohol, drugs, or free love result in regrets for some, but most would agree that without those experiences, they would not be the person they are in adulthood. Middle-aged adults will look at their children and wonder if anything has changed. They will wonder whether their kids will test the same limits or experiment with the same risky behaviors the parents once engaged in during childhood. Society must also ask itself the question: where do 'normal' adolescent impulsive behaviors stop and potentially harmful addictive patterns begin? Perhaps it is the increased accessibility, technology, and real threat of harm surrounding these behaviors today that makes actions that were once innocent rites of passage a cause for alarm. It is difficult to argue that things like the rise in

sexually transmitted diseases and the widespread social endorsement of gambling have had no effect on the current generation.

Within an analysis of the etiology and treatment of problem or pathological gambling, researchers, as well as the public, can no longer ignore this issue as it applies to adolescents. The numbers are staggering and hard to believe, so perhaps awareness is the first goal. Participation in adolescent gambling (among middle and high school students) has steadily increased, and in examining this problem more closely, some researchers have pointed to the greater availability and social approval of gambling. For example, 30 years ago only 2 states in the United States (US) allowed any legalized form of gambling, but today gambling is now legal in 48 out of 50 US states (exceptions are Utah and Hawaii) (1), and internet gambling allows residents to wager virtually anywhere. Because it appears that gambling regulation at least reduces the forms of gambling that adolescents can participate in, some may be quick to assume this is a social problem that is adequately controlled. However, even though youth are not permitted in casinos, adolescents are still finding ways to gamble. In this article, a review of treatment approaches for adolescent problem gambling is presented. The underlying premise is that effective treatment should be developed and guided by psychometrically sound assessments that detect the presence of the disorder and empirically validated research on physiological and/or psychological processes that contribute to the manifestation or maintenance of the disorder. The review will focus on both the processes at work that may sustain or reduce adolescent problem gambling and outline various treatment options that are currently available.

PHYSIOLOGICAL AND PSYCHOLOGICAL PROCESSES

The key to successful treatment of the problem adolescent gambler begins with an under-standing of how body and mind are affected by the gambling event itself. Additionally, it is important to understand that there are observed differences between problem and non-problem gamblers, both biologically and psychologically. Certain individuals may be more prone to gamble than others based on their biological makeup, as well as their reaction to gambling activities. Understanding how each contributes to the manifestation of a gambling problem is critical for determining the most effective possible treatment options.

Although research into the physiology involved in pathological gambling is in its early stages, much research has been conducted on the biological processes and from the neurocognitive perspective in the last decade. As with other impulse control disorders, it appears there is some evidence to suggest that abnormal serotonin levels exist in pathological gamblers (2). These findings have come from basic, neurobiological investigations (3), as well as from research on pharmacological treatments of pathological gambling (4). The release of dopamine, believed to be associated with behaviors that produce rewards or reinforcement (5), also may be involved in the physiology of pathological gambling (6). Growing research has also found an onset of problem gambling in older adults following introduction of pro-dopaminergic drugs for Parkinson's disease (7).

Recently, technology in functional magnetic resonance imaging, or fMRI, assessment has also made it possible to examine the neural correlates of behavior related to pathological gambling. A study by Potenza and his colleagues (8) found

that viewing videotapes depicting gambling scenarios evoked greater gambling urges for male pathological gamblers when compared with matched controls, and that such urges were associated with changes in patterns of activity in the frontal, paralimbic, and limbic structures of the brain. The results were supported by those of a similar study that employed gambling-related visual cueing and showed significantly greater activity in the prefrontal region of the brain in participants who were problem gamblers compared with matched controls (9). Further support for a neural basis of pathological gambling, similar to other impulse control disorders such as substance abuse, was provided in a study by Reuter et al. (10) that also found increased prefrontal activation in a pathological gambling participant sample when exposed to a guessing task. Similar results have been noted by Habib and Dixon (11), whereby pathological gamblers viewed actual slot machine spins and outcomes while in the fMRI scanner.

In addition to work done on the neurobiological chemistry involved in gambling, early biological conceptualizations of gambling include the role of subjective arousal (12). For example, a study by Anderson and Brown (13) on the differences between gambling in real casinos and analogue settings recorded elevated heart rates during gambling. The elevated heart rates were comparable to those observed with considerable exercise and were associated with riskier bets among high sensation seeking individuals. These findings have been supported in more recent research that has investigated increased arousal as measured by heart rate in gamblers specifically when winning compared with when losing (14) and in the context of treatment (15). A large portion of the research conducted on psychological processes of adolescent problem gamblers consists of correlational analyses that relate the gambling population to another clinical disorder, behavioral excess or deficit, or demographic condition (16-24). From this research has come a better understanding of the adolescent gambler profile and has shed light on what makes a young person at risk for developing a gambling problem. For example, adolescents with a gambling problem are more likely to engage in substance use (16,21), have parents with gambling problems (17), show signs of depression (18), attempt suicide (20), and engage in sexual activity (22) than their non-gambling counterparts. Many studies have concluded that problem gambling occurs more often in males (17,20,22) and that adolescents tend to gamble more as they get older (23).

Interestingly, some studies have found a relationship between the reasons why adolescents gamble or their beliefs and their level of pathology (21,23). For example, Lynch and colleagues (21) found that adolescents were more likely to report gambling for social reasons than to actually win money. It has also been found that, like adult problem gamblers, adolescent gamblers hold illogical beliefs about the independence of random events and their chances of winning as it relates to gambling (23). These findings are often linked with theory-driven models that attempt to explain the development of a gambling problem in adolescents (18,25-27). One example is that certain individuals possess personality traits that make them more susceptible to becoming problem or pathological gamblers. A recent study by Gupta, Derevnesky, and Ellenbogen (19) found that high levels of disinhibition, boredom susceptibility, cheer-fulness, and excitability combined with low levels of conformity and self-discipline were

associated with predictors of severity level in problem gambling among adolescents.

In recent years, some researchers have been exploring experimental methods that may be able to recreate various aspects of the gambling experience, with hopes of isolating a small number of factors that could be responsible for the development of problem gambling. Simulated gambling environments have been created (28), actual gaming devices have been brought into experimental laboratories (29), and childhood analogues to actual gambling have been developed (30). If certain triggers can be identified, then such variables should be targeted for elimination in treatment. Additionally, by teaching the problem gambler how such variables are triggering their desire to gamble, coping strategies can be trained to minimize these urges.

Despite such attempts to measure gambling behavior directly, direct experimentation involving independent variable manipulations using adolescent problem gamblers remains a challenge. There are various logistical hurdles and ethical considerations when conducting gambling experiments with adults who demonstrate gambling pathology (31), and these issues apply to adolescents as well and most likely to a greater degree. If researchers use adolescents with current gambling problems in a gambling experiment, then it may be viewed as contributing to a clinical disorder; which is akin to a study on drug abuse that provides drugs to drug addicts. If one uses adolescents with no known problems with gambling, then the investigation may be viewed as lacking external validity. However, if researchers simply remain concerned about limitations instead of moving forward to generate a body of evidence about the causal factors that contribute to gambling problems, then the therapy community is left to create treatment approaches based on hunches, personal experiences, or ideological or religious beliefs. Treatment has not waited for science, yet effective treatment must be guided by science. As more researchers embrace the challenge of conducting experimental research on adolescent problem gamblers, better care providers will be able to deliver effective treatments.

Perhaps one of the most logical assumptions for why a young person would want to gamble is that there is an opportunity to actually win money. With little to no effort, the child may be able to acquire a relatively large sum of money from another. Winning seems to be an outcome that could sustain gambling (32). However, with the odds of winning in most gambling games being against the player, something seems to be missing in an analysis that simply assumes that wins, or reinforcement, is what keeps someone gambling. Most problem gamblers experience financial losses and not wins. Maybe the possibility or the opportunity to win is enough to keep someone gambling, even when the odds of winning are not in their favor. In attempts to understand if winning jackpots are crucial to sustain gambling, researchers have often tested a player's ability to detect which game will produce more wins (33), or have pitted two identical games against each other that differ only on irrelevant characteristics, such as color or pre-experimental history (knowing that 'blue' is better than 'yellow') (28). It has been repeatedly shown that gamblers cannot always detect great differences in payback percentages and that choices among available games are often made for esoteric, self-constructed, and illogical reasons. Subsequent reports have noted that various additional non-reinforcing characteristics of the gambling game itself are able to cause increases in

gambling. Thee characteristics include the presentation of non-winning displays that resemble wins (i.e., near-misses) (34) and the availability of multiplier options (35). In short, winning does not always matter. The cognitions and language processes of the gambler do matter (36).

Additional psychological mechanisms have been suggested to control the problem behavior of the gambler. The adolescent gambler may find him/herself continuing to gamble for access to tangible items, such as vouchers and prizes, attention and socialization from peers, sensory stimulation, or the escape from stressors or psychological conflict in life. To date, escape from stress seems to be the most commonly reported cause for excessive gambling (37). In a survey of over 100 gamblers, escaping from the stress of life was overwhelming reported as the most frequent cause for excessive gambling (38).

The niche of 'bridge-research' related to problem gambling has great potential for easy translation into clinical practice. The 'bridge' is a metaphorical term used to describe research that oftentimes attempts to balance the demands for experimental rigor with the need for direct application in the clinical setting. As more researchers develop empirical investigations designed to relate to treatment directly, the gap between the laboratory and practice may begin to shrink. An example of such a bridge approach is that of Johnson and Dixon (29), who showed that when given the opportunity to do so, two pathological gamblers would engage in irrelevant choice making (picking numbers at roulette; selecting one of two identical slot machines to play) at various casino games. However, when the experimenters required these individuals to pay additional money (response cost) for the opportunity to engage in their illogical choice making, both gamblers tended to act more rationally. The results of this experiment could be applied in treatment programs, whereby clients are allowed to gamble in a controlled environment while being made aware of the illogical choices. Reflection on choices could be targeted in treatment with alternative decision strategies along with learning the objective nature of many casino games. Another study by Mui and Dixon (39) exposed some gamblers to a brief mindfulness exercise that sought to teach the client about values in their life and if gambling was consistent with such values, and other gamblers with illogical strategies on how to win when gambling. Those individuals given the mindfulness intervention reduced their subsequent gambling duration significantly. Other bridge studies have demonstrated an elimination of the near-miss effect in slot machine players (34), and how discounting of delayed rewards by pathological gamblers may be improved upon (40).

TREATMENT APPROACHES

Minimal research has investigated the evidence-based treatment of adolescent problem gamblers (41). Experts in the field have offered possible explanations for the lack of empirical findings, including few treatment centers are adequately equipped to treat adolescent problem gamblers, gamblers at this developmental stage rarely recognize the need and express a desire for treatment, poor funding for this type of research, and a general lack of awareness of the scope of the problem (42,43). As a result, treatment providers are being forced to adapt typical paradigms used with adults.

Pharmaceutical interventions

Pharmacological treatments for pathological gambling generally fit into the categories of various SSRIs (selective serotonin reuptake inhibitors), opioid antagonists, and mood stabilizers (44). Such

medical interventions work to normalize the levels of brain chemistry or to address comorbid psychiatric conditions to reduce the symptoms of gambling addiction. Currently no medication has been approved by the Food and Drug Administration, and no randomized controlled trial has been conducted on the use of anti-psychotics (44) to treat pathological gambling among adolescents. However, increased efficacy research is being conducted. In some cases, successes have been reported. For example, Grant and colleagues (45) investigated the use of the opioid antagonist, nalmefene, as an outpatient treatment for gambling symptoms. A 16-week, randomized double-blind, placebo-controlled trial was conducted using 207 pathological adult gamblers. The results indicated a difference in gambling severity among the groups, and few side effects were reported using low doses of the drug. Another example of the use of pharmacological treatments for excessive gambling was a study that used similar methodology, but the effect of the SSRI, fluvoxamine was evaluated (46). This study was on a smaller scale (n = 10) and the results were also less direct. A significant interaction effect was observed for the order of administration of the drug and placebo. The reader is referred to the article in this volume by Grant and Potenza (45) for the most current pharmacological treatments.

Community interventions

Along the lines of prevention, recent descriptions of what can be referred to as community interventions within a public health perspective may also be of importance in the present discussion of treatment approaches for pathological gambling. Korn and Shaffer (47) outline the goals of this approach adequately: to prevent gambling-related problems in at-risk populations, to promote knowledge and balanced attitudes through the dissemination of information, and to protect those groups that have been adversely affected by gambling-related policies. Specific strategies in implementing this prevention model have included informational videos (48) or more comprehensive programs that include information about the legality of gambling and development of coping skills conducted in public high schools (49).

Gamblers Anonymous, or GA, can also be conceptualized as a contemporary community intervention. GA is based on the 12-step model of Alcoholics Anonymous that heavily emphasizes spirituality and encourages members to meet each 'step' with the ultimate goal of completely abstaining from gambling. GA has included adolescent as well as adult problem gamblers (50). Although readily available to many community members, the efficacy of such an approach for adolescents is indeed limited.

Psychoanalytic Models

The psychodynamic approach toward the treatment of gambling problems has been around for almost 100 years. In 1920, Simmel (cited in 50) conceptualized pathological gambling as a manifestation of a narcissistic fantasy spurred by intense feelings of entitlement. In a brief review of psychoanalytic approaches to gambling, Lopez Viets and Miller (51) note that early psychoanalysts claimed that gambling behavior was a result of extreme deprivation during childhood or an individual's unconscious desire to lose. In his essay, *Doestoevsky and Patricide*, Freud briefly theorized that gambling was closely related to masturbation. He argued that since both gambling and masturbation involve overt motor activity followed by feelings of relief and guilt, compulsive gambling often becomes a substitution for

compulsive masturbation (52).

Perhaps the best known psychoanalytic model for treating pathological gambling was developed by Rosenthal and Rugle (53), who assert that the immediate goal of treatment should be abstinence and that the clinician should focus on confronting the gambler's denial and defenses as well as disrupting the gamblers need to chase losses with repeated wagers. According to their model, the clinician should combat the gambler's ambivalence toward therapy by engaging the gambler as an active contributor to the treatment process. Unfortunately, the authors' conceptualization of gambling treatment appears to be hindered by a lack of empirical support and practical applications of their model (54).

Despite the variety of psychoanalytic theories of gambling, little research has been published examining its effectiveness in treating pathological gambling. Most published reports are descriptive case studies with little or no empirical support (51). The largest psychoanalytic study of compulsive gambling to date was conducted in 1958 by Bergler. As noted by Lopez Viets et al (51), Bergler reported that of 60 clients, 75% experienced successful treatment. Unfortunately, Bergler did not report exactly what was meant by the term 'successful' and the 60 gamblers who received treatment were selected from over 200 referrals to the program (cited in 50). Overall, currently little evidence supports the efficacy of a psychoanalytic approach to treating pathological gambling other than successful case reports (54).

Early behavioral models

Some early treatments for pathological gambling consisted of behavior therapies such as aversive conditioning or systematic desensitization, sometimes with exposure. Aversion therapy was used for a variety of addictions in the early days of behaviorism and relies on the concept of classical conditioning. In such approaches, an aversive stimulus (e.g., an electric shock or a noxious substance) is paired with stimuli associated with the addictive substance or behavior. Barker and Miller (55) describe delivering painful, electric shocks to an adult patient who reported compulsive and undesirable rates of gambling while he observed a video of himself in a gambling environment and listened to auditory stimuli associated with gambling. Over the course of 10 days of treatment, the patient received more than 450 shocks. The authors reported complete abstinence of gambling at two month follow-up.

Another early behavioral technique for reducing gambling was imaginal desensitization therapy (56). This technique also relies on the principles of classical conditioning, but in this case antecedent stimuli associated with the addictive behavior are paired with relaxation training in an attempt to reduce anxiety. In a study comparing the effects of aversion and desensitization therapy, researchers implemented the latter condition by asking patients to imagine a scene that would stimulate gambling urges. Then, the therapist presented segments of this scene and induced relaxation for approximately 20 seconds. When the patient was adequately relaxed, the therapist went on to subsequent segments of the scene until it was presented in its entirety. Interestingly, at one-year follow up, 70% of patients (adults) who had been exposed to imaginal desensitization maintained gambling reductions as compared with only 30% of those exposed to aversion therapy. However, evaluations of such interventions for adolescents have not been reported.

Cognitive behavioral models

While strictly cognitive models have shown promise in eliminating gambling behavior (57-59), current trends in psychological treatment are suggesting that behavioral therapeutic approaches in combination with other traditional forms of therapy can be more effective. Even though aversion therapy and largely systematic desensitization for addictive behaviors has gone out of practice, behavioral principles play a major role in one of today's most widely accepted treatment for pathological gambling—cognitive behavioral therapy.

Cognitive behavioral therapy, or CBT, is the most widely used intervention for psychiatric conditions, including addiction disorders (60), and has recently come under widespread investigation in the treatment of problem gambling. CBT targets psychological problems from both the cognitive and the behavioral theoretical paradigm. This model, as it applies to gambling, involves the existence and manipulation of intermittent reinforcement of behavior emitted by the gambler, as well as cognitive distortions and erroneous belief patterns (61). This goal is accomplished through, among other things, trigger awareness. A 'trigger' may be conceptualized as a simple antecedent condition in which gambling takes place in the presence of, or from a cognitive perspective in that the actual trigger is an increase in the level of arousal as gambling thoughts and urges increase (62). Reinforcement of behaviors that are incompatible or alternative to gambling also plays a major role (50). Regardless of the theoretical framework, CBT has been shown to be effective in reducing gambling.

Petry and her colleagues (63) conducted a large scale, randomized control trial on the effectiveness of CBT when compared with GA for the treatment of over 200 gamblers. This study consisted of three experimental conditions: GA referral, GA referral plus CBT workbook, and GA referral plus 8 sessions of individual CBT. The frequency of days gambled, as well as the amount of money gambled was assessed at baseline, mid-treatment (after 1 month), post treatment, 6 months following treatment, and 1 year following treatment. To highlight the level of gambling addressed in the current study, the groups combined were gambling an average of more than $1,200 per month, approximately 14 days per month at the outset. Following treatment, all groups showed some improvement. Overall, however, CBT was found to reduce gambling compared with GA referral alone during treatment, and some of those effects were maintained at the 6-month and 1-year follow-ups (63). Other successes of CBT in treating problem gambling have been reported (64,65).

Ladouceur, Boisvert, and Dumont (66) reported the effect of CBT for the treatment of problem gambling in four adolescents (aged 17-19 years) that utilized a "multiple baseline across participants" design. The treatment package consisted of information about gambling, cognitive interventions for erroneous beliefs, problem-solving training, relapse prevention, and social skills training. Perceptions about their ability to control thoughts/behaviors related to gambling and the severity of their problem were recorded as primary dependent measures; the results showed clinically significant changes for all adolescents following the intervention. Furthermore, these measures were supplemented by reports of abstinence among all participants at 3- and 6-months follow up.

The McGill treatment paradigm (42) has been used to address adolescent gambling problems since 2003 and has served over 80 adolescents and young adults aged 14 to 21 years. The model encourages abstinence

over controlled gambling and places individuals into categories according to the etiology and comorbidity of their gambling behavior to design the type and duration of the intervention they receive. The authors assert that most clients fall into a range that is characterized by "*tending to gamble impulsively primarily for purposes of escape and as a way of coping with their stress, depression, and/or daily problems*" (42). The goals of treatment include understanding the motivations of gambling, increasing self-awareness, addressing cognitive distortions, and encouraging a decrease in gambling among other objectives.

The clinical technique termed "motivational enhancement" has been noted to strengthen the results of typical cognitive behavioral approaches to treatment of problem gamblers (67). Such approaches typically provide feedback to the individual regarding the treatment process, making them aware of their current state of recovery, while providing additional incentives for treatment compliance. Successes of incorporating motivational enhancement appear promising (65). Adoption into childhood therapeutic approaches might also include feedback mechanisms to parents and caregivers about progress of their child, assuming consent has been given, that may allow for the development of additional contingency arrangements outside of the therapy context (i.e., going to a movie, earning opportunities for preferred activities or tangible items).

Contemporary behavioral models

An additional model is based on the psychological treatment approach called Acceptance and Commitment Therapy (ACT) (68). ACT has been documented as successful for the treatment of many psychological problems including obsessive compulsive disorder (69), substance abuse (70), and smoking (71). There is also evidence that certain components of ACT are effective in directly reducing gambling behavior (72,39). Furthermore, a body of research using the ACT model with adolescents experiencing various clinical problems continues to grow (73-75).

ACT is a therapeutic approach to psychological problems that can best be conceptualized as a contemporary model of behavioral and cognitive therapies, with its roots in functional contextualism (76). ACT differs from the early behavioral models noted above in its emphasis on verbal learning and language as the key to behavior change. ACT is also distinct from traditional cognitive-behavioral approaches in its requirements of clients to "accept" their thoughts or urges to gamble rather than attempting to eliminate or remove such cognitions. ACT claims that cognitive events cannot be analyzed as causal entities. Instead, thoughts, feelings, and emotions are behavioral constructs. ACT is not considered to be part of traditional behavioral approaches. Rather, ACT is considered a distinct post-Skinnerian approach (77) claiming that language and cognition are at the root of human suffering.

At the core of ACT are six basic psychological processes that include acceptance, defusion, self as context, contact with the present moment, values, and committed action (78). These processes are said to be responsible for the ultimate outcome, which, in the case of ACT, is psychological flexibility. Psychological flexibility is an individual's ability to acknowledge and accept maladaptive rules or contingencies, while not restricting their behavior to the extent that it keeps them from living a valued life. The Acceptance and Action Questionnaire-II (AAQ-II) (79) is the standardized assessment tool that serves as the primary measure of this

outcome. The processes are presented here in a particular order; however the order in which they are presented and moved, as well as which processes are targeted within a therapeutic context is entirely determined by the case conceptualization of the individual client (80).

The process of acceptance is perhaps what most sets this therapy apart from traditional cognitive therapy—instead of controlling, restructuring, or attempting to eliminate unwanted thoughts, emotions, or urges. The term 'experiential avoidance,' a central tenet of the ACT perspective, is the opposite of acceptance in that "a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioral dispositions) and takes steps to alter the form or frequency of these events and contexts that occasion them" (68). This strategy to avoid painful stimuli, however, is inherently illogical because through language, it only makes the stimuli more salient (78). For example, if an individual tries to adhere to the rule "Don't think about gambling," then the simple formation of this rule includes at least a verbal reminder of the stimuli they seek to avoid—gambling.

For behaviors that could be termed as addictive, the act of engaging in the behavior itself creates an avenue for experiential avoidance (81). Gambling has the potential of being an avoidant or escape maintained behavior in that by sitting at a slot machine and playing for 45 minutes, for example, experiencing any other cognitive or emotional content is delayed or avoided altogether. For the gambler, this may include thinking or worrying about the amount of debt they have accumulated or any other source of psychological stress from marital problems to dealing with the loss of a loved one. It is often painful to experience certain thoughts and actually sit with them, especially if the behavior pattern of avoidance is longstanding; however this is precisely what occurs during the therapeutic exchange.

The process of defusion works against literal language (thoughts and other verbal behavior) serving as causal entities to behavior. For example, just because a person has the thought, 'I will die if I do not play a slot machine', does not mean that they will actually die and that because they had this thought, they must in fact play the slot machine. The term 'defusion' of thoughts suggests that the individual can have the thoughts but the painful or difficult functions are reduced. In essence, the client learns to interact differently with thoughts. This is done through exercises in which the client may be asked to say, instead of "I'm weak," "I'm having the thought that I'm weak." The therapist might also ask the client to say "I'm weak" over and over again quickly for two minutes straight, to sing the words "I'm weak" like an opera singer, or to describe what the thought "I'm weak" looks like by asking what color it is, how big is it, and what is its texture. A host of other defusion exercises are used as well (82), and these exercises are done to undermine the literalization and believability of the thoughts. This is done in an accepting and respectful manner as it attempts to create a gentle space that exists between the thought and thinker, the feeling and the feeler.

Work on the process, self as context, focuses on getting in touch with a transcendent sense of self that is ever present, rather than defining or labeling oneself by dynamic thoughts, feelings, or emotions. A person with an addiction often defines themselves as an addict. This self-labeling and admitting powerlessness over a certain substance or behavior is done in

traditional 12-step models. However, if this is the only self conceptualization one has, then there may be potential harm in the long run. For example, a person with a gambling problem who relapses may blame oneself or this very rigid definition of oneself for their behavior and act in accordance with it. Such a person may have the thought "I'm an addict and I'll always be just an addict so I might as well continue to gamble." A diffusion exercise using that thought may be helpful in this situation such that the client can examine their thoughts.

Contact with the present moment reinforces the idea that much of psychological suffering can be conceptualized as maladaptive preoccupation with either the past (as is often the case with depression) or the future (often the case with anxiety). Living in the present moment and letting experience rather than thoughts dictate behavior is offered as a solution to these fixations. This approach means becoming an active participant in the world around us even when that world brings about pain. It is often the problem with addiction that clients are looking for a good 'quit' date or they complain that it is just too hard to quit now; they'll quit when they find a job, when they stop feeling bad, etc. From an ACT perspective, the therapist challenges this avoidant behavior by emphasizing the importance of the present moment and noticing or showing up for what is going on without trying to evaluate, plan, or analyze it.

Likewise, the behavior of 'chasing wins' or adhering to the gambler's fallacy (the player is 'due' to win following a string of losses) could be conceptualized as discounting the present moment to obtain probable outcomes in the future. By becoming more aware of the present moment, perhaps the negative consequences that have occurred as a result of excessive gambling can become more salient. Acceptance and defusion could be used to help experience the painful or negative emotions related to those consequences.

Recognizing personal values is the process that promotes living a life that is important. Meaningful areas of a client's life such as family, friends, career, education, and spirituality are assessed and evaluated within the context of the present moment. The client is asked how much they value each of these areas and how much they are living in accordance with these values in the here and now. Values and living a valued life are the backdrops on which the therapeutic approach unfolds. For example, when acceptance is low and the problem gambler indicates, "*I just can't think about those things and gambling is the only thing that helps*," the therapist asks questions like,

> "*What if it meant that you could be living for something again? What if your life could have a clear purpose that you were proud of? Would you be willing to experience those thoughts for just a little while?*"

The extent to which a client is living a life that he/she values is a primary goal or measure of treatment in ACT. It is also important to highlight the difference between values and goals. Goals are objectives that can be met and forgotten about; values are life directions, things that still remain present even when goals are met. For example, a client may say they really value getting married. This statement is more like a goal because if the client gets married, they've satisfied that desire. The role of the ACT therapist is to help the client see that getting married may be a goal in the service of the value of having love in their life. This is something that will

always be true which is why values work is done prior to the next process. Once a client can identify true values then the goal setting process can begin.

Committed action is the process in which a client obligates to behave in patterns that are consistent with their values right now. The therapist posits that there are actions, sometimes tiny, that can be done now in the service of living a life that is important. After work is done on all of the other processes, the client then has to "vote with his or her own feet" (82). The client and therapist devise goals that, although may start out small, lead to effective, personally significant behavioral change. The fact that the process will not be easy and setbacks will occur is also emphasized. The 'Hikers on a Path' (82) metaphor is often used in therapy as a committed action process move. The therapist likens the client's journey to a hiker on a mountain in that even though the hiker is convinced he may never get there, a person across the valley can see they are moving in precisely the right direction. Committed action also means engaging when thoughts, feelings, or emotions stand to disrupt valued patterns of living. For the individual who gambles this may mean that the intensity of the urge to gamble seems unbearable. By using the processes of acceptance and defusion, the client will hopefully be able to engage in the chosen course of action with those urges and thoughts.

Given this description it seems logical that ACT may be beneficial in the area of treating adolescent gambling problems for many reasons. Perhaps the most glaring potential benefit is the focus on thoughts as determinants of behavior. Breaking down the causal relationship between common cognitive distortions of some pathological gamblers, such as the illusion of control and the gambler's fallacy, and behavior would no doubt be advantageous. While some may argue that traditional CBT models could accomplish this just as well, there is evidence to suggest that avoiding or averting an individual's attention from urges or cravings can actually be counter-productive (83). For this reason, an acceptance based therapy may be preferable.

Based on this assumption, recently a protocol using ACT for the treatment of adolescent problem gambling has been developed by Dixon and Nastally (84). The protocol uses the ACT processes described above to conceptualize and treat adolescent gambling as a psychological problem that is similar to other forms of addiction and stems from a lack of acceptance, fusion with literal language, escapism or avoidant behavior, and a lack of values direction and committed action (81). Work is done on each process in the service of assisting the client in abstaining from gambling behavior. For example, work on the process of values is done early on in the treatment of adolescent gambling because it is likely that these things have been neglected for some time. By assessing the clients' values, possible directions for therapy can be gained.

Acceptance and diffusion work is also incredibly relevant for adolescent problem gamblers. Since gambling may be a form of experiential avoidance for many clients, it is the role of the therapist to prepare them to come into contact with undesirable thoughts, feelings, and other psychological content in the absence of gambling. This may consist of actual urges or thoughts about wanting to gamble or content related to daily problems that gambling has allowed them to escape from. For example, one defusion exercise that may be used with an adolescent who feels a very strong urge to gamble would be to 'physicalize' that urge by giving it physical properties. The use of the adolescent imagination is key here.

Lastly, the process of committed action when dealing with addiction is two-fold; clients make the commitment of staying abstinent from gambling in the service of making other commitments (81). Abstaining from gambling represents the first goal to work toward. It is also important to anticipate with the client some barriers they may encounter while trying to meet this goal and reiterate strategies to deal with these barriers.

CONCLUSION

Many researchers are attempting to find answers to the reasons why some adolescents may become interested in and addicted to gambling. Effective assessments have been constructed and more elaborate and comprehensive ones will surely continue to develop. Scientists have made great strides at understanding the biological and psychological processes involved in sustaining the gambling behavior of today's adolescents. It appears that examining early wins or losses is not sufficient alone to explain the reason why someone may gamble.

Traditional behavioral approaches have led to a dead end, and strictly cognitive approaches lack the specificity to evaluate empirically. Instead it appears that adolescents have various thoughts, ideas, and rules in their head about the game, their ability to control the outcomes, and a denial of the depth of their problems. They also share similar biological characteristics to individuals prone to alcoholism and substance abuse.

The positive news however is that treatment options are becoming available. Although randomized clinical trials are scarce, more research in this area is beginning, which means that practitioners will have more options available to use in clinical settings. The authors of the described treatment models should be contacted for copies of their protocols so that independent field work can be tested. Component analyses of the key principles of the treatment package might be attempted to understand the basic mechanisms that are responsible for positive therapeutic outcomes. With the foundations that have been laid, the next decade of gambling research will be promising for underage persons that are either at risk for or are suffering from pathological gambling. By improving our knowledge base about the treatment of adolescent gambling, the widespread proliferation of gambling will not be such a risk.

REFERENCES

1. Black DM, Moyer T. Clinical features and psychiatric comorbidity of participants with pathological gambling behavior. Psychiatr Serv 1998;49:1434-9.
2. Potenza MN. The neurobiology of pathological gambling. Sem Clin Neuropsychiatr 2001;6:217-26.
3. Nordin C, Eklundh T. Altered CSF 5-HIAA disposition in pathological male gamblers. CNS Spectr 1999;4:25-33.
4. DeCaria CM, Begaz T, Hollander E. Serotonergic and nonadrenergic function in pathological gambling. CNS Spectr 1998;3:38-47.
5. Comings D E, Blum K. Reward deficiency syndrome: genetic aspects of behavioral disorders. Prog Brain Res 2000;126:325-41.
6. Bergh C, Eklund T, Sodersten P, Nordin C. Altered dopamine function in pathological gambling. Psychol Med 1997;27:473-5.
7. Gschwandtner U, Aston J, Renaud S, et al. Pathologic gambling in patients with Parkinson's disease. Clin Neuropharmacol 2001;24:170-2.
8. Potenza MN, Steinberg MA, Skudlarski

P, et al. Gambling urges in pathological gambling: a functional magnetic resonance imaging study. Arch Gen Psychiatry 2003;60:828-36.
9. Crockford DN, Goodyear B, Edwards J, et al. Cue-induced brain activity in pathological gamblers. Biol Psychiatry 2005;58:787-95.
10. Reuter J, Raedler T, Rose M, et al. Pathological gambling is linked to reduced activation of the mesolimbic reward system. Nat Neurosci 2005;8: 147-8.
11. Habib R, Dixon MR. The neurological indicators of the near-miss effect in pathological gamblers. Unpublished.
12. Boyd W H. Excitement: the gambler's drug. In: Eadington WR. Gambling and Society. Interdisciplinary studies on the subject of gambling. Springfield: Charles C Thomas, 1976:371-5.
13. Anderson G, Brown RIF. Real and laboratory gambling, sensation-seeking and arousal. Br J Psychol 1984;75:401-10.
14. Wulfert, E, Roland BD, Hartley J, et al. Heart rate arousal and excitement in gambling: winners versus losers. Psychol Addict Behav 2005;19:311-6.
15. Freidenberg BM, Blanchard EB, Wulfert E, et al. Changes in physiological arousal to gambling cues among participants in motivationally enhanced cognitive-behavior therapy for pathological gambling: a preliminary study. Appl Psychophysiol Biofeedback 2002; 27:251-60.
16. Griffiths M, Sutherland, I. Adolescent gambling and drug use. J Community Appl Soc Psychol 1998;8:423-7.
17. Gupta R, Derevensky JL. Adolescent gambling behavior: a prevalence study and examination of the correlates associated with problem gambling. J Gambl Stud 1998a;14:319-45.
18. G upta R, Derevensky, JL. An empirical examination of Jacobs' General Theory of Addictions: do adolescent gamblers fit the theory? J Gambl Stud 1998b;14:17-49.
19. Gupta R, Derevensky JL, Ellenbogen S. Personality characteristics and risk-taking tendencies among adolescent gamblers. Can J Behav Sci 2006;3: 201-13.
20. Langhinrichsen-Rohling J, Rohde P, Seeley JR et al. Individual, family, and peer correlates of adolescent gambling. J Gambl Stud 2004;20:23-46.
21. Lynch WJ, Maciejewski PK, Potenza MN. Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. Arch Gen Psychiatry 2004,61:1116-22.
22. Stinchfield R. Gambling and correlates of gambling among Minnesota public school students. J Gambl Stud 2000; 16:153-73.
23. Turner NE, Macdonald J, Bartoshuk M et al. Adolescent gambling behavior, attitudes, and gambling problems. Int J Men Health Addict 2008;6:223-37.
24. Wood RT, Griffiths MD. The acquisition, development and maintenance of lottery and scratchcard gambling in adolescence. J Adolesc 1998;21:265-73.
25. DiCle menti CC, Delahanty J, Schlundt D. A dynamic process perspective on gambling problems. In: Derevensky, JL, Gupta R. Gambling problems in youth. Theoretical and applied perspectives. New York: Kluwer Acad/Plenum, 2004:145-64.
26. No wer L, Blaszczynski A. A pathways approach to treating youth gamblers. In: Derevensky, JL, Gupta R. Gambling problems in youth. Theoretical and applied perspectives. New York: Kluwer Acad/Plenum, 2004:189-209.

27. Vitaro F, Arseneault L, Tremblay RE. Impulsivity predicts problem gambling in low SES adolescent males. Addiction 1999;94:565-75.
28. Zlo mke KR, Dixon MR. Modification of slot-machine preferences through the use of a conditional discrimination paradigm. J Appl· Behav Anal 2006; 39:351-61.
29. Johnson TE, Dixon MR. Altering response chains in pathological gamblers using a response cost procedures. J Appl Behav Anal 2009; 42:735-40.
30. Johnson TE, Dixon MR. Constructing relational frames of "more than" and "less than" to influence children's gambling behavior. J Appl Behav Anal, in press.
31. Weatherl y JN, Phelps BJ. The pitfalls of studying gambling behavior in a laboratory situation. In: Ghezzi PM, Lyons, CA, Dixon, MR, et al. Gambling. Behavior theory, research, and application. Reno: Context Press, 2006:105-26.
32. Ski nner BF. About behaviorism. New York: Alfred A. Knopf, 1974.
33. Weatherly JN. Female gamblers are unable to detect wins on slot machines. J Appl Behav Anal, in press.
34. Dixon MR, Nastally BL, Jackson JW, et al. Altering the near-miss effect in slot machine gamblers. J Appl Behav Anal, in press.
35. Ha w J. The multiplier potential of slot machines predicts bet size. Anal Gambl Behav 2009;3:32-39.
36. Dixon, MR. Manipulating the illusion of control: variations in gambling as a function of perceived control over chance outcomes. Psychol Rec 2000; 50:705-19.
37. D ixon MR, Johnson TE. The gambling functional assessment (GFA): an assessment device for identification of the maintaining variables of pathological gambling. Anal Gambl Behav 2007;1:44-9.
38. Dixon MR, Parker M. Evaluating escape functions of gambling behavior. Unpublished.
39. Mui N, Dixon MR. The effect of mindfulness vs. information in the reduction of gambling behavior. Unpublished.
40. Dixon MR, Holton B. Altering the magnitude of delay discounting by pathological gamblers. J Appl Behav Anal 2009;42:269-75.
41. NRC. Pathological gambling. A critical review. Washington, DC: APA, 1999.
42. Gupta R, Derevensky JL. A treatment approach for adolescents with gambling problems. In: Derevensky, JL, Gupta R. Gambling problems in youth. Theoretical and applied perspectives. New York: Kluwer Acad/Plenum, 2004;165-88.
43. Winters KC, Anderson N. Gambling involvement and drug use among adolescents. J Gambl Stud 2000;16: 175-98.
44. Hollander E, Sood E, Pallanti S, et al. Pharmacological treatments of pathological gambling. J Gambl Stud 2005; 21:101-10.
45. Grant JE, Potenza MN, Hollander E, et al. A multicenter investigation of the opioid antagonist nalmefene in the treatment of pathological gambling. Am J Psychiatry 2006;163:303-12.
46. Hollander E, DeCaria CM, Finkell JN et al. A randomized double-blind fluvoxamine/placebo crossover trial in pathologic gambling. Biol Psychiatry 2000;47:813-7.
47. Korn DA, Shaffer HJ. Gambling and the health of the public: adopting a public health perspective. J Gambl

Stud 1999;15:289-365.
48. Ferland F, Ladouceur R, Vitaro, F. Prevention of problem gambling: modifying misconception and increasing knowledge. J Gambl Stud 2002;18:19-30.
49. Gaboury A, Ladouceur R. Evaluation of a prevention program for pathological gambling among adolescents. J Prim Prev 1993;14:21-8.
50. Petry NM. Pathological gambling. Etiology, comorbidity, and treatment. Washington DC: APA, 2005.
51. L ópez Viets VC, Miller WR. Treatment approaches for pathological gamblers. Clin Psychol Rev 1997;17: 689–702.
52. Li nder RM. The psychodynamics of gambling. Ann Am Acad Pol Soc Sci 1950;269:93-107.
53. Rosenthal RJ, Rugle, LJ A psychodynamic approach to the treatment of pathological gambling: part I achieving abstinence. J Gambl Stud 1994;10:21-42.
54. Porter J, Ghezzi, PM. Theories of gambling. In: Ghezzi PM, Lyons, CA, Dixon, MR et al. Gambling. Behavior theory, research, and application. Reno: Context Press, 2006;19-43.
55. Barker JC, Miller M. Aversion therapy for compulsive gambling. Br Med J 1966;9:115.
56. McCona ghy N, Armstrong MS, Blaszczynski A, et al. Controlled comparison of aversive therapy and imaginal desensitization in compulsive gambling. Br J Psychiatry 1983;142: 366-72.
57. Echeburua J, Baez C, Fernandez-Montolo J. Comparative effectiveness of three therapeutic modalities in the psychological treatment of pathological gambling: long term outcome. Behav Cogn Psychother 1996;24:51-72.
58. Ladouce ur R, Sylvain C, Boutin C, et al. Cognitive treatment of pathological gambling. J Nervous Ment Dis 2001; 189:766–73.
59. Ladouc uer R, Sylvain C, Boutin C, et al. Group therapy for pathological gamblers: a cognitive approach. Behav Res Ther 2003;41:587-96.
60. DeRubei s, RJ, Crits-Christoph P. Empirically supported individual and group psychological treatments for adult mental disorders. J Cons Clin Psychol 1998;66:37-52.
61. Hodgins DC, Petry NM. Cognitive and behavioral treatments. In: Grant JE, Potenza. MN. Pathological gambling. A clinical guide to treatment. Arlington, DC: Am Psychiatr Publ, 2004:169-189.
62. Tavares H, Zilberman ML, el-Guebaly N. Are there cognitive and behavioral approaches specific to the treatment of pathological gambling? Can J Psychiatry 2003;48:22-7.
63. Petry NM, Ammerman Y, Bohl J, et al. Cognitive-behavioral therapy for pathological gamblers. J Con Clin Psychol 2006;74:555-67.
64. Milton S, Crino R, Hunt C, et al. The effect of compliance-improving interventions on the cognitive behavioural treatment of pathological gambling. J Gambl Stud 2002;18:207-29.
65. Wulfert E, Blanchard EB, Martel R. Conceptualizing and treating pathological gambling: A motivationally enhanced cognitive behavioral approach. Cogn Behav Prac 2003;10:61-72.
66. Ladouce ur R, Boivert JM, Dumont J. Cognitive-behavioral treatment for adolescent pathological gamblers. Behav Modification 1994;18:230-42.
67. Wulfert E, Blanchard EB, Freidenberg BM, et al. Retaining pathological gamblers in cognitive behavior therapy through motivational enhancement: a pilot study. Behav Modification 2006;

30:315-40.
68. Ha yes SC, Strosahl K, Wilson KG. Acceptance and commitment therapy. An experiential approach to behavior change. New York: Guilford, 1999.
69. Twoh ig MP, Hayes SC, Masuda A. Increasing willingness to experience obsessions: acceptance and commitment therapy as a treatment for Obsessive Compulsive Disorder. Behav Ther 2006; 37:3-13.
70. Ha yes SC, Wilson KG, Gifford EV, et al. A preliminary trial of twelve-step facilitation and acceptance and commitment therapy with polysubstance-abusing methadone-maintained opiate addicts. Behav Ther 2004;35:667-88.
71. Gif ford EV, Kohlenberg BS, Hayes SC, et al. Acceptance-based treatment for smoking cessation. Behav Ther 2004;35:689-705.
72. Dixon MR, Bordieri M. A single subject report of a pathological gambler treated with ACT therapy. Unpublished.
73. Heffner M, Sperry J, Eiftert GH, et al. Acceptance and commitment therapy in the treatment of an adolescent female with anorexia nervosa: a case example. Cogn Behav Prac 2002;9:232-6.
74. Metzler CW, Biglan A, Noell, J, et al. A randomized controlled trial of a behavioral intervention to reduce high-risk sexual behavior among adolescents in STD clinics. Behav Ther 2000;31: 27-54.
75. Wicksell RK, Melin L, Olsson GL. Exposure and acceptance in the rehabilitation of adolescents with idiopathic chronic pain: a pilot study. Eur J Pain 2007;11(3):267-74.
76. H ayes SC. Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. Behav Ther 2004; 35:639-65.
77. Ha yes SC, Barnes-Holmes D, Roche B. Relational frame theory. A post-Skinnerian account of human language and cognition. New York: Kluwer Acad, 2001.
78. Ha yes SC, Luoma JB, Bond FW, et al. Acceptance and commitment therapy: model, processes, and outcomes. Behav Res Ther 2006;44:1-25.
79. Bond FW, Hayes SC, Baer RA, et al. Preliminary psychometric properties of the Acceptance and Action Questionnaire—II: a revised measure of psychological flexibility and acceptance. Unpublished.
80. Ha yes SC, Strosahl KD, Luoma, J, et al. ACT case formulation. In: Hayes SC, Strosahl KD. A practical guide to acceptance and commitment therapy. New York: Springer Sci Business Media, 2004: 59-76.
81. Wilson KG, Byrd MR. ACT for substance abuse and dependence. In: Hayes SC, Strosahl KD. A practical guide to acceptance and commitment therapy. New York: Springer Sci Business Media, 2004: 59-76.
82. Strosahl KD, Hayes SC., Wilson KG., et al. An ACT primer: core therapy processes, intervention strategies, and therapist competencies. In: Hayes SC, Strosahl KD. A practical guide to acceptance and commitment therapy. New York: Springer Sci Business Media, 2004:59-76.
83. Masedo AI, Esteve MR. Effects of suppression, acceptance and spontaneous coping on pain tolerance, pain intensity, and distress. Behav Res Ther 2007;41:199-209.
84. Dixon MR, Nastally, BL. Acceptance and commitment therapy for pathological gamblers. Unpublished.

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):113-128

Internet-based interventions for youth dealing with gambling problems

Sally Monaghan, BPsych and Richard TA Wood, PhD

School of Psychology, University of Sydney, Australia and GamRes Research and Consultancy, Quebec, Canada

Abstract: A substantial proportion of adolescents and young adults gamble and rates of problem gambling amongst youth are significantly higher than found in adult populations. Despite this, few youth seek treatment suggesting that traditional services are failing to help this vulnerable population. Youth are progressively active online and use the Internet for social networking, recreation, and increasingly, to seek help for health and mental health issues where they would not be comfortable seeking traditional forms of professional help. In recognition of this, Internet-based therapy and guided interventions have been launched specifically for adolescents and young adults in an attempt to reduce high-risk behaviors and increase program utilization. Research has demonstrated that online therapeutic support is perceived to be acceptable and useful by youth. Furthermore, online interventions have demonstrated success in reducing smoking and heavy drinking amongst this typically hard to reach population. Given the success of similar programs, online problem gambling services are predicted to be effective in increasing youth awareness of their potentially problematic gambling behavior and assist adolescents and young adults in retaining control and minimizing and reducing gambling-related problems.

Keywords: Internet therapy, problem gambling, youth, online counseling, adolescents, young adults

Correspondence: Sally Monaghan, School of Psychology, Brennan MacCallum Building (A18), The University of Sydney, Sydney NSW 2006, Australia. Tel: Phone: +1514-803-3665; E-mail: sallym@psych.usyd.edu.au

Submitted: July 15, 2009. ***Revised:*** September 08, 2009. ***Accepted:*** September 16, 2009.

INTRODUCTION

Although typically seen as an adult pursuit, increasing numbers of adolescents and young adults are engaging in gambling and experiencing gambling-related problems. Studies from Australia, Canada, the US and UK that have assessed the rate of problem gambling among adolescents (aged 12-17 years) have found rates of problem gambling typically 2-3 times that found in adults (1-4). Young adults aged 18-24 also appear to have significantly more gambling-related problems than any other adult age cohort (5-7). Gambling amongst youth is particularly disconcerting as young gamblers are more likely to engage in alcohol and drug use and abuse/dependence, develop significant psychiatric problems including pathological gambling, substance use and mood disorders (8).

Despite the high rates of problem gambling amongst youth, this age group rarely recognizes their problems or seeks treatment. One reason for this is that youth gamblers are typically not suffering from life-changing experiences, such as losing

one's house, job, or family, that are often associated with problem gambling given that they do not have these to lose. However, youth gamblers may still experience significant psychosocial problems including financial losses, anxiety, guilt or depression, disruption and neglect of work, school, and relationships, lost opportunities and engagement in illegal activities (9).

Reluctance to seek help is not limited to young problem gamblers. It has been noted that young people have specific barriers when it comes to accessing mental health services (10). These include both structural barriers including time, costs, and travel, and personal barriers such as being overwhelmed by unfamiliar issues, lack of confidence in seeking help, or not recognizing the extent of their problem. There is also evidence that adolescents often prefer to seek help from informal sources, such as family and friends, rather than formal support including school counselors and mental health professionals (11). Given the failure of traditional treatment programs to recruit clients in need of help new interventions must be developed that are accessible to adolescents and young adults.

Interest in online therapeutic interventions has gained momentum with the emergence of increasing research that online programs for health and mental health problems have efficacy equal to or better than traditional programs including face-to-face therapy and brief interventions and educational and self-help options (12-14). The current paper discusses the feasibility of using online therapeutic support for helping young people experiencing gambling issues. Although a number of youth-focused informational websites aimed at preventing gambling-related harms (e.g., www.friends4friends.ca and www.wannabet.org) are currently available, the present paper is focused upon active interventions involving interactive self-help programs including personalized feedback or Internet-based interactions with therapists or peers through email, chat or discussion forums.

INTERNET USE

Results from the Pew Internet and American Life Project found that in 2007-2008, 93% of teenagers between the ages of 12 and 17 reported using the Internet, an increase from 73% in 2001 (15,16). Thirty-seven percent of the respondents indicated that they used email, instant messaging, and/or chat rooms to discuss subject matter that they would not have discussed with someone in person (16). Similar access rates have been found worldwide with a survey of adolescents in 13 countries observing that 100% of 12-14 year olds have Internet access in the United Kingdom, followed by 98% in the Czech Republic, 96% in Macau, and 95% in Canada (17). Even in the countries with the least Internet access usage was still common with 70% of adolescents in Hungary and Singapore reporting regular Internet use. In a similar study of 9 to 19 year olds in the UK, 47% of adolescents used email, chat or instant messaging and users indicated that talking to people online was the same or more satisfying as talking to people in real life (18) demonstrating the high comfort levels that adolescents have with Internet use.

The Internet is rapidly becoming a major source of health information for adolescents and young adults (19,20). Preliminary findings indicate that youth regard the Internet as appealing as it is an accessible and anonymous method of seeking help (19,21). For example, a study by Mission Australia (22) found that young

people aged 11–19 years rated the Internet as the fourth most important source of advice and support after friends, parents and relatives/family friends. Furthermore, Kids Help Line client data reveals that compared to telephone support, young people are five times more likely to seek help for mental health concerns, three times more likely to seek help about suicide and eating behavior issues, and twice as likely to seek help for self image, sexual orientation and sexual assault online (23). Similarly amongst older teenagers (15-17 years old), 21% reported searching the Internet for information on sensitive subjects, which they found difficult to talk about face-to-face (24).

RATIONALE FOR INTERNET INTERVENTIONS

High rates of Internet use amongst young adults and college students (25) have prompted the trial of several online interventions for smoking and alcohol use. There are several reasons that make online interventions advantageous in seeking to treat high-risk behaviors amongst youth. Firstly, the confidentiality and nonjudgmental quality of the Internet may increase the potential for youth to divulge personally relevant information, which may facilitate knowledge, attitude or behavioral changes (26). Compared with paper-and-pencil questionnaires, computerized programs for young people increase self-disclosure in sensitive areas, such as risky sexual behavior, excessive alcohol use, marijuana use, and family problems (27,28). The anonymity and accessibility of the Internet may allay young people's concerns about seeking help, especially their fears about being personally identifiable (29,30), which is particularly important for interventions for illegal activities such as underage gambling.

A further advantage of online interventions is the ability to assess a large and vulnerable population in a cost-effective and confidential manner and provide relevant resources to those in need. For those without Internet access in their homes, websites can be easily accessed from computers in schools, colleges, libraries and Internet cafes. Adolescents and young adults can complete online screening questionnaires in private and at their convenience and receive automatic and personalized feedback to determine their need for further intervention and be directed to relevant resources. There is evidence that brief online feedback that sets an individuals' gambling behavior against social norms is perceived as being useful for non-problem and problem gamblers and may encourage behavioral change (31). Although youth may be skeptical about discussing high-risk and illegal behaviors with a health practitioner, parent, or other adult, they are interested in how their behavior compares with that of their peers (32). Online feedback interventions appeal to this curiosity while reducing apprehension associated with talking to a professional. Furthermore, research indicates that youth respond better to electronic feedback than to in-person feedback regarding high-risk behaviors such as drinking (33-35).

Internet interventions can be tailored to be relevant for the individual accessing it, providing customized information, exercises and support based on their reported problems, age, gender, stage of readiness and needs. This is particularly useful for problem gambling interventions given the variety of forms (e.g. electronic gaming machines, sports wagering, online gambling) and reasons for gambling (e.g. risk-taking, boredom, social pressure, emotional escape).

Tailoring program content is more likely to be read, remembered, and viewed as personally relevant (36,37), which may ultimately increase program utilization and effectiveness.

Internet-based interventions also enable users to control their learning environment, move at their own pace, and receive information on demand (38). This may encourage youth to access the interventions at a time convenient to them and when they are at the appropriate stage of readiness for change. The convenience of online programs allows youth to access therapeutic support from experts or peers at any time if they need advice, counseling, or have any questions. Online programs overcome barriers to traditional treatment including geographical isolation, inability to attend individual or group sessions due to timing, transport or conflicting commitments, fears of stigmatization and/or privacy concerns.

INTERNET INTERVENTIONS FOR ADOLESCENTS

Interventions for adolescents concerning high-risk behaviors are very important as this is a critical developmental period in which behavioral experimentation occurs, peer pressure is high, and maladaptive behavioral patterns can be formed. Although research is still emerging, there is increasing evidence to support the use of online interventions for youth during this difficult period of emerging adulthood. In one large-scale study, 17,000 year 10 students from South Australia were surveyed about their use of the Internet to seek counseling and advice for personal problems (39). The results revealed that the adolescents surveyed were seeking help from the Internet at the same rate they sought help from other mental health professionals such as school counselors, psychiatrists and psychologists. The authors commented on the particular benefit of Internet therapy for teenage boys, who used the Internet as much as females, but are much less likely to seek help in person. This hypothesis is supported by further research demonstrating that about one in three adolescents were more able to self-disclose online than offline (40).

Kids Help Line (www.kidshelp.com.au) is a free confidential 24-hour online counseling service (provided in real-time, chat-based text exchange) specifically for Australians aged between five and 18 years (typically used by adolescents). Online focus groups reported that the online environment was less confronting than traditional forms of counseling, with responses indicating that it was less "intimidating" and "scary", that counselors wouldn't think they were "weird" and couldn't see if they cried (11). Additional advantages included privacy issues, particularly that the children would not be overheard and being able to take time in writing replies, which increased feelings of control and comfort with the counseling process. Participants indicated that they were comfortable with text communication and felt online counselors were more supportive than telephone counselors, indicating that the reduced emotional range in Internet counselor communication was an advantage. The most commonly reported challenges with text communication were concerns that counselors might not be able to adequately understand the participants' emotions, that miscommunications could occur and that it was more difficult to build a therapeutic alliance. Kids Help Line online services had limited hours of availability (closed at 9 pm) and ended sessions after approximately one hour. Participants reported waiting for up to three hours to chat with a counselor or missing out altogether, which highlights the

importance of having an adequate number of counselors available, extending hours of operation, and the possibility of having repeated sessions.

A further study of Kids Help Line by King and colleagues (41) directly compared one online counseling session with one telephone counseling session. Significant pre-existing differences were found between the groups as the online counseling group contained significantly more females, were older and reported high pre-counseling distress compared with the telephone counseling group. The higher distress levels were consistent with reported internal findings that young people using online counseling are more likely to be coded with mental health problems, suicidality, and sexual abuse than youth seeking telephone support. Results indicated that while both interventions had a substantial positive overall effect on distress levels, telephone counseling had a much more substantial effect than online counseling. Telephone counseling also generated greater therapeutic alliance, lower resistance, and higher collaboration as compared to online counseling, however, these variables did not predict counseling outcomes. The authors' hypothesized that while the duration of the telephone and online sessions were equivalent, due to the time involved with composing and typing messages, youth using the telephone were able to address their problems more effectively because of the greater speed and efficiency of communication. However, the authors argue that increasing the duration of online sessions would enhance the impact of this form of intervention.

Internet interventions may act as an adjunct to existing programs for adolescents to reduce risky behaviors. A trial of a web-based addiction to a high school-based smoking cessation program included a specially designed web site for adolescents, along with proactive phone calls from the group facilitator to the participant (42). Significant positive effects were found for the online intervention with 57% of participants reporting visiting the website, which was rated positively on several dimensions. Website utilization was associated with positive smoking cessation outcomes. In contrast, proactive phone calls did not increase quit rates or abstinence, which may be because it was difficult to reach the adolescents and engage them in conversation at the time of the call and in their home where they may be overheard.

An important component of online interventions may be tailored emails that provide personalized feedback, relevant cognitive and behavioral strategies and promote self-efficacy. Classroom-based web-assisted tobacco interventions found high school student smokers who participated in an interactive smoking cessation website and received tailored emails were significantly more likely to reduce their intentions to smoke and were more resistant to cigarette use at 6-month follow-up than those in an interactive control condition (43). The intervention also significantly reduced the likelihood of cigarette use by non-smokers.

Similarly, promising outcomes have been demonstrated with a "virtual world chat room" for adolescent smoking cessation. The Internet therapy program allows young smokers to interact with a trained cessation counselor and other teen smokers in a real-time "virtual world". In a randomized controlled trial smokers participated in 45-minute sessions weekly for seven weeks (44). Those participating in the online program were significantly more likely than controls to report weekly abstinence, reduced smoking and quit rates at the conclusion of the program. Only the

number of times quit was statistically significant at the one-year follow-up, suggesting booster sessions may be necessary to increase program effectiveness. Participants rated the intervention positively in terms of its ease of use, appeal and usefulness; however, only 9% logged on to receive all seven sessions with most participants receiving three online sessions.

Less promising results were found for a home-based self-guided online smoking cessation program for adolescents, which resulted in lower abstinence rates than face-to-face therapy sessions, although the treatment differences were not significant (45). Adolescents were randomly allocated to conditions, regardless of their intention to quit and while attendance rates were high for the brief office interventions, there was relatively low utilization of the website indicating that it did not sufficient keep teenagers engaged. The program attempted to use a non-directive, impersonal, patient-education approach, without professional guidance or prompting. The failure of this program suggests that online interventions may be more effective as an adjunct to face-to-face or online therapy, be coupled with reminders and prompts to use the site, and offer personalized, directive and interactive content and feedback to engage teenage smokers. Adolescents who used the online site made greater progress in reducing the number of days smoked compared to the face-to-face condition suggesting that the self-help site may be used as a self-management tool for those not ready to quit.

One modality of online support that could potentially help young people is discussion forums. These are an electronic venue in which individuals register a username and are allowed to post thoughts, ask questions, and respond to posts made by other users. Web-based discussion forums have differing levels of moderation, which determines the level to which the forum is monitored for potentially damaging or insensitive content. In a study of online bulletin boards for adolescents who self-harm the most common type of exchange were users providing informal support to other members (46). Members also discussed potential triggers for self-harm behavior, and formal help-seeking, with mainly positive attitudes. These themes can be construed as positive for adolescents often dealing with significant life issues and engaging in dangerous behavior and indicate that youth were attempting to use online forums in a helpful way to manage their concerns and problems. The study found positive correlations between informal support, encouraging disclosure, and advising formal treatment, suggesting that the online interactions may be providing self-injurers support and meaning outside a clinical setting.

Troublingly, the third largest category of posts was in relation to concealment of the practice and its effects, and users shared details about specific techniques used to self-injury. Such posts are potentially damaging as they may be suggestive of adolescent self-harm. The potential impact of such exchanges may be to expose vulnerable adolescents to a subculture in which harmful behavior is normalized and encouraged. The authors concluded that Internet discussion forums provide a powerful vehicle for bringing together adolescents dealing with significant difficulties, yet, greater involvement from adults and treatment providers as moderators is necessary to prevent increases of maladaptive behaviors. This may be particularly important for a problem gambling-based discussion forum to prevent users swapping tips and encouraging misinformation, including irrational beliefs and misunderstanding how outcomes are determined.

INTERNET INTERVENTIONS FOR YOUNG ADULTS

Due to the propensity for young adults to engage in high-risk behaviors, the ineffectiveness of traditional interventions and high use of the Internet amongst this cohort, online interventions are becoming increasingly used for college students and young adults. As with adolescent Internet interventions, research is at early stages, but positive effects have been found for Internet-based programs for high-risk behaviors including smoking and alcohol consumption (47-49). Online interventions may also be more appealing to young adults than traditional programs. In an online survey of a random sample of 1,564 university students, Kypri and colleagues (33) found significantly greater support (82%) among hazardous drinkers for online interventions than for health education seminars (40%) or practitioner-delivered interventions (58%). Similar positive results were found in an evaluation of an online smoking cessation program for young adults (50) and Internet-based counseling services for general mental health amongst college students (51), indicating Internet-based therapy programs may reach a wider population at need of assistance, who would not seek traditional services.

A trial of an Internet-based smoking cessation program amongst young adults found participants were more engaged in the program activities, rated their treatment more favorably and had quit for more consecutive days at 3- and 6-month follow-ups compared to participants who received an in-person counseling session and traditional print-based self-help materials (47). The online intervention was introduced in an in-person session and consisted of a self-help kit, but was augmented by 10-12 counseling emails tailored to the individual participant. Participants were encouraged to reply by email to their counselors with questions and comments, and to update their counselors on their cessation progress. Emails were sent weekly for the first month and then monthly for the following five months. Additional emails were sent around the participant's quit date. Although all participants received the same cognitive and behavioral techniques from the self-help guide and in-person session, those in the online condition were more likely to have adopted these and have made a quit attempt. The majority of participants (92%) read "most" or "all" or their emails indicating that this is an appropriate medium to communicate with young adults.

Another online smoking cessation program incorporated content of general interest to young adults, weekly reminder emails, interactive quizzes with tailored feedback, behavioral monitoring, peer-support via weekly emails from peer coaches, and weekly incentives ($10 gift card) (48). Compared with a control group, participants had increased short-term abstinence rates. Although long-term quit rates were not found, given that this study included participants who had no immediate plans to quit, an emphasis on taking breaks from smoking may encourage quitting attempts in the future.

Online interventions have also been shown to be effective in reducing hazardous drinking amongst college students (26,49, 52). Trials have demonstrated that online interventions that include personalized feedback with tailored motivational information about high-risk drinking are more effective than assessment only, educational websites, and interactive online interventions that do not include tailored feedback (26,32,49,52). Of significant note, these effects have also been shown for subgroups of heavy drinkers including

women, persistent heavy drinkers, those who intend to drink heavily for a particular occasion (e.g., 21st birthday), and those with low-motivation to change (26,52), demonstrating the usefulness of an online approach amongst a typically hard to reach population.

Importantly, brief online interventions have also been found effective for reducing high-risk behaviors amongst young adults (32). A trial of an Internet alcohol reduction intervention for college students found that students who completed a brief online screener for problem drinking and received personalized feedback found it easy to use, personally relevant and would recommend it to friends (53). The intervention prompted help-seeking behavior with 30% of participants accessing additional information on support services through the website.

Online peer-support may also be useful in assisting youth dealing with various issues. Reach Out! (http://www.reachout.com.au) is an Australian Internet-based mental health service for young people (aged 16-25) that receives approximately 230,000 individual visits a month (54). An online community forum enables youth to discuss various issues and is supported and monitored by clinical staff. Anecdotal evidence suggests that it is a positive, unique, and helpful online experience although little is known about the actual impact of the service (54).

INTERNET INTERVENTIONS FOR GAMBLING

Although Internet interventions are being increasingly implemented and evaluated to reduce some high-risk behavior amongst youth, there is little to no empirical evidence supporting the use of online interventions for gambling-related problems for youth. Based on the evidence presented above, it is reasonable to conclude that Internet interventions would be an acceptable form of treatment for gambling-related issues and preferred to traditional face-to-face or self-help alternatives. Internet therapy has been introduced to treat individuals with gambling problems in Australia, Canada, Finland, New Zealand, Sweden, Norway and the U.K. Although evidence is preliminary, positive results have been found indicating that Internet therapy, using self-guided interactive exercises combined with therapeutic support via telephone or email, is effective compared to wait-list controls, reaches individuals who would not otherwise present for treatment and is viewed positively by clients (55-60).

Two qualitative studies examining online support forums for adults dealing with gambling-related problems have indicated the usefulness of such an approach. A North American study of the Gambler Anonymous forum '*GA Web*' (61) and a study of two UK based forums '*Gambling Therapy*' and the '*GamCare*' forum (62) found similar results. They noted that the majority of members had previously avoided seeking face-to-face treatment because of an unwillingness to disclose information about themselves. Lurking (i.e., visiting but not registering presence to other users) at a problem gambling support group website made it easier for many to seek further help including face-to-face help and this appeared particularly true for the female clients in the study. Furthermore, Wood and Griffiths (63) found that the online virtual therapist service '*GamAid*' was used by far more female problem gamblers (relative to males) than any other comparable UK service, indicating that online therapeutic support may be perceived as more accessible to females who are typically reluctant to present for treatment at typically male dominated services.

Both Cooper (61) and Wood and Wood (62) found that for many members the forum was reported as the only support that they could access, due to financial, geographical, transportational, and/or emotional constraints. Wood and Wood (62) also reported that the forums helped most members to avoid the urge to gamble by posting and reading forum messages instead. Overall, it was reported that the forums helped the majority of members maintain better control over their gambling behavior. Given that Internet gambling is the fastest growing form of gambling, online support forums may prove to be an extremely useful way of helping those who develop problems with online gambling.

To date, there have not been any published studies that have looked at the utility of online therapeutic support for helping youth with gambling problems. This is likely due to the fact that at this point in time there do not appear to be any online services specifically aimed at youth with gambling problems. However, there has been a pilot project that aimed to provide online help for adolescents and young adults with gambling problems. The pilot was conducted in Canada by the International Centre for Youth Gambling Problems and High-Risk Behaviors at McGill University. An online platform offered individual and group chats for 28 hours per week run by graduate psychology students and supervised by psychological staff with various topics focusing on gambling and problems associated with gambling. Separate teen and young adult sites widely promoted throughout Canadian high schools, universities, and health care providers, and in popular media. From January through June, 2007 the site had 2,161 different visitors; 4,102 visits; and 1,031.893 hits. In total, from inception (November 2005) through the end of June 2007 the site received 1,999,778 hits. Although the website received a large number of visitors, and strong endorsement from the clinical and educational community, the number of adolescents and young adults who engaged in this service was minimal. Upon completion of the pilot project funding was not continued and the websites are no longer operational. The chief reason cited for the project termination was a lack of clients and sustained funding to warrant service continuation. One reason for the limited success of the intervention may be insufficient effective advertising and recruitment methods.

Although the pilot project described above was not successful, lessons from the development of online smoking cessation and hazardous drinking sites aimed at adolescents and young adults may aid in the development of a more effective youth-oriented online problem gambling intervention. In an evaluation of an online smoking cessation site, focus groups with college students indicated that a lack of time and interest discouraged use of social support features (50). Yet, other interventions with demonstrated effective-ness have incorporated peer-support into a wider program (48). Alternate apparently successful components include tailored feedback directing clients to relevant information and resources, interactive exercises and quizzes with automatic feedback, email reminders and prompts, email communication with therapists and content and formatting relevant to a youth audience (whether adolescent or young adult). Due to the apparent reluctance of youth to recognize the seriousness of their gambling-related problems, an important component of an online gambling treatment for youth may be an Internet-based assessment with automatic personalized normative feedback. Receiving feedback on how their own

gambling behavior compares with their peers may encourage adolescents and young adults to consider taking steps to modify their gambling involvement. Furthermore, recruitment strategies can be used to encourage all youth to complete online assessments and these can be actively encouraged or mandated within schools and universities and by health care providers.

The absence of youth from treatment services suggests both the perceived inaccessibility of existing services for youth and the reluctance to recognize gambling-related problems (64). To overcome these barriers to help-seeking online support services may be used in educational settings whereby youth use the services as part of structured school or college class activities. In educational terms, the Internet is being increasingly used as a media for progressive learning that appears to have some advantages over traditional teaching methods. For example, groups of online learners can motivate and support each other's learning experiences. Such an approach can communicate gambling prevention information to under-aged youth, as well as information on how to spot the signs of a gambling problem and how/where to seek help

Given the limited evidence on the utility of providing online support for youth gambling problems it is premature to determine whether such a program would be effective. However, based on the successful implementation of online interventions for other high-risk behaviors. this treatment option deserves further consideration and research, particularly given the success of this approach with adults.

ISSUES FOR CONSIDERATION

Some concerns have been raised over the use of Internet therapy with adolescents and young adults. The privacy offered by the Internet also prohibits therapists knowing the identity of the client which poses potential concerns in the case of suicidal ideation. An Israeli online forum specifically for youth suicide support has been shown to be very successful in helping adolescents dealing with suicide issues (65). The program has successfully intervened in several suicide attempts and received positive user feedback (65). However, Internet interventions may not be suitable for all youth and more intensive treatment may be required for some problems. Therapists should be trained to recognize serious mental health problems (e.g. personality disorders, psychosis) and recommend clients seek additional help as required.

Issues surrounding cross-jurisdictional therapy must also be considered. Most licensing bodies require therapists to practice only in states or provinces where they are licensed. If a client is located in a state other than where the therapist is located this could be considered a breach of this agreement. To avoid such difficulties online interventions may be limited to accepting members from the province they are located in if therapist contact is involved in the program.

Despite the apparent advantages of an online gambling treatment program, caution is required particularly for youth whose main problematic form of gambling is Internet gambling. There is increasing evidence that internationally adolescents and young adults are gambling online at higher rates than adults (66-74). Online problem gambling treatment services may not be suitable for youth who are unable to resist the urge to access online gambling sites. However, as an increasing proportion of school and university research, learning and general activities are conducted online it may be

useful to assist online gamblers with techniques to overcome urges to engage in Internet gambling without prohibiting all Internet use. An online support site may act as s safe place youth can go online when they are tempted to gamble and recommend specific tips and techniques to reduce problematic gambling behavior as well as offering online gambling blocking software to prevent youth from accessing Internet gambling sites. As Internet-based treatment services are not intended to replace existing interventions it is predicted that offering online support will be highly useful for some youth gamblers and not prohibit others from seeking alternate help if needed.

It is important for both counselors and youth clients to take care in transferring the high levels of comfort that youth have with Internet use into a therapeutic relationship. Over familiarity with the Internet appears to have lead adolescents to view Internet-based communications as not 'real writing', but rather the same as phone calls and casual conversations (75). However, in focus groups, teenagers said they are motivated to write when they can select topics that are relevant to their lives and interests and survey results show that the majority of youth enjoy writing for personal enjoyment, including writing in a journal, blogging, and writing music or lyrics (75). The results indicate that teenagers are able to write expressively and appropriately, and enjoy writing about their own lives, thoughts, and emotions. This suggests that Internet-based therapy may be successful amongst this age group. Care should be taken to ensure that emails between a therapist and client are carefully considered and worded, rather than terse and unedited. The lack of non-verbal cues in text-based communications can lead to misunderstandings regarding the tone and content of the message. Furthermore, counselors should become familiar with the online language (textese) of adolescents (e.g. lol, bbs, pos) in order that they do not miss such important tonal inflections.

CONCLUSIONS

Online therapeutic support services appear to have a great deal of potential to assist youth in dealing with gambling related problems given their access to and familiarity with the media, and the anonymous capabilities of such services. This is evidenced in their use of online therapeutic support for other health related issues and high risk behaviors. In particular, this type of support may be one way that could potentially help to bridge the gap between the few youth that seek help and the much larger number identified as experiencing problems overall. Certainly, existing evidence suggests that Internet-based interventions do already appear to help youth reduce smoking and heavy drinking. Furthermore, adult problem gamblers, who are often otherwise reluctant to seek support., have experienced positive effects of online gambling therapy The key challenge lies in designing appropriate online services and communication strategies that will appeal to and be accessible by youth. Whilst at the same time, ensuring that youth are aware of both the problems they may face in relation to their gambling behavior and the availability of such online services to assist them. Important design elements include ease of access (e.g. via emailed hyperlinks to a target population, hyperlinks on other highly accessed websites or easily searchable), reduced length, ease of navigation, non-judgmental language, brief assessments with personalized normative feedback, tailored content where appropriate and links to other services. Programs should emphasize the anonymity and privacy of

users by encouraging non-identifiable user names and anonymous emails (e.g. Hotmail, Yahoo, or Gmail accounts) to be used. Only careful attempts at engaging youth in this way will ultimately demonstrate the utility of online therapeutic support for helping youth overcome gambling problems, paired with evaluation studies to help further shape what does and doesn't work in this emerging branch of therapeutic support.

ACKNOWLEDGMENTS

The lead author would like to gratefully thank and acknowledge the Ontario Problem Gambling Research Centre and Centre for Addiction and Mental Health for funding research related to this manuscript.

REFERENCES

1. Delfabbro P. Thrupp L. The social determinants of youth gambling in South Australian adolescents. J Adolesc 2003;26:313-30.
2. Derevensky J. Gupta R. Gambling problems in youth: theoretical and applied perspectives. New York: Kluwer Academic/Plenum Publishers, 2004.
3. Ipsos MORI British survey of children, the national lottery and gambling 2008-09. London: Ipsos MORI, 2009.
4. Shaffer H, Hall M. Updating and refining prevalence estimates of disordered gambling behavior in the United States and Canada. Can J Public Health 2001;92:168-72.
5. Delfabbro P. Australasian Gambling Review, Third Edition. Adelaide: Independent Gambling Authority South Australia, 2008
6. Derevensky J. Foreword. In: Meyer G, Hayer T, Griffiths M. Problem Gambling in Europe. Springer: New York, 2009:xvxviii.
7. Welte J, Barnes G, Wieczorek W, Tidwell M, Parker J. Alcohol and gambling pathology among U.S. adults: prevalence, demographic patterns and comorbidity. J Stud Alcohol 2001;62: 706-13.
8. Lynch WJ, Maciejewski PK, Potenza MN. Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. Arch. Gen Psychiatry 2004;611:1116-22.
9. Shaffer HJ, Hall MN, Walsh JS, Vanderbilt J. The psychosocial consequences of gambling. In Tannenwald R. Casino development: how would casinos affect New England's economy. Special report No.2. Boston: Federal Reserve Bank Boston, 1995;130-41.
10. O wens PL. Hoagwood K, Horwitz SM, Leaf PJ, Poduska JM, Kellan SG, et al. Barriers to children's mental health services. J Am Acad Child Adolesc Psychiatry 2002;41:731-8.
11. Kin g R. Bambling M. Lloyd C. Gomurra R. Smith S. Reid W, et al. Online counseling: the motives and experiences of young people who choose the Internet instead of face to face or telephone counseling. Couns Psychother Res 2006;6:169-74.
12. Barak A. Hen L. Boniel-Nissim M. Shapira N. A comprehensive review and a meta-analysis of the effectiveness of internet based psychotherapeutic interventions. J Technol Hum Serv 2008;26:109-60.
13. Bennett GC. Glasgow RE. The delivery of public health interventions via the internet: actualizing their potential. Annu Rev Public Health 2009;30:273-92.
14. C uijpers P. van Straten A. Andersson G. Internet-administered cognitive behavior therapy for health problems: a systematic review. J Behav Med 2008; 31:169-77.

15. Pe w Internet & American Life Project. Teenage life online: the rise of the instant-message generation and the internet's impact on friendships and family relationship. 2001. Accessed 18 Feb 2009. Available at: http://www.pewinternet.org/
16. Pe w Internet & American Life Project. Generations online in 2009, 2009. Accessed 18 Feb 2009. Available at: http://www. pewinternet.org/
17. Centre for the Digital Future. World Internet Project: International Report 2008. Available at: http://www.digitalcenter.org/pages/site_content.asp?intGlobalId=42
18. Livingston S, Bober M. UK children go online. London School of Economics and Political Science, London. 2004. Accessed 7 April 2009, Available at: http://www.lse.ac.uk/collections/children-go-online/
19. Gra y LA. Klein JD. Noyce PS. Sesselberg T. Cantrill JA. Health information-seeking behavior in adolescence: the place of the Internet. Soc Sci Med 2005;60:1467-78.
20. Kaiser Family Foundation. Generation Rx.com: how young people use the internet for health information 2001. Available at: http://www.kff.org/entmedia/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=13719.
21. Nicholas J, Oliver K, Lee K, O'Brien M. Help-seeking behavior and the internet: an investigation among Australian adolescents. Aust e-J Adv Ment Health 2004;3:1-8.
22. Missio n Australia. National survey of young Australians. Melbourne: Mission Australia, 2007.
23. Kids Help Line. Kids Helpline Infosheet No 27, 'Online Counseling'. 2000. Available at: www.kidshelp.com.au
24. Borzeko wski DL, Rickert VI. Adolescent cybersurfing for health information: a new resource that crosses barriers. Arch Pediatr Adolesc Med 2001; 155: 813-7.
25. Pe w Internet and American Life Project. The internet goes to college. 2002 Accessed 26 August 2009; Available at: http://www.pewinternet.org/pdfs/PIP_College_Report.pdf.
26. Chia uzzi E. Green TC. Lord S. Thum C. Goldstein M. My student body: a high-risk drinking prevention web site for college students. J Am Coll Health 2005;3:263-73.
27. Paperny DM, Ayono JY, Lehman RM, Hammar SL, Risser J. Computer–assisted detection and intervention in adolescent high-risk health behaviors. J Pediatr 1990;116:456-62.
28. Turner CF, Ku L, Rogers SM, Lindbergh LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence. Science 1998;280: 867–73.
29. Gould MS. Munfakh JLH. Lubell K. Kleinman M. Parker S. Seeking help from the internet during adolescence. J Am Acad Child Adolesc Psychiatry 2002;41:1182-9.
30. Ski nner H, Biscope S, Poland B. Quality of internet access: barrier behind internet use statistics. Soc Sci Med 2003; 57:875-80.
31. Wood R, Williams R. Internet gambling: prevalence, patterns, problems and policy options. Final report prepared for the Ontario Problem Gambling Research Centre, Guelph, Ontario, 2009.
32. Dou mas DM. McKinley LL. Book P. Evaluation of two web-based alcohol interventions for mandated college students. J Subst Abuse Treat 2009; 36:65-74.

33. K ypri K. Saunders JB. Gallagher SJ. Acceptability of various brief intervention approaches for hazardous drinking among university students. Alcohol Alcohol 2003;38:626-8
34. Larimer ME. Cronce JM. Identification, prevention, and treatment revisited: individual-focused college drinking prevention strategies 1999–2006. Addict Behav 2007;32:2439-68.
35. Sau nders JB, Kypri K, Walters ST, Laforge RG, Larimer ME. Approaches to brief intervention for hazardous drinking in young people. Alcohol Clin Exp Res 2004;28:322-9.
36. Brug J, Campbell M. van Assema P. The application and impact of computer generated personalized nutrition education: a review of the literature. Patient Educ Couns 1999;36:145-56.
37. Dijkstra A. De Vries H. The development of computer-generated tailored interventions. Patient Educ Couns 1999; 36:193-203.
38. Chei ten S, Walters M. Comprehensive school health education and interactive multimedia. In Harris LM. Health and the new media: technologies transforming personal and public health. Mahwah, NJ: Erlbaum. 1995:145-62.
39. Oliver K, Nicholas J. The use of the internet to seek help among Australian adolescents. In: Innes M, Katsikitis, eds. Combined abstracts of the 2005 Australian Psychology Conf. Melbourne: Aust Psychol Soc, 2005:239.
40. Schou ten AP, Valkenburg PM, Peter J. Precursors and underlying processes of adolescents' online self-disclosure: developing and testing an "Internet-attribute-perception" model. Media Psychol 2007;10:292–314.
41. King R. Bambling M. Reid W. Thomas I. Telephone and online counseling for young people: a naturalistic comparison of session outcome, session impact and therapeutic alliance. Couns Psychother Res 2006;6:175-81.
42. Mer melstein R, Turner L. Web-based support as an adjunct to group-based smoking cessation for adolescents. Nicotine Tob Res 2006;8:S69-S76.
43. Norma n CD, Maley O, Li X, Skinner H. Using the Internet to assist smoking prevention and cessation in schools: a randomized, controlled trial. Health Psychol 2008;27:799-810.
44. Woodruff SI, Conway TL, Edwards CC, Elliott SP, Crittenden J. Evaluation of an internet virtual world chat room for adolescent smoking cessation. Addict Behav 2007;32:1769-86.
45. Patten CA, Croghan IT, Meis TM, Decker PA, Pingree S, Colligan, RC, et al. Randomized clinical trial of internet-based versus brief office intervention for adolescent smoking cessation. Patient Educ Couns 2006; 64:249-58.
46. Whitlock JL, Powers JL, Eckenrode J. Virtual cutting edge: the internet and adolescent self-injury. Dev Psychol 2006;42:1-11.
47. Abro ms LC, Windsor R, Simons-Morton B. Getting young adults to quit smoking: a formative evaluation of the X-Pack Program. Nicotine Tob Res 2008;10: 27-33.
48. A n LC. Klatt C. Perry CL. Lein EB. Hannrikus DJ. Pallonen UE, et al The RealU online cessation intervention for college smokers: a randomized controlled trial. Prev Med 2008;47: 194-9.
49. Walters ST, Hester RK, Chiauzzi E, Miller E. Demon rum: hightech solutions to an age-old problem. Alcohol Clin Exp Res 2005;29:270-7.
50. Escoffrey C. McCormick L. Bateman K. Patient Educ Couns 2004;53:217-25.

51. Li ntvedt OK. Sorensen K. Ostvik AR. Verplanken B. Wang CE. The need for web-based cognitive behavior therapy among university students, J Technol Hum Serv 2008;26:239-58
52. Neig hbors C, Lee CM, Lewis MA, Fossos N, Walter T. Internet-based personalized feedback to reduce 21st-birthday drinking: a randomized controlled trial of an event-specific prevention intervention. J Consult Clin Psychol 2009; 77:51-63.
53. Hallett J. Maycock B. Kypri K. Howat P. McManus A. Development of a web-based alcohol intervention for university students: Processes and challenges. Drug Alcohol Rev 2009; 28:31-9.
54. Webb M, Burns J, Collin P. Providing online support for young people with mental health difficulties: challenges and opportunities explored. Early Interv Psychiatry 2008;208-13.
55. Carlbring P. Internet-based self-help for pathological gambling. 6th European Conference on Gambling Studies and Policy Issues, Malmo, Sweden, 2005.
56. Carlbring P. Smit F. Randomized trial of internet-delivered self help with telephone support for pathological gamblers. J Consult Clin Psychol 2008; 76:1090-4.
57. Eide m M. Distance based therapy for problem gamblers in Norway. Paper presented at the 7th European Conference on Gambling Studies and Policy Issues. Nova Gorica, Slovenia, 2008, July. Available at: http://www.assissa.eu/easg/wednesday/1400-ses4/eidem_magnus.pdf.
58. Eide m M. Distance based therapy for problem gamblers in Norway. 14th International Conference on Gambling and Risk Taking, Lake Tahoe, NV, 2009.
59. Farrel -Roberts K. Problem gambling: www.gamblingtherapy.org: an online advice and counseling helpline. 6th European Conference on Gambling Studies and Policy Issues. Malmo, Sweden, 2005.
60. Peltonie mi T, Bothas H. Virtual prevention and treatment in Finland: some addictions-related examples. Media Seminar, Haarlem, October, 2007. Accessed 27 April 2009. Available at: http://www.a-klinikka.fi/ajankohtaista/paihdetiedotusseminaari07/Peltoniemi%20Bothas_Virtual%20prevention%20and%20treatment%20in%20Finland.pdf
61. Cooper G. Exploring and understanding online assistance for problem gamblers: the pathway disclosure model. Int J Ment Health Addict 2004; 1:32-8.
62. Wood RTA, Wood S. An evaluation of two UK online support forums designed to help people with gambling issues. J Gamb Issues 2009;23.
63. Wood RTA, Griffiths MD. Online guidance, advice, and support for problem gamblers and concerned relatives and friends: an evaluation of the Gam-Aid pilot service, Br J Guid Counc 2007;35:373-89.
64. Hardoon K. Derevensky J. Gupta, R. Empirical vs. perceived measures of gambling severity: why adolescents don't present themselves for treatment. Addict Behav 2003;28:933-46.
65. Barak A. Emotional support and suicide prevention through the internet: a field project report. Comput Human Behav 2007;23:971-84.
66. Delfabbro P. Lahn J. Grabosky P. Adolescent gambling in the Australian Capital Territory (ACT). ACT Gambling and Racing Commission. Canberra, Aust: ANU Centre Gamb Res, 2005.

67. Dereven sky, J. Adolescent gambling: is internet gambling a problem? Casino Gaming Int 2008; 99-101.
68. Focal Research Consultants. 2007 Nova Scotia adult gambling prevalence study. Nova Scotia Department of Health Promotion and Protection, 2008 Available at: www.gov.ns.ca/ohp/publications/Adult_Gambling_Report.pdf
69. Jackson A. Dowling N. Thomas S. Bond L. Patton G. Adolescent gambling behavior and attitudes: a prevalence study and correlates in an Australian population. Int J Ment Health Addict 2008;6:325-52.
70. McBride J, Derevensky J. Internet gambling behavior in a sample of online gamblers. Int J Ment Health Addict 2009;7:149-67.
71. MORI/International Gaming Research Unit Under 16s and the national lottery. London: National Lottery Commission, 2006.
72. Petry N. Weinstock J. Internet gambling is common in college students and associated with poor mental health. Am J Addict 2007;16: 325-30.
73. Rainone G. Gallati R. Gambling behaviors and problem gambling among adolescents in New York State: Initial findings from the 2006 OASAS school survey. Report New York Office Alcohol Subst Abuse Serv, 2006.
74. Wood ruff C, Gregory S. Profile of internet gamblers: betting on the future. UNLV Gaming Res Rev J 2005;9:1-14.
75. Pe w Internet & American Life Project. Writing, technology and teens 2008. Accessed 18 Feb 2009. Available at: http://ww.pewinternet.org/

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):129-138

Pharmacological treatment of adolescent pathological gambling

Jon E Grant, JD, MD, MPH and Marc N Potenza, MD, PhD

Department of Psychiatry, University of Minnesota Medical School, Minneapolis, Minnesota and Departments of Psychiatry and Child Study Center, Yale University School of Medicine, New Haven, Connecticut, United States of America

Abstract: Adolescents as a group appear to constitute a high-risk population for gambling problems. Given the rates of adolescent problem gambling and its impact on affected individuals and their families, effective treatments are important. There are, however, no pharmacological treatments for pathological gambling in children, adolescents, or adults that are currently approved by the United States Food and Drug Administration (FDA). Additionally, no studies have investigated directly the safety and efficacy of pharmacological treatments for pathological gambling in adolescents. This article reviews the literature on effective treatments in adults with pathological gambling, describes the safety data for the use of these drugs in adolescents, and provides a rationale for future studies to investigate the efficacy and tolerability of pharmacotherapies for pathological gambling in adolescents.

Keywords: Adolescence, impulse control disorders, pathological gambling, pharmacotherapy

Correspondence: Professor Jon E Grant, JD, MD, MPH, Department of Psychiatry, University of Minnesota Medical School, 2450 Riverside Avenue, Minneapolis, MN 55454 U.S.A Tel: 612-273-9736; Fax: 612-273-9779; E-mail: grant045@umn.edu

Submitted: August 15, 2009. ***Revised:*** September 28, 2009. ***Accepted:*** October 06, 2009.

INTRODUCTION

Problem gambling among adolescents can be conceptualized as belonging to a larger constellation of "developmental addictions". Data support a relationship between 'behavioral' and drug addictions in adolescents (1-2) and gambling, substance use, and other impulsive behaviors frequently co-occur in adolescents (3-4). The co-aggregation of impulsive behaviors appears particularly frequent in adolescent males. Arguably the most consistent and robust finding across youth gambling studies is that boys are more involved in gambling than girls and have higher rates of problem gambling than do girls (e.g., 5-7). Similarly, adolescent males have a greater likelihood of developing a substance use disorder than adolescent females. Nonetheless, the observation that these age-specific trends are seen in both males and females in epidemiological studies performed during different eras and involving different cultures suggests the existence of gender-independent factors in the developmental onset of addictive disorders (8).

Research on developmental biology suggests that the adolescent brain is a changing organ, and this finding has several important correlates. First, it suggests that treatments for adults might not work in the same manner in adolescents. Second, it suggests that treatments within adolescents might differ according to their brain maturational stage, and that within subjects, the effectiveness of specific treatments might vary over time. Third, treatments during specific developmental epochs in

adolescence may have an enduring impact on the presence or manifestation of adult psychiatric syndromes. These points highlight the importance of studying directly the efficacy and tolerability of specific treatments among adolescents.

Adolescents as a group appear to constitute a high-risk population for gambling problems. Although most adolescents gamble occasionally and do so responsibly, approximately 3%-8% have a significant gambling problem (9-10). Given the rates of adolescent problem gambling and its impact on affected individuals and their families, effective treatments are important. There are, however, no pharmacological treatments for pathological gambling in children, adolescents or adults that are currently approved by the United States (US) Food and Drug Administration (FDA). Thus, it is important for patients, parents and guardians to understand that any use of medications for pathological gambling is off-label, and a review of the benefits and risks of pharmacotherapy and other treatment options is warranted when devising an appropriate treatment plan. No study has investigated directly the safety and efficacy of pharmacological treatments for pathological gambling in adolescents. Therefore, we will review briefly the literature on effective treatments in adults, describe safety data for the use of these drugs for adolescents, and provide a rationale for future studies to investigate the efficacy and tolerability of pharmacotherapies for pathological gambling in adolescents.

PHARMACOTHERAPY

The empirical literature indicates that pharmacological treatments have been examined using randomized clinical trial methodologies only in adults with pathological gambling, and, therefore, no direct evidence of either safety or efficacy of these treatments in adolescents with the disorder is available. Developmental issues are important to consider when prescribing medication for adolescents. Because adolescents may metabolize medications more rapidly than do adults, some adolescents may require higher doses relative to body weight compared with adults. On the other hand, because adolescents may have less adipose tissue than adults, more bioactive drug may be available and, therefore, a greater likelihood of adverse events or a need for lower doses. Differences in central nervous system functioning and hormonal changes may further influence adolescents' responses to various medications.

Opioid antagonists

Given their ability to modulate dopaminergic transmission in the mesolimbic pathway, opioid receptor antagonists have been investigated in the treatment of pathological gambling. Evidence suggests that naltrexone, a mu-opioid receptor antagonist, is effective in reducing gambling and gambling urges in adults with pathological gambling. An initial double-blind study suggested the efficacy of naltrexone, an FDA-approved treatment for alcohol dependence and opioid dependence, in reducing the intensity of gambling urges, gambling thoughts, and gambling behavior (11). In an 11-week, double-blind, placebo-controlled study of 45 subjects with pathological gambling, significant improvement was found in 75% of naltrexone-treated subjects (mean dose 188 mg/d) compared with 24% of those treated with a placebo. In particular, individuals reporting higher intensity gambling urges responded preferentially to treatment (11).

Findings from the initial naltrexone study were recently replicated in a larger, longer study of 77 subjects randomized to

either naltrexone or placebo over an 18-week period. Those individuals treated with naltrexone had significantly greater reductions in gambling urges and gambling behavior and greater improvement in psychosocial functioning compared with those receiving a placebo. By the study endpoint, 39.7% of those on naltrexone were able to abstain from all forms of gambling for at least one month, whereas only 10.5% pf those individuals receiving a placebo attained complete abstinence for the same time period (12).

Another opioid antagonist, nalmefene, has also shown promise in the treatment of pathological gambling. Although nalmefene is currently not available in oral form in the US, in a large, multi-center trial, using a double-blind, placebo-controlled, flexible-dose design, 207 subjects were assigned to receive either nalmefene at varying doses or placebo. At the end of the 16-week study, 59% of those receiving nalmefene showed significant reductions in gambling urges, thoughts, and behavior compared with only 34% receiving a placebo (11).

Using the data from the nalmefene and naltrexone trials described above, analyses were performed to identify the factors associated with a positive treatment outcome (13). Consistent with the influence of opiate antagonists on alcohol consumption, a familial history of alcoholism was associated with a positive treatment response, as were strong gambling urges at treatment onset. In placebo-treated patients, younger age was the factor most closely associated with a positive placebo response. This finding, in conjunction with high placebo response rates observed in clinical trials involving adults with pathological gambling, suggests that placebo responses in adolescents with pathological gambling warrant consideration and that the findings from open-label trials should be considered cautiously.

Naltrexone has been used in the treatment of autism and appears to be well tolerated in young patients (14). Although not clearly beneficial for the social deficits of autism, naltrexone has demonstrated efficacy in controlling the hyperactivity of autistic children and adolescents (14). Preliminary results in the treatment of alcoholic adolescents support the efficacy of naltrexone in promoting abstinence when combined with traditional psychotherapy (15).

Naltrexone has demonstrated some efficacy in adolescents with autism and alcohol use disorders when used at 50 mg/d. The findings from studies of adults with pathological gambling suggest that naltrexone may be a promising treatment for adolescents with the disorder. The safety of naltrexone at the higher doses used in the adult studies (up to 200 mg/d), however, has not been examined in an adolescent population. Doses of naltrexone greater than 50 mg/d have warranted a 'black box' warning due to the medication's propensity for hepatotoxicity, particularly at higher doses. Therefore, more research on both the efficacy and safety of naltrexone in adolescent pathological gambling is needed to inform prescribing guidelines.

Antidepressants

Clomipramine. Serotonin reuptake inhibitors (SRIs), drugs blocking the action of the serotonin transporter and thus increasing the synaptic availability of serotonin, have been used with varying degrees of success in treating adults with pathological gambling. Clomipramine, a relatively non-selective SRI, was administered in a double-blind, placebo-controlled trial to one female patient who reported a 90% improvement in gambling symptoms when treated with 125 mg of clomipramine (16).

Gambling behavior remitted at week 3 of the trial, and improvement was maintained for the next 7 weeks of the trial.

Clomipramine is currently FDA-approved for the treatment of obsessive-compulsive disorder (OCD) in adolescents. Three studies have found the medication safe and efficacious in treating adolescent OCD. In one double-blind study, a mean dose of 141 mg/d resulted in a significant decrease of OCD symptoms compared with placebo (17). A later study comparing clomipramine with desipramine found that a mean dose of 150 mg/d resulted in a significantly greater improvement in OCD symptoms compared with desipramine (18). Still further, a multicenter study of clomipramine supports the efficacy and safety of clomipramine in the treatment of adolescents with OCD (19). The most common adverse effects observed in adolescents, including dry mouth, somnolence, and dizziness, are comparable to those found in adults. Adverse cardiac effects are possible and patients should be followed with blood levels and EKGs for safety purposes. Although these studies suggest clomipramine may be safe for adolescents with pathological gambling, the effectiveness of the drug requires further study.

Fluvoxamine. Fluvoxamine, a selective SRI (SSRI), has demonstrated mixed results in two placebo-controlled, double-blind studies of adults with pathological gambling, with one 16-week, crossover study supporting its efficacy at an average end-of-study dose of 207 mg/d (11), and a second six-month parallel-arm study with high rates of drop-out finding no significant difference in response to active or placebo drug (11). Fluvoxamine was the first SSRI to gain FDA approval for the treatment of adolescent OCD. A double-blind study (20) has demonstrated that fluvoxamine at doses ranging from 50mg to 300 mg/d is effective and generally safe in the treatment of adolescents with OCD.

Paroxetine. Two studies examining paroxetine in the treatment of adults with pathological gambling have revealed mixed results. The first 8-week study demonstrated significantly greater improvement for individuals assigned to paroxetine compared with placebo (61% of subjects on paroxetine showed improvement versus only 23% on placebo) (11). A 16-week, multi-center study of paroxetine, however, failed to find a statistically significant difference between active drug and placebo, perhaps in part due to the high placebo response rate (48% to placebo, 59% to active drug) (11).

Although never formally tested in adolescents with pathological gambling, paroxetine has been studied in adolescents suffering from major depressive disorder and OCD. In a double-blind study of adolescent depression, paroxetine was both safe and efficacious at doses equivalent to those used in adults (20–40 mg/d) (21). Other studies, however, found paroxetine treatment in adolescents to be associated positively with suicidality (22). As such, the off-label use of paroxetine in the treatment of adolescent pathological gambling should be carefully considered and closely monitored.

Sertraline. In a double-blind, 6-month, placebo-controlled trial using sertraline for pathological gambling in adults, a mean dosage of 95 mg/d demonstrated no advantage over placebo in a group of 60 pathological gamblers (11). Sertraline, FDA-approved for OCD in children and adolescents age 6-17 years, has not been studied in adolescents with pathological gambling.

Escitalopram. Escitalopram was used in a 12-week, open label trial with an 8-week double-blind discontinuation phase for

responders in 13 subjects with pathological gambling and co-occurring anxiety disorders (11). At the completion of the open-label phase (mean dose 25.4 mg/d), six individuals were considered responders, with concurrent decreases in gambling and anxiety severity observed. Gambling and anxiety improvement was maintained for those randomized to continue receiving active escitalopram, whereas receiving placebo was associated with a resumption of gambling and anxiety symptoms. The FDA recently granted approval to escitalopram for the treatment of adolescent depression. Double-blind studies found it safe and efficacious in treating depression in adolescents aged 12-17 years (23).

Bupropion. A recent study in 39 adults with pathological gambling used bupropion in a 12-week, double-blind, placebo-controlled design. When individuals with at last one post-randomization visit were assessed, nearly 36% of those receiving bupropion and 47% of placebo subjects were classified as responders. However, high treatment discontinuation rates of nearly 44% were observed, thus making definitive conclusions difficult to make regarding the efficacy of bupropion in the treatment of adult pathological gambling (24).

The response of adult gambling symptomatology to medications approved for depression and anxiety, particularly in the placebo-controlled trials of SSRIs, usually results in decreased thoughts about gambling, reductions in gambling behavior, and improvement in social and educational or occupational functioning As these studies have often excluded individuals with significant depression or anxiety, the data suggest that modulation of serotonin function in adults with pathological gambling may mediate improvement in symptoms specifically related to gambling.

Data supporting the efficacy of SRIs in the treatment of adult pathological gambling, albeit mixed, suggest that these medications may be beneficial for adolescents with pathological gambling problems. However, given changes during adolescence in serotonergic neuronal structure and function in such brain regions as the prefrontal cortex, direct investigation of the efficacy and tolerability of specific SRIs in adolescents with pathological gambling remains warranted. The use of these medications in adolescents suffering from mood disorders or OCD suggests that many of these medications may be safe in adolescents with pathological gambling. These medications, however, carry a warning about the possible increase in suicidality in young people and therefore should be used cautiously.

Mood stabilizers

Lithium Sustained-release lithium carbonate was used in a 10-week, double-blind, placebo-controlled study of 40 adults with bipolar spectrum disorders and pathological gambling. Lithium (mean level 0.87 meq/liter) was found to be superior to placebo in reducing the thoughts and urges associated with pathological gambling. No significant differences between groups were found in the frequency of gambling per week, time spent per gambling episode, or the amount of money lost (11). Lithium has been FDA-approved for the treatment of bipolar disorder in adolescents and has demonstrated safety in this population (25). The common adverse effects of lithium appear similar to those in adults: nausea, polyuria, tremor and acne. Given its general safety profile in adolescents and its efficacy in treating adult pathological gambling, lithium may be a potentially useful treatment for adolescent pathological gambling.

Atypical antipsychotics

Atypical antipsychotics, including drugs like risperidone, olanzapine, and ziprasidone, generally share the ability to antagonize serotonin 5HT2 and dopamine D2-like (D2, D3, and D4) receptors (26). These drugs have been explored as monotherapies and augmenting agents in the treatment of non-psychotic disorders and behaviors, including pathological gambling. Two recent studies have examined the use of olanzapine in the treatment of pathological gambling.

In a 12-week, double-blind, placebo-controlled trial of 42 adults with pathological gambling, olanzapine (mean dose 8.9 [5.2] mg) resulted in a 35% or greater reduction in PG-YBOCS (Yale-Brown Obsessive Compulsive Scale modified for Pathological Gambling) scores in 66.7% of the olanzapine group. However, as 66.7% of the placebo group had the same reduction in PG-YBOCS scores, no statistically significant treatment effect was noted for olanzapine (27). In yet another study using olanzapine, (28) Fong and his colleagues (28) assessed 21 adults with pathological gambling in a 7-week, double-blind, placebo-controlled trial. All subjects reported their primary form of gambling as video poker. Reductions in cravings to gamble and gambling behavior were noted in both the olanzapine and placebo groups, and no statistically significant difference between groups was observed.

Currently several atypical antipsychotic are FDA-approved for use in adolescents (e.g., schizophrenia, bipolar disorder, and autism). Although atypical antipsychotic drugs have been found to be well-tolerated in short-term trials involving adolescents (29), increasing concerns have been raised regarding their adverse effect profile, particularly regarding their propensity for impaired glucose control and weight gain in adults and adolescents (29). As such, emerging data regarding the long-term risk-benefit ratio may influence the decision to use these drugs in adolescents in general. Given the lack of support for the use of atypical antipsychotics in treating adults with pathological gambling and the potential risks of using these drugs with regard to adverse effects e.g., weight gain and impaired glucose regulation), their use in adolescents with pathological gambling would have to be well justified and carefully monitored over time.

Glutamatergic agents

Because improving glutamatergic tone in the nucleus accumbens has been implicated in reducing the reward-seeking behavior in addictions (30), N-acetyl cysteine (NAC), a glutamate-modulating agent, was administered to 27 adults with pathological gambling over an 8-week period, with responders randomized to receive an additional 6-week double-blind trial of NAC or placebo. Overall, 59% of individuals in the open-label phase experienced significant reductions in pathological gambling symptoms and were identified as responders. At the completion of the double-blind phase, 83% of those assigned to receive NAC were still responders compared with only 28.6% of those assigned to the placebo (31). The only reported side effects included mild nausea or flatulence. In studies of marijuana dependence and autism in children and adolescents, similar doses of NAC have been examined with side-effect profiles similar to that seen in adults.

FUTURE DIRECTIONS

Attention deficit hyperactivity disorder is among the most common mental illnesses in adolescents, with prevalence estimates in this population of 3%-7% (32). Adolescents suffering from ADHD often present with

impulsivity, and ADHD appears to confer a risk for the development of substance use and gambling disorders (33). Interestingly, an early study found that 24% adults with pathological gambling suffered from co-occurring ADHD (34).

The high rate of comorbidity between pathological gambling and ADHD may suggest shared neuropathology. Evidence suggests that both pathological gambling and ADHD are associated with alterations in the function of the prefrontal cortex (PFC) and in the PFC's connections to the striatum and cerebellum (35-36). The PFC is important for sustaining attention over a delay, inhibiting distraction, and allocating attention. The PFC in the right hemisphere, particularly in the right inferior frontal gyrus, may be especially important for behavioral inhibition (37). Lesions to the PFC may produce a profile of distractibility, forgetfulness, impulsivity, poor planning, and locomotor hyperactivity.

Given the high rates of comorbidity and possible shared neuropathology between pathological gambling and ADHD, medications that enhance decision-making in ADHD may also benefit the impulsivity underlying gambling behavior, given their similar deficits in impulse control. A recent study compared the impact of stimulant medication on decision making in ADHD by examining performance on the Cambridge Gamble Task between boys with and without ADHD. In comparison with healthy controls, the ADHD group made poorer decisions, placed their bets more impulsively, and adjusted their bets less according to the chances of winning. The study found that the ADHD group bet more conservatively on the methylphenidate session than on the placebo session (38). Based on this research, future pharmacological studies may wish to examine the effects of stimulant medication on adolescents with pathological gambling, particularly those with co-occurring ADHD. Future studies should also address the extent to which the observed ADHD findings extend to girls with the disorder and how the findings might then relate to the treatment of girls with pathological gambling.

CONCLUSIONS

Despite the high prevalence of pathological gambling in adolescents, research on this disorder, particularly with respect to pharmacological therapies, is in its relative infancy. Our understanding of the neuro-developmental changes that occur during adolescence and their influence on adolescent behaviors is at an early stage. Longitudinal studies involving neuro-imaging, genetics, and behavioral assessments should help advance our understanding of adolescents, and with this understanding should come advances in prevention and treatment strategies for problems frequently experienced by adolescents, including risk behaviors such as pathological gambling.

The available data on pathological gambling in adults suggest several possible pharmacological interventions. At present, arguably the best evidence suggests the use of naltrexone and lithium in treating pathological gambling in adults. However, no data exist directly evaluating the efficacy and safety of pharmacological treatments for pathological gambling in adolescents. The pharmacological treatment of other disorders in adolescents suggests that certain medications—SRIs, mood stabilizers, naltrexone—appear safe and effective at certain doses and for certain indications. Although the data suggest potentially promising pharmacological treatments for adolescent pathological gambling, definitive treatment recommendations await the

completion of controlled treatment studies in this population. As the combination of behavioral and drug therapies in other addictive disorders has been demonstrated to be superior to either treatment alone (39), future investigations in the treatment of pathological gambling in adolescents and adults should consider empirically validating such combined treatment approaches.

ACKNOWLEDGMENTS

This work was supported by NIH grants from the National Institute on Drug Abuse (NIDA) R01 DA019139 (MNP), RC1 DA028279 (JEG), the VA VISN1 MIRECC (MNP), and the Minnesota and Yale Centers of Excellence in Gambling Research that are supported by the National Center for Responsible Gaming and its Institute for Research on Gambling Disorders. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of any of the funding agencies.

Dr. Grant has received research grants from Forest Pharmaceuticals and GlaxoSmithKline. Dr. Grant receives yearly compensation from Springer Publishing for acting as Editor-in-Chief of the Journal of Gambling Studies, has performed grant reviews for NIH and the Ontario Gambling Association, has received royalties from Oxford University Press, American Psychiatric Publishing, Inc., Norton Press, and McGraw Hill.

Dr. Potenza has received financial support or compensation for the following: Dr. Potenza consults for and is an advisor to Boehringer Ingelheim; has consulted for and has financial interests in Somaxon; has received research support from the National Institutes of Health, Veteran's Administration, Mohegan Sun Casino, the National Center for Responsible Gaming and its affiliated Institute for Research on Gambling Disorders, and Forest Laboratories, Ortho-McNeil, Oy-Control/Biotie and GlaxoSmithKline pharmaceuticals; has participated in surveys, mailings or telephone consultations related to drug addiction, impulse control disorders or other health topics; has consulted for law offices and the federal public defender's office in issues related to impulse control disorders; provides clinical care in the Connecticut Department of Mental Health and Addiction Services Problem Gambling Services Program; has performed grant reviews for the National Institutes of Health and other agencies; has given academic lectures in grand rounds, CME events and other clinical or scientific venues; and has generated books or book chapters for publishers of mental health texts.

REFERENCES

1. Wagner FA, Anthony JC. From first drug use to drug dependence: developmental periods of risk for dependence upon marijuana, cocaine, and alcohol. Neuropsychopharmacology 2002;26:479-88.
2. Chambers RA, Potenza MN. Neurodevelopment, impulsivity, and adolescent gambling. J Gambl Stud 2003;19: 53-84.
3. Proimos J, DuRant RH, Pierce JD, Goodman E. Gambling and other risk behaviors among 8th- to 12th-grade students. J Pediatr 1998;102: e23.
4. Romer D, ed. Reducing adolescent risk: toward an integrated approach. Thousand Oaks, CA: Sage Publications, 2003.
5. Wallisch L. Gambling in Texas: 1992 Texas survey of adolescent gambling behavior. Austin, TX: Texas Commission Alcohol Drug Abuse, 1993.
6. Gupta R, Derevensky JL. Adolescent gambling behavior: A prevalence study and examination of the correlates

associated with problem gambling. J Gambl Stud 1998;14:319-45.
7. Stinchfield R. A comparison of gambling among Minnesota public school students in 1992, 1995 and 1998. J Gambl Stud 2001;17: 273-96.
8. Chambers RA, Taylor JR, Potenza MN. Developmental neurocircuitry of motivation in adolescence: a critical period of addiction vulnerability. Am J Psychiatry 2003;160:1041-52.
9. Shaffer HJ, Hall MN. Estimating the prevalence of adolescent gambling disorders: a quantitative synthesis and guide toward standard gambling nomenclature. J Gambl Stud 1996;12: 193-214.
10. Dereven sky JL, Gupta R. Prevalence estimates of adolescent gambling: a comparison of the SOGS-RA, DSM-IV-J, and the GA 20 questions. J Gambl Stud 2000;16:227-51.
11. Grant JE, Potenza MN. Treatments for Pathological gambling and other impulse control disorders. In: Nathan PE, Gorman JM, eds. A guide to treatments that work, 3rd ed. New York: Oxford Univ Press, 2007:561-77.
12. Grant JE, Kim SW, Hartman BK. A double-blind, placebo-controlled study of the opiate antagonist naltrexone in the treatment of pathological gambling urges. J Clin Psychiatry 2008;69:783-9.
13. Grant JE, Kim SW, Hollander E, Potenza MN. Predicting response to opiate antagonists and placebo in the treatment of pathological gambling. Psychopharmacology (Berl) 2008;200: 521-7.
14. Ca mpbell M, Anderson LT, Small AM, Adams P, Gonzalez NM, Ernst M. Naltrexone in autistic children: behavioral symptoms and attentional learning. J Am Acad Child Adolesc Psychiatry 1993;32: 1283-91.
15. Li frak PD, Alterman AI, O'Brien CP, Volpicelli JR. Naltrexone for alcoholic adolescents. Am J Psychiatry 1997; 154:439-41.
16. Hollander E, Frenkel M, DeCaria C, Trungold S, Stein DJ. Treatment of pathological gambling with clomipramine [letter]. Am J Psychiatry 1992; 149:710-1.
17. Fla ment MF, Rapoport JL, Berg CJ, Sceery W, Kilts C, Mellstrom B, et al. Clomipramine treatment of childhood obsessive-compulsive disorder. A double-blind controlled study. Arch Gen Psychiatry. 1985;42:977-83.
18. Leonard HL, Swedo SE, Rapoport JL, Koby EV, Lenane MC, Cheslow DL, et al. Treatment of obsessive-compulsive disorder with clomipramine and desipramine in children and adolescents. A double-blind crossover comparison. Arch Gen Psychiatry 1989;46:1088-92.
19. DeVeaugh-Geiss J, Moroz G, Biederman J, Cantwell D, Fontaine R, Greist JH, et al. Clomipramine hydrochloride in childhood and adolescent obsessive-compulsive disorder—a multicenter trial. J Am Acad Child Adolesc Psychiatry 1992;31;45-9.
20. Riddle MA, Reeve EA, Yaryura-Tobias JA, Yang HM, Claghorn JL, Gaffney G, et al. Fluvoxamine for children and adolescents with obsessive-compulsive disorder: a randomized, controlled, multicenter trial. J Am Acad Child Adolesc Psychiatry 2001;40:222-9.
21. Keller MB, Ryan ND, Strober M, Klein RG, Kutcher SP, Birmaher B, et al. Efficacy of paroxetine in the treatment of adolescent major depression: a randomized controlled trial. J Am Acad Child Adolesc Psychiatry 2001;40:762.
22. Abbott A. British panel bans use of antidepressant to treat children. Nature

2003;423:792.
23. E mslie GJ, Ventura D, Korotzer A, Tourkodimitris S. Escitalopram in the treatment of adolescent depression: a randomized placebo-controlled multi-site trial. J Am Acad Child Adolesc Psychiatry 2009;48:721-9.
24. Black DW, Arndt S, Coryell WH, Argo T, Forbush KT, Shaw MC, et al. Bupropion in the treatment of pathological gambling: a randomized, double-blind, placebo-controlled, flexible-dose study. J Clin Psychopharmacology 2007;27:143-50.
25. Geller B, Cooper TB, Sun K, Zimerman B, Frazier, J, Williams, M, et al. Double-blind and placebo-controlled study of lithium for adoles-cent bipolar disorders with secondary substance dependency. J Am Acad Child Adolesc Psychiatry 1998;37:171-8.
26. Potenza MN, McDougle CJ. The potential of atypical antipsychotics in the treatment of non-psychotic disorders. CNS Drugs 1998;9:213-32.
27. McElroy SL, Nelson EB, Welge JA, Kaehler L, Keck PE Jr. Olanzapine in the treatment of pathological gambling: a negative randomized placebo-controlled trial. J Clin Psychiatry 2008; 69(3):433-40.
28. Fong T, Kalechstein A, Bernhard B, Rosenthal R, Rugle L. A double-blind, placebo-controlled trial of olanzapine for the treatment of video poker pathological gamblers. Pharmacol Biochem Behav 2008;89:298-303.
29. Stigler KA, Potenza MN, McDougle CJ. Tolerability profile of atypical antipsychotics in children and adolescents. Pediatr Drugs 2001;3:927-42.
30. Kalivas PW, Peters J, Knackstedt L. Animal models and brain circuits in drug addiction. Mol Interv 2006;6:339-44.
31. Grant JE, Kim SW, Odlaug BL. N-acetyl cysteine, a glutamate-modulating agent, in the treatment of pathological gambling: a pilot study. Biol Psychiatry 2007;62:652-7.
32. Bloom B, Cohen RA, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2007. Vital Health Stat 10. 2009;239:1-80.
33. Mann uzza S, Klein RG, Bessler A, Malloy P, LaPadula M. Adult outcome of hyperactive boys. Educational achievement, occupational rank, and psychiatric status. Arch Gen Psychiatry 1993;50:565-76.
34. Specker SM, Carlson GA, Christenson GA, Marcotte M. Impulse control disorders and attention deficit disorder in pathological gamblers. Ann Clin Psychiatry 1995;7:175-9.
35. Brennan AR, Arnsten AF. Neuronal mechanisms underlying attention deficit hyperactivity disorder: the influence of arousal on prefrontal cortical function. Ann N Y Acad Sci 2008;1129:236-45.
36. Potenza MN, Leung HC, Blumberg HP, Peterson BS, Fulbright RK, Lacadie CM, et al. An FMRI stroop task study of ventromedial prefrontal cortical function in pathological gamblers. Am J Psychiatry 2003;160: 1990-4.
37. Cha mberlain SR, Sahakian BJ. The neuropsychiatry of impulsivity. Curr Opin Psychiatr 2007;20:255-61.
38. DeVito EE, Blackwell AD, Kent L, Ersche KD, Clark L, Salmond CH, et al. The effects of methylphenidate on decision making in attention-deficit/ hyperactivity disorder. Biol Psychiatry 2008;64; 636-9.
39. C arroll KM. Integrating psychotherapy and pharmacotherapy to improve drug abuse treatment outcome. Addict Behav 1997;22: 233-45.

©Freund Publishing House Ltd. Int J Adolesc Med Health 2010;22(1):139-151

Prevention of problem gambling in Chinese adolescents: Relevance of problem gambling assessment and positive youth development frameworks

Daniel TL Shek, PhD, FHKPS, BBS, JP[1,2,3] and Jik J Lee, BSocSc, PhD[1]

[1]Department of Applied Social Sciences and [2]Public Policy Research Institute, The Hong Kong Polytechnic University, Hong Kong, P.R.C.; [3]Department of Sociology, East China Normal University, Shanghai, PRC and [3]Kiang Wu Nursing College of Macau, Macau, PRC

Abstract: Although research findings show that adolescent gambling behavior is a growing problem, there are not many theory-driven prevention programs in the Chinese context. In this paper, two approaches of developing Chinese adolescent prevention program are described. In the first approach, it is argued that related programs should be developed with reference to the risk factors of problem gambling based on problem gambling assessment tools and frameworks. The modified Chinese G-MAP is used as an example to illustrate this approach. In the second approach, it is argued that programs incorporating positive youth development constructs would help adolescents develop positive qualities which would prevent them from developing problem gambling. The Project P.A.T.H.S. is given as an example. The issues related to the application of positive youth development constructs to adolescent problem gambling prevention are discussed.

Keywords: Gambling problems, adolescents, positive youth development, intervention programs, G-MAP

Correspondence: Daniel TL Shek, PhD, FHKPS, BBS, JP, Professor of Applied Social Sciences, Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hong Kong, P.R.C. E-mail: danielshek@polyu.edu.hk

Submitted: April 01, 2009. ***Revised:*** April 30, 2009. ***Accepted:*** May 09, 2009.

INTRODUCTION

A survey of the Western literature showed that adolescent gambling behavior is a growing problem. Shaffer and Hall (1) reported that 10% to 14% of the young respondents were at-risk for problem gambling. Griffiths and Wood (2) revealed that high levels of adolescent gambling were found in Europe, USA, Canada and Australia. Gupta and Derevensky (3) showed that 63% of underage adolescents in Grade 7 to Grade 12 were found gambling; out of the total population, 2.7% were found to be probable pathological gamblers, 6.6% were gamblers at-risk, and 54% were social gamblers. Dickson, Derevensky and Gupta (4) reported that 4% to 8% of the adolescents were problem gamblers, which was as high as two to four times that of the adult population. Hardoon, Gupta and Derevensky (5) suggested that 4.9% of the respondents were pathological gamblers, whereas 8.0% of them were at-risk. In Hong Kong, very few studies have examined problem gambling in adolescents. The Chinese Young Men's Christian Association of Hong Kong (6) found that 3.5% of the young respondents were

pathological gamblers and 0.8% of them were probable pathological gamblers. Although the reported prevalence rates of problem gambling in adolescents among different countries and/or cities may not be directly comparable because of different operational definitions of problem gambling, these figures do give us some idea about the seriousness of the problems in adolescents. All governments should therefore find means to tackle the problem.

This paper attempts to examine the issue of how adolescent problem gambling programs could possibly be developed. The first approach that we can adopt is to examine the risk factors associated with adolescent problem gambling and to develop prevention programs attempting to reduce the influence of the risk factors. Within this context, prevention programs based on gambling assessment tools, such as the Maroondah Assessment Profile for Problem Gambling (G-MAP), will help to develop the related programs and to identify adolescent problem gamblers. The second approach we can consider is to make use of the positive youth development (PYD) approach to develop PYD programs by applying PYD constructs. The basic logic of this approach is that with the strengthening of adolescent development, adolescent development problems would be reduced.

PREVENTION OF PROBLEM GAMBLING

In view of the growing problem gambling in adolescents, one obvious question is how problem gambling in adolescents can be prevented (7,8). From the prevention science perspective, there are two approaches dominating the development of preventive strategies. The first approach adopts the "traditional" conception (9), which includes three levels of dealing with the problem: 1) primary prevention (elimination of the occurrence of problems), 2) secondary prevention (early identification of high-risk groups and early intervention), and 3) tertiary prevention (prevention of further deterioration of the problem). The second approach adopts the "changing" conception (10), which includes three target groups: 1) universal prevention (targeting all adolescents regardless of their risk status), 2) selective prevention (targeting adolescents who have above-average risk of behaviors but no indication that their participation in risky behaviors is a problem), and 3) indicated prevention (targeting adolescents with noticeable signs and markers of a behavioral problem even they are not diagnosable). The focus on primary prevention and universal prevention initiatives have been commonly used to prevent adolescents' risky behaviors such as substance abuse.

It is noteworthy that prevention programs regarding problem gambling are underdeveloped. As pointed out by Dickson, Derevensky, and Gupta (4),

> *"despite increased awareness of the need to begin educating young children about the potential dangers of gambling, empirical knowledge of the prevention of adolescent gambling and its translation into science-based prevention initiatives is scarce"* (p. 97),

and the authors argued that

> *"the field of prevention of youth gambling problems can draw upon the substantial research on adolescent alcohol and substance abuse prevention which has a rich history of research, program development and implementation, and evaluation"* (p. 99).

Currently, a majority of intervention programs are developed by applying the

risk-factor concept. For example, the common strategy used in adolescents' substance abuse prevention programs is to identify the risk and protective factors in substance abusers. The purposes are to minimize the risk factors and to maximize the protective factors in young people (2,11). This strategy being used in problem gambling prevention is critical because it helps identify the risk factors involved in problem gambling and reduce them while strengthening the protective factors at the same time.

Gupta and Derevensky (12) have done an excellent job in summarizing some of the major risk factors for young people with serious gambling problems. The risk factors are listed below:

1. problem gambling is more popular among males;
2. risk-takers have greater risk for problem gambling;
3. prevalence rates of adolescents' problem gambling are 2 to 4 times those of adults;
4. problem gamblers have relatively lower self-esteem;
5. problem gamblers have higher rates of depression;
6. dissociation during gambling frequently occurs in problem gambling;
7. high risk of suicidal ideation and suicidal attempts exist in problem gamblers;
8. loss of quality friendship and relationship are common in problem gamblers; and problem gamblers have more gambling associates than do non-problem gamblers;
9. problem gamblers have increased risk for multiple addictions;
10. problem gamblers have higher excitability than the non-problem gamblers;
11. problem gamblers have poorer general coping skills; and
12. relative to non-problem gamblers, problem gamblers display increased delinquency and crime.

RELEVANCE OF PROBLEM GAMBLING ASSESSMENT

It is argued that understanding of the risk factors involved in adolescent problem gambling would help to develop adolescent problem gambling prevention programs. A survey of the literature showed that researchers have developed different assessment tools to identify risk factors in problem gambling. The G-MAP developed by Loughnan, Pierce, and Sagris-Desmond (13) is one of such examples. According to the G-MAP, the common risk factors identified in problem gambling are as follows:

- Problematic beliefs about winning (i.e., faulty cognitive problems): faulty belief in the efficacy of one's cognitive system (control factor), use of intuition and ideas about luck to achieve successful outcomes (prophecy factor), and belief that gambling is a reasonable way to make money (uninformed factor).
- Emotional and coping problems: use of gambling to lift their mood (good feelings factor), use of gambling to control stress (relaxation factor), use of gambling to alleviate boredom (boredom factor), and dissociation as well as disconnection from emotional responses when engaging in gambling (numbness).
- Problem situations: using gambling behavior as an "escape" from the perceived demands in life (oasis), and gambling as a result of the dire to be "naughty" or rebellious (mischief factor).
- Attitudes to self (cognitive/psychological problem): belief that others see them as 'losers' and wish that gambling can help

them to be 'winners' (low self-image factor), gambling as a result of the desire to maintain self-image of being a 'winner' (winner factor), belief that gambling is a disease or affliction that can only be solved by life-long abstinence (entrenchment), and conscious use of gambling to punish or hurt oneself (harm to self factor).

- Social problem: social factors that may contribute to gambling (systems factor) and use of gambling to satisfy the desire to be around people but minimize the pressure to interact with them (shyness factor).

To help to assess and develop intervention programs in the Chinese context, Shek, Chan, and Tung (14) translated and validated the G-MAP in Hong Kong. As the G-MAP developed in the West may not be suitable for people in Asian countries due to cultural differences, Shek et al (15) developed the modified Chinese version of the G-MAP (Chinese G-MAP) for the assessment of problem gambling. The modified Chinese G-MAP has 10 domains and 23 scales resembling 8 groups of factors related to pathological gambling. Detailed information of the Chinese version G-MAP is provided in the following section.

1. **Beliefs about winning domain (cognitive problems)**
- Control: belief in the efficacy of one's system in winning money.
- Prophecy: use of intuition and ideas about luck to achieve successful outcomes

2. **Feelings domain (emotional problems)**
- Boredom: use of gambling to alleviate boredom
- Good Feelings: use of gambling to lift one's mood
- Numbness: dissociation and disconnection from emotional responses when engaging in gambling
- Relaxation: use of gambling to cope with stress

3. **Situations domain (life situations related to pathological gambling)**
- Desperation: gambling as a result of desperation
- Rebellion: gambling as a result of the desire to be rebellious
- Oasis: use of gambling to reward oneself
- Transition: relation between gambling and transitional events in lives

4. **Attitudes to self domain (self-concept and psychological problem)**
- Low Self-Image: belief that one as a 'loser' and wish that gambling can help one to be a 'winner'
- Winner: gambling as a result of the desire to maintain self-image of being a 'winner'
- Low Self-Efficacy: belief that one is capable to control his/her gambling behavior

5. **Social Domain (Social Influences)**
- Friendship: use of gambling to increase social encounter
- Shyness: use of gambling to satisfy the desire to be around by people but minimize the pressure to interact with them

6. **Behavior domain (behavioral influences)**
- Habit: gambling in familiar environ-ment or with familiar people
- Leisure: gambling as a hobby or an interest

7. **Spirituality domain (spiritual influences)**
- Lack of Life Goal: belief that gambling and winning money are meaningful in one's life
- Self-Worth: gambling as a way to search for one's value

8. **Family domain (family influences)**
- Reinforcements: gambling for the sake of

one's family
- Escape: gambling as a way to escape from family problems

9. Attitudes to financial management domain (attitudinal influences)
- Attitudes to Financial Management: gambling as a way to deal with one's debts

10. Culture domain (cultural influences)
- Chinese Beliefs about Gambling: beliefs in the Chinese proverbs about gambling

Shek et al (15) showed that the Chinese G-MAP is valid and reliable. Obviously, the G-MAP dimensions can be used to develop adolescent prevention programs in the Chinese culture. For example, it would be helpful to train adolescents to deal with Chinese beliefs about gambling. Furthermore, the modified Chinese G-MAP can be used to identify Chinese adolescent problem gamblers who may need early intervention.

ALTERNATIVE COMPLEMENTARY APPROACH: POSITIVE YOUTH

Although the prevention science approach focusing on risk and protective factors of high-risk adolescent behaviors generated much research finding and produced many prevention programs in the past few decades, this approach has been criticized as taking a negative view about adolescent development. Based on the belief that adolescents are assets to be developed rather than problems to be solved, an alternative approach to tackle adolescent gambling problem is in order.

Some researchers (16) look upon the PYD to accomplish this goal. Damon (17) stated that the field of PYD focuses on adolescents' talents, strengths, interests, and future potentials. This focus is in sharp contrast to the prevention science approach's focus on adolescents' personal disadvantages, disabilities and behavioral problems, such as learning disabilities and substance abuse. Many researchers and intervention program developers believe that the effort on identifying and promoting young people's talents and strengths will raise their self-esteem, self-image, and life goals. As a result, the use of PYD constructs should be used to promote development of adolescents.

There are many PYD programs in the West. Catalano, Berglund, Ryan, Lonczak, and Hawkins (18,19), based on their revision of 77 PYD programs, concluded that there are 25 successful programs involving 15 identified PYD constructs. From a prevention of problem gambling's point of view, these 15 constructs are useful in developing adolescent problem gambling prevention programs. The meaning of these PYD constructs and the rationales for including them in problem gambling prevention programs are explained below.

1) Promotion of bonding: Promotion of bonding means to develop strong affective relationship with and commitment to people (healthy adults and positive peers) and institutions (school, community and culture). It is believed that strong linkages with healthy adults and significant others are important to prevent problem gambling in adolescents. Researchers found that many adolescent gamblers are negatively impacted by the following situations: a) many parents and friends of adolescent gamblers are gamblers; b) perceived family support in adolescent problem gamblers is poor (5), and c) quality friendships and relationships are lost and replaced by gambling associates among problem gamblers (12). According to family theories, adolescents' developmental problems are regarded as outcomes of their problematic family processes. In a longitudinal study examining the linkage between parental behavioral and psychological control and

adolescents' adjustment, Shek (20-22) showed that parental psychological and behavioral control are related to the children's psychological well-being (such as life satisfaction, mastery, life satisfaction and hopelessness). This construct is intimately linked to adolescents' gambling behavior.

2) Promotion of social competence: Social competence refers to interpersonal skills (such as communication, assertiveness, conflict resolution, and interpersonal negotiation), the ability to build up positive human relationships, and the provision of opportunities to practice such skills. There are several rationales to develop social competence as a means to prevent problem gambling: a) the social competence in adolescent gamblers is poor (e.g., outcomes of the G-MAP assessment), b) many friends and peers in adolescents with gambling problem are gamblers, and c) there is a poorly perceived peer support among adolescent problem gamblers (5).

3) Promotion of emotional competence: Emotional competence includes awareness of one's own emotions, ability to understand others' emotions, ability to use the vocabulary of emotion, capacity for empathy, ability to differentiate internal subjective emotional-experience from external emotional-expression, capacity to control emotional distress, awareness of emotional messages within relationships, and capacity for emotional management. The justifications for including this PYD construct is that there are greater emotional problems (such as depression and suicidal ideation) in adolescent gamblers (3) and emotional problems in problem gamblers.

4) Promotion of cognitive competence: Cognitive competence includes cognitive abilities, processes or outcomes (such as logical thinking, problem-solving, and goal setting), and critical thinking (such as making inferences, self-reflection, and coordination of multiple views). The cultivation of cognitive competence as a preventive strategy is important because researchers have found that there are illusions of control and unrealistic perceptions of luck in adolescent problem gamblers (23). The control factor (belief in the efficacy of their system), the prophecy factor (use of intuition and ideas about luck to achieve successful outcomes), and the uninformed factor (belief that gambling is a reasonable way to make money) in the G-MAP also suggest that cognitive dysfunction is a source of concern in problem gamblers. According to cognitive theories of problem gambling, cognitive dysfunction and irrational thoughts about problem gambling are the basic factors conducive to problem gambling.

5) Promotion of behavioral competence: This PYD construct includes the ability to use nonverbal and verbal strategies to perform socially acceptable and normative behavior in social interactions and to make effective behavior choices. The basic justification for including this construct in the prevention toolbox is that peer pressure plays an important role in adolescent problem gambling (24). A significant proportion of adolescent gambling activities take place in friends' homes. How to help adolescents resist negative peer influence has become a central focus in many of the current programs on the prevention of adolescents' high risk behaviors.

6) Promotion of moral competence: Moral competence refers to the orientation to perform altruistic behavior, ability to judge moral issues, as well as to promote the development of justice and altruistic behaviors in adolescents. It is argued that the promotion of this PYD construct is important because problem gamblers are unable to judge the negative consequences

of pathological gambling. Adolescent problem gamblers have weak moral constraint as reflected by the findings that they usually have a history of delinquency such as stealing money to fund their gambling (2).

7) Development of self-efficacy: Self-efficacy refers to beliefs in one's ability to organize and execute the courses of action required to produce given attainments as well as techniques to change negative self-defeating cognitions to positive ones. There are two reasons to support the inclusion of this PYD construct in problem gambling prevention programs. First, problem gamblers may either have very low self-efficacy (so that they wish to attain control via gambling) or over-estimate their ability to control the outcomes of gambling. Second, as increasing research evidence shows that self-efficacy is negatively related to substance abuse, it is argued that development of self-efficacy will reduce the likelihood of problem gambling.

8) Fostering prosocial norms: Prosocial norms are clear and healthy standards, beliefs, and behavior guidelines which promote socially desirable behavior. Prosocial norms often include altruism, solidarity, and volunteerism leading to prosocial behaviors, such as cooperation and sharing. As pointed out by Hardoon, Gupta, and Derevensky (5), adolescent gambling is closely related to delinquency and conduct problems. Because prosocial norms and behaviors can be viewed as incompatible with aggressive or deviant behaviors, it is expected that the promotion of prosocial behaviors, i.e., the PYD construct, will be conducive to the reduction of high-risk behaviors.

9) Cultivation of resilience: Resilience can be conceived as a capacity (the ability of an individual for adapting to changes in a healthy way), a process (a reintegration process for an individual to recover) or a result (positive outcomes after going through stressful events). Cultivation of resilience means fostering adolescents' capacity against unconstructive developmental changes and life stresses in order to 'bounce back' from stressful life experience and achieve healthy outcomes. The inclusion of resilience as a PYD construct is important for two reasons. First, research studies have showed that coping behaviors in adolescent gamblers are poor (3) and that problem gambling may occur after negative life events (G-MAP). Second, there are studies showing that resilience is negatively related to adolescent high-risk behaviors.

10) Cultivation of self-determination: Self-determination refers to an adolescent's ability to set goals and make choices according to his/her own thinking. Regarding skills and strategies which promote self-determination, they include self-awareness of strengths and limitations, goal setting and action planning, problem solving, choice-making, and self-evaluation. There are two justifications for promoting self-determination as a strategy to prevent problem gambling. First, problem gambling represents poor choice-making in adolescent behaviors. Second, as impulsivity is involved in adolescent problem gamblers, cultivation of self-determination is important (24).

11) Cultivation of spirituality: Cultivation of spirituality refers to promotion of the development of beliefs in a higher power or a sense of spiritual identity, meaning or practice. Two arguments support the use of this PYD construct in the prevention of adolescent problem gambling. First, there are research findings showing that purpose in life is negatively related to adolescents' high-risk behavior and psychological well-being (25). Second, according to the existential theory of Victor Frankl, psycho-

pathological behavior, such as problem gambling, is a result of existential vacuum that is created by a lack of meaning in an individual.

12) Promotion of beliefs in the future: Beliefs in the future refers to hope and optimism, including valued and attainable goals, positive appraisal of one's capability and effort (a sense of confidence), and positive expectancies of the future. As problem gamblers have heightened risk for suicidal ideation and attempts (4), it is assumed that such negative views about the future are antecedents of problem gambling, promotion of beliefs in the future will reduce the likelihood of problem gambling.

13) Development of clear and positive identity: This PYD construct refers to the building of self-esteem and facilitation of exploration and commitments in self-definition. As many studies have shown that the self-esteem of adolescent problem gamblers is lower than that of the control participants (4), it can be argued that promotion of self-esteem in adolescents will prevent the development of problem gambling in adolescents.

14) Opportunity for prosocial involvement: This PYD construct refers to events and activities that promote adolescents' participation in prosocial behaviors and maintenance of prosocial norms. As prosocial involvement is negatively related to delinquency and psychological problems (26,27), it can be argued that providing opportunities for prosocial involvement would prevent the development of problem gambling.

15) Recognition for positive behavior: This construct refers to the development of systems for rewarding or recognizing participants' positive behaviors such as prosocial behaviors or positive changes in behaviors. This PYD construct is important because adolescent problem gamblers may attempt to derive achievement from excessive gambling and many adolescent problem behaviors occur as a result of the lack of proper recognition for their positive behaviors.

POSITIVE YOUTH DEVELOPMENT PROGRAMS IN HONG KONG

The development of positive youth development programs is at its infancy in Hong Kong. In order to promote a holistic development among adolescents in Hong Kong, The Hong Kong Jockey Club Charities Trust has approved HK$400 million (note: the official exchange rate between US$ and HK$ is 1:7.8) to launch a project entitled "P.A.T.H.S. to Adulthood : A Jockey Club Youth Enhancement Scheme". The word "P.A.T.H.S." denotes Positive Adolescent Training through Holistic Social Programmes. The Trust invited academics of five universities in Hong Kong to form a Research Team to develop a multi-year universal PYD program to promote holistic adolescent development in Hong Kong, with Shek as the Principal Investigator. Besides developing the program, the Research Team also provides training for the teachers and social workers who implement the program, and carries out longitudinal evaluation of the project. There are two tiers of programs (Tier 1 and Tier 2 Programs) in this project. The Tier 1 Program is a universal PYD program in which students in Secondary 1 to Secondary 3 will participate, normally with 20 hours of training in the school year at each grade. Because research findings suggest that roughly one-fifth of adolescents will need help of a deeper nature, a Tier 2 Program will generally be provided for at least one-fifth of the students who have

greater psychosocial needs at each grade (i.e., selective program).

The overall objective of the Tier 1 Program is to promote holistic development among junior secondary school students in Hong Kong. To achieve this objective, program elements related to PYD constructs are included in the Tier 1 Program (28). These elements include: promotion of bonding, cultivation of resilience, promotion of social competence, promotion of emotional competence, promotion of cognitive competence, promotion of behavioral competence, promotion of moral competence, cultivation of self-determination, promotion of spirituality, development of self-efficacy, development of a clear and positive identity, promotion of beliefs in the future, provision of recognition for positive behavior, provision of opportunities for prosocial involvement, and fostering prosocial norms (28,29). Both Chinese and English curriculum manuals have been produced with reference to all PYD constructs except the recognition for positive behavior. For the recognition for positive behavior, it is argued that this element should be implemented as a regular principle inside and outside classrooms. As such, no specific curricula are needed.

For the evaluation of the program, objective outcome evaluation, subjective outcome evaluation, secondary data analyses, process evaluation, interim evaluation, qualitative evaluation based on focus groups, student weekly diaries and case studies have been used. Based on these strategies, existing research findings generally revealed that different stakeholders have positive perceptions of the program, workers, as well as benefits the program, and that the program is effective in promoting holistic PYD among Chinese adolescents in Hong Kong (28-33).

DISCUSSION

Although the utilization of PYD programs represents a reasonable approach to prevent adolescent problem gambling, several issues should be considered for developing adolescent prevention programs in Hong Kong.

First, it is important to examine the goal(s) of problem gambling prevention programs. Basically, there are two possible goals of such prevention programs: abstinence of gambling vs. harm minimization or harm reduction of problem gambling (7,8). With specific reference to the Chinese culture of Hong Kong, parents basically do not tolerate gambling in adolescents. As such, abstinence of gambling is regarded as the legitimate objective of gambling prevention programs. This goal is clearly exemplified by the anti-gambling program initiated by the Hong Kong Education City. On the other hand, gambling prevention programs in the West are commonly designed within the context of harm reduction or minimization.

The second issue is whether specific gambling prevention programs or generic PYD programs should be designed. While the former has the advantage of having specific focus on problem gambling as well as spending fewer manpower and financial resources, the stigmatizing effect of such programs should not be underestimated. For example, for schools admitting 'better' students, most schools tend to deny any gambling problems among their students. These schools will not join such prevention programs as a defense mechanism. On the other hand, as 'generic' PYD programs targeting the total youth population are non-stigmatizing in nature, school administrators, teachers, and parents will accept the prevention programs more readily. Nevertheless, the basic question that should be asked is whether the PYD program should

be a panacea to all adolescents with high-risk behaviors.

Third, while it is reasonable to propose that researchers can apply the elements and principles of substance abuse prevention programs to problem gambling prevention programs, one query that should be raised is whether there are any meaningful similarities between substance abuse prevention programs and problem gambling prevention programs. Basically, one has to identify the lowest common multiples of both types of prevention programs. Although many common risk factors are involved in substance abuse and problem gambling (e.g., sensation seeking and higher predisposition in males), there are some differences involved. For example, as parents generally do not tolerate problem gambling behavior in adolescents, their tolerance for substance abuses in their children is even less.

Fourth, to ensure that problem gambling prevention programs are effective, one should ask what theoretical mechanisms are intrinsic to those programs that can contribute to the effectiveness of the programs (34). It is noted that the theory of reasoned action, self-concept theories, and cognitive theories have been applied to many existing gambling prevention programs. Hardoon and Derevensky (35) also pointed out different theories of gambling behaviors, including personality, cognitive, learning/behavioral, general addiction, and social learning theories of gambling behaviors. With reference to the ecological approach, there can be different personal and environmental risk and protective factors that may contribute to the success of problem gambling prevention programs. Hence, it is important to argue for the use of theoretical mechanisms in problem gambling prevention programs because these theories will serve as the backbone in designing the prevention programs.

The fifth issue concerns the universality of problem gambling prevention programs. A survey of the literature shows that most of the existing gambling prevention programs are designed in Western countries. If one assumes that knowledge transcends culture and prevention theories are universally applicable, one can simply translate the English version of such programs and apply them in different cultures. Nevertheless, as the meaning of gambling has different meanings under different cultures, there are researchers arguing for the design of indigenous gambling prevention programs utilizing the 'emic' approach rather than the 'etic' approach.

Sixth, although it is conceptually desirable to have problem gambling prevention programs, whether such programs are really effective in reducing problem gambling behavior in adolescents is an empirical question to be considered. As such, evaluation of the effectiveness of the gambling prevention program is an important issue to be addressed. Unfortunately, program evaluation is not a simple and straightforward task and there are many types and approaches of evaluation (36). In his discussion of the major strategies of evaluation, Patton (37) outlined three basic types of evaluation: quantitative evaluation, qualitative evaluation, and utilization-focused evaluation. Ginsberg (38) summarized the major forms of evaluation, including quantitative and qualitative approaches, cost-benefit analyses, satisfaction studies, needs assessment, single-subjects designs, experimental approaches and models, utilization-focused evaluation, empowerment evaluations, fraud and abuse detection, client satisfaction, and journalistic evaluation. Using starting alphabets as the bases of classification,

Patton (37) suggested that there are more than 100 types of evaluation. Because of the complexity of the nature of evaluation and because different paradigms are involved, researchers are confronted with the task of developing appropriate evaluation approaches and strategies in the field of gambling prevention.

Finally, it would be exciting if the key elements of prevention approach and positive youth development approach could be integrated. According to Catalano et al (18), there are several attributes of the prevention science perspective. These include: 1) identification of risk and protective factors; 2) adoption of a developmental perspective; 3) assertion that problem behaviors share many common antecedents; and 4) assertion that risk and protective factors change youth outcomes. On the other hand, several characteristics associated with the positive youth development approach were identified: 1) emphasis on integrated youth development (i.e., focusing on a range of youth developmental possibilities and problems) rather than dealing with a single youth problem; 2) upholding the belief that "problem-free is not fully prepared"; 3) emphasis of person-in-environment perspective; and 4) focus on developmental models on how young people grow, learn and change. In their discussion of the positive youth development approach, Catalano et al. (19) pointed out that the attributes of positive youth development and characteristics of the prevention science approach are compatible and both approaches could be cooperative rather than competitive. As such, it will be theoretically and practically interesting to see how we can design an integrated program for Chinese adolescents based on the dimensions of G-MAP and the PYD constructs intrinsic to the P.A.T.H.S. Project.

In summary, with the growing severity of the problem of adolescent problem gambling, prevention of adolescent problem gambling is an urgent issue that should be addressed by researchers, professional workers, prevention program developers, and policy-makers. It is argued that the utilization of the G-MAP findings as well as the application of PYD constructs is a promising approach for the problem gambling prevention field in the West as well as in Hong Kong.

ACKNOWLEDGMENTS

The preparation of this work was financially supported by The Hong Kong Jockey Club Charities Trust and Wofoo Foundation. The findings on the impact of parental psychological and behavioral control on adolescent psychological well-being are based on a study funded by the Research Grants Council of the Government of the Hong Kong Special Administrative Region, Hong Kong (Grant CUHK4293/03H).

REFERENCES

1. Shaffer HJ, Hall MN. Estimating the prevalence of adolescent gambling disorders: A quantitative synthesis and guide toward standard gambling nomenclature. J Gambl Stud 1996;12: 193-214.
2. Griffiths M, Wood RTA. Risk factors in adolescence: The case of gambling, videogame playing, and the Internet. J Gambl Stud 2000;16:199-225.
3. Gupta R, Derevensky JL. An examination of the differential coping styles of adolescents with gambling problems. Montreal, Quebec: Int Centre Youth Gambl Problems High-Risk Behav, 2001.
4. Dickson LM, Derevensky JL, Gupta R. The prevention of gambling problems

in youth: A conceptual framework. J Gambl Stud 2002;18:97-159.
5. Hardoon KK, Gupta R, Derevensky JL. Psychosocial variables associated with adolescent gambling. Psychol Addict Behav 2004;18:170-9.
6. Chinese Young Men's Christian Association of Hong Kong. A research report on adolescent gambling in Hong Kong. Hong Kong: Chinese Young Men's Christian Assoc Hong Kong, 2004.
7. Dickson LM, Derevensky JL, Gupta R. Harm reduction for the prevention of youth gambling problems: Lessons learned from adolescent high-risk behavior prevention programs. J Adolesc Res 2004;19:233-63.
8. Dickson L, Derevensky JL, Gupta R. Youth gambling problems: A harm reduction prevention model. Addict Res Theory 2004;12:305-16.
9. Caplan G. Principles of preventive psychiatry. New York: Basic, 1964.
10. Levine M, Perkins DV, eds. Principles of community psychology: Perspectives and applications. New York: Oxford Univ Press, 1997.
11. Elias MJ, Gager P, Leon S. Spreading a warm blanket of prevention over all children: Guidelines for selecting substance abuse and related prevention curricula for use in the schools. J Prim Prev 1997;18:41-69.
12. Gupta R, Derevensky JL. Adolescents with gambling problems: From research to treatment. J Gambl Stud 2000;16: 315-42.
13. Loughnan T, Pierce M, Sagris-Desmond A. Maroondah assessment profile for problem gambling: Administrator's Manual. Melbourne: Aust Council Educ Res, 1999.
14. Shek DTL, Chan EML, Tung CKK. Best practice of gambling counseling in Hong Kong: Developing a localized instrument for assessing the psychological profiles of individuals with problem gambling. Hong Kong: Tung Wah Group Hosp, 2006.
15. Shek DTL, Sun RCF, Lee JJ, Chan EML. Development and validation of an indigenous Chinese measure of problem gambling. Hong Kong: Even Centre, Tung Wah Group Hosp, Dept Applied Soc Sci, Hong Kong Polytech Univ, 2009.
16. Benson PL, Saito RN. The scientific foundation of youth development. Youth Development: Issues, Challenges, and Directions 2000;125-148. Accessed 17 Jan 2009. Available at: http://www.ppv.org/indexfiles/yd-index.html
17. Damon W. What is positive youth development? Ann Am Acad of Polit Soc Sci. 2004;591:13-24.
18. Catalano RF, Berglund ML, Ryan JAM, Lonczak HS, Hawkins JD. Positive youth development in the United States: Research findings on evaluations of positive youth development programs. Prev Treatment 5(1).
19. Catalano RF, Berglund ML, Ryan JAM, Lonczak HS, Hawkins JD. Positive youth development in the United States: Research findings on evaluations of positive youth development programs. Ann Am Acad Polit Soc Sci 2004;591:98-124.
20. Shek DTL. Perceived parental control and parent-child relational qualities in Chinese adolescents in Hong Kong. Sex Roles 2005;53(9-10):635-46.
21. Shek DTL. Conceptual framework underlying the development of a positive youth development program in Hong Kong. Int J Adoles Med Health 2006;18(3):303-14.
22. Shek DTL. Perceived parental behavioral control and psychological control

in Chinese adolescents in Hong Kong. Am J Fam Ther 2006;34(2):163-76.
23. Gupta R, Derevensky JL. Adolescent gambling behavior: A prevalence study and examination of the correlates associated with problem gambling. J Gamb Stud 1998;14:319-45.
24. La nghinrichsen-Rohling J, Rohde P, Seeley JR, Rohling ML. Individual, family, peer correlates of adolescent gambling. J Gambl Stud 2004;20:23-46.
25. She k DTL. Meaning in life and psychological well being: An empirical study using the Chinese version of the Purpose in Life Questionnaire. J Genet Psychol 1992; 153:185-200.
26. Ma HK, Shek DTL, Cheung PC. The relation of social influences and social relationships to prosocial and anti-social behavior in Hong Kong Chinese adolescents. In: Shohov SP, ed. Advances in psychology research. New York: Nova Sci, 2002:8:177-201.
27. She k DTL, Ma HK, Cheung PC. A longitudinal study of adolescent antisocial and prosocial behavior. Psychologia 2000;43:229-42.
28. She k DTL, Ma HK, Sun RCF. Interim evaluation of the Tier 1 Program (Secondary 1 Curriculum) of the Project P.A.T.H.S.: First year of the Full Implementation Phase. Scientific WorldJournal 2008;8:47-60.
29. She k DTL, Sun RCF, Siu AMH. Interim evaluation of the Secondary 2 Program of Project P.A.T.H.S.: Insights based on the Experimental Implementation Phase. Scientific WorldJournal 2008;8:61-72.
30. She k DTL. Evaluation of Project P.A.T.H.S. in Hong Kong: Triangulation of findings based on different evaluation strategies. ScientificWorld Journal 2008;8:1-3.
31. She k DTL, Siu AMH, Lee TY, Cheung CK, Chung R. Effectiveness of the Tier 1 Program of Project P.A.T.H.S.: Objective outcome evaluation based on a randomized group trial. ScientificWorldJournal 2008;8:4-12.
32. She k DTL, Sun RCF, Lam CM, Lung DWM, Lo SC. Evaluation of Project P.A.T.H.S. in Hong Kong: Utilization of student weekly dairy. ScientificWorld Journal 2008;8:13-21.
33. She k DTL, Ma HK. Design of a positive youth development program in Hong Kong. Int J Adolesc Med Health 2006;18(3):315-27.
34. Evan s RI. Some theoretical models and constructs generic to substance abuse prevention programs for adolescents: Possible relevance and limitations for problem gambling. J Gambl Stud 2003;19:287-302.
35. Hardoon KK, Derevensky JL. Child and adolescent gambling behavior: Current knowledge. Clin Child Psychol Psychiatry 2002;2:263-81.
36. Chel imsky E, Shadish WR. Evaluation for the 21st century: A handbook. Thousand Oaks, CA: Sage, 1997.
37. Patton MQ. Utilization-focused evaluation: The new century text. Thousand Oaks, CA: Sage, 1997.
38. Ginsber g LH. Social work evaluation: Principles and methods. Boston: Allyn Bacon, 2001.