Gambling Problems and Features of Attention Deficit Hyperactivity Disorder Among Children and Adolescents

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Abstract: Adolescence has been typically described as a developmental stage during which risky behaviors are common. Although considerable attention has been paid to high-profile risky behaviors, including alcohol and drug abuse, eating disorders, and smoking, little attention has focused on adolescent problem gambling. Given the DSM criteria of problem gambling being designated as an impulse control disorder, the relationship between adolescent problem gambling and impulsivity was assessed by using 2336 adolescents aged 12 to 19 years. Adolescents experiencing problem gambling- related behaviors were found to have a greater number of self-reported Attention Deficit Hyperactivity Disorder symptoms. The results are discussed with respect to the relationship between adolescent impulsivity and gambling problems.

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Adolescence is a developmental stage that is increasingly being associated with a multitude of risky behaviors.[1] The propensity to participate in gambling activities is among the many risky behaviors engaged in by adolescents. In fact, it has been suggested that 4% to 8% of adolescents currently exhibit a serious gambling problem, and another 10% to 14% of adolescents remain at-risk for developing a severe gambling-related problem.[2–4] Researchers have been actively attempting to identify a constellation of psychosocial variables that may contribute to the development and maintenance of adolescent gambling.[5–9]

Impulsivity has been conceptualized to be an important component of pathologic gambling. The American Psychiatric Association considers pathologic gambling in adults as a disorder of impulse control as reflected by its classification in the Diagnostic and Statistical Manual of Mental Disorders (DSM)-III-R and DSM-IV.[10,11] There is ample research that has indicated that pathologic gamblers, or more specifically, a subgroup of pathologic gamblers, display elevated levels of impulsivity,[12–14] with higher levels of impulsivity being generally associated with greater disturbance.[13] More recently, Clarke using a small university sample, reported greater impulsiveness among problem gamblers versus nonproblem gamblers by using the Eysenck Impulsiveness Questionnaire.[15]

Attention Deficit Hyperactivity Disorder is a disorder whose salient features include inattention and impulsivity.[11] The common trait of impulsivity observed in pathologic gamblers and those with ADHD has been taken to suggest a relationship between ADHD and gambling.

An early study by Carlton et al investigated that role of attention deficits in pathologic gamblers.[16] By using neurophysiologic measures, pathologic gamblers were found to display a number of abnormalities as marked by their differential EEG activation. It was suggested that the subtle EEG deficits found in recovered pathologic gamblers actually paralleled those found in children with attention deficit disorders (ADD). This similarity seems to suggest that gamblers may have shown higher levels of ADD-related behavior during childhood.[16] In fact, several researchers have reported a strong correlation between pathologic gambling and childhood behaviors related to ADD using retrospective self-report measures.[16,17] Moreover, it was found that 20% of problem gamblers met the criteria for ADHD.[18]

Unfortunately, most of the research conducted on the relationship between ADHD and problem gambling has been generally based on retrospective adult data, small sample sizes, and treatment samples that included severely disordered gamblers. One study that explored the role of impulsivity in adolescents found that self-reported impulsivity in early adolescence predicted problem gambling in later adolescence.[19] A drawback to this study was that the sample was exclusively male and of low SES, thereby restricting its generalizability.

Given the findings obtained with adult pathologic gamblers, and our current definition of gambling problems being an impulse control disorder, it was predicted that a similar relationship existed between ADHD, impulsivity, and child and adolescent problem gambling behavior. Both males and females were included in this study to increase its potential generalizability and to allow for the exploration of gender differences, given noted differences within the literature concerning the higher prevalence of ADHD among males.

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The present study examined the relationship between hyperactivity, impulsivity, and youth gambling problems. It is anticipated that these results will provide a greater understanding of the factors that may contribute to placing youth at heightened risk for excessive gambling involvement. Furthermore, the results will provide valuable information that can be used for the identification of high-risk youth and the subsequent development and implementation of prevention and treatment programs.

PATIENTS AND METHODS

The sample consisted of 2336 adolescents (981 males; 1326 females; 29 did not respond to questions concerning gender) in grades 7 through 13 (age range, 12–19 years; Mean = 14.76; standard deviation [SD] = 1.91). Participants were selected from 8 school boards, 34 schools (17 elementary schools; 17 high schools) in the province of Ontario, representing diverse geographic (both urban and rural) locations. Participants from each grade level were as follows: grade 7 (N = 359), grade 8 (N = 398), grade 9 (N = 336), grade 10 (N = 372), grade 11 (N = 413), grade 12 (N = 238), and grade 13 (N = 220).

Instruments

Self-report measures were used throughout this study. Although there is little doubt that parent and teacher rating scales provide a substantial contribution to the research in child psychology and psychiatry, the importance of self-report measures has been stressed because they provide invaluable information.[20,21] Given that secondary school teachers may have few opportunities to observe the adolescent during the entire day and that many adolescents engage in behaviors outside parents' or teachers' view, it may be difficult for parents and teachers to accurately report on such information. Moreover, internalizing states of depression and anxiety are less likely to be apparent to parents and guardians, especially as children become more independent.[22] Overt restlessness tends to decrease with age[23] and impulsivity takes on a more cognitive form in adolescents than in younger children. Taken together, these factors suggest the importance of using self-report measures during adolescence. As such, sole reliance on teacher and/or parent ratings may result in respondent bias and may present an incomplete picture of the adolescent.

Gambling Activities Questionnaire

The Gambling Activities Questionnaire (GAQ)[24] assesses 4 general domains related to gambling behavior: descriptive information, including prevalence and types of activities, familial gambling and substance abuse history, social networks, and academic achievement. Questions within each section domain are discrete, analyzed individually, and no cumulative scores are calculated.

DSM-IV-MR-J

A revised version of the DSM-IV-J,[25] the DSM-IV-MR-J (MR = multiple response, J = juvenile),[26] includes 12 items (9 categories) used to screen for pathologic gambling during adolescence. Items are modeled on the DSM-IV[11] criteria for diagnosis of adult pathologic gambling. The DSM-IV-MR-J was developed for use with adolescents who have gambled during the past year. To compensate for the lack of opportunity for probing, most of the questions in the revised instrument have been given 4 response options: "never," "once or twice," "sometimes," or "often." The DSM-IV-MR-J represents a more conservative classification system of problem and pathologic gambling groups in that various questions require an endorsement above a certain severity level to receive a score of 1. The instrument assesses a number of important variables related to pathologic gambling: progression and preoccupation, tolerance, withdrawal and loss of control, escape, chasing, lies, and deception, illegal activities, and family or school disruption. Internal consistency and reliability for this scale is adequate: Cronbach's alpha = 0.75 (although slightly lower than 0.78 for the original DSM-IV-J screen).[26]

Conners-Wells' Adolescent Self-Report Scale: Long Version (CASS:L)

The Conners-Wells' Adolescent Self-Report Scale: Long Version (CASS:L)[27] is an 87-item, self-report scale, designed for children aged 12 to 17 years (both male and female standardized profiles are provided). This scale is comprised of 10 subscales: Family Problems (12 items), Emotional Problems (12 items), Conduct Problems (12 items), Cognitive Problems (12 items), Anger Control Problems (8 items), Hyperactivity (8 items), ADHD Index (2 items), and DSM-IV Symptoms Subscales reflecting Inattentiveness (9 items) and Hyperactive-Impulsiveness (9 items). Respondents indicate whether the item is "Not at all True" (never, seldom), "Just a Little True" (occasionally), "Pretty Much True" (often, quite a bit), or "Very Much True" (very often, very frequently). This scale contains rationally derived subscales that relate directly to DSM-IV criteria.[11] Reliability, internal consistency coefficients range from 0.75 to 0.9, and test-retest reliability was reported to be 0.6 to 0.9 for the different subscales. Factor analysis on derivation and cross-validation samples was conducted. Convergent, divergent, and discriminant validity was strongly supported.[22]

Procedure

Institutional review board review and approval for the study was received from McGill University. Informed consent was obtained from parents and children before their participation. Participation was voluntary and individuals were able to terminate their participation at any time. Research assistants administered the surveys and were present to answer any questions. All students who returned the required parental consent form and were willing to participate in the study were included. No records were maintained concerning the participation rate, although the numbers were fairly high. Students completed the instruments in one 50-minute period and were assured total anonymity and confidentiality. A random sample of schools within each of the approved school boards was approached for their consent.

The data were coded and entered by using a Fugitsu (Scan partner 620C, Fujitsu, Jakarta, Indonesia) scanner and Optical Mark Recognition software (Remark Office OMR

6.0, Malvern, PA). This software recognizes optical marks and barcodes. Once the data were collected, completed questionnaires were scanned into the image scanner and subsequently saved as an SPSS 11.0 file set for analysis. This procedure has proven to have a low data entry error rate.

Data Analyses

Participants were divided into groups based on gambling severity as measured by their gambling behavior (GAQ) and the DSM-IV-MR-J gambling screen. These groups include nongamblers, social gamblers (DSM-IV-MR-J score = 0–1), at-risk gamblers (DSM-IV-MR-J score = 2–3), and probable pathologic gamblers (DSM-IV-MR-J score ≥4). It should be noted that the CASS:L has been normed for 12- to 17-year-olds. Because this scale was developed for clinical use, it was decided to include some older youth in analyses but to interpret these results with caution.

Missing Data

Preliminary analyses of the data revealed that a small number of participants omitted 1 or more items on several subscales of the CASS:L. As such, an appropriate method to replace missing data was based on recommendations from the authors of the CASS:L (K. Conners, personal communication, 2002). Conners[22] has recommended that an extrapolation formula be used to calculate values to replace missing items:

Extrapolated raw score = (score for nonmissing items) * [(total number of items on the scale)/(total number of nonmissing items for the scale)].

Response Distortion

Completed questionnaires that were problematic (eg, ridiculous names, responses completed in an obvious pattern, inconsistent responses, omission of more than 2 scales) were discarded (representing approximately 2.5% of completed questionnaires).

RESULTS

Gambling Prevalence and Participation

Gambling Prevalence

Sixty-six percent of adolescents reported gambling within the past year (77.2% males, 58.8% females), and 20% of youth reported engaging in gambling activities on a regular, weekly basis (28% males; 11.4% females). Analyses revealed significant gender differences with respect to gambling involvement, such that males were more likely to be regular gamblers (once per week or more) than females (χ^2 (2, N = 2299) = 140.9; $P < 0.001$). Moreover, the results indicated that 33.3% of youth were classified as nongamblers, 53.8% as social gamblers, 8% as at-risk gamblers, and 4.9% as probable pathologic gamblers. An analysis of gambling severity by gender revealed that males more likely to be classified as probable pathologic gamblers (9.1% versus 1.7%) or at-risk gamblers (11.8% versus 4.8%) than females (χ^2 (3, N = 2,299) = 157.43; $P < 0.001$).

Participation in Gambling Activities

Males reported engaging in all gambling activities significantly more than females, with the exception of occasional lottery play, bingo, and regular Internet gambling (with money). Male and female occasional gamblers reported engaging in different types of activities. Thus, whereas male occasional gamblers preferred card games, females reportedly preferred the lottery. With respect to preferred regular activities, the principal activity reported by both males and females was card playing, and the second most popular preferred activity was sports pools for males and the lottery for females. When the sports lottery (legal in Ontario) and lottery draws were combined, the lottery was found to be the most popular form of gambling for both males and females. No particular developmental trends were noted.

In terms of gambling severity, individuals were classified based on their DSM-IV-MR-J responses whereby a score of 0 to 1 was coded as a social gambler, an at-risk gambler denoted a score of 2 to 3, and a score ≥ 4 led to a probable pathologic gambler classification. With respect to regular involvement (once per week or more) in gambling activities by gambling severity, probable pathologic gamblers reported engaging in all activities significantly more than social gamblers and at-risk gamblers (Table 1). The preferred activities for both probable pathologic gamblers and at risk-gamblers were cards, sports pools, games of skill, and sports lottery. A slightly similar pattern was observed in social gamblers who seemed to prefer cards, the lottery, followed by sports pools.

TABLE 1. Regular Involvement in Gambling Activities: Gambling Severity

	Gambling Groups		
Activity	Social Gambler† N = 1257	At-risk Gambler‡ N = 178	Probable Pathologic Gambler§ N = 112
Cards*	6.1	19	37.2
Sports pool*	3.1	14.7	36.6
Sports lottery*	1.9	13.6	27.7
Lottery*	4.2	12.1	20.4
Videogames*	1.6	4.3	21.2
VLT machines*	0.5	2.2	6.2
Bingo*	2.6	4.9	9.7
Slot machines*	0.9	1.6	8.8
Games of skill*	2.6	14.7	35.4
Racetrack*	0.5	2.7	4.4
Casino games*	0.5	3.3	10.6
Internet gambling ($)*	0.2	2.7	4.5

Data are percentages.
Regular involvement refers to gambling once per week or more.
* $P < 001$.
† DSM-IV-MR-J score (0–1).
‡DSM-IV-MR-J score (2–3).
§ DSM-IV-MR-J score (≥4).
DSM-IV-MR-J, Diagnostic and Statistical Manual of Mental Disorders, Multiple Response, Revised for Juveniles, Fourth Edition.

Conners–Wells' Adolescent Self-Report Scale

The CASS:L is comprised of 10 subscales of which a description of high scores on the 4 pertinent ADHD subscales of interest is provided in Table 2. The data from the remaining 6 subscales suggest significant differences on the family problems, emotional problems, conduct problems, and anger control problems scales, with at-risk and probable pathologic gamblers reporting a greater propensity to have such problems.[7] Participants' raw scores on each of the 4 subscales were calculated and transformed into T scores (mean = 50; *SD* = 10), covaried for age and gender, according to the test manual. It should be noted that the manual suggests a clinical cutoff of a T score that is 1½ *SD* above the mean (≥65) for therapeutic purposes. Thus, to determine the proportion of youth who scored in the clinical range on each of the 4 subscales in question, scores also were divided into normal (T score ≤ 64), and clinical (T score ≥ 65) groups.

Frequencies for the total sample revealed that 9.9% of the sample met the criteria for ADHD, as assessed by the ADHD Index, with 6% meeting criteria for hyperactivity. In terms of DSM-IV symptoms, 11.5% reported clinically relevant levels of inattentive symptoms, and 9% reported hyperactive-impulsive symptoms.

Gambling Severity and ADHD Problems

To determine whether there were significant mean differences (Table 3) across gambling groups, a 1-way analysis of variance (ANOVA) was performed with each of the 4 CASS:L ADHD subscales as the dependent variables and gambling groups as the factor. Results revealed significant group differences for the subscales: hyperactivity ($F [3, 2324] = 26.11$, $P < 0.001$), ADHD index ($F [3, 2324] = 46.28$, $P < 0.001$), DSM-IV inattentive symptoms ($F [3, 2324] = 44.23$, $P < 0.001$), and DSM-IV hyperactive-impulsive symptoms ($F [3, 2324] = 26.11$, $P < 0.001$). Posthoc comparisons using Tamahane's T2 statistic revealed a pattern of higher mean T scores on the subscales as gambling severity increased. More specifically, probable pathologic gamblers had significantly higher scores on the 4 subscales compared with the other gambling groups (Table 4). However, an exception to this pattern was observed on the hyperactivity and DSM-IV hyperactive-impulsive scale in which the PPG group was not statistically different from the at-risk gambler group (there is ample evidence that at-risk adolescent gamblers and PPGs share many similar properties.[7]

With respect to gender differences within gambling groups on the CASS:L subscales, the data set was split by gambling group and independent samples *t* tests for gender were performed on the subscales. Interestingly, gender differences were more evident as gambling involvement increased. Moreover, females seemed to have significantly higher scores than males, even when covaried for gender (Table 3). Specifically, with respect to nongamblers, males were found to have higher mean scores on the DSM-IV: inattentive subscale, $t (368.79) = 2.78$, $P < 0.01$. Of the social gamblers, females were found to have higher mean scores on the hyperactivity subscale, $t (1240) = -2.15$, $P < 0.05$, whereas again males were found to have higher mean scores on the DSM-IV: inattentive subscale, $t (1077.76) = 2.89$, $P < 0.01$. Female at-risk gamblers were found to have significantly higher mean scores on the hyperactivity, $t_{177} = -3.61$, $P < 0.001$, ADHD Index, $t_{177} = -2.87$, $P < 0.01$, and DSM-IV: hyperactive-impulsive, $t (105.13) = -2.07$, $P < 0.05$, subscales than at-risk males. Female probable pathologic gamblers similarly scored significantly higher on the scale measuring hyperactivity, $t_{109} = -2.25$, $P < 0.05$, and ADHD Index, $t_{109} = -2.58$, $P < 0.05$, than males in this group.

With respect to developmental differences within gambling groups, the data set was split by gambling group and a 1-way analysis of variance was conducted with the CASS:L subscales as dependent variables and grade as the independent factor. No notable developmental differences by gambling groups were observed.

A further examination of the mean scores in Table 4 revealed that despite significant group differences, group means were within 1 standard deviation of the scale's norms. Given our interest in comparing a clinical youth sample to a nonclinical youth sample, all subsequent analyses were conducted with the groups formed by using a clinically relevant cutoff (T score ≥ 65). Furthermore, nongamblers and social gamblers were combined to form a nonproblematic gambler group, because these groups were not statistically different from one another.

Cross-tabulations were conducted to explore differences in the level of reported symptoms across gambling classification by gender. For ease of interpretation, CASS:L ADHD subscales are presented by gender and gambling group in Table 4. A positive relationship was found between reported problems of gambling severity across subscales regardless of gender. A greater percentage of male probable pathologic gamblers reported clinically relevant symptoms than all other groups on the hyperactivity scale, $\chi^2 (2, N = 981) = 8.9$, $P < 0.05$; ADHD

TABLE 2. CASS:L Subscale Descriptions ADHD and Subtypes

CASS:L Subscale	High Score Description
F. Hyperactivity	Have difficulty sitting still, feeling more restless and on the go than most individuals their age
G. ADHD Index	Identifies adolescents "at-risk" for ADHD
H. DSM-IV: inattentive	Indicative of an above-average correspondence with the DSM-IV diagnostic criteria for inattentive-type ADHD
I. DSM-IV: hyperactive-impulsive	Indicative of an above-average correspondence with the DSM-IV diagnostic criteria for hyperactive-impulsive–type ADHD

ADHD, Attention Deficit Hyperactivity Disorder; CASS:L, Conners-Wells' Adolescent Self-Report Scale: Long Version; DSM-IV-MR-J, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

TABLE 3. ADHD and Subtypes as Assessed by the CASS:L

CASS:L Subscales	Total	Gambling Groups: Nongambler N = 789	Social Gambler* N = 1257	At-risk Gambler† N = 178	Probable Pathologic Gambler‡ N = 112
		Mean	*Mean*	*Mean*	*Mean*
Hyperactivity					
Male	978	47.08	48.41	49.49	52.53
Female	1321	47.2	49.49	54.55	57.32
Total	2328	47.19	48.96	51.25	53.73
ADHD Index					
Male	978	49.73	50.86	53.41	57.65
Female	1321	49.16	50.43	57.91	63.82
Total	2328	49.39	50.6	54.91	59.13
DSM-IV: inattentive					
Male	978	50.72	52.15	55.2	58.54
Female	1321	48.47	50.43	55.39	60.45
Total	2328	49.15	51.18	55.37	59.17
DSM-IV: hyperactive-impulsive					
Male	977	47.5	50.28	53.9	57.29
Female	1321	47.31	50.47	57.37	60.59
Total	2327	47.42	50.37	54.99	58.27

Subscale scores have a mean of 50 and a standard deviation of 10.
*DSM-IV-MR-J score (0–1).
† DSM-IV-MR-J score (2–3).
‡ DSM-IV-MR-J score (≥4).
ADHD, Attention Deficit Hyperactivity Disorder; CASS:L, Conners-Wells' Adolescent Self-Report Scale: Long Version; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; MR, Multiple Response; J, Revised for Juveniles.

index, χ^2 (2, N = 981) = 38.71, $P < 0.001$; DSM-inattentive, χ^2 (2, N = 981) = 30.38, $P < 0.001$; and DSM hyperactive-impulsive, χ^2 (2, N = 980) = 50.01, $P < 0.001$, scales. A similar finding was observed for females within the hyperactivity scale, χ^2 (2, N = 1327) = 31.19, $P < 0.001$; ADHD index, χ^2 (2, N = 1327) = 100.69, $P < 0.001$; DSM-inattentive, χ^2 (2, N = 1327) = 18.3, $P < 0.001$; and DSM hyperactive-impulsive, χ^2 (2, N = 1327) = 28.31, $P < 0.001$, scales.

Furthermore, gender differences in the reporting of severity of self-reported problems assessed by the CASS:L were evident across some ADHD subscales. For example, a larger percentage of female social gamblers reached the clinical threshold on the DSM-IV inattentive scale, χ^2 (1, N = 178) = 7.38, $P < 0.01$, compared with males. A similar finding was observed for at-risk females such that a larger percentage of female at-risk gamblers reported clinically relevant symptoms on the ADHD index χ^2 (1, N = 178) = 11.21, $P < 0.001$, and hyperactivity subscale χ^2 (1, N = 178) = 6.84, $P < 0.01$, compared with males in this category. Interestingly within the PPG category there were no significant differences in the level of reported symptoms between males and females.

DISCUSSION

The relationship between self-report measures of hyperactivity, impulsivity, and youth gambling problems were examined among an adolescent population. With respect to problem gambling, overall, 4.9% of adolescents were found to have a probable pathologic gambling problem with 8% classified as at-risk gamblers, whereas most youth were found to be nongamblers (33.3%) or social gamblers (53.9%). Males were found to be more likely to gamble and to have gambling associated problems than females (eg, more males were found to be at-risk and probable pathologic gamblers). These findings are consistent with most previous research .[2–4,28–32] However, these results contrast other recent Ontario surveys, which found slightly lower prevalence rates for probable pathologic gambling (2.8%) using the same gambling screen (DSM-IV-MR-J).[33,34] Similarly, it is important to note that the sample had an unequal distribution of males and females, thus affecting overall prevalence rates of gambling and problem gambling. As well, differences may be attributed to regional divergence, school, or sampling bias. Nonetheless, a significant number of adolescents younger than aged 19 years are gambling and experiencing serious gambling-related problems.

ADHD, Impulsivity, and Gambling Behavior

Overall, 9.9% of adolescents reported symptoms consistent with ADHD. According to ADHD subtypes, 6% of the sample reported hyperactivity, 11.5% inattention, and 9% reported hyperactive-impulsive symptoms. These frequencies are similar in range to those reported by Scahill and Schwab-Stone whose literature review revealed that the best prevalence estimates for ADHD in school-aged students ranged from 5% to 10%.[35]

TABLE 4. CASS:L Clinical Cutoffs: ADHD and Subtypes

CASS:L Subscales	T Scores: Clinical Males (≥65)	T Scores: Clinical Females (≥ 65)
Hyperactivity*		
Non- and social gambler† (N = 2018)	4.1	5.6
At-risk gambler‡ (N = 178)	6.1	18.8
Probable pathologic gambler§ (N = 112)	11.2	26.1
ADHD Index*		
Non- and social gambler† (N = 2018)	8.6	6.9
At-risk gambler‡ (N = 178)	13.2	34.4
Probable pathologic gambler§ (N = 112)	30.3	47.8
DSM-IV inattentive*		
Non- and social gambler† (N = 2018)	12.1	8.4
At-risk gambler‡ (N = 178)	14.9	17.2
Probable pathologic gambler§ (N = 112)	33.7	30.4
DSM-IV hyperactive-impulsive*		
Non- and social gambler† (N = 2018)	6.6	7.6
At-risk gambler‡ (N = 178)	12.3	23.4
Probable pathologic gambler§ (N = 112)	29.2	26.1

Data are percentages.
* Significant differences across gambling groups ($P < 0.001$).
† DSM-IV-MR-J score (0–1).
‡ DSM-IV-MR-J score (2–3).
§DSM-IV-MR-J score (≥4).
ADHD, Attention Deficit Hyperactivity Disorder; CASS:L, Conners-Wells' Adolescent Self-Report Scale: Long Version; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; MR, Multiple Response; J, Revised for Juveniles.

Taking into consideration gambling severity, it was observed that adolescent PPGs had significantly higher mean scores on all CASS:L subscales that assess ADHD symptoms compared with other adolescents in this study. In contrast, the mean scores of the PPG group and at-risk group, although significantly greater than the social gambler group, were not statistically different from each other on the hyperactivity and DSM-IV hyperactive-impulsive subscales. This finding may lend further support to the notion that at-risk gamblers and PPGs may in some cases be more similar than dissimilar.[7,36] With respect to gender differences, male nongamblers and social gamblers displayed higher mean scores on the DSM-IV inattentive subscales compared with females. However, on subscales other than the DSM-IV inattentive subscale, it was observed that females in the social and at-risk groups scored higher than males in these respective groups. Interestingly, although there were more individual male PPGs, female PPGs as a group had higher mean scores on the hyperactivity and ADHD index subscales. These results, on some level, do not provide support for the commonly observed finding that being a male gambler tends to be associated with a more severe outcome on psychosocial measures.[7] A possible interpretation for this finding may be that being female and a gambler is a condition that is reflected or preceded by more severe symptomatology.[31] It remains plausible that the observed gender differences may be the result of unequal sample sizes that amplify any group differences.

Given our interest in exploring differences in problem gambling between a clinical and normal sample, a clinical cutoff ($T > 65$) on the ADHD subscales was used. A similar finding was obtained by using the clinical cutoffs as opposed to merely comparing group means. The finding that more adolescent probable pathologic gamblers in this study endorsed classic ADHD symptoms in the clinical range reaffirms the predicted hypothesis and the findings among adults with histories of ADHD. In particular, a larger percentage of adolescent PPGs scored in the clinical range on the ADHD CASS:L subscales compared with their peers. Gender differences also were observed when using the clinical cutoff ($T > 65$), such that a greater percentage of female than male gamblers reported clinically relevant symptoms on the ADHD subscales, although the sample size for females was limited. Interestingly, the frequency of males and females PPGs reporting clinically relevant symptoms did not differ. Thus, PPGs regardless of gender tended to report more ADHD symptoms that were within a "clinical" range. A lack of significant gender differences among PPGs when using a clinical cutoff may be interpreted to suggest that ADHD and impulsivity may be a general risk factor, at least for 1 subtype of problem gambler, which contributes to gambling severity (see the following for their pathway model).[37] Alternatively, these findings also may offer support for the notion that increased levels of impulsivity has been associated with adolescent pathologic gamblers as well as for adult pathologic gamblers.[12,38]

Overall, these findings are consistent with other research suggesting that pathologic gamblers, or a subgroup of pathologic gamblers, display elevated levels of impulsivity .[12–14] ADHD is characterized by traits of impulsivity, hyperactivity, and inattention.[11] Previous research has also indicated that subtle EEG deficits found in recovered pathologic gamblers parallel those found in children with ADD.[16] Adolescent problem and pathologic gamblers have been found to score higher on the excitability factor of the High School Personality Questionnaire, indicating similar traits to children with ADHD (eg, distractibility, overactivity, and impulsivity).[36] Thus, it seems as though ADHD, particularly the impulsive subtype, is related to adolescent problem gambling.

Although this study represents an interesting beginning, further behavioral and physiologic research is needed to clarify the relationship between ADHD and gambling. These results, however, do indicate that with respect to risk reduction prevention efforts for problem gambling, special attention should be paid to children with ADHD. Furthermore, there seems to be considerable clinical evidence supporting the need to assess for impulsivity and ADHD when treating adolescent pathologic gamblers.[39]

Limitations and Directions for Future Research

Although this study yielded interesting findings regarding ADHD as a possible risk factor that may contribute to the

development and maintenance of gambling behavior, it is not without limitations. The current study relied exclusively on self-report data and no corroborative data were obtained. Limitations in terms of geographic and regional differences should be noted. More importantly, this study failed to inquire about concomitant mental health disorders (eg, depression, anxiety, substance abuse, etc.) which have been shown to be related to problem gambling. No information was ascertained as to whether participants had previously taken, or were currently taking, stimulant medications. It would have been difficult to conduct a study of this magnitude by using interview data and corroborative reports of parents and teachers. Nevertheless, if feasible, future studies should attempt to supplement self-report data with corroborative reports from parents, peers, and school records. Cross-sectional designs provide necessary information in the quest to delineate the factors that may contribute to the development of gambling behavior; yet, they cannot provide information on causality or directionality of findings. It will be vital to conduct longitudinal research to address questions of causality and directionality.

Adolescence is an important developmental period for the onset of mental health problems and for the need to adapt successfully to psychosocial changes. It also is a time of increased sensitivity and vulnerability, frequently associated with a wide range of emotional and behavioral difficulties. As such, the finding that youth are experiencing a host of problems related to their gambling behavior suggests the need for the development of effective mental health and risk reduction prevention programs. Gambling awareness campaigns are crucial given the large numbers of underage youth who are reporting engaging in state-regulated gambling activities prohibited by legislation. Further advances in identifying protective factors may provide much-needed information for the development of science-based prevention programs. Screening issues, including the identification of impulsivity, also may be important for the development of targeted prevention programs. Gambling remains one of the most frequently engaged in and potentially addictive activity by youth. It is time to take a proactive stance in the reduction of youths' participation in these activities and to directly address the subsequent problems that ensue.

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