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Youth Gambling Problems: Examining Risk and Protective Factors

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ABSTRACT *This study examined the relationship between several pre-examined risk factors for youth problem gambling, a number of potential protective factors for youth problem gambling, and the development of adolescent problem gambling. The sample consisted of 2179 students, ages 11–19. The results of analyses of variance revealed that lower family and school connectedness are associated with adolescent problem gambling. Further, an examination of the effect of potential protective factors on a set of risk factors predictive of adolescent problem gambling suggests that lack of family cohesion plays a role in predicting at-risk and problem gamblers. The results are framed in terms of a general model of risky behaviour and implications for prevention are outlined.*

Introduction

Youth problem gambling can best be realized as one form of adolescent risk behaviour (Romer, 2003) that necessitates preventive measures to safeguard the social, physical and psychological health of youths who gamble. Several comprehensive reviews have outlined the extensive research efforts that have recently been undertaken to identify and understand the correlates and risk factors associated with adolescent problem gambling (Derevensky and Gupta, 2004; Hardoon and Derevensky, 2002). Nevertheless, few if any studies have sought to identify the protective factors that function to increase resilience related to adolescent problem gambling.

Evidence of resiliency in children has expanded the prevention field from a risk-prevention framework to one that includes both risk-prevention and the fostering of protective factors (Garmezy, 1985; Rutter, 1987; Werner, 1986). Research now clearly indicates that prevention policies and programmes must incorporate a balanced approach focusing efforts on both the reduction of risk while simultaneously promoting protective factors (e.g. Pollard *et al.*, 1999). Although several protective factors are amenable to policy, prevention and therapeutic interventions, some are more difficult to strengthen (e.g. achievement motivation).

Protective Factors for Problem Gambling

Jessor (1998) has provided a model from which problem gambling can be viewed as a form of adolescent risky behaviour with potential health and life-compromising outcomes. This conceptual framework provides a theoretical foundation for designing general mental health prevention programmes that aim to foster

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resiliency and has been adapted to include youth problem gambling based upon a growing body of empirical research (Dickson *et al.*, 2002). Accordingly, although youth problem gambling shares a number of common risk factors with other health compromising behaviours, it also has a number of unique risk factors including paternal pathological gambling, access to gambling venues and early onset of gambling experiences (Derevensky and Gupta, 2004; Dickson *et al.*, 2002).

It has been hypothesized that the protective factors associated with the reduction of multiple problem behaviours (e.g. drug and alcohol abuse, reckless driving, risky sexual activity, etc.) may also be involved in directly affecting or moderating/mediating youth problem gambling (Dickson *et al.*, 2002). Similar to studies examining protective factors for tobacco, drug and alcohol abuse, protective factors for youth problem gambling are best conceptualized as those which are directly associated with less problematic gambling, interact with risk factors to buffer and minimize the effects of gambling, disrupt the mechanism through which risk factors operate, or prevent the initial occurrence of particular risk factors of disordered youth gambling. An overview of possible protective factors for youth problem gambling suggested by the extensive body of research on youth high-risk behaviours suggests that family cohesion, mentorship, school connectedness, achievement motivation, involvement in conventional activities and coping strategies are likely to buffer youths from the development of problem gambling.

Family Cohesion

Family cohesion, also referred to as 'family connectedness' in the literature, essentially deals with feelings of bonding with one's family (Olson, 2000; Resnick *et al.*, 1997) and has been identified as a significant social environmental protective factor against a number of high-risk behaviours (Springer *et al.*, 1997). Empirical studies suggest that increased family cohesion is related to adolescent reports of increased family life satisfaction (Henry, 1994) and to decreased problem behaviours (Barber and Buehler, 1996; Barrera and Li, 1996). Resnick *et al.* (1997) report that family cohesion has been found to be protective against every health risk behaviour measure except pregnancy, though problem gambling was not included among the list of health risk behaviour measures assessed.

Mentorship

A mentor relationship is one in which adolescents are given adult support, counsel and friendship. Mentoring relationships have been shown to have an affective function (e.g. emotional support) (Klaw and Rhodes, 1995) and an instrumental function (Darling *et al.*, 1994), contributing to several aspects of youth resilience. Adults are thought to be instrumental by teaching skills, introducing new activities to adolescents and by strengthening the adolescents' sense of competence. Mentor relationships can be naturally occurring or programmed, the latter of which has been incorporated into several prevention programme evaluations as a protective factor in youths' social environment (Rogers and Taylor, 1997; Taylor *et al.*, 1999). The 'Big Brothers–Big Sisters' (BBBS) (Tierney *et al.*, 1995) evaluation, which found that participants were 46% less likely to initiate drug use and 27% less likely to initiate alcohol use, provides the most provocative evidence that mentoring alone can positively impact on youths' high-risk behaviours.

School Connectedness

Perceived school connectedness constitutes an individual's belief that they belong, are respected and cared for at school. It is a feeling of being treated fairly, close to others and a part of the school; all of which contribute to youths' social bonding and competence. McNeely *et al.* (2002) reported that perceived school connectedness is associated with a number of school characteristics including school size, perceptions of safety (classroom management and school discipline policies) and number of friends. School connectedness has been found to reduce the overall frequency, prevalence and intensity of involvement in cigarette, alcohol and marijuana use, as well as delinquent and violent behaviour, independent of community context, gender, or ethnic group (Dornbusch *et al.*, 2001).

Achievement Motivation

As a stable personality trait, achievement motivation is conceptualized as one's unique internal drive or need that impels an individual towards action (Atkinson, 1957). Findings suggest that achievement motivation exerts a protective function for substance abuse and promotes academic and psychological resilience (Gordon Rouse, 2001; Lengua and Stormshak, 2000; Waxman *et al.*, 1997).

Involvement in Conventional Activities

Activities and events that afford the opportunity for youths to actively participate, make positive contributions and experience positive social exchanges foster prosocial involvement. Prosocial involvement promotes social, emotional, moral and cognitive competencies and fosters self-determination and positive identity (for a summary of research findings, see Catalano *et al.*, 2002). Whether naturally occurring or programmed (e.g. youth development programmes), youth involvement in extracurricular school and community-based activities and organizations (e.g. cultural clubs, religious groups, sports groups and volunteer community services) has been found to be protective of a number of adolescent high-risk behaviours (Catalano *et al.*, 2002; Elder *et al.*, 2000; Jessor *et al.*, 1998).

Coping Strategies

Although the literature is sparse, findings suggest that resilient youths (exhibiting minimal depression despite reporting high levels of negative life events) use problem-solving coping strategies more frequently than vulnerable youths (exhibiting high levels of depression and stress) and non-adjusted youths (exhibiting high depression and low stress) (Dumant and Provost, 1999). The protective function of active coping on internalizing disorders has been similarly identified in several other studies (Holahan and Moos, 1991; Steinhausen and Winkler Metzke, 2001). Evidence for the protective function of coping tends to be indirect for externalizing problem behaviours (e.g. substance use, delinquency). For example, Grant *et al.* (2000) failed to find direct evidence that active coping strategies buffer the influences of stress on youths' internalizing and externalizing behaviours, but found evidence existing largely in the form of trends in the relation between active coping and specific subtypes of stress (e.g. daily hassles, major life events).

Identifying Protective Factors in the Presence of Risk

An important caveat to delineating protective factors for youth problem gambling is to examine them in concert with risk factors. As articulated by Jessor (1998), the effect of protective factors is demonstrable in the presence of risk. Furthermore, the identification and quantification of the effects of protective factors requires understanding that a protective factor may decrease the probability of a negative outcome in two ways. First, it can directly reduce problem behaviour (Jessor *et al.*, 1995; Stacy *et al.*, 1992), measured via its main effects. Second, a protective factor can moderate the impact of risk on behaviour (Jessor *et al.*, 1995; Masten *et al.*, 1990; Stacy *et al.*, 1992). Accordingly, when protection is high, the strength of the relationship between a risk factor and the negative outcomes decreases.

Research Goals

To date, there have been no studies examining protective factors as predictive of increased resilience related to adolescent problem gambling. Given that the study of protective factors must be undertaken in the presence of risk factors, the field is now mature enough to conduct research on protective factors. The primary goal guiding this study was to delineate those factors that would reduce the likelihood of youth problem gambling in the presence of conditions and factors that promote excessive youth gambling problems. More specifically, the goal was to investigate whether family connectedness, school connectedness, effective coping, mentor relationships, achievement motivation and involvement in conventional organizations differ as a function of gambling severity and whether these possible protective factors moderate the combined effects of several known risk factors (including trait anxiety, school problems, low self-perceived academic achievement, stressful life experiences, perceived familial and peer problem behaviour, risk propensity and being male) for youth problem gambling.

Methodology

Participants

The youths in this report were part of a larger study of resilience to problem gambling, substance use and multiple risk behaviours. Thirty-two school boards in the Province of Ontario were selected to participate and formal applications to conduct research were made to each of these boards. Ten school boards granted permission to conduct the study within their schools and a random sample of schools was approached for consent (no data was collected in the tenth school board because of time and distance limitations). Thus, participants were selected from nine School Boards in the Province of Ontario, representing diverse geographic (both urban and rural) locations. The sample included 2,179 youths (921 males and 1,250 females) in grades 7 ($n = 349$), 8 ($n = 346$), 9 ($n = 252$), 10 ($n = 351$), 11 ($n = 351$), 12 ($n = 352$) and 13 ($n = 172$). The sample was randomly selected and is believed to be representative of the general population. With respect to gambling severity, the distribution of participants is consistent with previously reported prevalence studies (Adalf and Ialomiteau, 2000; Shaffer and Korn, 2002), although it is noteworthy that this research was not designed as a prevalence study of adolescent problem gambling.

Response Rates

Response to the questionnaire was largely determined by how each school enlisted student participation (e.g. voluntary or involuntary teacher consent to conduct a questionnaire during class time) and the schools' means of obtaining parental consent forms (e.g. incentive provided, highly supportive). As such, response rates were not obtained. Preliminary analyses were conducted in order to obtain a sample as free from response bias and missing information as possible. An extrapolation formula outlined by the State–Trait Anxiety Inventory manual (STAI; Spielberger, 1983) and the Personal Experience Screening Questionnaire (PESQ) manual (Winters, 1991) was used to calculate a value to replace a missing item when a scale was missing less than 10% of data (except for the DSM-IV-MR-J [*Diagnostic and Statistical Manual of Mental Disorders* IV (MR = multiple response, J= juvenile)]; Fisher, 2000). Analysis of the DSM-IV-MR-J indicated that two participants had completely omitted this scale (and were thus omitted from further analyses) while 63 participants had not fully completed the scale. Given the importance of retaining the problem gamblers in this sample, the total DSM score for probable pathological gambling was calculated regardless of whether a student has missed items on the DSM-IV-MR-J scale, with the caveat that their DSM-IV-MR-J score may actually be an underestimate of their true score and the overall prevalence of gambling severity may be somewhat underestimated in this study sample. Although it is permissible to work on data missing less than 10% of information by making statistical adjustments, it is preferable to work with complete data to obtain the most refined results. Given the large sample size and an analysis revealing consistent proportions across sample groups, it was decided that the current study would only include questionnaires that have complete information on all independent and dependent variables (for further discussion of the treatment of missing data see Dickson *et al.*, 2003).

Overall, actions taken based on the amount of missing data collected resulted in the total remaining sample being a minimum of 2,179 for all analyses with the exception of the logistical regressions which required cleaning of all outliers on all independent and dependent variables (an N of 2,099 used for the regression analyses). Although actions taken to handle missing data in this study may be considered highly conservative, they were deemed necessary given the nature of this study and its implications for prevention. Furthermore, the aforesaid steps document the removal process and exemplify the considerable efforts of conducting research with large samples of adolescents.

Measures

DSM-IV-MR-J (Fisher, 2000)

Participants completed a slightly modified version of the DSM-IV-MR-J. This measure of youth problem gambling includes 12 items (nine categories) used to screen for pathological gambling during adolescence. The items are modelled after the DSM-IV (American Psychiatric Association, 1994) criteria for diagnosis of adult pathological gambling. The revised 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 four response options; 'never', 'once or twice', 'sometimes', or 'often'. The DSM-IV-MR-J represents a more conservative classification system of

problem and pathological gambling groups in that various questions require an endorsement above a certain severity level to receive an endorsement rating (score of 1). Any score of 4 or more within the nine categories is indicative of pathological gambling. Based on clinical judgement and past research indicating the similarities between at-risk and probable pathological gamblers, the scale was modified for this study to enable youths to respond to item 6 ('In the past year, after losing money gambling, have you returned another day to try and win back money you lost?') with the above four response headings wherein they received a score of 1 if they selected a 'sometimes' or 'often'. Internal consistency reliability for this scale is adequate, with Cronbach's $\alpha = 0.75$ (although slightly lower than 0.78 for the original DSM-IV-J screen) (Fisher, 2000) and the α for the modified version used in this study was found to be 0.82.

Family Adaptability and Cohesion Evaluation Scales (FACES-II)—Family Cohesion Subscale (Olson, Portner and Bell, 1982)

Family relations as a function of emotional bonding among family members was assessed by the 16-item Cohesion Subscale of the FACES-II which has been found to have good reliability ($\alpha = 0.87$) (Hampson *et al.*, 1991) and validity (Daley *et al.*, 1991; Knight *et al.*, 1992). Youths were assigned a family cohesion type based on their total cohesion score, ranging from 'very connected' (scores between 71 and 80), 'connected' (scores between 60 and 70), 'separated' (scores between 50 and 59) and 'disengaged' (scores between 15 and 50).

School Connectedness (Resnick *et al.,* 1997)

Youths were asked about their feelings during the current school year, of being connected to their school, on an eight-item school connectedness scale with response options on a five-point Likert scale ranging from 'strongly agree' to 'strongly disagree'. Items were standardized by age (grade level).This measure is derived from the National Longitudinal Study of Adolescent Health (Add Health, 1998), has reasonable reliability ($\alpha = 0.77$) and has been used in a number of studies (e.g. Dornbusch *et al.*, 2001; Jacobson and Rowe, 1999).

Achievement Motives Scale (AMS) (Gjesme and Nygard, 1970)

The AMS is a 30-item scale comprised of two subscales (15 items each), measuring adolescent's motive to approach success (Ach-S) and motive to avoid failure (Ach-F), with reliabilities of 0.78 and 0.85 respectively. This potential protective personality factor represents participants' tendency to engage in challenging situations. The AMS identifies individuals with the combination of high motives to approach success and low motives to avoid failure (those who are more apt to anticipate positive outcomes and apply themselves in situations where the outcomes are uncertain). Although this measure has yet to be used in the examination of youth high-risk behaviours, its validity has been established in a number of studies (Hagtvet and Zuo, 2000; Halvari, 1997; Nygard, 1982; Nygard and Gjesme, 1973).

Mentorship

Youths were considered to have this potential protective factor if they positively endorsed the statement, 'Is there an adult in your life (apart from your parents) that you feel cares for you?' and reported having been involved in at least one activity (e.g. played organized sports, worked on project for school, talked about a personal problem) with their mentor in the previous month.

Involvement in Conventional Activities

Individuals indicated from a list of clubs and community organizations their past, present and future plans for involvement during the current school year. Youths were subsequently identified as being involved or uninvolved.

Adolescent Coping Orientation for Problem Experiences (ACOPE) (Patterson and McCubbin, 1987)

This self-report questionnaire is a modified version of the Young Adult Cope, consisting of 54 specific coping behaviours which adolescents use to manage, change and adapt to stressful situations. Individuals respond on a five-point scale (1 = never; 2 = hardly ever; 3 = sometimes; 4 = often; 5 = most of the time) to indicate how often they use each coping strategy when feeling tense or facing a problem. This study utilizes the subscales described by Jorgensen and Dusek (1990) called 'salutary effort' (effective coping) and 'stress palliation' (ineffective coping). Thirty-nine items form the effective coping subscale ($\alpha = 0.89$) representing a mixture of adaptive cognitive, behavioural and emotional strategies. Fifteen items form the ineffective coping subscale ($\alpha = 0.78$) and measure a risk factor for youth problem gambling (Getty *et al.*, 2000; Marget *et al.*, 1999; Nower, 2001).

Age and Gender

Participant's age and gender were obtained as two measures of risk given that older youths and males have been found to be at considerably greater risk for problem gambling.

The Adolescent-School Problems Scale (A-sch) (Butcher *et al.*, 1992)

The A-sch is a 20-item content scale from the Minnesota Multiphasic Personality Inventory-Adolescent (MMPI-A) (Archer, 1997). T-scores (covaried for gender) were obtained, whereby higher scores reflect greater negative attitudes toward academic achievement, poor school performance, and behavioural and academic deficits. T-scores range from normal (below 60), to moderately elevated school problems (60–64), to significant school problems and symptoms ($\geq$ 65). This scale has high face validity (Acher, 1997) and its reliability for use on a normative sample is 0.69 for both males and females (Milne and Greenway, 1999).

State–Trait Anxiety Inventory (STAI)—Trait Anxiety Subscale (Spielberger, 1983)

Participants completed the 20-item trait anxiety subscale of the STAI in order to measure the presence of this risk factor for adolescent problem gambling (Ste-Marie *et al.*, 2002). The STAI Trait subscale asks respondents to rate the frequency of their

anxiety feelings on a 4-point Likert scale ($\alpha = 0.90$) with the following anchors: 'not at all'; 'somewhat'; 'moderately so'; and 'very much so'. Gender-based T-scores ($M = 50$, $SD = 10$) were obtained whereby elevated T-scores indicate higher levels of anxiety.

Self-Perceived Academic Achievement

Participants' perceived academic achievement was assessed through responses to the statement 'Overall, my grades are ...' (below average, average, or above average). Low self-perceived academic achievement has frequently been identified as a risk factor and correlate for the development of youth problem gambling (Hardoon *et al.*, 2002; Ladouceur *et al.*, 1999).

Stressful Life Experiences

In light of past research outlining the impact stressful life events has on the presence of youths' gambling behaviours (Jacobs, 1986; Kaufman *et al.*, 2001), a list of major stressful life events was included whereby participants identified stressful life events experienced (lifetime or current).

Perceived Familial and Peer Problem Behaviour

The following two items from the Gambling Activities Questionnaire (GAQ) (Gupta and Derevensky, 1999) were included to assess peer and familial history of gambling and drugs and alcohol problems: 'To your knowledge do any these people have a gambling problem and/or a drinking or drug problem?' Participants were given the following list of multiple choice responses; mother/stepmother, father/stepfather, sister, brother, other relative, friend, classmate, and other person in your life.

Risk Involvement and Perception Scale (modified RIPS) (Shapiro *et al.,* 1998)

Risk propensity refers to the extent to which youths perceive involvement in risky activities as both highly beneficial and not very risky and was assessed with the 'perceived risks' and 'perceived benefits' subscales of the modified version of the RIPS. The assessed behaviours represent a range of involvement from common behaviours (e.g. drinking alcohol) to low frequency behaviours (e.g. cocaine use). From the original 27 items, three items pertaining to sexual activity were excluded based on the request of school boards, two items (binge eating and taking speed) were omitted based on observations during data collection that a number of students failed to understand their meaning, and two items regarding gambling were removed. The modified perceived risks and benefits subscales have good reliability with α coefficients of 0.92 and 0.88 respectively. The anchor points for each 20-item scale include: $0 =$ not risky or beneficial, $1–2 =$ slightly risky or beneficial, $3–5 =$ moderately risky or beneficial, $6–7 =$ very risky or beneficial and $8 =$ extremely risky or beneficial. A risk propensity score was derived by summing the totals for each scale and dividing perceived benefits by perceived risks, where higher scores indicate greater dispositions to risk-taking.

Procedure

All instruments were combined into one large questionnaire. Data collection was group administered and took place either in classrooms, the school cafeteria, or library, and took approximately 50 minutes to complete. Research assistants were available to answer all student questions. Informed consent was obtained from parents and children prior to their participation. A separate consent form was developed for students age 18 and over as they were able to provide their own consent. Participation was voluntary and students were assured total anonymity, confidentiality, and were randomly assigned an identification number.

Data Analysis

Participants were divided into four groups based upon gambling frequency and gambling severity as measured by their performance on the DSM-IV-MR-J gambling screen. These groups include non-gamblers (identified by answering 'No' to the question, 'Have you ever gambled in the past year?'), social gamblers (DSM-IV-MR-J score $= 0-1$), at-risk gamblers (DSM-IV-MR-J score $= 2-3$), and probable pathological gamblers (PPGs) (DSM-IV-MR-J score ≥ 4). The data in this cross-sectional design was analyzed with SPSS 11.0. Chi-square tests of independence were used to test for significant differences in the frequency of reported protective and risk factors between gambling groups.

The original research design involved conducting a multivariate analysis of variance (MANOVA) with gambling groups as the grouping variable in order to determine if there were significant differences within gambling groups on the dependent measures. However, exploratory analyses indicated that a number of the variables were highly correlated and that the data did not adequately meet the assumptions of MANOVA. It was therefore determined to run a series of one way analysis of variances (ANOVAs). Univariate analysis of variance and *post-hoc* tests of significance were used to determine whether there were significant differences in the means of reported levels of each protective and risk factor between gambling groups. A series of logistic regressions were run to test the moderating effects of protective factors on risk factors of youth problem gambling. Although all analyses were stratified by age and gender, the goal of this study is to examine, on a broader conceptual level, the general effects of protective factors in the presence of multiple risk factors influencing youth problem gambling. As such, developmental and gender differences are not reported here (for results regarding age and gender differences, see Dickson *et al.*, 2003).

Results

Youth Problem Gambling

Data analyses revealed that 37.9% of youths were classified as non-gamblers, 49.3% as social gamblers, 7.8% as at-risk gamblers, and 5.0% as PPGs. Chi-square tests of independence revealed a statistically significant relationship between gender and DSM-IV-MR-J categories $\chi^2(3, N = 2{,}179) = 211.12$, $p < 0.001$, with males being almost six times more likely to be classified as PPGs and two times more likely to be classified as at-risk gamblers than females (11.7% vs 4.9%).

Possible Protective Factors by Gambling Groups

Chi-square analyses indicated that the frequency of reported presence of achievement motivation, having a mentor and involvement in prosocial activities did not substantially vary by gambling groups. However, frequency analysis identified associations between the increased presence of particular factors and lower reports of gambling severity. Similarly, univariate analysis of variance and *post-hoc* tests of significance indicated that the mean scores of gambling groups significantly varied on several of the possible protective factors.

Family Cohesion

There was a significant difference in reported level of family cohesion between gambling groups $\chi^2(3, N = 2{,}179) = 84.26$, $p < 0.001$ (Table 1). Accordingly, PPGs were less likely to report being connected (11.1%) than at-risk gamblers (21.8%), social gamblers (28.7%), and non-gamblers (34.2%). Family cohesion mean scores progressively decreased from non-gamblers to each level of gambling severity group, $F(3, 2{,}175) = 27.80$, $p < 0.001$ (Table 2). *Post hoc* analyses revealed significant differences between all pairwise comparisons with the exception of differences between at-risk gamblers and PPGs.

School Connectedness

At-risk gamblers (15.9%) and PPGs (16.7%) were significantly less likely than social gamblers (22.3%) and non-gamblers (30.6%) to report being highly connected to their school, $\chi^2(6, N = 2{,}179) = 60.22$, $p < 0.001$ (Table 1). Furthermore, school connectedness mean z-scores significantly varied between gambling groups, $F(3, 2{,}175) = 24.88$, $p < 0.001$ (Table 2), and an examination of the means suggested a negative association between school connectedness and gambling severity. *Post hoc* analyses indicated significant differences between all pairwise comparisons with the exception of at-risk gamblers and PPGs.

Effective Coping

To explore whether effective coping varied by gambling severity, effective coping scores for the total sample ($M = 110.47$, $SD = 19.67$) were ranked into quartiles to create the following three groups: (1) the bottom quartile representing those reporting the least use of effective coping strategies; (2) the middle two quartiles representing participants reporting average use of effective coping strategies; and (3) the top quartile including those with the greatest use of effective coping strategies. PPGs (15.7%) were less likely to be identified as high users of effective coping skills than at-risk gamblers (26.5%), social gamblers (23.3%) and non-gamblers (29.3%), $\chi^2(6, N = 2{,}179) = 15.48$, $p < 0.05$ (Table 1). Results indicate statistically significant but negligible differences in coping mean scores as a function of gambling severity, $F(3, 2{,}175) = 5.07$, $p < 0.01$.

Risk Factors for Youth Problem Gambling

Consistent with previous research findings, frequency analyses and univariate analyses of variance indicated that all continuous risk factors included in this study

Table 1. Presence of possible protective factors reported by gambling groups

	Gambling groups[1]			
(*N* = 2,179)	Non gambler	Social gambler	At-risk gambler	Probable pathological gambler
Mentorship	74.1	76.2	79.6	71.4
Involvement in conventional activities	87.0	85.1	87.2	90.4
Family cohesion***				
Very connected	8.8	3.9	3.5	1.9
Connected	34.2	28.7	21.8	11.1
Separated	27.9	34.5	27.6	31.4
Disengaged	29.1	32.9	47.1	56.6
School connectedness[2]***				
High	30.6	22.3	15.9	16.7
Average	48.5	54.7	44.7	43.5
Low	20.9	23.0	39.4	39.8
Effective coping[3]*				
High use	29.3	23.3	26.5	15.7
Moderate use	46.4	50.7	45.3	54.7
Low use	24.3	26.0	28.2	29.6
Achievement motivation[4]				
High	19.3	21.1	17.1	16.7
Average	59.1	60.5	58.8	65.7
Low	21.5	18.3	24.1	17.6

[1]Percentage within gambling groups categorised by the DSM-IV-MR-J.
[2]Groups created by ranking all scores. Low school connectedness group = bottom quartile; Average = middle two quartiles; High group = top quartile.
[3]Effective coping groups created by ranking all scores. Low use group = bottom quartile; Moderate use group = middle two quartiles; High use group = top quartile.
[4]Groups created by ranking all scores. Low achievement group = bottom quartile; Average group = middle two quartiles; High group = top quartile.
*$p < 0.05$, ***$p < 0.001$.

(trait anxiety, risk propensity, ineffective coping and school problems) were found to significantly differentiate between gambling groups. Regarding categorical risk correlates, significant differences between non-gamblers, social-, at-risk- and PPGs were found in reported frequency of perceived familial and peer problem behaviours, various stressful life experiences, and self-perceived academic achievement were found (Table 3).

Table 2. Gambling severity group differences on protective and risk factors

Gambling	*df*, *N*	*F*	*p*
Family cohesion	3, 2,175	27.80	<0.001
School connectedness	3, 2,175	24.89	<0.001
Effective coping skills	3, 2,175	5.07	<0.01
Trait anxiety	3, 2,175	19.06	<0.001
Risk propensity	3, 2,175	47.69	<0.001
School problems	3, 2,175	61.48	<0.001
Ineffective coping skills	3, 2,175	58.91	<0.001

Note: Although effective coping skills was found to be statistically significant, the means between problem-behaviour groups did not meaningfully vary.

Table 3. Differences in categorical risk correlates by gambling severity

	Gambling groups[1]			
	Non-gambler	Social gambler	At-risk gambler	PPG
Individual with gambling problem				
Mother/stepmother**	2.1	3.8	5.3	6.5
Father/stepfather*	2.3	4.3	2.9	7.4
Sister***	0.1	0.7	2.9	2.8
Brother***	1.0	1.7	7.6	15.7
Other relative***	10.9	14.7	18.8	21.3
Friend***	6.2	10.2	34.1	41.7
Classmate***	4.1	8.5	17.1	29.6
Significant other ***	4.0	4.7	9.4	15.7
Individual with a substance abuse problem				
Mother/stepmother***	2.1	4.2	8.2	11.1
Father/stepfather***	7.0	10.8	17.1	22.2
Sister***	1.2	3.0	2.4	10.2
Brother***	3.0	6.1	10.0	13.9
Other relative***	19.0	24.1	31.8	37.0
Friend***	20.2	29.8	45.3	51.9
Classmate***	16.4	21.8	29.4	35.2
Significant other***	8.6	10.4	19.4	16.7
Stressful life event				
Parental divorce and/or remarriage of parents	20.7	23.3	28.2	19.4
Death of friend/family member you are close to**	59.0	65.2	70.6	70.4
Moving to a new town/city	29.0	28.5	34.7	35.2
Physical/sexual abuse	7.1	7.7	9.4	12.0
Parent lost his/her job	16.8	19.4	25.3	22.2
Close family member had/has serious mental/physical illness	32.3	33.8	35.3	38.0
Arrest of family member***	10.2	13.4	23.5	26.9
You have had a serious illness in the past few years***	8.2	10.8	15.3	22.2
You have been pregnant (females only)*	1.1	2.7	3.3	10.0
Below average self-perceived grades***	6.5	9.2	14.7	23.1

[1]Percentage. Categorized by the DSM-IV-MR-J.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Results of a series of one-way analyses of variance whereby gambling was the factor with each risk factor entered as the dependent variable, revealed that the means between gambling severity groups on trait anxiety, school problems, risk propensity and ineffective coping significantly differed (for means tables, see Dickson *et al.*, 2003) and that an examination of the means indicates a linear relationship such that as high severity gambling groups reported greater risk factor scores (Table 2). *Post hoc* analyses revealed that at-risk gamblers and PPGs do not differ in reported levels of school problems, risk propensity and in their frequency of using ineffective coping strategies although differences were found for all other pairwise comparisons. Furthermore, non-gamblers and social

gamblers reported similar levels of trait anxiety while at-risk gamblers and PPGs reported similar and significantly greater trait anxiety than non-gamblers and social gamblers ($p < 0.05$).

Logistical Regression

Prior to running binary logistical regression analyses, each variable was examined for outliers and scores found to lie above and/or below three standard deviations were omitted from analyses to avoid biasing the results. The removal of outliers across all variables resulted in an omission of 80 participants (3.7%) of the sample used in all prior analyses, resulting in a total sample size of 2,099 participants. In order to facilitate the generalizability of results, a 'Hold-out sample technique' (Tabachnick and Fidell, 2001) was used whereby the regression model was developed on the training sample (72%, $n = 1{,}511$) and applied on the validation sample (28%, $n = 588$) which was a portion of the sample that was not included in the development of the model.

The following three models were developed wherein gambling entered as the dichotomous dependent variable with at-risk/PPGs (DSM-IV-MR-J scores ≥ 3) receiving a value of 2 and non- and social gamblers receiving a value of 1: (1) all risk factors entered as independent variables; (2) all protective factors entered as independent variables; and (3) all risk and protective factors that had been retained in the previous regression models were entered. The initial results obtained on a sample without weights indicated that a weighted sample (which may be necessary to use when the predicted variable, such as probable pathological gambling, is a small proportion of the total sample) was not necessary for subsequent analyses. For purposes of brevity, only the final model will be discussed in detail.

Independent variables were entered using the backward stepwise likelihood-ratio (backward LR) method which is often considered the preferred method of exploratory analyses because it assesses the overall predictive capability of the model rather than significance of independents alone (Tabachnick and Fidell, 2001) and has the advantage of identifying variables that may only appear significant when another variable is controlled or held constant (Menard, 1995). Thus, even if a variable is not found to be significant by the Wald or F-ratio, it is retained in the model based on its significant likelihood ratio. Such factors have an indirect effect on the other factors in the model, though it is not possible to determine how and on what variable(s) it is indirectly affecting. The strength of association between each risk or protective factor and the outcome of at-risk/pathological gambling was estimated by an odds ratio (OR) with a 95% confidence interval (Hosmer and Lemeshow, 1989).

The receiver operating characteristics (ROC) curve, a measure of discrimination which graphically represents the trade off between false negative and false positive rates was calculated to ascertain the model's capability to predict future outcomes. For example, if one was to randomly select a student and discover whether he/she has a gambling problem, the ROC curve would graphically represent the random chance of finding an individual with a gambling problem, with a value of approximately 0.50. The closer the ROC curve is to the upper left hand corner of the graph, the better the results (see Figure 1). Figure 2 comparing the C statistic (area under the ROC curve) for the training and validation samples permitted an examination of how well the model fit the data and the generalizability of the results.

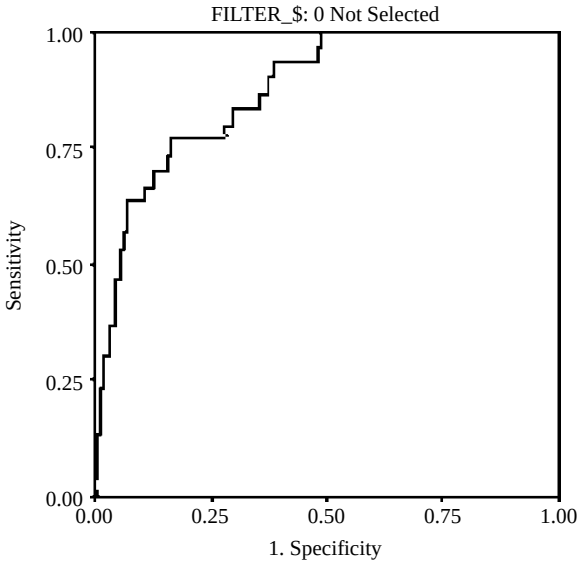

Figure 1. ROC curve: risk and protective factor model for at-risk gamblers and PPGs on validation sample

Risk Factors for At-Risk and Probable Pathological Gamblers

The first logistic regression was performed with entering all risk factors except stressful life experiences, (trait anxiety *t*-score, risk propensity, school problems *t*-score, ineffective coping, perceived academic achievement, parental-, sibling-, friend- and other person with a gambling problem, and parental-, sibling-, friend- and other person with a substance use problem) as the covariates along with gender and age. Results generated a good model fit on the basis of seven predictor variables retained, identified as Model 1: gender, trait anxiety, risk propensity, school problems, sibling gambling problem, friend gambling problem and other perceived substance use problem in an individual unidentified by the participant (Table 4). The area under the ROC curve for the training sample was 0.855 (CI = 0.83, 0.88) and 0.850 (CI = 0.81, 0.89) for the validation sample, indicating good prediction of both non- and social gamblers and at-risk/PPGs. Similar C statistics obtained for both the training and validation samples suggest excellent generalizability of the model.

Protective Factors for At-Risk and Probable Pathological Gamblers

A second logistic regression was performed with entering potential protective factors (FACES-family cohesion subscale, school connectedness, perceived academic achievement, and gender) as the covariates. Achievement motivation and effective coping were not entered because the results from the ANOVA analysis on these factors did not reveal substantial differences between gambling groups. Results generated a good model fit on the basis of three predictor variables, identified as Model 2: gender, family cohesion and school connectedness (Table 5). The area under the ROC curve was 0.76 (CI = 0.73, 0.80) for the training sample and 0.72 (CI = 0.66, 0.78) for the validation sample, demonstrating that Model 4 increases prediction by 44% (increase from 0.50 to 0.72) relative to random classification and has good generalizability.

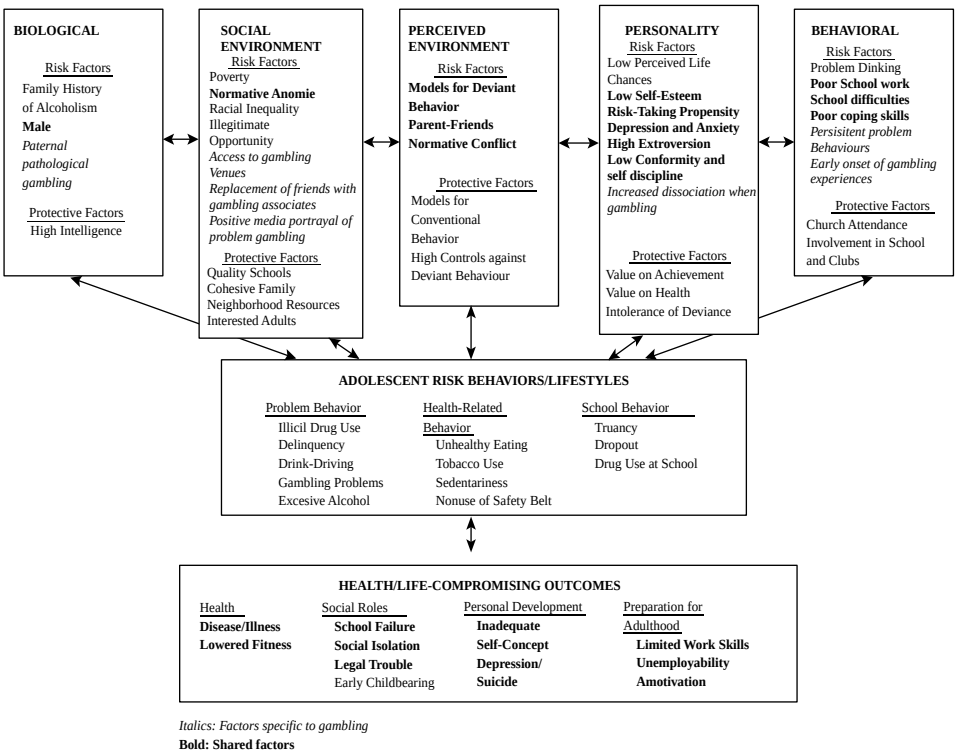

Figure 2. Modified Jessor's Adolescent Risk Behavior Model with youth gambling risk factors (Dickson, Derevensky and Gupta, 2002)

Risk and Protective Factors for At-Risk and Probable Pathological Gamblers

A final logistic regression model combining risk and protective factors for both at-risk gamblers and PPGs was performed. Accordingly, gambling was entered as the dichotomous dependent variable with at-risk/PPGs (DSM-IV-MR-J scores ≥ 3) receiving a value of 2 and the rest of the sample a value of 1. All risk and protective factors that had been retained in Models 1 (risk factors only) and 2 (protective factors only) were entered as independent variables (using backward LR), entering risk factors in block one and protective in block two. Therefore, the

Table 4. Model 1: risk factors for at-risk and PPGs

Variable	*B*	S.E.	Wald	*df*	*p*	Exp(*B*)	95% CI
Gender	−1.38	1.94	50.46	1	<0.001	0.25	0.17–0.37
Trait anxiety	0.02	0.01	4.48	1	0.34	1.03	1.85–9.05
Risk propensity	1.64	0.24	46.25	1	<0.001	5.14	2.44–5.57
School problems	0.05	0.01	29.83	1	<0.001	1.05	1.21–2.52
Sibling gambling problem	1.41	0.41	12.09	1	0.001	4.09	1.00–1.05
Friend gambling problem	1.31	0.21	38.57	1	<0.001	3.69	3.21–8.24
Substance use problem (identity not indicated)	0.56	0.19	8.73	1	0.003	1.74	1.03–1.7

Notes: B = Parameters, Exp(*B*) = odds ratio. Gender coded as 2 for female and 1 for male. CI indicates confidence interval.

Table 5. Model 2: protective factors for at-risk and PPGs

Variable	*B*	S.E.	Wald	*df*	*p*	Exp(*B*)	95% CI
Gender	−1.45	0.17	70.32	1	<0.001	0.24	0.89–0.96
Family cohesion	−0.045	0.01	32.11	1	<0.001	0.96	0.94–0.97
School connectedness	−0.079	0.02	20.87	1	<0.001	0.92	0.17–0.33

Notes: *B* = Parameters; Exp(*B*) = odds ratio. Gender coded as 2 for female and 1 for male. CI indicates confidence interval.

most predictive risk factor model was obtained prior to entering the protective factors and upon entering protective factors, only those protective factors that maximized the model's predictive power were retained. As can be seen in Table 6, the variables to be retained, termed Model 3, are: gender, trait anxiety, risk propensity, school problems, sibling gambling problem, friend gambling problem, other substance use problem, family cohesion and school connectedness. Model 3 indicates that the area under the ROC curve was 0.858 (CI = 0.83, 0.89) for the training sample and 0.835 (CI = 0.79, 0.88) for the validation sample, indicating that the model's overall ability to correctly identify PPGs and at-risk gamblers and the unspecified group (consisting of non- and social gamblers) is good, with a 67% increase in prediction from random assignment (from 0.50 to 0.835). The similar C statistic for the training and validation samples indicates that the model is not significantly overfitting the data, which suggests that the results can be generalized.

The odds ratio [Exp(*B*)] is a measurement of relative risk when directionality is determined; the values indicate the change in odds of the behaviour being present with a one-unit change in the independent variable (*B*), holding constant the contribution of the other variables. If the odds ratio is sufficiently deviate from 1, the factor and outcome of pathological gambling are considered to be associated. To interpret odds ratios for continuous variables, it is important to consider that each factor is measured on a different scale.

Model 3 suggests that the odds of becoming an at-risk/PPG for those with one-unit increase in trait anxiety (a *T*-score scale) are not substantial (OR = 1.01, CI = 0.99, 1.04) and that trait anxiety only has an indirect effect in the model

Table 6. Model 3: risk and protective factors for at-risk and PPGs

Variable	*B*	S.E.	Wald	*df*	*p*	Exp(*B*)	95% CI
Gender	−1.35	0.20	48.11	1	<0.001	0.26	0.18–0.38
Trait anxiety	0.01	0.01	0.98	1	0.322	1.01	0.99–1.04
Risk propensity	1.57	0.25	40.98	1	<0.001	4.80	2.97–7.76
School problems	0.04	0.01	14.51	1	<0.001	1.04	1.02–1.06
Sibling gambling problem	1.38	0.41	11.27	1	0.001	3.96	1.77–8.85
Friend gambling problem	1.33	0.21	39.13	1	<0.001	3.78	2.49–5.73
Substance use problem (identity not indicated)	0.56	0.19	8.73	1	0.003	1.75	1.21–2.54
Family cohesion	−0.02	0.01	4.42	1	0.036	0.98	0.96–1.00
School connectedness	−0.04	0.02	3.08	1	0.079	0.96	0.92–1.00

Note: *B* = Parameters; Exp(*B*) = odds ratio. Gender coded as 2 for female and 1 for male. CI indicates confidence interval.

because of its non-significant *F*-ratio. One unit increase in school problems was also not found to substantially increase participant's odds of developing a gambling problem (OR = 1.04, CI = 1.02, 1.06) although it was retained in the model because it increases the model's overall predictive ability. Participants who report knowing someone with a substance use problem (identify unspecified) have an increase in odds of developing a gambling problem by 1.8 times (CI = 1.21, 2.54). More substantially, the odds of developing a gambling problem are approximately 4 times greater for an individual with a sibling (OR = 3.96, CI = 1.77, 8.85) or friend (OR = 3.78, CI = 2.49, 5.73) with a gambling problem and five times greater for every unit increase in risk propensity (OR = 4.8, CI = 2.97, 7.76).

A negative parameter for a variable indicates that the variable diminishes the risk (likelihood of the predicted outcome). The protective factors that entered did not have substantial ORs, but were retained in the model as they improved the model's overall predictive function. As such, one unit increase in family cohesion (OR = 0.98, CI = 0.96, 1.0) and school connectedness (OR = 0.96, CI = 0.92, 1.01) decreases the odds of becoming an at-risk/PPG by approximately 1.0 times. School connectedness was found to have only an indirect effect on the other factors in the model. Females had decreased odds of becoming at-risk/PPGs by 0.26 times (CI = 0.18, 0.38).

Discussion

Risk and Protective Correlates/Factors for At-Risk Gamblers and PPGs

The current study has enabled the identification of a set of predictor variables that lead to at-risk and probable pathological gambling. These include trait anxiety and risk propensity, experiencing school problems, having a sibling and/or friend with gambling problems, being male and knowing a significant other with a substance use problem. Particular attention should be paid to these youths when developing gambling specific awareness campaigns. In addition, while some risk and protective factors had a direct impact upon youth problem gambling (e.g. risk propensity), others had an impact on the prediction of youth problem gambling through their influence of other risk and protective factors (e.g. trait anxiety and school connectedness). Further studies exploring how factors exerting indirect effects operate to increase risk are needed.

The importance of the social environment on severity of problem behaviours was clearly found. Probable pathological gamblers were found to report knowing a number of individuals with substance use problems. Reports of having friends and classmates with substance use problems increased linearly with increasing gambling severity and strongly suggest that having or knowing peers with substance use problems is a risk correlate of youth problem gambling. Clinically, youths with severe gambling problems often report losing old 'good' friends (positive role models) and acquiring new gambling associates (Gupta and Derevensky, 2000).

Results confirm the impact trait anxiety and risk propensity have on youth problem gambling, although this study was unable to identify personality factors that decrease an individual's chances of developing gambling problems. Trait anxiety increased linearly as gambling severity increased, yet, its indirect influence in the predictive model for at-risk/PPGs suggests that how it operates to

increase a youth's risk is complex; moderating various risk and protective factors through indirect processes. This finding is consistent with research illustrating the inhibiting effects of excessive anxiety on preventive health behaviours in general (Leventhal, 1971).

Youths who report high risk propensity consider there to be greater benefits in risk taking and have lower perceptions of the costs and negative consequences of such activities, compared to their peers. These youths appear to be at much greater increased risk for the development of gambling problems compared to the norm. Past research indicates that perceived benefits are substantially associated with risk judgements (Gullone and Moore, 2000) and behavioural intentions and high-risk behaviours (Covington and Omelich, 1992; Urberg and Robbins, 1981). This study confirms these findings with the substantial increase in odds for developing a gambling problem owing to an individual's intentions to become involved or maintain involvement in multiple high-risk behaviours. Results suggest that it is crucial to understand what outcomes youths value and that intervention programmes may need to continue to address perceptions about risk and encourage harm reduction strategies. However, perceptions of benefits and risks need to be examined longitudinally in order to substantiate such conclusions.

This study examined a number of factors in the behavioural domain including protective correlatives (e.g. effective coping and involvement in conventional activities) and risk correlates (e.g. ineffective coping, school difficulties and low self-perceived academic achievement). However, only the report of school problems was found to play a predictive function for at-risk and probable pathological gambling with a large percentage of probable pathological gamblers (43.5%) meeting the criteria for significant school problems on the MMPI-A and a smaller but significant proportion of at-risk gamblers (23.5%) meeting this criteria as well. These youths are likely to have negative attitudes toward academic achievement, poor school performance and behavioural and academic deficits and are at general increased risk for gambling problems, among involvement in other high-risk behaviours.

An examination of the effect of potential protective factors within a predictive risk factor model of adolescent problem gambling suggests that protective factors within a youth's perceived environment may play an important role in the development of at-risk and probable pathological gambling. PPGs were much more likely to be classified in the disengaged category on the FACES-II compared to other adolescents and although family cohesion in itself did not increase one's odds of developing at-risk or probable pathological gambling, it was found to contribute to the overall predictive function of Model 3; predicting at-risk and probable pathological gambling. School connectedness, one's feeling of being treated fairly, close to others, and an integral part of the school, was also found to be associated to gambling severity, although its predictive influence appeared to be only indirect (influencing other variables in the model).

Given that the addition of protective factors to the risk factor models did not increase prediction of at-risk and probable pathological gambling (e.g. comparing Model 1 to Model 3), the overall results suggest that it may be more the absence of risk than the presence of protective factors that drives the odds of developing problem gambling. However, this may be partially due to the possibility that the risk factors are so strong that the protective factors lose their predictive power when added, as suggested by the good predictive ability of Model 2 (entering only protective factors to predict at-risk/PPGs). If this study were replicated with a sample that included delinquent students, disadvantaged students, or students

struggling with substantial school difficulties, perhaps the role of the protective factors would be more significant. Future studies might usefully include sampling from community organizations, youth detention centres and other non-educational settings. Finally, these factors need to be examined over-time to test their protective function on the development of problem gambling and their commonality with other high-risk behaviours (e.g. substance use) and the results from this study suggest the merit of this pursuit.

The current study has tapped into several of the variables in Dickson *et al.*'s (2002) modification of Jessor's (1998) 'General conceptual model for high-risk behaviours', for the development of a gambling problem. With a specific directive to provide health care professionals and service providers with useful information regarding youth problem gambling, this study identified a set of predictor variables that are likely to lead to youth problem gambling. These variables span across the model domains and include both the presence of risk factors and protective/compensatory factors. The results further suggest that risk and protective factors associated with multiple health-compromising behavioural outcomes are similar for youth problem gambling. By modifying the risk and protective factors that predict multiple problem behaviours, prevention initiatives will likely have a greater impact on youth's long-term development than focusing on only those factors that predict a single negative behavioural outcome.

While an increasing body of research points to slight variance in risk factors in light of the existence of multiple pathways leading to a specific behavioural outcome (e.g. youth problem gambling), research incorporating protective factors consistently report convergence of important protective factors. In particular, the importance of healthy and meaningful relationships has been highlighted. Findings from this study suggest that family and school connectedness are associated with at-risk gambling and that accounting for the combined effects of risk and protective factors (e.g. family connectedness) increases our understanding of the of the progression to severe, excessive problem gambling. As such, the results suggest that simply focusing on strengthening protective factors without attending to risk exposure is an incomplete strategy for reducing the prevalence of problem behaviours.

Several limitations are inherent in the cross-sectional nature of this study. First, causal interpretation of the relationships among risk, protection and behavioural outcomes require replication and longitudinally designed studies are required to reassess the findings to formulate causal inferences. Prospective analyses will also have to consider more complex models of multiple risk and protective factors (e.g. structural equation modelling) as they interact and unfold over time. Thus, findings from the present study only 'suggest' important treatment targets; longitudinal studies showing improved outcomes for youths at-risk for problem gambling following interventions on the variables identified in this study would assist in documenting their causal influence.

The present study exclusively used self-report data wherein adolescents may not answer sensitive questions honestly; either exaggerating or playing down involvement in certain activities (McCord, 1990). Further, there is always the risk that a sampling bias may have occurred given that schools and participants may have self-selected to participate. However, it is important to note that this method may have under-estimated the prevalence of problem gambling given that school samples tend to underestimate pathology because youths at greatest risk are more

likely to drop-out of school or to have been absent or truant during the administration of the questionnaire (MacMahon and Trichopoulos, 1996).

A number of protective factors were tapped only superficially (e.g. mentorship) and the set of risk and protective factors was far from exhaustive. As such, measuring a broader and more exhaustive range of risk and protective factors might yield somewhat different results. The use of multiple instruments measuring similar constructs will help ensure the reliability of the identification of risk and protective factors.

Finally, there is a growing body of studies in the literature that refer to factors that directly reduce problem behaviour, as seen in this study in the detection of significant main effects in the ANOVA and regression analyses, as 'compensatory' while reserving the term *protective* for only those factors that are represented by a significant interaction effect on a risk variable. It is therefore important to note that 'protective' factors as conceptualized in this study may be more clearly specified by the term 'compensatory'. Although the goal of this study was to identify protective factors for youth problem gambling, further research is required in delineating protective factors to examine the specific paths in which the identified protective factors operate.

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