Identifying the Relationship Between Mental Health Symptoms, Problem Behaviors and Gambling Among Adolescents

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Abstract

Background: Adolescence represents a significant social and psychological developmental period which can lead to the experimentation with multiple high-risk behaviours. Although associations with problem gambling in youth have been established in the research literature, there is lack of consistency in the results and measures used to assess these constructs while considering the impact of gender and age. The current study examined the relationship between mental health symptoms (anxiety, depression), problem behaviours (aggression, delinquency) and gambling among high-school youth.

Method: Questionnaire responses were collected from 6,818 junior and senior high-school students in a mid-western U.S. community.

Results: Statistical analyses revealed that all mental health symptoms and problem behaviors were related to an increase in gambling frequency and risk for a gambling problem. Of note, both aggressive and delinquent/antisocial problems held the highest risk for gambling problems compared to anxiety and depressive problems. Significant differences were also observed in terms of gender and age.

Conclusion: This study contributes to our understanding of mental health issues and risky behaviors among adolescents.

Keywords: Adolescence; At-risk gambling; Behavioral problems; Mental health

Introduction

Gambling is a prevalent and growing public and mental health concern amongst adolescents. Recent data suggests that adolescents are gambling to an increasing extent [1,2], where 36-79% of adolescents report having gambled over the past year [3-5]. Although adults tend to gamble more frequently than adolescents, the prevalence of problem gambling (PG) has been estimated to be two to four times higher in youth aged 12 to 17, with rates of Problem Gambling (PG) ranging from 3% to 8% [4,6-8]. Furthermore, an additional 10% to 14% of adolescents who gamble could be considered 'at risk' for PG later in life [9]. With the social acceptance of gambling and the advent of online forms of gambling, novel and exceedingly accessible gambling venues have emerged which increase the potential risk for PG among youth [1,10-13].

On average, age of first gambling experience (for money) has been reported to be as low as 10 to 12 years of age, which is

considerably younger than age of first tobacco, alcohol, or drug use [6,9]. Further, although adolescents often begin by engaging in gambling occasionally and for recreational purposes (i.e., social gambling), they may progress more rapidly than adults from social gambling to problem or disordered gambling [14,15]. Trends in gambling behaviors highlight that among youth and adults, the rate of problem gambling is two times higher amongst males when compared to females [16,17]. Compared to females, males report increased risk-taking, begin gambling earlier, commit more time and money to gambling, wager more frequently, and experience higher rates of gambling-related problems [9,16]. As disordered gambling may be closely linked to externalizing behaviors and substance use in males, among females disordered gambling appears to be more closely associated with symptoms of depression and avoidance coping styles [18].

Adolescence marks an important period of psychological and social development which is often accompanied by both positive

and negative transitional events. Mental health and behavioral problems are quite common in adolescents, with high prevalence rates for depression, anxiety, substance-use and conduct disorder [19-21]. Of importance, a recent study depicted how internalizing and externalizing problems can emerge in early childhood and remain present throughout one's life [22]. Additionally, youth often have more responsibility, autonomy and freedom during adolescence, which often leads to increased experimentation with a variety of high-risk behaviors (including gambling, drinking, substance use, and unprotected sexual behavior) [4,23]. Finally, adolescents also tend to manifest high levels of impulsivity and are generally more vulnerable to social pressure. Combined, these risk factors increase the likelihood of excessive adolescent engagement in gambling activities [24].

Gambling during adolescence has been associated with a wide range of negative psychological, social, and academic outcomes. For example, rates of anxiety, depression, low self-esteem, delinquency and substance use have been reported to be significantly higher in adolescents who gamble [25-29]. Disordered gambling has also been associated with increased rates of conduct problems, anti-social behaviors, attention deficit/hyperactivity disorder and internalizing disorders in youth [30-34]. To account for this it has been suggested that gambling could serve as a maladaptive coping mechanism where adolescents engage in gambling to dissociate or escape from stressful life events [10,35]. If these maladaptive coping strategies are not acknowledged in the early stages of adolescence, continued gambling behavior could lead to the development of severe medical or psychiatric problems later in life [33,36-38].

Given the widespread consequences associated with disordered adolescent gambling, a better understanding of the relationship between mental health symptoms, problem behaviors and gambling would support future prevention and intervention efforts with adolescents. This research sought to identify the mental health symptoms and problem behaviors associated with risk for developing a gambling problem and increased gambling frequency.

Materials and Methods

This study utilized data from the 2016 Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Board/Wood County Education Service Center Survey on Alcohol and Other Drug Use amongst adolescents in junior high and high school in Wood County, Ohio. Surveys were administered to all public school students from grades seven to twelve. To ensure informed consent and anonymity on the survey, each school principal was provided with a consent form which was given to the parents informing them of the importance of the survey. Students then completed the surveys administered by their respective classroom teachers, were informed that the surveys were completely anonymous, and were able to withdraw from participation at any time with no penalty.

Participants

A total of 6,818 adolescents between age 10 and 19 (M_{age}=14.9 years, SD=1.77) from Wood County Ohio public schools participated in the study. The sample was evenly distributed by gender (49% male, n=3, 341) and a large majority of students identified as Caucasian (79%) (**Table 1** for sample demographics). Wood County, Ohio is located in the American Midwest with an estimated population of 130,219 of which a majority of residents identify as white (93%), with 94% of persons over 25 years having completed their high school education [39].

Of the original 7,136 adolescents who consented and completed the survey, 318 were excluded prior to conducting the analyses. Reasons for exclusion included: inconsistent responding (e.g,, reported using a substance during the past month, but not over the last year), reported the use of a fake drug, reported using all drugs at all times in the maximum amount, or reported participation in all gambling activities on a daily basis.

Measures

Problem behaviors and mental health: Mental health symptoms and problem behaviors were measured using the Problem Severity Scale (PSS) from the Ohio Scales for Youth (OSY). The PSS was developed based on four sources of information: (1) problem behaviors based on the DSM-IV, (2) common presenting problems for youth with emotional disturbance, (3) consultations with childcare service providers, and (4) items from commonly used instruments assessing psychopathology [40]. Psychometric studies based on the OSY suggest the PSS is reliable (internal consistency α =0.93), valid, and sensitive to change [40]. The PSS consists of 20-items based on common mental health symptoms (e.g., feeling sad or depressed) and problem behaviors (e.g., arguing with others), which are rated on a 6-point Likert scale ranging from 0 (not at all) to 5 (all of the time). A total score can by calculated by summing the 20 items, with higher scores indicating greater levels of overall problem severity.

Table 1 Sample demographics.

Demographic characteristics	N	%
Gender		
Male	3341	49.0
Female	3224	47.3
Missing	253	3.7
Age		
10 - 12	669	9.8
13 - 15	3219	47.2
16 - 19	2675	39.2
Missing	255	3.7
Ethnicity		
White	5409	79.3
Black or African American	167	2.4
Latino	276	4.0
Asian	113	1.7
Pacific Islander	16	0.2
Middle Eastern	36	0.5
Native American	34	0.5
Multicultural	205	3.0
Other	114	1.7
Missing	448	6.6

Bonadio and Tompsett using a confirmatory factor analysis on the PSS concluded that a four factor model: Aggression, Anxiety, Depression and Delinquency, were an enhanced representation of the PSS [41] when compared to the previously hypothesized two factors model including externalizing and internalizing symptoms [42]. Each specific factor is associated with a unique number of items (Aggression=8, Anxiety=3, Depression=6, Delinquency=3), with higher response scores for each factor indicating greater problem severity. To better understand the role of mental health symptoms and problem behaviors in relationship to gambling related issues, the added score for each factor score was trichotomized as either low, moderate or high problem severity.

Participation in gambling: The frequency of gambling participation on 11 common gambling activities (playing cards, betting on games of personal skill, betting on sports teams, lottery tickets, scratch-offs, online poker, mobile device/smart phone betting, bingo, keno, fantasy sports, and daily fantasy sports) were assessed. Participants were asked how frequently they engaged in each activity during the past 12 months on a 5-point Likert scale ranging from 0 (not at all) to 5 (daily). Frequency of gambling behavior was recoded into a dichotomous score: frequent gambling (participation more than once a month) and social/no gambling (participation less than once a month or not at all). There is ample evidence that increased gambling frequency has been associated with enhanced risk for a gambling problem [4,43].

At-risk gambling problems: To measure risk for a gambling problem, a three-item screen, the NORC DSM-IV Screening for Gambling Problems-Loss of Control, Lying and Preoccupation (NODS-CLiP) was administered to assess gambling severity. This measure was derived from the NODS, a 17-item measure assessesing gambling severity based on the 10 DSM-IV criteria for pathological gambling. The NODS-CLiP is a shortened version of the NODS, including the three most reliable items revealing PG [44]. The questions in the NODS-CLiP target three crucial aspects of problem and disordered gambling: preoccupation with gambling, loss of control while gambling, and lying about one's gambling. Each question requires a dichotomous (yes or no) answer; with an affirmative answer to any of the questions indicating a high risk for a gambling problem. The NODS-CLiP has been reported to have excellent sensitivity, capturing 94% of NODS problem gamblers and has a high specificity level of 0.96 [44].

Results

Chi-square analyses were conducted to better understand the relationship between mental health symptoms (anxiety and depression), problem behaviors (aggression and delinquency) and gambling behaviors (risk for a gambling problem and frequent gambling) by gender **(Table 2)**. To highlight differences in the extent of the prior problem behaviors, comparisons were conducted between those categorized as low problem and high problem. **Table 3** depicts the prevalence and means scores for aggressive, anxiety, depressive and delinquent/antisocial problems amongst both males and females.

Overall, 6.7% (n=458) of the sample were at-risk for a gambling problem, with more males (9.5% of males, n=316), in comparison to females (3.9% of females, n=126) reporting high scores. In terms of gambling frequency, 13.1% (n=891) of the sample could be classified as frequent gamblers (gambling more than once a month). A higher proportion of males were found to have gambled frequently (19.2% of males, n=642; 6.6% of females, n=213). Overall, both males and females with severe problems on the PSS were significantly more likely to be at-risk of a gambling problem, χ^2 (2, 2779)=51.46, $p<0.001$ (males); χ^2 (2, 2724)=15.38, $p<0.001$ (females) **(Figure 1)**. This was also the case for high aggressive problems, χ^2 (2, 2839)=49.96, $p<0.001$ (males); χ^2 (2, 2789)=11.66, p =0.003 (females), with 48.4% of males and 38.9% of females with elevated aggressive problems being considered at-risk. Further, 32% of males and 47.1% of females who indicated high anxiety problem were at increased risk for a gambling problem, χ^2 (2, 2891)=40.29, $p<0.001$ (males); χ^2 (2, 2827)=6.48, p =0.04 (females). Additional analyses revealed a similar pattern was present for individuals with high depressive problems, where 38.2% of males and 59% of females with high depressive problems had increased risk for a gambling problem, χ^2 (2, 2873)=33.0, $p<0.001$ (males); χ^2 (2, 2812)=14.41, p =0.001 (females). Finally, high delinquent/antisocial problems were also associated with a higher risk of a gambling problem, χ^2 (2, 2890)=52.71, $p<0.001$ (males); χ^2 (2, 2837)=11.55, p =0.003 (females), with 22.9% of males and 20.7% of females with high delinquent/antisocial problems being identified as at-risk for a gambling problem.

Chi-square analyses revealed that males and females with high overall problems were significantly more likely to be frequent gamblers, χ^2 (2, 2895)=118.16, $p<0.001$ (males); χ^2 (2, 2832)=56.52, $p<0.001$ (females) **(Figure 1).** Moreover, 50.6% of males and 64.1% of females with high aggressive problems were frequent gamblers, with males being 3.6 times more likely, χ^2 (2, 2956)=132.36, $p<0.001$, and females being 5 times more likely, χ^2 (2, 2899)=85.54, $p<0.001$, to gamble frequently. Further, males and females with high anxiety scores were significantly more likely to gamble frequently, χ^2 (2, 3012)=41.0, $p<0.001$ (males); χ^2 (2, 2937)=35.64, $p<0.001$ (females), with 27.8% of males and 55.2% of females with high anxiety problems gambling frequently. Additional analyses revealed that individuals with high depressive problems were significantly more likely to gamble frequently, χ^2 (2, 2993)=44.48, $p<0.001$ (males); χ^2 (2, 2925)=45.77, $p<0.001$ (females). Within this group, 35.3% of males and 65.2% of females with high depressive problems gambled frequently. Finally, males with high delinquent/antisocial problems were 4.7 times more likely, χ^2 (2, 2890)=52.71, $p<0.001$, and females were 5.6 times more likely to be frequent gamblers, χ^2 (2, 2837)=11.55, p =0.003. Specifically, this analysis revealed that 26.6% of males and 32% of females with high delinquent/antisocial problems were considered frequent gamblers.

Further chi-square analyses were conducted on the sample based on the age of the participants **(Table 2)**. Given the significant relationship between gambling behaviors, mental health symptoms, behavioral problems and age, it was hypothesized

Table 2 Chi-Square analyses comparing risk for problem gambling and frequent gambling amongst high mental health symptoms and problem behaviors.

High Mental Health Symptom/ Problem Behavior	Problem Gambling		Gambling Frequency	
	No Risk for Problem Gambling	Risk for Problem Gambling	Not a Frequent Gambler	Frequent Gambler
Overall Problems				
Male	25.4% (630)	42.9% (129)***	23.3% (538)	42.1% (248)***
Female	38.5% (1006)	56.9% (62)***	37.1% (979)	63% (121)***
10-12 years	20.2% (93)	40.5% (15)*	19.5% (97)	38.9% (21)***
13-15 years	30.3% (757)	43.1% (78)***	28.4% (691)	47.4% (180)***
16-19 years	37.0% (789)	51.3% (98)***	36.3% (732)	48.6% (168)***
Aggression Problems				
Male	30.6% (775)	48.4% (148)***	27.7% (650)	50.6% (308)***
Female	33.9% (906)	38.9% (55)**	32% (866)	64.1% (125)***
10-12 years	23.6% (112)	46.2% (18)**	22.1% (114)	51.8% (29)***
13-15 years	32.4% (829)	49.2% (91)***	29.8% (740)	56.4% (220)***
16-19 years	34.1% (743)	48.5% (94)***	32.3% (665)	51.5% (184)***
Anxiety Problems				
Male	17.6% (455)	32% (98)***	16.8% (403)	27.8% (172)***
Female	35.7% (968)	47.1% (56)*	34.4% (940)	55.2% (112)***
10-12 years	20.9% (102)	34.2% (13)	20% (105)	34.5% (20)*
13-15 years	25.1% (651)	33.2% (63)*	24.2% (609)	33.6% (134)***
16-19 years	30.3% (671)	39.8% (78)*	30.2% (630)	35.8% (130)*
Depressive Problems				
Male	23.8% (610)	38.2% (117)***	22.5% (535)	35.3% (216)***
Female	42.1% (1134)	59% (69)***	40.7% (1110)	65.2% (131)***
10-12 years	23.5% (115)	43.6% (17)*	22.7% (120)	44.6% (25)***
13-15 years	30.5% (785)	39.7% (75)*	29.3% (732)	41.2% (163)***
16-19 years	38.5% (847)	48.5% (94)*	38.3% (796)	44.2% (159)*
Delinquent Problems				
Male	11% (283)	22.9% (70)***	8.2% (198)	26.6% (163)***
Female	11.2% (304)	20.7% (25)**	10% (275)	32% (65)***
10-12 years	2.8% (14)	4.9% (2)	1.7% (9)	12.3% (7)***
13-15 years	7.6% (198)	18.8% (36)***	6% (151)	23% (92)***
16-19 years	17% (376)	29.4% (57)***	15.1% (314)	36% (129)***

Note: *p<0.05; **p<0.01; ***p<0.001

Table 3 Descriptive statistics of mental health symptoms and problem behaviors over the last month.

Type of Mental Health Symptom/Problem Behavior	Severity of Mental Health Symptom/Problem Behavior			N	M	SD
	Low	Moderate	High			
Overall Problems						
Male	39.9% (1159)	28.8% (961)	23.6% (787)	2907	12.08	15.37
Female	25.6% (836)	28.3% (914)	34.2% (1102)	2842	16.62	17.43
10-12 years	35.4% (237)	29.3% (196)	17.6% (118)	551	10.97	14.61
13-15 years	30.9% (995)	29.7% (957)	27.1% (872)	2824	13.82	16.44
16-19 years	28.2% (754)	26.9% (719)	33.7% (902)	2375	15.74	17.05
Aggression Problems						
Male	32.5% (1086)	27.7% (924)	28.7% (960)	2970	6.43	7.21
Female	29.3% (944)	30.1% (972)	30.8% (994)	2910	6.84	6.98
10-12 years	35% (234)	29% (194)	21.4% (143)	571	5.53	6.51
13-15 years	31.1% (1002)	28.5% (919)	29.9% (962)	2883	6.72	7.16
16-19 years	29.7% (794)	29.2% (780)	31.9% (852)	2426	6.82	7.17
Anxiety Problems						
Male	49.6% (1656)	23.9% (789)	17.2% (576)	3030	1.89	3.15
Female	30.5% (983)	28.3% (913)	32.7% (1055)	2951	3.49	4.16

10-12 years	38.9% (260)	29.7% (199)	18.7% (125)	584	2.20	3.30
13-15 years	40.7% (1310)	27.4% (881)	23.1% (744)	2935	2.57	3.73
16-19 years	40% (1070)	23.6% (630)	28.5% (763)	2463	2.92	3.90
Depressive Problems						
Male	50.3% (1679)	17.3% (577)	22.6% (754)	3010	2.98	5.52
Female	32.1% (1036)	20.3% (656)	38.6% (1245)	2937	5.64	7.51
10-12 years	44.7% (299)	21.1% (141)	21.7% (145)	585	3.06	5.62
13-15 years	42.6% (1370)	20.1% (647)	27.9% (897)	2914	4.06	6.64
16-19 years	39.1% (1046)	16.5% (442)	35.9% (960)	2448	4.88	7.00
Delinquent Problems						
Male	68.7% (2295)	11.2% (374)	10.8% (362)	3031	0.89	2.33
Female	67.4% (2174)	13.9% (449)	10.6% (341)	2964	0.82	1.97
10-12 years	80.3% (537)	5.8% (39)	2.4% (16)	592	0.29	1.53
13-15 years	74.1% (2384)	9.9% (319)	7.5% (243)	2946	0.62	1.90
16-19 years	57.8% (1545)	17.5% (467)	16.6% (445)	2457	1.27	2.48

that differences would be similarly found based on age. For the following analyses, participants were divided into three age groups; 10-12 years (n=669); 13-15 years (n=3,219); and 16-19 years (n=2,675). Overall, 16-19 year olds were at the highest risk of a gambling problem (7.5%, n=200), when compared to 10-12 year olds (6.6%, n=44) and 13-15 year olds (6.1%, n=197). In terms of gambling frequency, a larger proportion of 16-19 year olds gambled more than once a month (14%, n=375), in comparison to 13-15 year olds (12.9%, n=415) and 10-12 year olds (9.4%, n=63). The prevalence and mean score of aggressive, anxiety, depressive and delinquent/antisocial problems amongst the three age groups are found in **(Table 3)**.

Amongst participants aged 10-12 years, 40.5% of those with high overall problems on the PSS were at-risk of problem gambling, χ^2 (2, 497)=8.38, p =0.015 and 38.9% were frequent gamblers, χ^2 (2, 551)=17.72, p<00.1 **(Figure 2).** Moreover, 46.2% of those with high aggressive problems were at-risk of problem gambling, χ^2 (2, 514)=10.41, p=0.005. Similarly, 51.8% of 10-12 year olds with high aggressive problems were categorized as being frequent gamblers, χ^2 (2, 571)=27.19, p<0.001. Further, high anxiety problems were not significantly related with being at-risk for a gambling problem, yet 10-12 year olds with high anxiety problems were significantly more likely to be frequent gamblers, χ^2 (2, 583)=6.53, p=0.038. Of note, 34.5% of those with high anxiety problems were considered frequent gamblers. As for individuals reporting high depressive symptomatology, 44.6% of 10-12 year olds were significantly more likely to gamble frequently, χ^2 (2, 584)=16.09, p<0.001, and 43.6% were at-risk of a gambling problem, χ^2 (2, 529)=7.9, p=0.019. Finally, 10-12 year olds with high delinquent/antisocial problems were not significantly more likely to be at-risk of a gambling problem, however, they were 9.2 times more likely to gamble frequently, χ^2 (2, 591)=28.66, p<0.001. Specifically, 12.3% of youth with high delinquent/antisocial problems were frequent gamblers.

As for high-school students aged 13-15, all mental health symptoms and problem behaviors were significantly associated with being at-risk for a gambling problem and being identified as a frequent gambler. High overall problem scores on the PSS resulted in individuals being significantly more likely to gamble
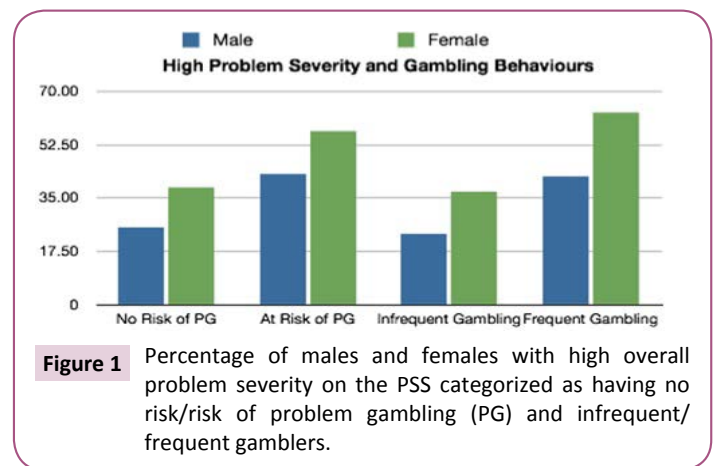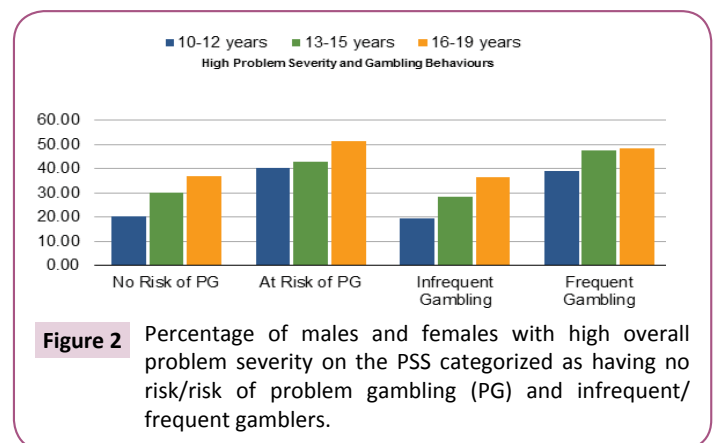
frequently, χ^2 (2, 2812)=72.84, p<0.001, and be at-risk for a gambling problem, χ^2 (2, 2683)=13.94, p =0.001 **(Figure 2).** Of importance, 49.2% of those with high aggressive problems were at-risk of a gambling problem, χ^2 (2, 2741)=26.88, p<0.001 and 56.4% were categorized as frequent gamblers, χ^2 (2, 2871)=117.56, p<0.001. High anxiety and depressive problems were slightly associated with gambling in this age group, with individuals reporting high anxiety scores being 1.6 times more likely to be identified as being at-risk of a gambling problem, χ^2 (2, 2784)=6.53, p =0.038, and being a frequent gambler, χ^2 (2,

2917)=16.11, p<0.001. Specifically, 33.2% of those with high anxiety problems were at-risk of a gambling problem and 33.6% of these were categorized as frequent gamblers. Further, those youth high reporting depressive symptomatology were 1.6 times more likely to be at-risk of a gambling problem, χ^2 (2, 2763)=7.37, p =0.025, and were

1.7 times more likely to be frequent gamblers, χ^2 (2, 2898)=22.71, p<0.001. Among 13-15 year olds, 39.7% of those with high depressive problems were at-risk of a gambling problem and 41.2% were categorized as frequent gamblers. Finally, 18.8% of participants with high delinquent/antisocial problems were at-risk of a gambling problem, χ^2 (2, 2793)=31.20, p<0.001, and 23% were categorized as frequent gamblers, χ^2 (2, 2930)=194.02, p<0.001.

For adolescents between the ages of 16 and 19, high overall problem scores on the PSS was associated with being at-risk of a gambling problem, χ^2 (2, 2324)=19.40, p<0.001 and gambling frequently, χ^2 (2, 2365)=26.86, p<0.001 **(Figure 2)**. Results revealed that 48.5% of those with high aggressive problems were at-risk of a gambling problem, χ^2 (2, 2373)=19.78, p<0.001, whereas 51.5% of those with high aggressive problems were categorized as frequent gamblers, χ^2 (2, 2413)=51.16, p<0.001. As for high anxiety and depressive problems, both anxiety, χ^2 (2, 2408)=7.89, p =0.019, and depression, χ^2 (2, 2393)=7.91, p =0.019, were significantly related to an increased risk of a gambling problem. In the current sample, 39.8% of those with high anxiety problems and 48.5% of those with high depressive problems were at-risk for a gambling problem. As for gambling frequency, high anxiety problems, χ^2 (2, 2450)=6.27, p =0.04, and high depressive problems, χ^2 (2, 2436)=7.89, p =0.019, only slightly increased the risk to be categorized as frequent gamblers. Finally, 16-19 year olds high in delinquent/antisocial problems were 2.4 times more likely to be at-risk of a gambling problem, χ^2 (2, 2400)=28.18, p<0.001, and 3.7 times more likely to be categorized as frequent gamblers, χ^2 (2, 2443)=100.31, p<0.001. Specifically, 29.4% of those with high delinquent/antisocial problems were at-risk of a gambling problem, whereas 36% were categorized as frequent gamblers.

Discussion

The aim of the study was to identify which types of mental health symptoms and problem behaviors increase the likelihood of being at-risk of a gambling problem and associated with enhanced frequency of gambling, while taking into consideration gender and age. Results from the study indicate that overall, aggressive, anxiety; depressive and delinquent/antisocial symptoms increased the likelihood of males and females being at-risk of a gambling problem. This was also the case for gambling frequency. As for individuals aged 13-15 and 16-19, all mental health problems and problem behaviors were significantly related to both risks for PG and gambling frequency. For the 10-12 year olds, high anxiety and delinquency problems were not significantly related to being at-risk for PG, although these mental health and behavioral problems were related to increased frequency of participation in gambling activities. As

for depressive and aggressive problems, 10-12 year olds were significantly more likely to be at-risk for PG or frequent gamblers when these problems were high in severity.

These findings confirm the association between gambling behaviors with a range of externalizing and internalizing symptoms [25,27,28,29,33,38]. The results emphasize the importance of aggressive and depressive problems in enhancing the risk for both PG and frequent gambling within both males and females. Desai, Maciejewski, Pantalon, and Potenza reported that externalizing and internalizing problems are gender dependent, with males who gamble expressing more externalizing problems and females who gamble expressing more symptoms of depression and avoidance coping [18]. This study confirms these findings, as aggressive and delinquent problems increased the likelihood of being at-risk for PG to a larger extent in males when compared to females. However, delinquent, aggressive, anxiety and depressive problems increased the likelihood of females being categorized as frequent gamblers to a larger extent than in males. To this extent, it may be the case that females with severe mental health symptoms and problem behaviors are gambling frequently as an avoidance coping mechanism to help deal with their difficulties [10], without experiencing significant preoccupation or loss of control with their gambling behaviors. Moreover, perhaps females who gamble frequently are gambling as a maladaptive coping mechanism through which they can avoid an array of psychological or social problems [4]. As such, females may more frequently fail to be identified as being at-risk for PG even though they are gambling often. Furthermore, the NODS-CLiP may be more sensitive to externalized problems such as lying and impulsivity. As externalizing symptoms are generally more prevalent in males [18] this disproportional influence could help explain why high aggressive and delinquent problems are more predictive of risk for PG amongst males.

The results for various age groups revealed that severe mental health symptoms and problem behaviors generally had a higher likelihood of identifying individuals as frequent gamblers when compared to identifying them as at-risk for PG. In this sample of junior-high and high-school students, problem behaviours and mental health symptoms appeared to increase steadily with age. As such, increasing age appears to have an influence on the prevalence of mental health symptoms and problem behaviours, whether or not gambling is taken into account [19]. In this case, it is possible that gambling behaviors could exacerbate both mental health symptoms and problem behaviors during the earlier stages of adolescence with the hazardous potential of being maintained over time.

Severe delinquent/antisocial problems within the past month held the highest risk of identifying participants as being both at-risk for PG and as frequent gamblers. This result was the case for both males and females and all age groups analyzed. As assessed by the PSS, delinquent problems include breaking laws, skipping school, and lying. This is in congruence with the DSM-IV categorization of PG which indicates lying about past gambling as a primary symptom of PG [27,44]. As lying is a core aspect of both delinquent behaviours and PG, it would be expected that

delinquent problem increase risk for PG. Further, this finding corroborates the study by Räsänen, Lintonen, Tolvanen, and Konu, who reported that frequent gambling was associated with higher rates of delinquent behaviors amongst 14-16 year olds [34]. The impact of age revealed that high delinquent problems resulted in youth aged 10-12 year olds being 9.2 times more likely to be frequent gamblers, followed by 13-15 year olds (5.8 times more likely) and 16-19 year olds (3.7 times more likely). It is possible that younger individuals who gamble illegally are more prone to a broader range of other rule breaking behaviors [27,28]. As a result, higher delinquent problems in younger individuals may be an overall risk factor for problematic gambling in youth.

High aggressive problems significantly increased the likelihood of identifying people as being at-risk for PG and frequent gamblers. Aggressive problems measured through the PSS include arguing with others, getting into fights, getting angry, and substance use. Consequently, these results are to be expected as rates of substance-use and antisocial behaviors are typically higher in adolescents who gamble [27,32]. Of note, high aggressive problems revealed females to be 5 times more likely and males 3.6 times more likely to be frequent gamblers. Since previous research suggests that both frequent gambling and high aggressive behaviors are typically more prevalent in males [9,16,20], it is plausible that females who gamble are doing so in environments which facilitate and exacerbate aggressive behaviors as the norm [24]. Considering the prior, it is possible that females with high aggressive problems may be at a higher risk of engaging in frequent gambling activities.

Finally younger children, ages 10-12 with high aggressivity were 6.4 times more likely to gamble frequently and were 3.5 times more likely to be at-risk for PG. These odds ratio were higher than those for 13-15 year olds (4.3 times; 2.7 times) and 16-19 year olds (2.6 times; 2.3 times), suggesting that severe aggressive problems are the strongest predictor of risk for PG in younger adolescents. Perhaps then, younger individuals who are engaging in impulsive externalizing behaviors such as excessive anger, fighting and substance-use, are more vulnerable to social pressure than older adolescents [24]. Further, environments where adolescents engage in gambling may also predispose them to other risky behaviours such as substance and alcohol use [26]. As a result, it may be the combination of impulsivity, social pressure and environmental influences which drastically increase the risk of frequent gambling and risk for PG amongst 10-12 year olds, in comparison to older individuals who may be more resistant to such pressures.

Limitations and Future Directions

Although this study fosters a deeper understanding of the relationship between mental health symptoms, problem behaviors and risky gambling behaviors, several noteworthy limitations must be acknowledged. For one, the use of self-report questionnaires to measure mental health symptoms, problem behaviors and gambling behaviors may have impacted the acquired prevalence of these constructs as they are sensitive topics to disclose in spite of the anonymity of the survey. Additionally, these mental health symptoms and problem behaviors were measured using a restricted number of items on a broader problem severity scale. The PSS has been used in the

past to assess overall levels of problem severity [40], but not in regards to the specific areas of aggressivity, anxiety, depressive and delinquent/antisocial problems. Although these underlying factors have been validated through confirmatory factor analysis [41], further psychometric studies are required to confirm these findings amongst a variety of norm groups and populations. Second, although the study had a large sample size, the sample was restricted to junior high school and high school students in a single geographical area of the United States. Additional studies may be required to generalize these results to various populations and cultures. Third, to screen for the risk of PG, a shortened version of the NODS measure was given due to the restricted time period allocated to take the survey and available space within the questionnaire. Although other longer and more comprehensive assessments of gambling behavior are available, the NODS-CLiP has shown high sensitivity and specificity in prior research [44].

Conclusion

In conclusion, the current findings support previous research highlighting the relationship between gambling behaviors and a variety of mental health symptoms and problem behaviors in adolescent youth. Of importance, this study describes and emphasizes the existing differences in gambling behaviors between males and females and youth of varying ages. High levels of aggressive, anxiety, depressive and delinquent/antisocial problems put adolescents at-risk, not only in terms of their psychological and social wellbeing, but also by increasing their risk for problematic and disordered gambling behaviors. Given that gambling has increased in its accessibility and has become more socially accepted [12,13], enhanced attention must be drawn to behaviors and symptoms which increase the likelihood of youth participation in gambling. This study strengthens our current understanding of these symptoms and as such, can assist in the development of future intervention programs targeting problematic gambling behaviours in a holistic manner. That is, paying attention not only to gambling behaviours, but the constellation of associated psychological and social sequela which may vary by gender and age. Future research should aim to optimize our understanding of problem behaviors and mental health symptoms resulting in problematic gambling by identifying variables which moderate this relationship.

Competing and Conflicting Interests

The authors have no potential conflicts of interest to declare with respect to the research, authorship, and/or publication of this article.

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