

Adolescent Online Gambling in Cyprus: Associated School Performance and Psychopathology

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Abstract This paper presents results from the study of gambling behaviors in a representative sample of Cypriot high-school students. The aim of the study was to ascertain epidemiology of adolescent online gambling in Cyprus and possible correlates. The sample consisted of 2,684 students (48.5 % boys, 51.5 % girls) from the first grades of junior (Gymnasium) and senior (Lyceum) high school. Our results indicate that gamblers presented with lower school achievement and related expectations while scoring consistently higher on measures of Internet addiction, parental bonding and psychopathology. Discriminant analysis revealed two profiles which explained the most variance in gambling behavior; the first profile that corresponded to more explained variance was the student with higher psychopathology, less prosocial behavior, higher Internet addiction score with higher frequencies of online activities and moderate levels of truancy and lower expectation of school achievement. The second profile was that of a student who reported less psychopathology, more prosocial behavior, less involvement with the Internet in general but skipped classes more and his prospects on finishing high school were even slimmer. These results will be utilized in the design of a comprehensive prevention program in an effort to combat online addictive behaviors.

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Introduction

Online Gambling in Adolescence: An Expanding Phenomenon

Pathological gambling is now the first behavioral addiction to be officially included in the substance-related disorders chapter of the new edition of the diagnostic manual of the American Psychiatric Association, DSM-5 (APA 2013). The authors justified this change with the increasing and consistent evidence that gambling resembles substance use disorders to the extent that it activates the brain reward system with effects similar to those of drugs of abuse. DSM-5 now employs the term ‘gambling disorder’ rather than pathological gambling, although both terms essentially refer to the same clinical entity since the major changes in diagnostic criteria were lowering the threshold from five to four positive criteria, the ‘has committed illegal acts such as forgery, fraud theft or embezzlement to finance gambling’ criterion having been eliminated, and setting a clear time frame of 12 months for all criteria to be present.

Gambling in adolescence, while being prohibited by law across the globe, still represents a significant problem for some time now (Griffiths 1995). Online gambling is an extension of gambling in the online environment that possesses several unique characteristics which enhance and augment the gambling experience (Griffiths 2003). The advent of online gambling has arguably made it easier for an adolescent to gamble, especially with a host of new opportunities for play without spending any real money (Griffiths and Parke 2010). Those gambling-like opportunities have spread via social networking sites and expanded to include online friends and acquaintances (Griffiths 2013), their actual effect on the propagation of gambling with real money is as yet undetermined. Younger age in general is a significant predictor of online gambling activity (Wood and Williams 2009) though the fact that adolescent gambling is prohibited makes relevant data hard to come by, since adolescents fake their stated age in order to gamble online. The reported rates of adolescent problem gambling have ranged from 2 % in the UK (Ipsos 2009), 2.1–4.9 % in the US (Derevensky et al. 2007; Welte et al. 2007), 8 % in Quebec, Canada (Gendron et al. 2009) 6.7 % in Australia (Splevins et al. 2010), 8.8 % in New Zealand (Rossen 2008), 4 % in Iceland (Olason et al. 2011), 2.5 % in Norway (Molde et al. 2009), 2.8 % in Brazil (Spritzer et al. 2011). It was reported that online gamblers tended to be more heavily involved with gambling than offline gamblers (Derevensky 2011; Kristiansen and Fredriksen 2008; Potenza et al. 2011). With most online samples being recruited by chance, or responding willfully to be included in a survey, it is hard to conclusively determine whether those percentages correspond to real-life data, and more importantly, it is near impossible to replicate those results some years down the line using a comparable population.

Parental Bonding and Gambling

Deficits in parental bonding have been linked to increased incidence of pathological gambling (Grant and Kim 2002; Floros et al. 2013). Those parental practices that are reported include an excessive degree of control and thwarting of independence while at the

same time demonstrating emotional coldness, being distant and indifferent to the child's needs. This profile of overprotection and low care is labeled as 'affectionless control'.

Online Gambling and Adolescent Psychopathology

Although adolescent gambling has been associated to a host of psychopathological entities including depression and dissociation (Molde et al. 2009), ADHD (Derevensky et al. 2007; Breyer et al. 2009), drug and alcohol abuse (Lynch et al. 2004; Brewer et al. 2010), these findings related to associations rather than cause and effect relationships as those found in longitudinal studies or laboratory experiments. Associations in cross-sectional surveys can be attributed to various common antecedent factors related to poor impulse control, impaired risk perception (Spurrier and Blaszczynski 2013) or socio-familial risk (Casey et al. 2011; Hardoon et al. 2004). Recently however, in a related study the authors concluded that those common factors may explain the initial emergence of an association between depressive symptoms and gambling problems in adolescence. However, once emerged, their escalation seems to be better explained by a mutual direct influence between the two sets of disorders (Dussault et al. 2011). Psychopathology is thus an important predictor of adolescent gambling tendencies while gambling in itself could lead to an increase of psychopathology. An open issue is also whether parenting affects adolescent psychopathology which in turn affects gambling predilection. Our focus in this study will additionally include overt psychopathology. Since deficits in parental bonding is a known mediator of adverse psychological outcomes in adolescence that even carry over to adulthood (Enns et al. 2002) and could in turn act as the principal variable in affecting gambling behavior, including measures of both parental bonding and psychopathology in a study on adolescent gambling would be ideal.

School Performance and Adolescent Gambling

Pathological gamblers were more likely to have poor school performance in both cross-sectional (Winters et al. 1993) and longitudinal (Winters et al. 2002) studies. Having however a large number of possible confounder variables makes it hard to ascertain whether this is a primary effect of pathological gambling or a secondary effect related to co-occurring psychopathology and possible issues at home.

The Situation in Cyprus and the Rationale for this Study

The Republic of Cyprus is at the present time mostly inhabited by Cypriots of ethnic Greek origin, following the 1974 invasion of the island and subsequent division along ethnic lines. There haven't been any major epidemiological surveys of online or offline adolescent gambling in Cyprus and adolescent gambling is prohibited by law. There is an active prohibition of all online gambling under effect as well, in order to preserve the market of the state-run monopoly in gambling; this is hampering the calculation of the actual frequency of online gambling since it is a clandestine affair. There are no brick-and-mortar casinos operating either for the same reason, yet this has led to a large influx of Greek Cypriots to the occupied north when inter-community movement was made possible in order to gamble in the local casinos that operated legally there (Webster and Timothy 2006), showing the potential for expansion in gambling behavior. A small cross-sectional survey run in two public high schools in the capital (Trichina et al. 2011) revealed that

69 % of the 245 polled adolescents had gambled at least once during their lifetime, with 17 % having gambled online. Of them, 34 % of boys and 12 % of girl gamblers had gambled in an online casino. The percentage of the population at risk was 6 % and those classified as addicted to all forms of gambling 7 %. The penalties of the law, or any ethical concerns, do not appear to be a major obstacle when the urge to gamble is present and a large scale survey is justified if we are to ascertain true epidemiology.

In 2010 the Hellenic association for the study of internet addiction disorder (IAD) in cooperation with the local Drug abuse prevention center 'Hippocrates' of the Greek Organization against Illicit Drugs completed a large cross-sectional survey of the entire adolescent student population of the island of Kos (2,017 students) on online addictive behaviors, including online gambling. Results indicated that 37.2 % of the total student population have had some online gambling experience while 4.1 % were classified as addicted to online gambling following the criteria of the DSM-IV-J questionnaire for gambling addiction (Floros et al. 2013). Online gambling was predicted by gender, parenting practices and patterns of specific online activities including online video gaming, pornography, social networking and random browsing. The publication of those results led to an interest from the Cypriot Ministry of Health and Ministry of Education and Culture for the setting-up of a corresponding survey in Cyprus, the reasons being the expectation that the common cultural heritage and similar life styles between Kos and Cyprus could mean that the Cypriot adolescent population is facing similar risks and demonstrating comparable epidemiological data on those behaviors. Results from a similar survey carried out in Cyprus could be then utilized in formulating a prevention program for Cypriot youth. This paper will describe the methodology and results of this survey in Cyprus while drawing up comparisons with the similar Greek survey wherever this is applicable. The reader is referred to the original publication for the rationale on the inclusion of items on specific online activities, Internet addiction and parental bonding indexes in the research material (Floros et al. 2013).

Methods

Aims of this Study

Following the review of the literature and based on past experience this study was designed to ascertain the epidemiology of Internet gambling in Cyprus. Related research questions to be answered were

- whether results would be similar to those in Greece,
- whether specific online activities are associated with online gambling tendencies,
- whether parenting practices would be associated with Internet gambling,
- whether Internet gamblers would present with more psychopathology than non-gamblers and whether this trend would be more evident in addicted gamblers, and finally
- whether current psychopathology would be a more important parameter in predicting gambling behavior than parenting practices.

Study Design and Population

The study is part of a larger research project 'Internet and Cypriot high school students 2012' focusing on online behaviors of the youth in the island. It was designed by the

Hellenic Association for the Study of IAD in collaboration with the Cypriot Ministry of Health and Ministry of Education and Culture under the program “European Network of Schools for Health Promotion”. Proper permission for the study was sought for and granted by the official centre of Educational Research and Validation of Cyprus after a review for matters of ethics and legality. This study was of a cross-sectional design which excluded individuals who were receiving treatment of any kind for overt psychopathology and a provision was made for the referral of any individuals coming forward with psychic complaints to the local mental health services. All students were given an explanation for the purpose of the study and could freely opt out. In order to have an accurate picture of the problem in each area of Cyprus and achieve our stated goals, we proceeded with a study with a student sample representative of the entire student population. The research sample was drawn nationwide to be representative of the first and fourth grades of the Cypriot high schools. The methodology and research material were similar to those employed in the aforementioned study in Greece (Floros et al. 2013) in order to facilitate comparison between the two countries which shared common language and culture. This is the first published report from the island of Cyprus on adolescent online gambling.

The research material was distributed in schools and participation was voluntary and confidential during one school hour offered to the project by the school’s director. Our research sample consisted of 2,684 adolescent students between 12 and 16 years of age in 32 school units situated across 5 provinces. The survey sample is representative of the high school population in the first grades of Gymnasium and Lyceum (1st and 4th year of high school education), chosen since they represent important developmental milestones for the adolescents of the island. Total number of students in those grades in Cyprus approaches each year the 8,000 mark. The “SPSS for Windows 20” was used for all data analysis (Nie et al. 2011).

Measures

Students were handed material that included extended demographics, a detailed questionnaire on Internet activities and the Greek versions of the DSM-IV-MR-J questionnaire, Young’s diagnostic questionnaire (YDQ), parental bonding instrument (PBI) and the strengths and difficulties questionnaire (SDQ).

The demographics questionnaires included questions on sex, age, parental educational and occupational background, family’s financial status, school performance and related goals. All Internet and computer activities were measured on a Likert scale for frequency during the last 3 months.

The DSM-IV-MR-J (MR = multiple response, J = juvenile) (Fisher 2000) was developed for use with adolescents that have gambled during the past year and includes 12 items (corresponding to 9 categories) used to screen for pathological gambling during adolescence. The items are modeled after the DSM-IV-TR (APA 2000) criteria for diagnosis of adult pathological gambling. To compensate for the inability of following-up on an ambiguous verbal answer, most of the questions in the revised instrument have been given four response options; “never”, “once or twice”, “sometimes”, or “often”. In each question a specific cut-point indicates a degree of severity corresponding to a positive answer, so as to model the yes/no categories of the DSM-IV-TR criteria. Any score of 4 of the 9 categories or greater is indicative of pathological gambling. The instrument assesses a number of important variables related to pathological gambling: progression and preoccupation, tolerance, withdrawal and loss of control, escape, chasing, lies, and deception, illegal activities and family/school disruption. The Greek adaptation of this questionnaire

has been successfully employed previously in the Greek study mentioned (Floros et al. 2013).

The YDQ (Young 1996), based on DSM-IV criteria on gambling was utilized with our sample to provide a measure of IAD as was the case in the Greek study mentioned. Categorization is based on the number of positive criteria, with individuals responding positively to 0–2 questions deemed as moderate users, those responding positively to 3–4 as possibly prone to addiction and those with over 5 as being addicted to the internet.

The PBI consists of 25 items rated on a four-item Likert scale (Parker 1990). The subject is handed two identical questionnaires which refer to each parent. Results are grouped in two factors, Care, which is measured by 12 items and Overprotection measured by 13 items. Care scores range in the continuum between one pole defined by empathy, closeness, emotional warmth, affection and on pole defined by neglect, indifference and emotional coldness. Overprotection scores range from overprotection, intrusion, excessive contact, control and prevention of independent behavior to autonomy and allowance of independence. The official Greek adaptation of the PBI (Avagianou and Zafiropoulou 2008) was employed in this study as was the case in the Greek study mentioned.

The SDQ is a brief behavioral screening questionnaire for children and adolescents ages 4–16 years old. It is a genuinely dimensional measure of child mental health; in a validation study children with higher total difficulty scores have greater psychopathology as judged by the prevalence of clinical disorder (Goodman and Goodman 2009). It contains queries on 25 attributes, some positive and others negative. These 25 items are divided between 5 scales: Emotional symptoms (5 items) conduct problems (5 items), hyperactivity/inattention (5 items), peer relationship problems (5 items) and prosocial behavior (5 items). The first four scales are added together to generate a total difficulties score. The official Greek adaptation of the SDQ was employed in this study (Giannakopoulos et al. 2009).

Results

Sample Demographics and Classification on Gambling Practices

There were a total of 2,684 students participating in the survey, aged 12–16. Of them 1,302 were boys (48.5 % of the sample, mean age 13.67 years, SE .042) and 1,382 girls (51.5 % of the sample, mean age 13.63, SE .041). Age distribution was similar across the sexes. Demographics for the adolescent sample are presented in Table 1.

Five-hundred thirteen adolescents from our sample (19.11 %) reported having had some experience using the Internet to gamble online during the past 3 months. Of those 513 adolescents 437 considered themselves as being regular players at some time during the past year; 67 of them were classified as demonstrating addictive symptomatology (2.5 % of the total student sample and 13.8 % of those who had had gambling experience) as classified by their results in the DSM-IV-MR-J questionnaire. Fifty-nine were boys and 8 of them girls; there was a statistically significant difference between sexes with regards to group membership with males being more likely members of both the addicted gambler and the not-addicted gambler groups than females, Kendall's tau-b = .205, SE .018, $p < .001$. There was a statistically significant difference between addicted gamblers, not-addicted gamblers and non-players with regards to age, $F(2, 2,681) = 7.125$, $p = .001$, with those adolescents gambling being older than non-gamblers. There weren't any statistically significant differences in age between addicted and non-addicted gamblers but

Table 1 Demographics of adolescent responders to the survey

Variable	Frequency	Percentage		
Sex				
Boys	1,302	48.5 %		
Girls	1,382	51.5 %		
Age				
12	1,191	44.4 %		
13	93	3.5 %		
14	16	0.6 %		
15	1,217	45.3 %		
16	167	6.2 %		
Students per type of school				
Gymnasium	1,292	48.1 %		
Lyceum	1,203	44.8 %		
Technical school	189	7 %		
Estimated family income per month				
Up to 1,000 euros	587	21.9 %		
1,000–2,000 euros	699	26 %		
2,000–3,000 euros	484	18 %		
3,000–4,000 euros	320	11.9 %		
4,000–5,000 euros	214	8 %		
Over 5,000 euros	165	6.1 %		
Did not answer	215	8 %		
	Family allowance	Own work-chores		
Available weekly income				
None	549	20.5 %	1,641	61.1 %
Up to 30 euros	1,458	54.3 %	260	9.7 %
30–40 euros	254	9.5 %	92	3.4 %
41–50 euros	140	5.2 %	60	2.2 %
51–60 euros	62	2.3 %	44	1.6 %
Over 60 euros	104	3.9 %	101	3.8 %
Did not answer	117	4.4 %	486	18.1 %
Technology-related monthly expenses				
Up to 20 euros	1,324		49.3 %	
21–40 euros	528		19.7 %	
41–60 euros	253		9.4 %	
Over 60 euros	368		13.7 %	
Did not answer	211		7.9 %	
Using the Internet to gamble in gambling websites (previous 3 months)				
Have not	2,171		80.9 %	
A few times	123		4.6 %	
A couple of times per month	78		2.9 %	
At least once a week	73		2.7 %	
Almost daily	60		2.2 %	

Table 1 continued

	Family allowance	Own work-chores
More than once a day	61	2.3 %
Did not answer	118	4.4 %
<i>Classified as possibly addicted to gambling</i>		
Yes	67	2.5 % (18.1 % ^a)
No	370	13.8 % (81.9 % ^a)
Not measured	2,247	83.7 %

^a Valid percentage among those with previous gambling experience

interestingly those students who were older in each class (e.g. 13 years of age instead of 12 and 16 instead of 15) were more likely to be involved with gambling ($p < .05$). Those students are typically those who have missed at least one school year for any reason. There was a statistically significant difference in the number of gamblers across the three types of schools ($p < .001$) with technical school being the more likely to have students who gambled, both addictively and not.

Gambling and School Performance

Those students who had high scores on the DSM-IV-MR-J reported being truant more frequently (Spearman $r_s = .243$, $p < .001$) and having lower school achievement in literature (Spearman $r_s = -.108$, $p < .05$) and mathematics courses (Spearman $r_s = -.114$, $p < .05$) this year but not the previous one. The students were asked as to whether they believed they would finish high school on time, drop a year or more, or even quit it altogether. Those students who gambled, addictively or not, tended to make gloomier predictions for their future, Kendall's tau-b = .136, SE .24, $p < .001$. Effect sizes (etas) were small to medium (Cohen 1988).

Correlates of Online Gambling with Internet Addiction, Parental Bonding and Individual Strengths and Difficulties

Tables 2 and 3 present the results from the YDQ, PBI and SDQ questionnaires across the three main groups, non-gamblers, non-addicted and addicted gamblers. Online gambling was associated with statistically significantly higher Internet Addiction scores ($p < .001$), lower parental care ($p < .001$) and higher parental overprotection ($p < .001$) (Table 2). In most cases the differences were pronounced only between the non-gambler and the other two groups and not between the non-addicted and addicted gambler groups. When comparing the percentages of gamblers across the SDQ groups, formed after employing the official cut-off values, there was a clear trend for individuals belonging in each case in the 'high' categories of the SDQ (denoting serious problems) to be more likely to gamble, addictively or not (Table 3). The effect sizes varied from low for the Hyperactivity and Emotional Symptoms scales to medium for the Prosocial, Conduct Problem, Peer Problem and Total Difficulties scales. A MANOVA analysis of the differences in SDQ scores between the three gambling groups found statistically significant differences, Pillai's trace = .086, $F(10, 4,456) = 20.081$, $p < .001$ with post hoc tests showing that the between-groups differences were statistically significant except in the SDQ Hyperactivity and Prosocial scales where the differences between the non-addicted and addicted groups

didn't reach statistical significance. Figure 1 presents a graphic representation of predicted mean scores in SDQ across the three gambling groups for better illustration of this effect.

Discriminant Analysis for Predicting Internet Gambling Frequency

Stepwise discriminant analysis was used in order to determine the best combination of predictor variables for ascertaining group membership on gambling, the three groups being those students who did not gamble, those gamblers who were not addicted and those addicted. The final combination reached in the analysis included the following variables: number of skipped classes due to truancy, response in the question 'when will you finish high school' (higher response corresponding to worse outcomes), amount of money spent on technology items each week, frequency of seeking study related information online, frequency of visiting online pornography websites, frequency of using online bank services, frequency of random web-browsing, total YDQ score, scores on the Prosocial scale (higher scores are indicative of pro-social orientation) and the Total Difficulties scale of the SDQ. Our analysis concluded with two statistically significant canonical functions (Table 4). Wilks' lambda was significant, $\lambda = .97$, $\chi^2 = 59.362$, $p < .001$, which indicates that the model including these variables was able to significantly discriminate between the three groups. Table 5 presents the unstandardized canonical discriminant function coefficients with which we may form the two equations which describe the two dimensions; from those two equations we may conclude that the first canonical dimension relates to cases of adolescents who fare relatively better in their studies, face more psychological adversity, are less social and tend to be involved more heavily with the Internet; this dimension accounts for the largest percentage of explained variance in the canonical correlate (90.7 % of total). The second dimension relates to cases with more adverse impact on their studies, who face less psychological difficulties and are more socially extroverted and for whom using the Internet is not a priority; this dimension accounts for 9.3 % of the total explained canonical correlate variance. The corresponding percentages of explained variance in the gambling grouping variable are 22.8 and 2.9 % respectively.

Given that Box's M test revealed that the covariance matrices were uneven, the analysis proceeded with a separate-groups covariance matrix. The predictions made by the model had a reasonable percentage of success with 76.4 % of all cases classified correctly by the model, this value ranging from 83.6 % (1,415 of 1,693 cases) for those who did not gamble at all to 36.7 % (102 out of 278 cases) for those who gambled but were not addicted and 54.2 % (26 out of 48 cases) for those who were classified as addicted gamblers. The latter two percentages are restricted by the low incidence of cases in our sample leading to a model with less sensitivity and more specificity. Table 6 presents the individual weights of each predictor variable in the classification function, providing the reader with insight as to each variable's predictive value in discerning between each group.

Discussion

The epidemiology of Internet gambling in our representative Cypriot sample was similar to that reported in other Western countries in this timeframe. The comparison with results from Greece, a country that shares both ethnic and cultural background are of particular interest; when measured using the same research instrument two years earlier, adolescents in a Greek island reported somewhat higher rates of online gambling addiction (4.1 % of the total sample or 11.1 % of those with some gambling experience). In this sample

Table 2 Comparison of mean scores in age

Variable	Comparison between gambling categories (mean Likert score, SE of the mean)			One-way ANOVA	Group differences
	No gambling (a)	Non-addicted gambler (b)	Addicted gambler (c)		
Age	13.6 (.3)	13.9 (.8)	13.92 (.19)	$F(2,2681) = 7.125$ $p = .001$	a to b, $p = .001$
YDQ total score	2.41 (.04)	3.65 (.1)	4.32 (.27)	$F(2,25226) = 82.24$ $p < .001$	a to b, a to c $p < .001$, b to c $p < .05$
Maternal care	27.12 (.15)	23.65 (.36)	21.3 (.89)	$F(2,2196) = 50.31$ $p < .01^*$	a to b, a to c $p < .001$
Paternal care	24.64 (.16)	22.01 (.34)	19.87 (.75)	$F(2,201) = 30.44$ $p < .01^*$	a to b, a to c $p < .001$
Maternal overprotection	15.32 (.12)	17.3 (.29)	17.84 (.74)	$F(2,2225) = 22.72$ $p < .01^*$	a to b $p < .001$ a to c $p = .002$
Paternal overprotection	14.23 (.13)	16.49 (.29)	16.51 (.67)	$F(2,2193) = 25.08$ $p < .01^*$	a to b $p < .001$ a to c $p = .008$

Internet addiction and parental bonding factors between non-gamblers, Non-addicted gamblers and addicted gamblers

*Bonferroni corrected for multiple comparisons in related constructs

Table 3 Categorization of gamblers across the SDQ groups

Gambling groups	ESS groups			CPS groups			Hyperactivity groups		
	Average	At risk	High	Average	At risk	High	Average	At risk	High
No gambling	1,740 (84.2 %)	144 (7.7 %)	182 (8.8 %)	1,336 (64.8 %)	283 (13.7 %)	443 (21.5 %)	1,734 (84.8 %)	166 (8.1 %)	144 (7.7 %)
Not addicted gambler	253 (76.4 %)	31 (9.4 %)	47 (14.2 %)	150 (44.2 %)	51 (15 %)	138 (40.7 %)	253 (76 %)	40 (12 %)	40 (12 %)
Addicted gambler	33 (56.9 %)	13 (22.4 %)	12 (20.7 %)	12 (20.3 %)	13 (22 %)	34 (57.6 %)	40 (69 %)	12 (20.7 %)	6 (10.3 %)
Kendall's tau-b value (SE) <i>p</i>	0.104 (.022), <i>p</i> < .001			0.189 (.02), <i>p</i> < .001			0.095 (.022), <i>p</i> < .001		
Gambling groups	PPS groups			SDQ-TD groups			Prosocial groups		
	Average	At risk	High	Average	At risk	High	Average	At risk	High
No gambling	1,437 (69.5 %)	447 (21.6 %)	185 (8.9 %)	1,357 (71 %)	278 (14.5 %)	277 (14.5 %)	1,599 (77.2 %)	225 (10.9 %)	247 (11.9 %)
Not addicted gambler	147 (44 %)	131 (39.2 %)	56 (16.8 %)	144 (47.2 %)	62 (20.3 %)	99 (32.5 %)	191 (56.5 %)	65 (19.2 %)	82 (24.3 %)
Addicted gambler	16 (27.6 %)	22 (37.9 %)	20 (34.5 %)	15 (26.8 %)	8 (14.3 %)	33 (58.9 %)	30 (53.6 %)	13 (23.2 %)	13 (23.2 %)
Kendall's tau-b value (SE) <i>p</i>	0.209 (.02), <i>p</i> < .001			0.218 (.022), <i>p</i> < .001			0.169 (.021), <i>p</i> < .001		

ESS emotional symptoms scale, CPS conduct problem scale, PPS peer problem scale, SDQ-TD SDQ total difficulties

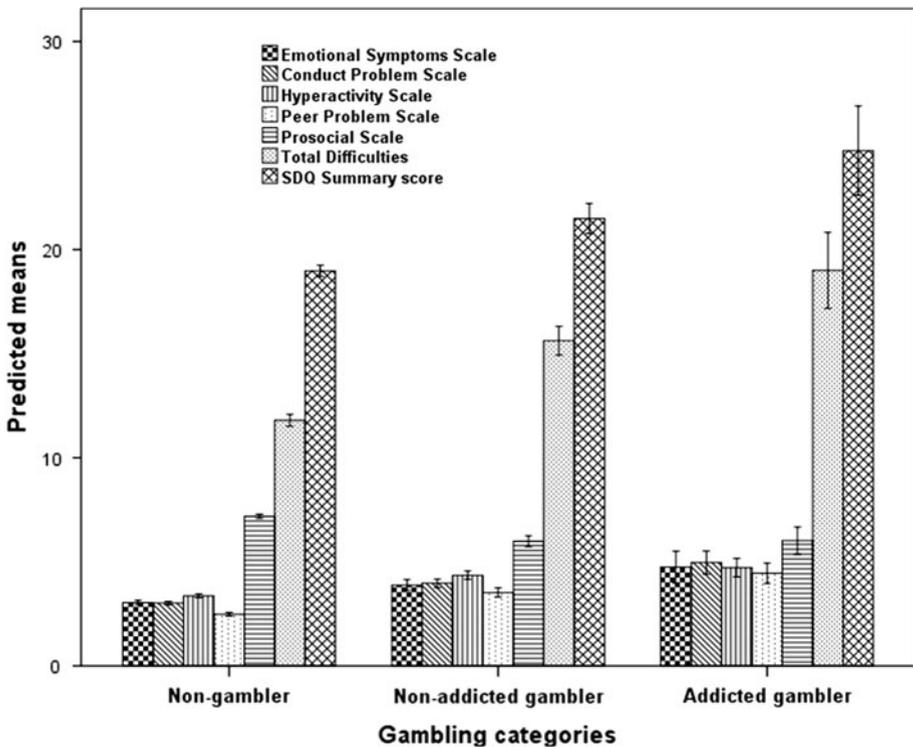


Fig. 1 Graphical depiction of the predicted mean scores of SDQ scales across the three distinct populations, non-gamblers, non-addicted gamblers and addicted gamblers. Bars represent ± 1 SE

Table 4 Summary of canonical discriminant functions

Function	Eigenvalue	% of variance	Canonical Correlation	Canonical r^2	Wilks' Lambda	Chi square	df	Sig
1	.295	90.7	.478	.228	.749	572.042	20	<.001
2	.030	9.3	.172	.029	.970	59.362	9	<.001

however there was a higher chance of being addicted among online gamblers (18.1 %). In both cases male gender was associated with online gambling, as were the measured parental bonding factors. Internet browsing habits correlated with online gambling addiction, although in this sample online video gaming and social networking did not feature in the final discriminant analysis model. Internet addiction was a significant predictive factor in both studies. Maternal and paternal care correlated with lower scores in the gambling outcome measure while overprotection with higher scores, this pattern of 'affectionless control' was associated with pathological gambling in other studies as well (Grant and Kim 2002).

It was also evident that gamblers and addicted gamblers in particular, tended to present with higher levels of psychopathology and deficits of pro-social behavior.

The predictor variables that contributed in the discriminant analysis model were items related to high school obligations, some specific online activities, Internet addiction score

Table 5 Canonical discriminant function coefficients (unstandardized)

	Function	
	1	2
Constant	-1.867	-1.012
Truancy	.879	2.693
When will you finish high school	.247	.728
Spending money on items related to technology	.123	.094
Seeking study-related information	-.061	-.278
Online pornography	.221	.034
Online banking services	.544	-.077
Random browsing	.080	-.075
Total YDQ score	.134	-.115
Prosocial scale	-.110	.207
Total difficulties	.028	-.005

Table 6 Classification function coefficients (Fisher's linear discriminant functions)

	Gambling groups		
	Not player	Not addicted	Addicted
Constant	-15.193	-19.525	-26.785
Truancy	-3.327	-3.082	1.079
When will you finish high school	4.234	4.311	5.446
Spending money on items related to technology	1.386	1.509	1.760
Seeking study-related information	1.152	1.164	.769
Online pornography	.666	.929	1.223
Online banking services	.443	1.141	1.675
Random browsing	.387	.511	.515
Total YDQ score	.159	.361	.380
Prosocial scale	1.307	1.106	1.223
Total difficulties	.358	.395	.421

and the Total difficulties and the Prosocial index from the SDQ. The unique element in this analysis is that two markedly different profiles of affected individuals are described by the two canonical dimensions; the first profile that corresponded to more explained variance was the student with higher psychopathology, less prosocial behavior, higher IAD score with higher frequencies of online activities and moderately affected school performance. The second profile was that of a student who reported less psychopathology, more prosocial behavior, less involvement with the Internet in general but skipped classes more and his prospects on finishing high school were slimmer.

Those online activities that were included in the model were replicated in the corresponding study in the Greek adolescent population. More important in predicting behavior was using web-based online banking services, an activity reported as the most frequent online activity of Internet gamblers (AGA 2006). This activity was coupled in our sample

with a larger propensity for buying items related to technology; it is unclear whether there is a link between those two tendencies; a possible explanation could be that under the guise of buying items for ‘the computer’ an adolescent could conceal other online spending as well, yet we cannot safely claim this to be true. Online pornography was another frequent activity with this profile and so was random browsing. Both may be just attempts to combat boredom, or escape problems via distraction; adolescent exposure to pornography and gambling could also signify less adult supervision. There could be some common neurobiological underpinnings for both behaviors when they are compulsive, but research is inconclusive so far. A recent study has classified pathological gambling, sexual compulsivity in a “reward deficiency” cluster in order to differentiate them from two other clusters of OCD spectrum disorders (Lochner and Stein 2006). Unfortunately there is a problem of heterogeneity within each group that hampers research; different preferences for different types of gambling may relate to different subtypes of gamblers (van Holst et al. 2010); the same may hold for sexual compulsivity as well. Ninety-three percent of boys and 62 % of girls were exposed to online pornography during adolescence in a study published some years ago (Sabina et al. 2008) yet online pornography use by minors remains an under-researched theme, a PubMed search resulted in 33 results mostly dealing with unwanted exposure to pornography and adolescent solicitation. In the remaining relevant articles, wanted exposure to pornography correlated with rule-breaking and depression (Wolak et al. 2007), while an attempt to assess the extent of any associations between online pornography and sexual behavior found that students, both male and female, in the wanted exposure group were higher sensation-seekers (Luder et al. 2011). Rule-breaking and sensation-seeking are attributes commonly associated with gambling behaviors and risk-taking in general (Griffiths 1995; Mishra et al. 2010).

Parental bonding indexes did not make any meaningful contribution in the discriminant analysis; it appears that parental bonding is more likely a predictor of adolescent psychopathology, which in turn relates to gambling behavior.

IAD has also been correlated with online gambling addiction, and this finding persists even if we control for specific online activities, as was the case and in other studies; so far IAD’s definition has not been finalized and some argue that in fact we should think in terms of specific online addictions, as in online gaming or online pornography addiction, rather than in terms of a distinct entity. This rationale has led to the inclusion of ‘Internet Gaming Disorder’ in Section III of the new version of the *Diagnostic and Statistical Manual of the American Psychiatric Association* as a condition warranting more clinical research and experience, before it might be considered for inclusion as a formal disorder (APA 2013). Still the fact that measures used to score IAD repeatedly produce variables that serve as reliable predictors of specific online activities could show that IAD refers to a single common denominator to all cases of excessive preoccupation with specific online behaviors; the unique moderating effect of the Internet in their establishment and perpetuation. Although most of those online activities have offline forms (e.g. video gaming, gambling, pornography), it appears that this unique effect what makes them more alluring. This effect is a product of attributes like affordability, ease of access, aloneness, anonymity, disinhibition, accelerated intimacy, time distortion (dissociation) and intensity/stimulation of online content (Greenfield 1999; Griffiths 2003). An additional factor of this influence however that came into prominence as online socialization prevailed in the daily lives of the adolescents worldwide is the continuous, everyday interaction between users through the medium (Floros and Siomos 2013). The gambling industry is taking advantage of this effect; their new efforts centre on an attempt to increase the level of interaction with real and familiar co-players (Turner 2011) and

various opportunities already exist for online gambling through social networking sites (Korn et al. 2010), the issues raised being too numerous to mention (Griffiths 2013). So far research has employed generic measures of gambling and generic measures of the unique characteristics of the Internet in an attempt to describe online gambling behaviors, yet those behaviors may not have taken place if either of the two constructs was absent. If both Internet addiction and online gambling share common antecedents in adolescence then the logical questions would be why an adolescent would choose gambling over another activity and whether he/she would still gamble if online gambling opportunities were unavailable. The two canonical dimension profiles that emerged could correspond to two different predilections, the more frequent one to that of an adolescent who started online gambling as one of the possible online activities to peruse while the less frequent one to that of an adolescent who merely used the Internet as the easiest way to gamble. In-depth reviewing is necessary to confirm such a hypothesis. Future research also needs to include as many facets of online gambling as possible, not necessarily limiting the scope to gambling with monetary prizes, as free-to-play gambling is a model with thousands of players that could potentially correspond to the first profile of our study and be at risk for developing addictive gambling behavior.

Limitations

The main limitations of the study refer to the cross-sectional design and lack of items on the particular types of gambling that the players favored. A cross-sectional survey cannot conclusively attribute etiological factors to outcomes but rather serves as a snapshot of a population in time. Those limitations were unavoidable since our results are part of a larger epidemiological survey and the scope of every single online activity was necessarily limited. However, since this is the first large-scale survey of its kind in Cyprus, it can provide with pointers for future follow-up research in each individual section. The Internet offers us an opportunity to monitor behaviors at a small cost; the frequency of logging in a gambling site for example could be monitored and offer us concrete statistics for a specific time frame. That however would require the consent of the user. Assessing the true frequency of a behavior that is socially undesirable is difficult if confidentiality is not assured and this could be an obstacle to any longitudinal studies. Recruiting an adolescent sample which would be willing to enter a cohort study on those behaviors is not only difficult but also raises ethical issues.

Conclusions

Addictive online gambling in our adolescent sample was high among those who engaged in online gambling and associated with adverse outcomes both in school and general psychopathology as well. Two distinct latent profiles were helpful in predicting whether an adolescent can be classified as a gambler, demonstrating that different persons can outwardly demonstrate the same behavior and we should keep an open mind when examining a psychosocial problem. Results from our study will be utilized in the design of a comprehensive prevention program for addictive online behaviors. Follow-up research of the moderating effects of the Internet on gambling behaviors is needed.

Conflict of interest None.

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