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Gambling involvement and problem gambling correlates among European adolescents: results from the European Network for Addictive Behavior study

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Abstract

Purpose Worldwide, concern has grown over the expansion of gambling among adolescents, who have an increased likelihood of developing risk-taking behaviors. This study aimed to increase knowledge of problem gambling among adolescents in seven European countries and to assess the effect of demographic and lifestyle factors recorded in the European Network for Addictive Behavior survey (https://www.eunetadb.eu).

Methods A cross-sectional school-based study ($n = 13,284$) was conducted in Germany, Greece, Iceland, The Netherlands, Poland, Romania and Spain. Anonymous self-completed questionnaires included socio-demographic data, internet usage characteristics, school achievement, parental control, the Internet Addiction Test, the South Oaks Gambling Screen-Revised for Adolescents Test and Achenbach's Youth Self-Report.

Results 12.5% of the participants reported last year gambling activities either online or offline. 3.6% of the study participants and 28.1% of gamblers (either online or offline) were at risk or had a gambling problem. The study results showed that a higher proportion of adolescents was either at risk or had a gambling problem among males, in the older age group, when the parental educational level was lower/middle, and in the absence of siblings. Furthermore, being at risk or having a gambling problem was associated with lower age at first use of the internet, lower school grades, using the internet 6–7 days per week, and problematic internet use. At risk or problem gamblers had higher scores on all scales of problem behavior and lower scores (lower competence) on activities and academic performance.

Conclusions Our findings underline the need for better gambling legislation and suggest the importance of developing social responsibility tools that may help diminish adolescent gambling involvement, with special attention to males.

Keywords Adolescents · Gambling · Internet · Addictive Behavior

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Introduction

Adolescence is considered to be a particularly important developmental period for risk-taking behaviors which are attributed to the adolescents' lack of appreciation of potential adverse effects [1, 2]. Furthermore, adolescents have an increased likelihood of developing addictive behavioral patterns [3–6]. Consequently, adolescence may represent a vulnerable period for the development of internet addictive behavior, and problem gambling disorder [7–10].

Involvement in gambling activities (i.e., betting on uncertain results depending on chance) [11] is a very popular form of entertainment especially among adolescents [12]. The prevalence of gambling among youth has been reported to range between 1.9% [13] and 15.1% [14]. More recently,

an international review reported that adolescent gambling prevalence rates range from 0.2 to 5.6% in Europe [15]. The significant variability between countries may be attributed to diversity in respect of socio-cultural factors, legislation, measuring instruments, and target populations [5]. Gambling has changed dramatically in a short period of time [3]. There is great concern that the rapid expansion of legalized gambling as well as the introduction of new technological advances in gambling, have been associated with increased rates of problem gambling and gambling disorder among adolescents worldwide [4, 5, 16–18].

Problem gambling disorder is characterized by dependence, loss of control and disruption to significant areas of a gambler's life [18]. The terms "problem and pathological gambling" were replaced by the term "gambling disorder" in the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders. Nevertheless, the term at-risk/problematic gambling (ARPG) has been previously proposed to define gambling disorder as well. Individuals were classified as ARPG if they had endorsed one or more of the DSM-IV criteria [19, 20]. In this study we use the term problem and at risk problematic gambling to remain consistent with the measurement instrument employed [18].

Problem gambling is usually fully manifested in late adolescence or early adulthood, although gambling involvement can start as early as pre-adolescence [21]. There are consistent reports that the prevalence rates of problem gambling in adolescents (4–8%) are considerably higher than in the general adult population (1–3%) [22–25]. Risk factors for adolescent problem gambling include male gender, younger age, low socioeconomic status, early exposure to gambling with a parent or alone, poor grades in school, delinquency or truancy history [3, 26, 27], alcohol and drug use, deviant peers and impulsive behavior [1, 13, 26, 28–34].

The internet serves as a low-cost, easy-to-access platform for social interaction and leisure activities and allows participation in gambling by adolescents. The current generation of youth has grown up in a society where gambling is generally accepted, heavily available, and widely promoted [23], while technological developments have generated new forms of online gambling via the mobile phone and interactive television [35]. Internet gambling is a fast expanding industry with explosive growth worldwide [36]. It could be potentially more tempting and addictive than offline gambling due to an early onset, convenience, accessibility, affordability, anonymity and interactivity [37, 38]. With the wide availability and popular use of the internet, there is concern that adolescents who are exposed to a new array of gambling opportunities may exhibit excessive or problematic gambling behavior [8, 39]. Recent data suggest that the prevalence of problem gambling is higher among internet gamblers than offline players [11, 40, 41]. Engagement in internet gambling, particularly among

adults, has been previously correlated with psychosocial and emotional maladjustment, including depression and suicidal ideation [5, 42]. Internet adult gamblers are also more likely to report consuming alcohol and illicit drugs compared to offline gamblers [43–45]. Previous research has also documented that involvement in internet gambling, particularly among at-risk and problematic adolescents, was associated with poor academic functioning [19].

To date, the association between utilizing the internet and exhibiting problematic behavioral patterns [46], such as problem gambling [47], and the consequent development of problematic internet use has not been adequately elucidated [37, 48]. Problematic internet use (PIU) is a term commonly used to refer to excessive engagement in online activities that leads to significant psychosocial and functional impairment [49]. Limited studies have indicated that internet problem gambling is associated with PIU among adolescents [8, 50–55]. However, the research findings are inconsistent. Some researchers have concluded that, although problem gambling and PIU share common etiologies and consequences, they should be considered as separate disorders [56], whereas others suggest that individual behavioral addictive disorders may represent different presentations of the same disorder sharing common underlying psychological and social processes [8, 57]. As the findings are inconsistent, further research is needed to understand the relationship between these two proposed behavioral addictive disorders.

Although concern has been growing about internet gambling among adolescents who are frequent internet users [58–60], knowledge of problematic internet gambling behavior among European adolescents is limited [15, 21, 23, 24, 61]. A survey assessing problematic gambling behavior among internet and offline adolescent gamblers on a representative and multi-national basis is also necessary to increase knowledge of the distribution of adolescent problematic gambling within different groups of adolescents and its relationship with socio-demographic and dysfunctional internet behavioral problems. The European Network for Addictive Behavior (EU NET ADB) project [62] included among its aims the extension of this body of research by investigating the prevalence and determinants of gambling participation and problematic gambling among adolescents in seven European countries—Germany, Greece, Iceland, The Netherlands, Poland, Romania and Spain—using consistent methodological procedures.

Therefore, the aim of the present study was to increase awareness and knowledge of the growing problem of gambling among European adolescents and to identify socio-demographic, psychosocial factors and behavioral correlates of problematic gambling behavior among adolescents in the seven European countries participating in the EU NET ADB survey.

Methods

Participants and procedure

This cross-sectional, quantitative, school-based study was performed in the context of the EU NET ADB protocol [62], in Germany, Greece, Iceland, The Netherlands, Poland, Romania and Spain, during the school year 2011–2012. The study and its methods received ethical approval according to the requirements of each of the participating countries [62]. A common research protocol was employed by all seven countries. A random clustered probability sample of adolescents attending school in the 9th and 10th grades was drawn in each country. The primary sampling unit was the school class and official national lists were used as sampling frames, stratified according to region (using the European Union NUTS system or other appropriate national regional classification) and population density. A random sample of about 100 classes was drawn in each country to achieve a target sample size of 2000 adolescents per country. These classes were selected by systematic sampling from the list commencing from a random starting point. In case of non-class-based educational systems, clusters were formed in line with current school structure, and a similar sampling procedure was followed [62]. In the absence of a list, classes were selected with probability proportional to size. These procedures resulted in the selection of individual adolescents with equal probabilities.

All students registered in the selected classes were eligible for participation. All participants were required to provide parental informed consent; forms that emphasized the confidentiality and anonymity of the study were provided to their legal guardians prior to the execution of the study. Students attending class on the day of data collection completed anonymously a paper-and-pencil self-report questionnaire administered by a trained researcher in one school hour. The anonymous and confidential nature of the study was stressed. Further details of methodology can be found in the EU NET ADB project report [62].

The questionnaire was completed by 13,708 adolescents. Approximately 10% of registered students were absent on the day of data collection and 3% of those present either refused to participate or did not have the necessary permission. The response rate, as a percentage of registered students, was very high in all countries (95.0% in Spain, 92.3% in Greece, 89.2% in The Netherlands, 88.0% in Poland, 86.7% in Romania and to 86.5% in Germany) except Iceland (62.9%) where many students could not produce parental consent for participation. The local researchers attributed this to the requirement for school staff to remind parents, a procedure in which they were not allowed to intervene. Comparing schools with high and low response rates did not indicate systematic bias on key variables [62]. Out of 13,708 subjects, the study sample excluded those who were aged under 14 or above 18 ($n = 112$) and those who did not report either their gender or age ($n = 296$), leaving a total of 13,284 persons for the analysis.

Measures

The questionnaires used in the study were developed by the EU NET ADB consortium [63]. They were then tested and refined through a two-stage process of cognitive interviewing and pilot testing in each country.

Socio-demographic variables Gender and age were recorded. Parental education was used as a proxy measure of socioeconomic status. Two categories were created, low/middle (primary and/or secondary school) and high (post-secondary and/or tertiary education) educational level, based on the highest qualification earned by either parent.

The *South Oaks Gambling Screen-Revised for Adolescents* (*SOGS-RA*) [64] was used for the assessment of adolescents' "problematic gambling". Adolescents were first asked if they had gambled during the previous 12 months in a real-life venue and separately, through an internet gambling internet site. These questions were preceded by a statement that the following questions were asking about games of chance and betting. The SOGS-RA was administered to respondents who answered positively. Briefly, this scale consists of 12 problem severity items and other gambling characteristics in the last 12 months (such as onset, attitudes about legal age limit and odds of winning, amount of money gambled, and reasons for gambling, loss of control over the game, action taken to recover monetary losses, interference with family, school, and relational life, guilt feelings about the money spent, and consequences of gambling). In this 12-item questionnaire, each item except the first is scored either 1 (affirmative) or 0 (non affirmative). The first item is scored 1 if the respondent answers "every time" or "most of the time" and 0 otherwise. For the development of an adolescent gambling problem severity scale the following cutoff scores are applied: (a) 0–1: "no problem" gambling; (b) 2–3 "at risk" gambling; (c) > 4: "problem" gambling [18]. In our study the SOGS-RA was not used as a continuous scale, but it was dichotomized into two categories. Participants with a total score of 0 or 1 were classified as non-problem gamblers, those and scoring 2 or more were classified as at-risk or problem gamblers (ARPG) [64].

Internet and social networking site (SNS) use Participants were asked about their daily frequency of internet use ("How often do you use the internet?"). The selected answers ranged from "less than 1 h" to "more than 6 h" in half-hour intervals. Adolescents were further asked whether

they belonged to any SNS and for how long they used SNS on a typical weekday ("normal school day") and at weekends or in vacation ("non-school day") during the past 12 months. Possible answers ranged from "not at all" to "more than 4 ". A single estimate of daily SNS during the whole week was produced as the weighted average of weekday and weekend use. The frequency of SNS was dichotomized into moderate (< 2 h daily) and heavier (≥ 2 h daily) using the median response ("2 h per day").

The internet addictiontest is a 20-item scale, which evaluates the degree of preoccupation, compulsive use, behavioral problems, emotional changes, and impact of internet use upon the adolescents' functioning. Response scores to each item range from 0 to 5, and the total score ranges between 0 and 100 points [65]. The following cutoff scores were adopted to assess internet addictive behavior [66]: no signs (0–19); mild, yet non-problematic signs (20–39); at risk (40–69); internet addictive behavior (70–100). Two missing values per subject were allowed and were replaced by the country-specific median in the calculation of the score. The test had high internal consistency (Cronbach's $\alpha = 0.92$).

Psychosocial wellbeing was measured using Achenbach's *Youth Self-Report* (*YSR*) [67]. The YSR is an instrument measuring adolescent competence and problems in social, academic, cognitive, internalizing and externalizing behaviors [67]. It had already been translated and standardized in all participating countries prior to the present study, and is known to present excellent psychometric properties and suitability for use in cross-national research [68, 69]. This instrument was not employed in the German arm of the study.

Statistical analysis

Categorical variables are presented with relative and absolute frequencies. For the comparison of proportions Pearson's Chi-square tests (χ^2) of independence were used. Odds ratios (OR) with 95% confidence intervals were computed to show the effect of every study factor on being either at risk or having a problem with gambling. Multiple logistic regression analysis was used to find independent factors associated with being at risk or having a problem with gambling. The independent variables entered into the model were country, gender, age, highest educational level of the parents, whether the respondent had siblings, age at first use of the internet, school grades last year, average days per week of internet use, how often parents limit time on the internet, whether parents allow them to visit every site and problematic internet use. Interaction effects of country with gender and age were tested via the regression analysis and it was not significant. Adjusted odds ratios are shown from the results of the logistic regression analyses. To explore

the association of YSR scale scores with being at risk or having problem gambling, linear regression analyses were conducted. Dependent variable was each YSR subscale and independent variables the presence of being at risk or having problem gambling, age, gender, parental educational level and country. All p values reported are two-tailed. All statistical tests and confidence intervals were corrected for the complex sample design with countries as strata and classes as clusters. Analyses were conducted using SPSS statistical software (version 19.0).

Results

Sample characteristics are shown in Table 1. Seven thousand girls and 6284 boys participated in the study. 61.4% of the sample were aged less than 16 years and 38.6% from 16 to 17.9 years. The educational level of the parents was high in 62.7% of the participants. The mean age at first use of the internet was 9.6 years (SD = 2.5) and in almost half of the participants (51.5%) last academic year's grades were good. There was often or very often parental control on time using the internet in 21.2% of the participants and 63.7% of the teens used the internet 6 or 7 days per week. Data on online and offline gambling are shown in Table 2. One in ten participants reported gambling offline in the last year and almost 6% had gambled online while 12.5% of the study sample reported having gambled in any environment (data not shown). The proportion of respondents who reported internet gambling was much higher in boys than girls (10.1% vs. 2.3%, $p < 0.001$) and in those aged from 16 to 17.9 years than those aged from 14 to 15.9 years (7.6% vs. 4.9%, $p < 0.001$). Furthermore, the proportion who reported gambling in an offline venue was much higher in boys than girls (17.3% vs. 4.8%, $p < 0.001$) and slightly higher in those aged from 16 to 17.9 years than those aged from 14 to 15.9 years (11.5% vs. 10.1%, $p = 0.016$). Comparing rates between countries, Greece (21.8%) and Romania (13.5%) exhibited the highest rates of gambling in an offline venue, and Spain (4.9%) and The Netherlands (6.9%) exhibited the lowest rates. Romania (12.9%) and Greece (7.9%) also exhibited the highest rates of internet gambling, and Iceland (3.1%) and Spain (2.5%) the lowest rates (Table 2).

Problem gambling was reported by 3.6% of the whole sample, by 28% of those who gamble, by 48.4% of internet gamblers, and by 26.5% of gamblers in a offline venue (data not shown). Among all adolescents, the proportion of ARPG was highest in Romania (8.8%) and Greece (5.0%) and lowest in Spain (1.3%) and Iceland (2.1%) (Table 3). Univariate analysis showed a higher proportion of ARPG adolescents among males, in the older age group, and in those whose parents had lower/middle education, without siblings, and with lower grades. Additionally, the proportion of ARPG

Table 1 Sample characteristics of 13,284 adolescents in the 7 participating countries

	N (%)
Country	
Greece	1967 (14.8)
Spain	1980 (14.9)
Romania	1830 (13.8)
Poland	1978 (14.9)
Germany	2354 (17.7)
The Netherlands	1249 (9.4)
Iceland	1926 (14.5)
Gender	
Female	7000 (52.7)
Male	6284 (47.3)
Age (years)	
14–15.9	8156 (61.4)
16–17.9	5128 (38.6)
Educational level of the parents	
Low/middle	4165 (37.3)
High	7007 (62.7)
Has siblings	
No	1584 (12.0)
Yes	11,597 (88.0)
Age at first internet use, mean (SD)	9.6 (2.5)
Grades last academic year	
Low performance (1–11.9)	1966 (16.1)
Moderate(12–14.9)	3946 (32.4)
Good (15–20)	6281 (51.5)
Average days per week using the internet (days/week)	
<6	4609 (36.3)
6–7	8100 (63.7)
Parental control on time spent online	
Never/seldom	7151 (54.2)
Sometimes	3250 (24.6)
Often/very often	2793 (21.2)
Parental permissiveness on content visited online (allowing every site)	
Never/seldom/sometimes	2755 (22.5)
Often/very often	5334 (43.6)
My parents do not know which websites I visit	4146 (33.9)
Internet behavior	
Functional internet behavior	11,029 (86.1)
Dysfunctional internet behavior (problematic internet use)	1778 (13.9)

was higher among those who used the internet 6–7 days on average per week and in subjects with problematic internet use. Furthermore, ARPG was associated with lower age at starting internet use. Interestingly, the frequency of parental mediation of online time and content was not shown to be significantly associated with problem gambling.

When multiple logistic regression analysis was performed (Table 4) to consider all the potential correlates simultaneously, it was found that being female, having siblings and older age at first internet use were independently associated with lower likelihood ARPG. All countries except Greece had statistically significant lower odds of ARPG in comparison to Romania. Adolescents with good academic performance in the previous year had lower odds of ARPG compared with to those with low academic performance. Frequency of parental mediation of online content or time was not shown to protect against problematic gambling. Subjects with problematic internet use had 3.8 times greater odds of ARPG.

Table 2 Adolescents' involvement with offline and online gambling

	Offline gambling in last 12 months (%)	p	Online gambling in last 12 months (%)	p
All adolescents	10.6		5.9	
Sex				
Female	4.8	< 0.001	2.3	< 0.001
Male	17.3		10.1	
Age (years)				
14–15.9	10.1	0.016	4.9	< 0.001
16–17.9	11.5		7.6	
Educational level of the parents				
Low/middle educational level	11.3	0.628	7.0	0.063
High educational level	11.0		6.0	
Country				
Greece	21.8	< 0.001	7.9	< 0.001
Spain	4.9		2.5	
Romania	13.5		12.9	
Poland	9.7		6.3	
Germany	8.6		4.1	
The Netherlands	6.9		5.7	
Iceland	8.8		3.1	

Table 5 presents results from the multiple linear regression analyses with dependent variable each YSR subscale separately and independent variables age, sex, parental educational level, ARPG, and country. Control for the other independent variables, indicated that ARPG was significantly associated with higher scores (greater problems) on all scales of problem behavior ($p < 0.001$). ARPG predicted lower scores (lower competence) on Activities and Academic Performance score.

Discussion

The present study investigated a wide range of correlates of problem gambling among European teenagers from seven European countries. Although adolescent gambling is recognized as an important public health issue in Europe and worldwide [70], research on adolescent internet gambling involvement and gambling disorders among European adolescents is limited and focused on a limited range of covariates [13, 21, 26, 50, 53–55, 71, 72]. In this survey, we sought to extend existing knowledge by examining the correlates of problem gambling among European youth, by focusing on internet gambling and by identifying differences in demographic (gender, age, parental educational level, age of first contact with Internet) and family factors (family structure, parental mediation) that may increase the odds of the occurrence of at risk or problem adolescent gambling in the countries studied.

In our study, gambling participation was relatively higher than the recently published review estimates [15]. Recent international analyses have documented variations in youth gambling prevalence rates across different European countries and suggested that prevalence rates of adolescent gambling are so diverse because countries differ with regard to both accessibility and availability of gambling venues [15].

According to our study, Greece and Romania exhibited higher rates of gambling in online and offline venue, whereas Spain, The Netherlands and Iceland exhibited lower rates. The significant variability between countries may be also attributed to socio-cultural factors; in certain cultures the prevailing attitude is that gambling is benign or even normative, and often gambling initiation occurs in the presence of family members [3, 5]. Furthermore, regulatory interventions influence the accessibility of gambling among youth and this may be especially relevant in Greece which lagged behind in establishing legislation to safeguard youth participation, and did not establish regulatory legislation until 2011 [72]; accordingly, the present cohort of adolescents could easily access offline gambling premises. It is of note that the observed differences between country gambling rates may be attributed to socio-cultural factors characterizing the study population. Although, the differences between countries were significant, this study does not provide larger socio-cultural or legislative context for such differences. Further studies are needed to examine the extent to which adolescent gambling is legally permissible in the examined region and may thus diminishing social barriers among adolescents for

Table 3 Percentage of adolescents at risk or having a problem with gambling, by demographics and other characteristics

	Internet gambling (SOGS-RA)		*p*
	Non-gamblers	At risk or gambling problem	
	N (%)	N (%)	
Country			
Greece	1637 (95.0)	86 (5.0)	<0.001
Spain	1815 (98.7)	24 (1.3)	
Romania	1501 (91.2)	145 (8.8)	
Poland	1666 (96.6)	59 (3.4)	
Germany	2181 (97.8)	50 (2.2)	
The Netherlands	1084 (97.0)	34 (3.0)	
Iceland	1755 (97.9)	38 (2.1)	
Gender			
Female	6387 (99.0)	67 (1.0)	<0.001
Male	5252 (93.4)	369 (6.6)	
Age (years)			
14–15.9	7221 (97.0)	226 (3.0)	<0.001
16–17.9	4418 (95.5)	210 (4.5)	
Educational level of the parents			
Low/middle	3578 (95.4)	172 (4.6)	0.008
High	6264 (96.7)	215 (3.3)	
Has siblings			
No	1380 (95.2)	70 (4.8)	0.011
Yes	10,174 (96.6)	360 (3.4)	
Age when started using internet, mean (SD)	9.6 (2.4)	9.3 (2.8)	0.001**
Last academic year's grades			
Low performance (1–11.9)	1627 (93.3)	116 (6.7)	<0.001
Moderate (12–14.9)	3415 (96.1)	139 (3.9)	
Good (15–20)	5687 (97.5)	145 (2.5)	
Days per week using the internet on average			
<6 days/week	4094 (97.2)	118 (2.8)	<0.001
6–7 days/week	7119 (96.0)	299 (4.0)	
Parental control on time			
Never/seldom	6218 (96.1)	251 (3.9)	0.109
Sometimes	2889 (97.0)	88 (3.0)	
Often/very often	2466 (96.3)	94 (3.7)	
Perceived parental permissiveness on content (allowing every site)			
Never/seldom/sometimes	2402 (96.7)	81 (3.3)	0.935
Often/very often	4752 (96.8)	158 (3.2)	
My parents do not know which websites I visit	3653 (96.9)	117 (3.1)	
Internet behavior			
Functional internet behavior	9904 (97.4)	260 (2.6)	<0.001
Problematic internet use	1392 (89.6)	162 (10.4)	

participating in such practices both in real-life and cyber venues.

The current generation of youth has grown up in a society where the development of technology has generated new forms of legalized gambling (e.g., online gambling, mobile gambling, gambling within online video games, simulated gambling) [35, 73–75]. In our study, the observed prevalence of internet gambling (almost 6%) is similar to the rates found in previous studies among other European adolescent populations [21, 50–52, 54]. However, a growing body of review data [21, 23] indicates considerable variability (between 0.2% and 12.3%) in the prevalence of adolescent problem gambling among different European countries, possibly due to the heterogeneity

Table 4 Multiple logistic regression analyses results with for being either at risk or having a problem (ARPG) with gambling the dependent variable

	OR (95% CI)[a]	p
Country		
Romania	1.00[b]	
Greece	0.57 (0.36–0.92)	0.020
Spain	0.11 (0.06 –0.19)	<0.001
Poland	0.29 (0.17–0.49)	<0.001
Germany	0.23 (0.13–0.41)	<0.001
The Netherlands	0.18 (0.09–0.35)	<0.001
Iceland	0.18 (0.10–0.33)	<0.001
Gender		
Female	1.00	
Male	6.12 (4.18–8.95)	<0.001
Age (years)		
14–15.9	1.00	
16–17.9	1.12 (0.83–1.52)	0.467
Educational level of the parents		
Low/middle	1.00	
High	0.81 (0.61–1.08)	0.151
Has siblings		
No	1.00	
Yes	0.68 (0.49–0.95)	0.023
Age when started using internet, mean (SD)	0.94 (0.88–0.99)	0.040
Last academic year's grades		
Low performance (1–11.9)	1	
Moderate (912–14.9)	0.74 (0.51–1.07)	0.112
Good (15–20)	0.55 (0.36–0.84)	0.005
Days per week using the internet on average		
<6 days/week	1.00	
6–7 days/week	1.00 (0.73–1.37)	0.994
Parental control on time		
Never/seldom	1.00	
Sometimes	0.88 (0.62–1.24)	0.461
Often/very often	0.92 (0.65–1.29)	0.615
Perceived parental permissiveness on content (allowing every site)		
Never/seldom/sometimes	1.00	
Often/very often	0.91 (0.64–1.30)	0.603
My parents do not know which websites I visit	1.14 (0.73–1.80)	0.562
Dysfunctional internet behavior		
Functional internet behavior	1.00	
Dysfunctional internet behavior	3.80 (2.82–5.14)	<0.001

[a]Odds ratio (95% confidence interval)

[b]Indicates reference category

in terminology and methodological procedures employed, the diversity of screening instruments with different cut-offs between studies, as well as the cultural differences among countries [1, 15]. More collaboration is needed between researchers from different countries to improve comparability between national studies and to understand the effect of different legislation in youth online gambling patterns.

Findings in our study are quite alarming, with 3.6% of the study participants and 28.1% of gamblers (either online or offline) being either at risk or having a gambling problem. Furthermore, approximately one in two (48.4%) internet gamblers and one in four (26.5%) offline gamblers were either at risk or had a gambling problem. This finding is consistent with previous data suggesting that the prevalence of problematic gambling is higher among internet gamblers

Table 5 Multiple linear regression analyses result with YSR scales as dependent variables and independent ARPG after adjusting for other variables

	Range	β (SE)[a]	p
Activities score	0–12	− 0.97 (0.25)	<0.001
Social score	0–12	− 0.06 (0.15)	0.719
Academic performance	0–4	− 0.25 (0.04)	<0.001
Total competence score	0–28	− 1.06 (0.36)	0.003
Anxious/depressed score	0–26	2.86 (0.34)	<0.001
Withdrawn/depressed score	0–16	1.25 (0.21)	<0.001
Somatic complaints score	0–20	2.07 (0.23)	<0.001
Social problems score	0–22	2.11 (0.26)	<0.001
Thought problems score	0–24	2.56 (0.27)	<0.001
Attention problems score	0–18	1.73 (0.21)	<0.001
Rule-breaking (delinquent) behavior score	0–30	4.70 (0.34)	<0.001
Aggressive behavior score	0–34	4.69 (0.43)	<0.001
Internalizing problems score	0–62	6.14 (0.69)	<0.001
Externalizing problems score	0–64	9.49 (0.73)	<0.001
Total problems score	0–210	22.58 (2.11)	<0.001

[a]Regression coefficient (standard error) adjusted for age, sex, parental educational level of the parents, country

than offline players [21, 35, 38, 71, 73]. As other authors have already suggested [75], the accessibility, affordability, convenience and anonymity of internet gambling may serve as a good means for young people to engage in gambling activities without age verification and parental supervision.

This study also indicated that being either at risk or having a problem with gambling was positively associated with frequent internet engagement (using the internet 6–7 days on average per week) and was four times more likely among adolescents who exhibited problematic internet use. Gambling frequency is one of the strongest predictors of problem gambling [76]. Although frequency alone is not enough to diagnose problematic gambling, adolescents who gamble more frequently routinely show more adverse gambling consequences and problems [10]. The extent to which PIU exists as a distinct entity, as opposed to the internet serving as an outlet for other addictive behaviors (e.g., gambling, videogaming, shopping) has been debated [11, 40, 41, 50–52, 56, 77, 78]. PIU shares many features with impulse control disorders, and PIU and problem gambling share characteristics of substance dependence such as tolerance, withdrawal and craving. Some researchers have suggested that PIU and problem gambling may represent different expressions sharing common etiologies [8, 57]. However, it should be noted that, although the above biologically related factors can account for gambling behavior, they fail to explain other observations, for example, the variations in motivations to gamble or why some gambling activities appear to be "more addictive than others" [77].

Consistent with the cumulative body of research [9, 13, 43, 51, 77, 79, 80] our findings indicated that gambling practices were more often adopted by male adolescents. Boys as compared with girls typically report larger wagers and increased risk-taking behavior and begin gambling earlier, on more games and more often, commit more time and money to gambling, and experience more gambling-related problems [74]. Some researchers have proposed that this pattern may result from parents encouraging boys to participate in gambling more than girls [81], creating an environment where gambling is a significant part of male culture [78, 82]. Nevertheless, further research is needed before any of the factors associated with adolescent problem gambling can be branded as male-specific.

Most alarming, however, is our finding indicating that adolescents aged 16–17.9 years showed significantly higher proportions of internet gambling and offline gambling compared to adolescents aged 14–15.9 years. Such vulnerability among this particular age group may be explained by increased independence and diminishing parental supervision. Social factors are pivotal drivers of adolescent gambling and this may be more relevant among older adolescents [50]. This pattern needs to be carefully considered, especially in view of the fact that adolescent gambling predicts patterns of gambling behavior in adulthood [83].

According to our findings, adolescents who were younger when they first started using the internet are at greater risk of developing gambling problems. These results correspond to previous findings that associated age of gambling onset and adolescent problematic gambling behavior.[20]. Furthermore, early onset age of gambling has been previously associated with more severe gambling behavior [84] that may predict substance use disorders, depression and other psychiatric concerns in adulthood [10, 16]

Previous studies have documented that familial factors (e.g., family socio-demographic factors, parental monitoring, family cohesion, parents' level of education, parenting practices, family members' attitudes and behaviors and their relationship characteristics) may significantly influence adolescent problem gambling behavior [24, 27, 85–88]. In our study, lower/middle educational level of the parents, and not having siblings; seem to increase the risk of being either at risk or having a problem with gambling. One possible explanation for these findings could be that adolescents with parents from a lower socioeconomic stratum (for which education is a proxy) may perceive gambling as acceptable and normal [70]. Family relationships and family structure (e.g., single-parent family or not having siblings), as the key factors in an adolescent's "micro" developmental context, may be related to involvement in gambling as they influence family cohesion, and the provision of support and engagement in shared activities between parents or family members and adolescents [89, 90].

Interestingly, restrictive parental mediation of online content or time was not shown to be associated with the likelihood of exhibiting problem gambling. Previous findings concerning parental mediation effects on other online adolescent risks are mixed [91]. For example, it has been reported that restrictive mediation of content (monitoring websites used) lowered the risk of victimization, while other researchers [92] suggested that software restrictions rather than parental monitoring reduced risks. Furthermore, parental monitoring has been demonstrated to be a protective factor for gambling problems among adolescents [3, 85, 93]. Among youth, problem gambling has been associated with poor academic performance and higher rates of school truancy and dropout [19, 94, 95]. Similarly to previous reports, our findings indicated that a higher proportion of adolescents being either at risk or having a problem with gambling had lower grades.

Internalizing pathology has also been associated with gambling and gambling problems in youth [19]. However, it is of note that gambling has been associated with the development of adverse emotional symptoms among adolescents, including depression and suicidal ideation [5, 42]. Previous research has also indicated that adolescents who engage in internet gambling are more likely to display aggressive behavior [95, 96]. According to other authors, levels of aggressive and disruptive behavior in childhood and early adolescence predicted at risk/problem gambling in later adolescence [97]. Consistent with other results, our findings indicated that engagement in gambling was significantly associated with marked externalizing (i.e., behavioral) and internalizing (i.e., emotional) problems. One explanation is that adolescents with psychosocial problems escape from their problems through gambling, while the reverse may also be true: adolescents who heavily engage in gambling may miss out on positive social encounters or other developmental opportunities and may accordingly be adversely affected. Given that the present study was cross-sectional, it is not possible to infer the one or the other.

Strengths and limitations

The strengths of the present study include primarily that it serves as one of the limited studies of its kind conducted to provide estimates of the prevalence of gambling involvement and gambling disorders within different groups of European teenagers. Although one of the limitations of the existing literature is that most studies have focused on a limited range of covariates [98], this study identifies a wider range of factors that increase the odds of the occurrence of adolescent gambling, including demographic, socioeconomic and psychosocial characteristics. Therefore, the study is one of very few that investigates the exploratory power of a wide range of variables that

may be important for better understanding adolescent gambling among European adolescents. Furthermore, the random sampling and anonymous self-reporting have substantially limited the potential for selection and reporting biases. The multi-national representativeness and the high response rate should also be emphasized as strengths of the study. The limitations of the study include the following. First, the data from this cross-sectional study are inadequate to reveal temporal associations between gambling behavior and other variables. Second, our simple questions did not provide details of the adolescent's gambling behavior. Third, several years have passed since the study was conducted, which limits the extent to which it represents the current picture of adolescent gambling, bearing in mind the rapid technological developments in Internet, and especially mobile, technologies. Fourth, this study relies on self-report data, limiting the measurement to individual perceptions and liable to introduce biases, such as recall bias or the bias arising if there is any remaining element of social desirability in responding. However, recall bias is expected to be small in this study, as the recall period refers to a short (4–5 years) time span. Fifth, in common with almost all school-based studies, data were collected from only those students who were present on the day of data collection. Finally, the adolescents themselves constituted the only source of data, since it was impractical to seek information from other sources such as parents, teachers and school records.

Conclusion

In conclusion, the results of this study raise concern that engagement in gambling may be associated with a range of adverse health measures. Furthermore, our findings underline the need for better gambling legislation and the need for developing social responsibility tools and skills training (emotional regulation, problem-solving and decision-making skills) to prevent the development of problem gambling. Our study results also suggest that the medium of the internet may be more likely to contribute to problem gambling than gambling in offline environments. Longitudinal studies are needed to examine the extent to which adolescent gambling behaviors may interact over developmental epochs, and to examine the implications for health throughout the lifespan. Thus, prevention and treatment strategies that target problematic gambling behavior may also help diminish underage involvement in gambling especially among males.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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