Do cigarette smoking and alcohol consumption associate with cannabis use and problem gambling among Spanish adolescents?

¿El consumo de cigarrillos y alcohol se relaciona con el consumo de cánnabis y el juego problema en adolescentes españoles?

M. Carmen Míguez*; Elisardo Becoña*

*University of Santiago de Compostela (Spain)

Abstract

This article examined the relationship between cigarette smoking or alcohol consumption and cannabis use and problem gambling among a random and representative sample of 1447 Spanish adolescents (797 males and 650 females with an average of 12.8 years). An ad-hoc questionnaire was used to assess cigarette smoking, alcohol consumption (beer, wine and spirits) and cannabis use. Gambling was assessed with the South Oaks Gambling Screen Revised for Adolescents (SOGS-RA). Results indicated a positive and significant association between cigarette smoking and alcohol consumption and the two aforementioned variables. A larger percentage of cigarette smokers and drinkers was found among those participants who had consumed cannabis before or scored significantly in problem gambling. Additionally, multiple regression analysis confirmed that both cigarette smoking and alcohol consumption (beer and wine) were the most determinant variables for cannabis use and problem gambling.

Key words: smoking, alcohol, cannabis, gambling, adolescents.

Resumen

Este estudio examinó la relación entre consumo de tabaco y alcohol, y consumo de cannabis y juego problema en una muestra aleatoria y representativa de 1.447 adolescentes españoles (797 varones y 650 mujeres con una media de edad de 12,8 años). Los participantes respondieron a un cuestionario elaborado a tal efecto que recogía información acerca del consumo de cigarrillos, de alcohol (cerveza, vino y licores) y cannabis. El juego se evaluó con el South Oaks Gambling Screen Revised for Adolescents (SOGS-RA). Los resultados indicaron una asociación positiva y significativa entre el consumo de tabaco y alcohol y las dos variables analizadas. Se halló un mayor porcentaje de fumadores y consumidores de alcohol entre los que habían consumido cánnabis en alguna ocasión así como entre los jugadores problema. Además, el análisis de regresión lineal múltiple mostró que tanto el consumo de cigarrillos como de alcohol (cerveza y vino) se relacionaban positivamente con el inicio en el consumo de cánnabis y con una mayor implicación en el juego.

Palabras clave: tabaco, alcohol, cannabis, juego, adolescentes.

Cigarette smoking is considered a substantial public health problem and the main global cause of preventable death that is also affecting young people (WHO, 2013). Recently, cigarette consumption has decreased globally, although an increase has been observed among female adolescents in the last Spanish National Survey on Drugs in the School Population (Plan Nacional sobre Drogas, 2011). Given that nicotine is one of the most addictive substances, smoking in adolescence, even in a sporadic fashion, may lead to a serious addiction in adulthood with substantial adverse long-term health consequences (Edwards, 2004; Kandel & Merrick, 2003). Moreover, if in addition to tobacco use there is the consumption of other substances, as can be alcohol use, this can have synergistic effects which increase the risks tobacco has in health (Burke, Hunter, Croft, Cresanta, & Berenson, 1988) or can cause other effects such as poor academic performance (Inglés et al., 2013).

Likewise, the consumption of alcohol has considerable social and health repercussions, and, its use is also increasing among adolescents (Plan Nacional sobre Drogas, 2011). Currently, in Spain the most common pattern of alcohol use involves abusive drinking (binge drinking) on weekends with recreational purposes (Ministerio de Sanidad, Servicios Sociales e Igualdad & Instituto Nacional de Estadística, 2012). Smoking and drinking among adolescents is one of the main concerns for public healthcare systems in most developed countries. Smoking most often occurs in combination with alcohol use; in Spain, as in other countries, alcohol and tobacco are the most consumed legal drugs in adolescence (Hoffman, Welte & Barnes, 2001; Míguez & Becoña, 2006; Orlando, Tucker, Ellickson & Klein, 2005; Plan Nacional sobre Drogas, 2011; Piko, 2006; Reed, McCabe, Lange, Clapp, & Shillington, 2010).

As regards illegally traded substances, cannabis is the substance most widely consumed in Europe (European Monitoring Centre for Drugs and Drug Addiction [EMCDDA], 2011). The last Spanish National Survey on Drugs in the School Population (*Encuesta Estatal sobre uso de Drogas en Estudiantes de Enseñanzas Secundarias*) reveals that among secondary school students surveyed (aged 14 to 18), 17.2% reported having consumed this substance in the previous 30 days (Plan Nacional sobre Drogas, 2011). This implies an increase in the number of adolescents consuming more than one substance at the same time. Alcohol, tobacco and cannabis use is highly prevalent among young people in Spain as compared with most European countries (European Monitoring Centre for Drugs and Drug Addiction [EMCDDA], 2011), with polydrug use being the most prevalent pattern (Plan Nacional sobre Drogas, 2011).

Cigarette smoking and cannabis use often co-occur (Brook, Lee, Finch, & Brown, 2010; Degenhardt, Hall, & Lynskey, 2001). This comorbidity is significant, in that, in addition to the separate effects of tobacco and cannabis use on psychosocial functioning, concurrent use of these substances can have a cumulative effect on physical functioning (Peters, Budney, & Carroll, 2012). Several mechanisms may explain this strong relatedness. Some researchers have hypothesized that both tobacco and alcohol serve as "gateways" to the use of the illicit drugs initiating with marijuana and progressing to "hard" drugs like cocaine (Kandel and Yamaguchi, 2002; Kandel, Yamaguchi, & Klein, 2006). Tobacco (Agrawal, Silberg, Lynskey, Maes, & Eaves, 2010; Korhonen, Prince van Leeuwen, & Reijneveld, 2010) and alcohol (Willner, 2001) onset have been linked to a higher propensity to start and maintain cannabis use (Fergusson, 2008). Nevertheless, certain researchers (e.g. Patton, Coffey, Carlin, Sawyer, & Lynskey, 2005) have hypothesized that, in some cases, cannabis use may lead to tobacco initiation ("reverse gateway theory").

Another issue among adolescents is *problem gambling* (in this case an addictive behaviour without substance), with an estimated prevalence higher than that of the adult population (Shaffer & Hall, 1996). Problem gambling is circumscribed to non-clinical populations, especially in studies carried out in order to estimate prevalence in the general population. Problem gamblers experience difficulties, originated from their gambling behaviour, which have an impact on many aspects of their daily life (for instance, academic performance, relationships with parents or peers, etc.*)*. One of the consequences of problem gambling in children and adolescents is that it increases the likelihood of the development of pathological gambling in adults. Therefore, it is important to detect it at an early age. Among the variables that have been associated with problem and pathological gambling are alcohol use (Barnes, Welte, Hoffman, & Tidwell, 2009) and/or smoking (Becoña, 2009; McGrath, Barrett, Stewart, & McGrath, 2012). This is due, in part, to the fact that gambling takes place in contexts in which substances such as tobacco and alcohol are available (Arbinaga, 2000).

Different studies have focused on the analysis of the co-occurrence between cigarette smoking or alcohol use and some cannabis use or problem gambling but no research has been carried out in adolescents.

The aim of the present *ex post facto* study was to explore the relationship between tobacco or alcohol use and cannabis use, assess whether the same kind of relationship can be established with problem gambling; and finally, to analyze the level of association between consumption of a legal substances (tobacco or alcohol) and initial consumption of an illegal substance (cannabis) or engagement in gambling. It was hypothesized that there would be a positive and significant relationship between smoking or alcohol use and cannabis experimentation as well as with problem gambling.

Method

Participants

By means of a probabilistic sampling method, a random and representative sample of 1,447 participants aged 11 to 16 from the school population in Galicia (a region in nor-

thern Spain) was recruited, stratified by province and size of municipality. The sample, who participated in a cross-sectional descriptive study, was made up of 650 females and 797 males, with an average of 12.8 years of age ($SD = 1.2$).

Data collection

The study was approved by the regional education authorities of Galicia (Spain) as well as by headmasters and school councils. This was a clustered randomized study. The sample was obtained by random selection of schools from among all public and private schools, using a random number table and with stratification by province and by municipality size (over 50,000 inhabitants, from 20,001 to 50,000 inhabitants, from 10,001 to 20,000 inhabitants, from 5,000 to 10,000, and under 5,000 inhabitants), giving a total of 17 schools selected from different cities and towns in the region. In schools in which there was more than one class for each grade, the class to be included in the study was also randomly selected. In-class anonymous questionnaires were self-administered within a single class period without the presence of the teacher. Participation in this study was voluntary. Data were collected by two trained psychologists. Overall survey response rate was 92.41%.

Measures

For each participant, demographic variables (age, sex), reported cigarette consumption, and alcohol and cannabis use were recorded by an ad-hoc instrument.

The smoking, alcohol and cannabis use questionnaire comprises 17 items assessing the use of these substances in terms of frequency, quantity, and aged of initial use. Consumption of each substance was assessed with the same set of questions. Participants were asked whether they had ever used alcohol, cannabis, or tobacco. In the case of alcohol, type of drink (beer, wine and spirits) was also recorded. If a participant answered "Yes", information on frequency of use was obtained. Response choices ranged from *never smoked/drank this beverage in my life* to *every day* on a 5-point scale (considering the categories "never in my life", "once or twice in my life" "sometimes," "very often" and "daily"). Questions were asked about usual quantities of each substance, i.e., daily and weekly mean consumption (e.g. with regard to beer students were asked "Have you ever drunk beer?" If so, "How many beers do you drink weekly?" and "How many beers do you drink daily?").

In order to assess problem gambling, Winters, Stinchfield, and Fulkerson's (1993) South Oaks Gambling Screen Revised for Adolescents (SOGS-RA) was administered. This questionnaire comprises 12 items, each with two response options (YES/NO). Scores obtained with the SOS-RA provided us with three categories: non-gambler or non-problem gambler (0 or 1 points), at risk gambler (2 or 3 points), and problem gambler (4 points or over). Internal consistency reliability within our sample was good (Cronbach's alpha = 0.83).

Statistical analysis

SPSS Version 18.0 for Windows was used for all the analyses, and statistical significance was considered when $p < 0.05$. The relationship between categorical variables was analyzed by means of the chi-square test, in those cases in which chi-square was significant, Cramer´s V coefficients were calculated for estimating the effect size. Differences in continuous variables were assessed by means of independent Student´s t test. Stepwise multiple linear regression analysis was used to examine the association between dependent variables cannabis use and problem gambling (scores on the SOGS-RA) and independent variables age, daily and weekly cigarette consumption, and daily and weekly beer, wine, and spirits consumption.

Results

Tobacco, alcohol and cannabis use

A total of 27.4% ($n = 397$) of the sample reported having smoked tobacco at least once. Of these, 5.6% ($n = 81$) reported smoking daily [5.9% ($n = 47$) were male and 5.2% ($n = 34$) were female (χ^2 (1) = 0.188, p = 0.665)]. The prevalence of weekly smokers was 9.3% ($n = 135$). Of those reporting having smoked at least once, 14.9% said they had smoked just once or twice in their lives, 6.3% smoked sometimes and 3.3% very often. Mean age at which these young people tried their first cigarette was 10.7 ($SD = 2.3$) years, and 94.4% of first contacts with tobacco were between the ages of 10 and 13; males starting earlier than females (10.2 vs. 11.3 years); gender difference was statistically significant ($t = 3.84$, $p < 0.05$).

Regarding to alcohol, 36.4% ($n = 526$) of participants said they had tried some alcoholic beverage, and 7.3% ($n = 105$) recognized drinking alcohol every week. Of the drinks assessed, beer was the most widely consumed (Table 1). Concerning the relationship between alcohol use and smoking, we found a significantly higher percentage of alcohol users among the daily smokers for each of the drinks assessed (Table 2). Thus, 45.7% of the smokers drank beer weekly, compared to 4.5% of the non-smokers (χ^2 (1) = 205.70, $p < 0.001$); wine is drunk by 23.5% of the smokers but by just 3.5% of the non-smokers (χ^2 (1) = 68.86, $p < 0.001$). As far as spirits are concerned, the percentages were 42.0% vs. 2.9% (χ^2 (1) = 240.25, $p < 0.001$).

Taking into account the frequency of smoking, there was a significantly higher percentage of alcohol users among those who reported smoking daily compared to those who smoked sporadically. For each one of the drinks assessed (Figure 1), the greater the involvement in smoking (considering the categories "never," "sometimes," and "daily"), the higher the percentage of alcohol users. Differences between groups were statistically significant for each one of the drinks: beer ($\chi^2(2) = 185.52$, $p < 0.001$); wine ($\chi^2(2) = 45.09$, $p < 0.001$) and spirits ($\chi^2(2) = 221.84$ $p < 0.001$).

Table 1.
Characteristics of sample

	n	%
Gender		
Male	797	55.1
Female	650	44.9
Tobacco use		
At least once	397	27.4
Daily smokers	81	5.6
Weekly smokers	105	7.3
Alcohol use		
Beer weekly	98	6.8
Wine weekly	67	4.6
Spirits weekly	74	5.1
Cannabis use		
At least once	32	2.2
Gambling		
Non-gambler	1234	85.3
At-risk gambler	147	10.1
Problem gambler	66	4.6

Table 2.
Relationship between use of tobacco and alcohol, cannabis and gambling (%)

	Smoker	Non-smoker	χ^2	Cramer's V
Alcohol use				
Beer			205.70***	.38***
No	54.3	95.5		
Yes	45.7	4.5		
Wine			68.86***	.22***
No	76.5	96.5		
Yes	23.5	3.5		
Spirits			240.25***	.41***
No	58.0	97.1		
Yes	42.0	2.9		
Cannabis use			223.13***	.39***
No	74.1	99.2		
Yes	25.9	0.8		
Gambling			45.40***	.18***
Non-gambler	4.2	95.8		
At-risk gambler	9.5	90.5		
Problem gambler	22.7	77.3		

***p< .001

There was a higher percentage of participants who had used cannabis at least once (Table 2) among the smokers (25.9%) than among the non-smokers (0.8%) (χ^2 (1) = 223.25, $p < 0.001$). In this case there were no daily users. The percentage of participants who tried cannabis (Figure 2) is higher among daily smokers (27.9% of the daily smokers, as against 4.5% of the occasional smokers and 0.4% of the non-smokers). Likewise, there was a higher percentage of participants who had used cannabis at least once among alcohol users (Table 3) for each one of the drinks assessed ($p < 0.001$).

Tobacco and alcohol use and problem gambling

The results indicated that 85.3% of the participants belonged to the "non-gambler" category, 10.1% to that of "at risk gambler" and 4.6% to that of "problem gambler" (Table 1). A significant association ($p <.001$) was found between type of gambler and smoker status ("non-smoker" vs. "smoker") and drinker status ("non-drinker" vs. "drinker"). The percentage of smokers in the "non-gambler" group was 4.2%; among "at-risk gamblers" it reached 9.5%; and in the "problem gambler" group it peaked at 22.7%. Thus, the percentage of smokers in the "problem gambler" category is double that in the "at-risk gambler" category and in this latter category it is again twice than that found in the "non-gambler" category. Thus, the percentage of smokers is four times higher in the "problem gambler" category than in the "non-gambler" one (Table 2).
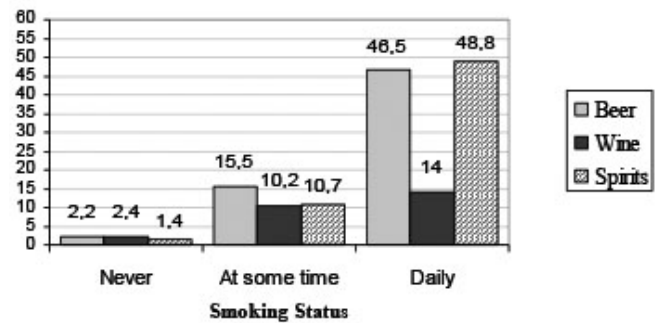

Figure 1. Percentage of weekly alcohol consumers for different beverages, according to smoking frequency
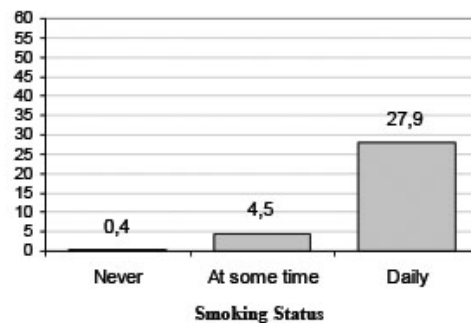

Figure 2. Use of cannabis at least once (%) according to smoking frequency

Table 3.
Relationship between use of alcohol (beer, wine and spirits), cannabis and gambling (%)

	Beer		χ^2	Cramer's V	Wine		χ^2	Cramer's V	Spirits		χ^2	Cramer's V
	No	Yes			No	Yes			No	Yes		
Cannabis use			199.08***	0.37***			40.90***	0.16***			176.34***	0.34***
No	94.6	5.4			95.9	4.1			96.0	4.0		
Yes	31.3	68.8			71.9	28.1			43.8	56.3		
Gambling			61.93***	0.21***			17.97***	0.11***			26.15***	0.13***
Non-gambler	95.1	4.9			96.0	4.0			95.8	4.2		
At-risk gambler	86.4	13.6			94.6	5.4			93.2	6.8		
Problem gambler	72.7	27.3			84.8	15.2			81.8	18.2		

***$p < .001$

Table 4.
Results of multiple regression analysis

Model	B	Standard error	Beta	t	p	C.I. (95%)
CANNABIS USE						
Number of daily cigarettes	0.062	0.004	0.387	15.97	0.001	0.054 -0.069
Weekly beer consumption	0.060	0.005	0.293	12.09	0.001	0.050 -0.070
Weekly wine consumption	0.044	0.006	0.161	6.92	0.001	0.031 -0.056
Constant	1.003	0.005		199.22		0.993 -1.013
PROBLEM GAMBLING (scores SOGS-RA)						
Weekly beer consumption	0.341	0.033	0.265	10.44	0.001	0.277 -0.405
Weekly wine consumption	0.096	0.044	0.056	2.17	0.030	0.009 -0.182
Number of daily cigarettes	0.056	0.026	0.056	2.11	0.035	0.004 -0.108
Constant	0.529	0.035		15.09	0.001	0.460 -0.597

Concerning the relationship between alcohol use and problem gambling, we found a significantly higher percentage of alcohol users among the problem gamblers ($p < 0.001$) for each of the drinks assessed (Table 3). The percentage of smokers and alcohol users rises with increasing involvement in gambling.

Quantifying the relationship between cannabis use and problem gambling and significant variables

We carried out two stepwise multiple linear regression analysis in which we included the variables age, number of cigarettes smoked per day, alcohol used (beer, wine and spirits), in order to predict cannabis use and problem gambling. The first multiple regression analysis (Table 4) explained the 25% of the variance with three significant variables of a greater likelihood of cannabis use: higher levels of daily cigarette consumption ($beta = 0.38$; $F = 255.20$, $p < 0.001$), higher levels of weekly beer consumption ($beta = 0.29$; $F = 213.56$, $p < 0.001$), and higher levels of weekly wine consumption ($beta = $ 0.16; $F = 162.96$, $p < 0.001$). In the first step, daily cigarette consumption accounted for 15% of the variance, in step 2, weekly beer consumption added an additional 8% of the variance and, in step 3, weekly wine consumption explained 2% of the variance. Regarding the predictors of scores obtained with the SOGS-RA, the regression model explained a lower percentage of variance (7%) with three significant variables: higher levels of weekly beer consumption ($beta = 0.26$; $F = 108.98$, $p < 0.001$), higher levels of weekly wine consumption ($beta = 0.05$; $F = 56.94$, $p < 0.001$) and higher levels of daily cigarette consumption ($beta = 0.05$; $F = 39.58$, $p < 0.001$).

Discussion

The results of this study indicated that smoking in the students of this sample was related to other addictive behaviours. It was observed how among smokers there is a higher percentage of users of alcoholic beverages, so that the greater the involvement in smoking, the greater the use of

alcohol. This relationship was found for all the alcoholic drinks that were assessed (beer, wine and spirits). Thus, as other studies have confirmed, use of cigarettes by adolescents most often co-occurs with use of alcohol, that is, both substances are used concurrently (Hoffman, Welte, & Barnes, 2001; Reed et al., 2010). Likewise, among the smokers, 25.9% reported having used cannabis on some occasion, compared to 0.8% of non-smokers (Table 2). The same positive relationship was found between alcohol consumption and cannabis use. For example, 68.8% of beer drinkers reported having used cannabis on some occasion, compared to 31.3% among those who did not drink beer (Table 3). In accordance with previous studies indicating that early onset of smoking and drinking increases the risk of subsequent use of cannabis or other drugs (Agrawal et al., 2010; Becoña et al., 2011; Fergusson, 2008; Korhonen et al., 2008; 2010; Prince van Leeuwen et al., 2011; Willner, 2001), our results show that tobacco and alcohol use were associated with cannabis use, as hypothesized.

Adolescence is a critical developmental phase that opens a window of vulnerability, especially with regard to substance use. Normally, cannabis use initiation occurs during this life stage. Early onset of cannabis use in adolescence has been associated with a higher risk of experimenting with other substances (Agrawal et al., 2006) and of developing a substance use disorder or dependence (Perkonigg et al., 2008), which makes early detection of alcohol and cigarette use very important.

The second goal of this study was to determine the relationship between tobacco or alcohol use and problem gambling. The results showed a clear association between a greater involvement in gambling and greater cigarette and alcohol use, with clear differences in smoking and drinking between problem gamblers and those who either do not gamble at all or those whose gambling does not reach the level of seriousness of the first group (Tables 2 and 3). Thus, higher percentages of alcohol and cigarette users were found among problem gamblers compared to the other groups, and their daily and weekly cigarette consumption is also higher. Likewise, as hypothesized, in this study both tobacco and alcohol use were related to problem gambling.

Although high rates of comorbidity between smoking and/or drinking and gambling have been documented (Becoña & Míguez, 2001; McGrath & Barret, 2009), little empirical attention has been directed towards investigating the exact nature of this relationship, i.e., how smoking might affect gambling or vice versa. A growing body of literature suggests that smoking and gambling might share similar environmental influences (McGrath & Barret, 2009). For example, in Spain, the sale of tobacco, alcohol and access to gambling premises is prohibited to minors. However, the reality is different, as the prevalence of these behaviours in young people under the age of 18 is high, which is largely the consequence of both the high accessibility to various forms of gambling and the availability of tobacco and alcohol (Harper, 2003). Therefore, there is a need for a strict application of the law.

The results of the present study are consistent with previous research that found an association between adolescent tobacco and alcohol use, drug use and deviant behaviour in general (e.g., Brook, Balka, Ning, Whiteman, & Finch, 2006; Brook et al., 2006; Wanner, Vitaro, Ladouceur, Brendgen, & Tremblay, 2006), described as adolescent problem behaviour syndrome or general deviance syndrome (McGee y Newcomb, 1992; Welte & Barnes, 1987). Concurrent consumption of at least two substances is the most common pattern in Spain (Plan Nacional de Drogas 2011; 2012). Multi-substance use can be understood as an attempt to enhance or compensate the effects of different drugs or simply experience new sensations. In any case, this tendency poses more health risks, social issues and higher treatment attrition.

In this study, it was not possible to establish causal relationships between cigarette smoking and alcohol consumption, on the one hand, and cannabis use and problem gambling on the other. Future research should explore in more depth the possibility of causal connections. Attention should also be paid to previous behaviours and personality factors that could predispose individuals to a series of addictive behaviours (Becoña et al., 2012; Rush, Becker, & Curry, 2009). It is important to analyze this association to determine whether we can speak of a simple relationship, a relationship modulated by other variables, or a causal relationship. The measures to adopt will depend on the nature of these relationships. Nevertheless, it is clear that interventions have to be carried at an early age because the prevalence of smoking and alcohol and cannabis use increases with age during adolescence (Duncan, Gau, Duncan, & Strycker, 2011; Plan Nacional sobre Drogas, 2011).

The present findings should be considered in the context of several limitations. Firstly, this study was cross-sectional and no conclusions about causality can be drawn from our results. It would be necessary to replicate it and carry out a long-term follow-up in order to draw some firmer conclusions. Secondly, the validity of the self-report data in this study cannot be verified, therefore it should be considered with caution (Becoña & Míguez, 2006; Botvin, Botvin, Renick, Filazzola, & Allegrante, 1984), since response bias might have occurred (e.g., tendency to endorse problematic behaviours or tendency to under-report problem behaviours). Although anonymity was guaranteed, a social desirability effect cannot be ruled out, although it must be said that this methodology (main outcome measure: self-reported status at survey) is the most used in this type of studies (Villalbí, Suelves, Saltó y Cabezas, 2011). In any case, the study also has several strengths. It was carried out on a very large sample of young people aged 11 to 16 years. Furthermore, we should point out that whereas the majority of studies focus on the assessment of the relationship between two substances (either tobacco

and/or alcohol and cannabis), here we have also assessed relationships with problem gambling.

In sum, the results of the current study provide a contribution to the literature on the associations between smoking and drinking behaviours and concurrent conditions in adolescents, as well as congruent data with the gateway hypothesis to cannabis consumption and problem gambling behaviour. However, more research is necessary to understand the multi-faceted association between smoking and drinking and the variables analyzed, since both are not isolated behaviours, but rather these are associated with other risk behaviours from very early ages.

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Conflicts of interest

The authors declare no conflict of interest concerning this article.

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