

# Cannabis use among adolescents: Risk pattern, implications and possible explanatory variables

## *Consumo de cannabis entre adolescentes: patrón de riesgo, implicaciones y posibles variables explicativas*

ANTONIO RIAL\*, GREGOR BURKHART\*\*, MANUEL ISORNA\*\*\*, CARMEN BARREIRO\*, JESÚS VARELA\*, SANDRA GOLPE\*.

\* Universidad de Santiago de Compostela, Santiago de Compostela, España. \*\* European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). \*\*\* Universidad de Vigo, Vigo, España.

### Abstract

In contrast to the achievements with other substances, it has not yet been possible to reduce the levels of cannabis use, the most used illegal substance among Spanish adolescents. The objective of this paper consists of updating levels of use (incorporating ages 12 and 13), estimating high-risk use and analyzing possible associated variables. For this purpose, a correlational method was used consisting of the administration of a survey to compulsory secondary school and high school students from the autonomous community of Galicia (Spain) in 2016. Results obtained from a sample of 3,882 Galician adolescents aged 12 to 18 ( $M = 14.52$ ;  $SD = 1.72$ ) reveal that the percentage of adolescents currently using tobacco and cannabis is higher than that of those using tobacco alone (12.7% vs 10.5%). This implies not only a higher probability of using other illegal substances, but also of developing rather high-risk use pattern, binge drinking or even experiencing problematic Internet use or cyberbullying. From a preventive perspective, the results reveal that personal variables such as self-esteem, assertiveness, social skills or impulsiveness have really weak explanatory power compared with other variables related to the setting of rules and limits by parents. One of the main conclusions of this paper is the need to adopt a comprehensive prevention approach. *Key words:* Adolescents; Cannabis; Consumption; Tobacco; Related variables.

### Resumen

Contrariamente a lo que ocurre con el resto de sustancias todavía no se han logrado disminuir los niveles de consumo de cannabis, que sigue siendo la droga ilegal más consumida entre los adolescentes españoles. El objetivo de este estudio consiste en actualizar los niveles de consumo (incorporando la franja de edad de 12-13 años), estimar los consumos propiamente de riesgo y analizar las posibles variables asociadas. Para ello se ha utilizado una metodología correlacional consistente en la realización de una encuesta a estudiantes de ESO y Bachillerato de la comunidad autónoma de Galicia (España) en el año 2016. La muestra final estuvo compuesta por 3.882 adolescentes gallegos de entre 12 y 18 años ( $M = 14,52$  y  $DT = 1,72$ ). Los resultados obtenidos revelan que a día de hoy es ya mayor el porcentaje de adolescentes que consumen tabaco y cannabis que únicamente tabaco (12,7% vs 10,5%) y que ello no sólo implica una mayor probabilidad de consumir otras sustancias ilegales, sino también de desarrollar un patrón consumo de alcohol de riesgo, de *Binge Drinking* o incluso de experimentar un Uso Problemático de Internet o de ciberacoso. Las variables personales como la autoestima, la asertividad, las habilidades sociales o la impulsividad tienen una capacidad explicativa realmente débil, en comparación con otras variables vinculadas al establecimiento de normas y límites por parte de los padres. Una de las principales conclusiones de este trabajo es la necesidad de adoptar un enfoque de prevención integral.

*Palabras clave:* Adolescentes; Cannabis; Consumo; Tabaco; Variables asociadas.

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#### Send correspondence to:

Antonio Rial Boubeta. Facultad de Psicología, C/ Xosé María Suárez Núñez, s/n. Campus Vida - Universidad de Santiago de Compostela. 15782- Santiago de Compostela (España). E-mail: antonio.rial.boubeta@usc.es

The data from the latest Spanish national survey on the use of drugs among secondary school students (ESTUDES 2014/15) (Plan Nacional sobre Drogas, 2016) show that, unlike what has been the case with other substances, the figures for cannabis use have hardly declined in comparison to the previous year, with this still the most used illegal drug among adolescents between 14 and 18 years of age. Looking beyond the levels of consumption, the 2014/15 ESTUDES report also reveals that 2.5% of Spanish adolescents have a high-risk pattern of use, with a positive score in the Cannabis Abuse Screening Instrument (CAST) (Legleye, Piontek & Kraus, 2011).

Moreover, other studies have warned of a decrease in the onset ages for different substances, among them cannabis (Golpe, Barreiro, Isorna, Gómez & Varela, 2016), and emphasize the consequences that an early start in use can lead to (Brook, Stimmel, Zhang & Brook, 2008; Hernández, Roldán, Jiménez, Mora, Escarpa & Pérez, 2009; Kokkevi, Gabhainn & Spyropoulou, 2006). According to the official data available (Nacional sobre Drogas, 2014) the onset age for cannabis is 14.9 years, although given the sampling frame used (14-18 years of age) this data may not accurately represent reality.

While some authors maintain that an increasing number of adolescents already begin using in cannabis before tobacco (Álvarez et al., 2016; Rolle et al., 2015), classical theories postulate that alcohol and tobacco use precede cannabis onset and this, in turn, the beginning of other illicit drug use (Kandel, 2003). Authors such as Morral, McCaffrey and Paddock (2002) or Swift et al. (2011) argue for example that starting to use cannabis represents a qualitative leap that would increase the risk of “progressing” towards other illegal drugs, and this makes it a matter of great importance. Nor should it be forgotten that when adolescents start using cannabis, they usually maintain their smoking habits (Álvarez et al., 2016; Ariza et al., 2014), so much so that the most common form of cannabis use among most European consumers is to mix it with tobacco for smoking (Font-Mayolas et al., 2013; Pirona, Noor & Burkhart, 2015). This combined use not only strengthens the habit maintenance of these two substances, but also increases its addictive potential (Hindocha et al., 2016; Tullis, Dupont, Frost & Gold, 2003), with severe implications at the neurobiological level, the study of which should, according to Pirona et al. (2015), receive more attention than it has had to date.

In addition to the above, there are a number of socio-health aspects that justify the need for continued progress in the study of cannabis (Isorna, 2017). Numerous studies have emphasized the implications that the use of this substance have at the brain development level, both from a structural and functional point of view (Jacobus & Tapert, 2014). There have also been adverse effects on health at the respiratory and cardiovascular levels (Bech-

told, Simpson, White & Pardini, 2015). It has been associated with a higher prevalence of psychotic symptoms (Arseneault et al., 2002; Henquet et al., 2005), anxiety, depression or an increased risk of suicide (Feingold, Weiser, Rehm & Lev-Ran, 2016; Silins et al., 2014). From a psychosocial point of view it has been found that adolescents who use cannabis present greater difficulties in studying or working, perform worse at school and get involved in more conflicts or discussions, as well as in fights or physical aggression (Guerrero et al., 2015; Morales, Ariza, Nebot, Pérez & Sánchez, 2008; Plan Nacional sobre Drogas, 2014) and risky sexual practices (Harper, Dittus & Ethier, 2016). Furthermore, cannabis use in adolescence has been linked to a greater likelihood of developing potential dependence in adulthood (George & Vaccarino, 2015) and to the use of other drugs (Fergusson & Boden 2008; Michaelides, Miller & Jutras-Aswad, 2014). It has also been shown that driving under the influence of this drug increases the risk of car accidents (Asbridge, Hayden & Cartwright, 2012; Gerberich et al., 2003; Hartman & Huestis, 2013). Finally, no less important are the studies that have linked cannabis to the problematic use of the Internet (Golpe, Gómez, Braña, Varela & Rial, 2017; Rucker, Akre, Berchtold & Suris, 2015) and different risky on line practices, such as sexting (Benotsch, Snipes, Martin & Bull, 2013), cyberbullying (Halbohn, 2016) or the problematic use of online videogames (Van Rooij et al., 2014).

The potential implications at different levels of cannabis use justifies the need to develop specific lines of action at the level of prevention, duly supported by scientific evidence. This is precisely what has led different researchers to try to identify possible associated variables in an attempt to determine the relative weight of each one as prognostic factors. Some of the most studied have been those to do with personality characteristics, especially impulsivity (Barkus, 2008; Moreno et al., 2012) and sensation seeking (González, Sáiz, Quirós & López, 2000; Malmberg et al., 2010). Other studies have focused on analyzing the role of social skills (Griffith-Lending et al., 2011). However, in recent years, models based on an environmental prevention approach have become increasingly important (Burkhart, 2011). Such models assume that people do not get involved in using substances only for personal or cognitive reasons, but are influenced by environmental factors. Research by Guxens, Nebot, Ariza and Ochoa (2007) or Thompson and Auslander (2007), for example, emphasizes the importance of cannabis use within the circle of adolescent friends. Terzic, Santric, Sbutega and Vasic (2013), on the other hand, warn that dysfunctional family contexts or bad relationships with parents are also associated with cannabis use, while Vázquez et al. (2014) emphasize the time at which the adolescents come home at night and Varela, Marsillas, Isorna & Rial (2013) focus on the money available.

Taking all of these considerations into account, this study has a triple objective: (1) to establish current figures for the number of adolescents users of both cannabis and other psychoactive substances, as well as onset ages high-risk consumption, incorporating adolescents aged 12 and 13 into the sample frame; (2) notwithstanding the impossibility of establishing cause-effect relationships, to analyze the relationship between the polydrug use of tobacco and cannabis and other behaviors in order to explore possible implications such as the consumption of other substances, high-risk alcohol use and binge drinking, problematic use of the Internet or certain risky practices on the Internet; (3) to analyze the role of possible prognostic factors, both of a personal (such as self-esteem, impulsivity, social skills or assertiveness), and of a family nature (essentially the money available and coming-home time at night).

## Method

### Participants

In order to realize the above-mentioned objectives, a selective methodology was used consisting of a survey among students in compulsory secondary education (ESO) and those studying for the high school certificate (Baccalaureate) in the provinces of A Coruña and Pontevedra. In particular, we applied a correlational transversal model, using two-stage sampling; by clusters for the selection of the first-level units (school) - establishing quotas a priori by type of school - and intentional sampling for the selection of second-level units (individuals). Despite the non-probabilistic nature of the sampling used, it was found that the final sample quotas matched the population quotas in terms of sex, age, school year and school. Fifteen schools in different municipalities agreed to participate, both public and private, including charter, both urban and rural. Initially, 4063 questionnaires were collected, although 62 were discarded on review, either due to an excessive number of missing values ( $n = 32$ ) or incoherent response patterns ( $n = 30$ ). A further 119 cases were subsequently eliminated for being outside the age range under study (12-18 years), resulting in a final sample of 3882 adolescents (49.9% male and 50.1% female) between the ages of 12 and 18 ( $M = 14.52$ ,  $SD = 1.72$ ). Of these, 2669 attended public schools and 1213 attended private or charter schools. ESO pupils accounted for 74.8% (38% in the first phase and 36.8% in the second) and 25.2% were studying for the Baccalaureate.

### Instrument

The data were collected through a questionnaire prepared expressly for the present study, in which questions were grouped into five blocks. A first block was taken from ESTUDES 2014/15 (Plan Nacional sobre Drogas, 2016) con-

taining questions on habits of alcohol use, getting drunk and binge drinking (defined as "the intake of 6 or more alcoholic drinks per occasion", by studies such as Parada et al., 2011 or Golpe et al., 2017), as well as the use of tobacco, cannabis, cocaine, ecstasy, amphetamines and hallucinogens, both in the previous year and the previous month. A second block included three specific screening tools. The Cannabis Abuse Screening Test (CAST, Legleye et al., 2011), which identifies adolescents with high-risk cannabis use. Although CAST has three categories based on the total score obtained ("no risk" = 0-1 points, "low risk" = 2-3 points, "high risk" = 4 or more points), in accordance with ESTUDES 2014/15, only the latter cut-off point was used, thus distinguishing adolescents making abusive or problematic use of cannabis from non-users and those whose use does not put them at high risk. A version of the Alcohol Use Disorders Identification Test (AUDIT) recently validated with Spanish adolescents by Rial, Golpe, Araujo, Braña and Varela (2017) was used to identify alcohol users, with the cut-off point also being a score of  $\geq 4$ . Finally, to identify problematic Internet users, the Problematic Internet Use Scale for adolescents was applied (PIUS-a) (Rial, Gómez, Isorna, Araujo & Varela, 2015), with a cut-off score  $\geq 16$ , as recommended by the authors. A third block aimed at assessing different risky behaviors on the Internet, such as sexting, participation in online gambling and online betting, cyberbullying, contact with strangers, etc. The fourth block included questions referring to possible variables associated with cannabis use. Among them, personal variables such as self-esteem were explored (through the Rosenberg Self-esteem Scale, adapted by Martín, Núñez, Navarro and Grijalvo, 2007); assertiveness (through the Assertiveness Scale included in the Evaluation Instruments Bank of the European Monitoring Centre for Drugs and Drug Addiction [EMCDDA]), impulsivity (through the Barrat Impulsivity Scale, adapted by Martínez, Fernández, Fernández, Carballo and García, 2015), and social skills (through the Social Skills Scale of Oliva et al., 2011). To find out coming-home time and money available, two questions taken from Varela et al. (2013) were used. Finally, a fifth block collected sociodemographic data such as sex, age and school type.

### Procedure

Data were collected directly in the school classrooms in small groups (between 15 and 20 individuals) using a questionnaire completed individually by each adolescent. This took place in the first quarter of 2016 and was carried out by a team of psychologists with proven experience in carrying out this type of task. Each subject was informed of the purpose of the study, and confidentiality and anonymity of their responses was guaranteed. In all cases, school managements and the respective parent and student associations consented to take part. Participation was totally voluntary

Tabla 1. Use of various substances among secondary school adolescents by sex and age groups, according to substance. Eastern Galicia, 2016.

LAST YEAR	GLOBAL		SEX		<i>p</i> *	AGE GROUP			<i>p</i> *
	12-18 years % (n)	14-18 years % (n)	male % (n)	female % (n)		12-13 years % (n)	14-15 years % (n)	16-18 years % (n)	
Cannabis	14.8 (575)	19.8 (509)	15.3 (295)	14.3 (277)	.42	4.5 (57)	12.6 (171)	27.9 (338)	< .001
Alcohol	52.1 (2021)	64.3 (1655)	50.7 (980)	53.4 (1035)	.10	27 (344)	54.5 (741)	75.4 (914)	< .001
drunkenness	26.3 (1017)	34.4 (882)	25.4 (490)	27 (522)	.28	9.4 (120)	21.6 (293)	48.6 (589)	< .001
6 or more alcoholic drinks	18.1 (697)	23.8 (608)	18.7 (361)	17.2 (332)	.25	6 (76)	14.3 (193)	34.4 (415)	< .001
Tobacco	23.4 (905)	30 (768)	21.2 (410)	25.4 (491)	.002	9.7 (124)	21.3 (289)	39.6 (479)	< .001
Cocaine	0.9 (34)	1 (26)	1.1 (21)	0.6 (12)	.16	0.5 (7)	1 (13)	1.1 (13)	.32
Ecstasy/ amphetamines/ hallucinogens	1.1 (42)	1.4 (35)	1.2 (24)	0.9 (17)	.34	0.5 (6)	0.9 (12)	1.9 (23)	.002
<b>CAST (cut point ≥ 4)</b>	<b>3.8</b>	<b>4.9</b>	<b>4.2 (80)</b>	<b>3.4 (66)</b>	<b>.23</b>	<b>1.3 (16)</b>	<b>3.7 (50)</b>	<b>6.3 (76)</b>	<b>&lt; .001**</b>

LAST MONTH	GLOBAL		SEX		<i>p</i> *	AGE GROUP			<i>p</i> *
	12-18 years % (n)	14-18 years % (n)	male % (n)	female % (n)		12-13 years % (n)	14-15 years % (n)	16-18 years % (n)	
Cannabis	8.5 (330)	11.4 (294)	8.6 (166)	8.4 (162)	.84	2.6 (33)	6.6 (90)	16.8 (204)	< .001
Alcohol	32.3 (1253)	41.3 (1062)	30 (580)	34.5 (669)	.003	13.6 (174)	29.1 (394)	55.1 (668)	< .001
drunkenness	12.9 (499)	17.2 (442)	11.7 (225)	14 (272)	.03	3.8 (49)	9.3 (126)	26.1 (316)	< .001
6 or more alcoholic drinks	8.6 (334)	11.4 (293)	8.9 (171)	8.3 (161)	0.57	2.6 (33)	6.6 (89)	16.8 (204)	< .001
Tobacco	16.1 (623)	20.7 (532)	14.3 (276)	17.8 (345)	.003	6.7 (85)	14.1 (191)	28.2 (341)	< .001
Cocaine	0.4 (15)	0.3 (8)	0.4 (7)	0.4 (7)	1	0.5 (6)	0.4 (6)	0.2 (2)	.38
Ecstasy/ amphetamines/ hallucinogens	0.4 (16)	0.4 (11)	0.3 (6)	0.5 (9)	.61	0.3 (4)	0.5 (7)	0.3 (4)	.65

Note. \* *p*-values for Chi-square test.

and the time required to complete the questionnaire was approximately 20 minutes. The study was also approved by the Bioethics Committee of the University of Santiago de Compostela.

### Data analysis

After an initial descriptive analysis and a bivariate tabulation, three comparison groups were established, with the first formed by adolescents who did not use tobacco or cannabis in the previous year, the second made up of those who only used tobacco, and the third with those who used both substances. Adolescents who used only cannabis, making up 2.1%, were excluded from the analysis. The differences between the groups were analyzed using parametric and non-parametric contrasts, depending on the nature of the variables. In the case of quantitative variables, unifactorial Anova with post-hoc Tukey contrasts and the partial eta squared coefficient ( $\eta^2p$ ) were used to estimate the effect size. In the case of qualitative variables, contrasts of independence  $\chi^2$  and contingency coefficients (CC) were applied. The analyses were performed using the statistical package IBM SPSS Statistics 20.

## Results

### Levels of use and onset ages

As can be seen in Table 1, alcohol is the substance most frequently used by adolescents aged 12-18 years, followed by tobacco and cannabis. More specifically, over half the adolescents in the sample (52.1%) drank alcohol in the previous year, 1 in 4 got drunk and 18.1% consumed 6 or more alcoholic drinks in the same occasion or drinking episode. Tobacco was smoked by 23.4%, and 14.8% used cannabis. A slight increase is observed for all substances when analyzing levels of use with a reduced sample of adolescents aged 14 to 18. With regard to the youngest age group (12-13 years), which was not included in ESTUDES, the results reveal that 27% drank alcohol in the previous year (13.6% in the previous month), 9.4% used tobacco (6.7% in the previous month) and 4.5% cannabis (2.6% in the previous month). By sex, results reveal little difference between boys and girls in the use of the different substances, and when such differences do exist (tobacco use in the previous year and alcohol, drunkenness and tobacco in the previous month), the prevalence figures are higher for

girls. In terms of age group, the differences are more than evident, with the percentage of users being significantly higher among adolescents aged 16 to 18.

Onset ages for tobacco and cannabis use are 14.08 and 14.8 respectively, with the onset of other substances such as alcohol at 13.6 years, the age of first drunkenness 14.6, cocaine 15.08 and consumption of ecstasy, amphetamines or hallucinogens at 14.9. It should also be added that 56.3% of those who have tried tobacco at some time in their lives, and 38.8% of those trying cannabis did so first aged 14 or younger.

### High-risk use

The data collected in Table 1 reveal that 3.8% of the adolescents in the sample exceeded the cut-off point established by the original authors of CAST ( $\geq 4$ ) or, put another way, one in four (25.4%) of those who used cannabis in the previous year and slightly more than one in three (37.5%) of those who used it in the previous month were using the substance with high risk. To this percentage we should add the 2.1% of adolescents with low-risk use (2-3 points in CAST). In comparison, 94.1% do not present any risk.

Table 2. Use of various substances and high-risk use of alcohol among secondary school students, by sex and age group. Eastern Galicia, 2016.

SUBSTANCES USED AND HIGH-RISK USE (last year)	GLOBAL				
	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	<i>p</i> *	CC
Alcohol	36.9 (1064)	93.9 (383)	98.6 (486)	< .001	.46
Drunkenness	10.4 (299)	53.7 (219)	87.1 (429)	< .001	.54
6 or more alcoholic drinks	6.3(180)	31.8 (128)	69.3 (339)	< .001	.50
AUDIT cut point $\geq 4$	13.3 (371)	41.5 (158)	67 (310)	< .001	.41
Cocaine	0 (0)	0 (0)	5.9 (29)	< .001	.22
Ecstasy/amphetamines/hallucinogens	0.1 (3)	0.5 (2)	6.3 (31)	< .001	.21

SEX	Male				Mujer			
	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	<i>p</i> *	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	<i>p</i> *
Alcohol	36.8 (540)	90.9 (149)	98 (239)	< .001	37 (522)	95.9 (233)	99.2 (244)	< .001
Drunkenness	10.3 (151)	54.9 (90)	85.2 (207)	< .001	10.4 (146)	53.1 (129)	89 (219)	< .001
6 or more alcoholic drinks	6.6 (97)	36.3 (59)	71.6 (174)	< .001	5.8 (82)	29 (69)	66.7 (162)	< .001
AUDIT cut point $\geq 4$	13.8 (195)	36.8 (56)	64.3 (146)	< .001	12.8 (175)	44.7 (102)	69.5 (162)	< .001
Cocaine	0 (0)	0 (0)	7 (17)	< .001	0 (0)	0 (0)	4.5 (11)	< .001
Ecstasy/amphetamines/hallucinogens	0.1 (1)	0.6 (1)	8.2 (20)	< .001	0.1 (2)	0.4 (1)	4.1 (10)	< .001

AGE GROUP	12-13 years				14-15 years				16-18 years			
	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	<i>p</i> *	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	<i>p</i> *	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	<i>p</i> *
Alcohol	19.1 (217)	92.1 (70)	97.9 (46)	< .001	42.3 (438)	91.9 (136)	97.2 (137)	< .001	58.2 (402)	96.1 (172)	99.3 (296)	< .001
Drunkenness	3.2 (37)	43.4 (33)	85.1 (40)	< .001	9.2 (95)	45.3 (67)	77.9 (109)	< .001	23.7 (163)	65.4 (117)	91.6 (273)	< .001
6 or more alcoholic drinks	1.8 (20)	28.9 (22)	60.9 (28)	< .001	5.2 (54)	22.4 (32)	66.4 (93)	< .001	15 (103)	40.4 (72)	71.6 (212)	< .001
AUDIT cut point $\geq 4$	2.7 (30)	13.5 (10)	13.3 (6)	< .001	11.1 (110)	35.6 (48)	63.6 (82)	< .001	34.4 (229)	59.3 (99)	77.7 (219)	< .001
Cocaine	0 (0)	0 (0)	14.9 (7)	< .001	0 (0)	0 (0)	6.4 (9)	< .001	0 (0)	0 (0)	4 (12)	< .001
Ecstasy/amphetamines/hallucinogens	0 (0)	0 (0)	8.5 (4)	< .001	0 (0)	0 (0)	8.8 (11)	< .001	0.4 (3)	1.1 (2)	5.1 (15)	< .001

Note. \* *p*-values for Chi-square test.

No significant differences were found according to sex, but by age there was a 5-times greater high-risk use rate among 16-18 year olds (6.3%) than among 12-13 year olds (1.3%) ( $\chi^2 = 44.52$ ;  $p < 0.001$ ).

**Link between tobacco and cannabis use**

If we analyze what happens specifically in the case of tobacco and cannabis, a first point of interest is that the majority of adolescents (74.7%) do not use either substance. On the other hand, it was found that there are more adolescents who smoke both substances (12.7%) than to-

bacco only (10.5%), with the difference being significant ( $\chi^2 = 8.02$ ,  $p < 0.01$ ). The percentage of adolescents who use only cannabis turned out to be very low (2.1%). It has also been found that 54.7% of those who smoked tobacco in the previous year also used cannabis, while 86% of those who used cannabis also smoked tobacco (Figure 1).

**Other risky practices**

As can be seen in Table 2, the number of users of other substances is significantly higher among those adolescents who use tobacco and cannabis compared to the other two

Table 3. Use of tobacco and cannabis by risky online practices and problematic Internet use among secondary school adolescents by sex and age group. Eastern Galicia, 2016.

RISKY ONLINE PRACTICES AND PROBLEMATIC INTERNET USE	GLOBAL			p*	CC
	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)		
Cyberbullying victim	5 (145)	9.3 (38)	8.9 (44)	< .001	.08
Cyberbullying perpetrator	3.3 (95)	5.1 (21)	11 (54)	< .001	.12
Sexting	3.2 (91)	8.4 (34)	14.4 (71)	< .001	.17
Online betting	5.4 (156)	8.1 (33)	12.2 (60)	< .001	.10
Erotic websites	26.2 (754)	31.9 (130)	47.9 (236)	< .001	.17
Contact with strangers	28.4 (818)	40.2 (164)	44.6 (219)	< .001	.13
Problematic Internet use	15 (422)	26.1 (103)	30.3 (144)	< .001	.15

SEX	Male				Female			
	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	p*	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	p*
Cyberbullying victim	3.9 (57)	9.1 (15)	5.3 (13)	< .001	6.2 (88)	9.5 (23)	12.6 (31)	< .001
Cyberbullying perpetrator	4.4 (65)	6.1 (10)	14.3 (35)	< .001	2.1 (30)	4.5 (11)	7 (17)	< .001
Sexting	2.9 (42)	7.4 (12)	13.1 (32)	< .001	3.4 (48)	9.1 (22)	15.4 (38)	< .001
Online betting	9.6 (141)	17.1 (28)	20.7 (50)	< .001	1.1 (15)	2.1 (5)	3.7 (9)	< .001
Erotic websites	43.8 (641)	60.4 (99)	74.2 (181)	< .001	7.9 (112)	12.8 (31)	21.5 (53)	< .001
Contact with strangers	30.6 (449)	42.1 (69)	49 (119)	< .001	26.1 (368)	39.1 (95)	40.4 (99)	< .001
Problematic Internet use	13.1 (187)	22.9 (36)	30.2 (71)	< .001	17.1 (235)	28.3 (67)	30.7 (73)	< .001

AGE GROUP	12-13 years				14-15 years				16-18 years			
	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	p*	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	p*	None % (n)	Only tobacco % (n)	Tobacco and cannabis % (n)	p*
Cyberbullying victim	3.9 (44)	11.8 (9)	14.9 (7)	< .001	6.2 (64)	9.5 (14)	12.1 (17)	.04	5.2 (36)	8.4 (15)	6.7 (20)	.15
Cyberbullying perpetrator	2.4 (27)	5.3 (4)	6.4 (3)	.17	3.9 (40)	6.1 (9)	13.7 (19)	< .001	3.8 (26)	4.5 (8)	9.7 (29)	.002
Sexting	1 (11)	3.9 (3)	0 (0)	.01	3.4 (35)	8.9 (13)	15.6 (22)	< .001	6.4 (44)	10.1 (18)	16.1 (48)	< .001
Online betting	2.9 (33)	6.6 (5)	8.5 (4)	.06	6 (62)	8.8 (13)	8.6 (12)	.20	8.7 (60)	7.8 (14)	13.8 (41)	.04
Erotic websites	12.6 (144)	10.5 (8)	10.6 (5)	.06	28.8 (297)	38.8 (57)	44.7 (63)	< .001	44.1 (305)	35.8 (64)	55 (164)	< .001
Contact with strangers	19.1 (217)	23.7 (18)	17.4 (8)	.61	33.8 (350)	38.5 (57)	51.8 (73)	< .001	35.5 (244)	48 (86)	45.5 (135)	.001
Problematic Internet use	10.7 (118)	22.2 (16)	15.6 (7)	.02	16.8 (171)	27.3 (39)	32.4 (44)	< .001	19.3 (129)	26.9 (47)	31.6 (91)	< .001

Note. \* p-values for Chi-square test.

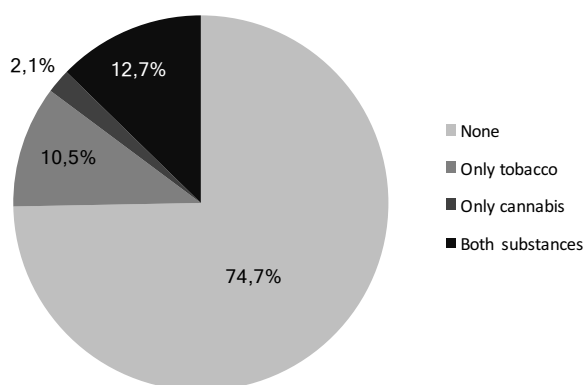


Figure 1. Use of tobacco, cannabis and both combined by secondary school students. Eastern Galicia, 2016.

groups, especially in terms of intensive alcohol use. For example, it can be observed that the percentage of adolescents who admitted to having been drunk in the previous year went from 10.4% among those who did not use either of the two substances, to 87.1% among those who used tobacco and cannabis ( $\chi^2 = 1591.02$ ;  $p < 0.001$ ;  $CC = .54$ ). The same is true for drinking 6 or more alcoholic beverages per occasion, which goes from 6.3% to 69.3% ( $\chi^2 = 1269.17$ ,  $p < 0.001$ ,  $CC = .50$ ). Similarly, the rates of use for cocaine, ecstasy, amphetamines and hallucinogens are also significantly higher, although effect sizes are more moderate. Furthermore, it has been possible to confirm that the incorporation of cannabis into the repertoire of substance use is also associated with greater high-risk consumption. So much so that the number of high-risk alcohol users, as detected by AUDIT, is 5 times higher in the case of adolescents who smoke tobacco and cannabis (13.3% vs. 67%) ( $\chi^2 = 764.26$ ;  $p < 0.001$ ,  $CC = .41$ ). The analyses by sex and age group reveal that these differences are maintained among both boys and girls as well as all age groups.

With regard to online behavior by adolescents (Table 3), it was found that users of tobacco and cannabis have a significantly higher probability of engaging in a variety of risky behaviors. In particular, the magnitude of effect size reveals that sexting ( $\chi^2 = 117.61$ ;  $p < 0.001$ ;  $CC = .17$ ) and accessing websites with erotic content ( $\chi^2 = 112.61$ ;  $p < 0.001$ ;  $CC = .17$ ) are the risky practices most closely associated with this pattern of simultaneous use. Likewise, it has been observed that the percentage of problematic Internet users goes from 26.1% among those who consume tobacco to 30.3% among those who consume tobacco and cannabis, a figure doubling that found for adolescents who do not consume any substance (15%) ( $\chi^2 = 84.34$ ;  $p < 0.001$ ;  $CC = .15$ ). The differences found between the different comparison groups are maintained regardless of sex, with the highest percentages found among the users of both substances, except in the case of victims of cyberbullying. While boys using tobacco are the ones with the

highest prevalence figures (9.1%) ( $\chi^2 = 10.75$ ,  $p < 0.001$ ), in the case of girls, the highest percentages are among those who consume both substances (12.6%) ( $\chi^2 = 16.49$ ;  $p < 0.001$ ). Depending on the age group, it is worth mentioning the absence of statistically significant differences between the majority of risk practices among adolescents aged 12-13 years, except for being victims of cyberbullying (predominant risky behavior among users of both substances), sexting and problematic Internet use (predominant among tobacco users). After the age of 14, the observed trend is the same as that registered globally.

### Associated variables

Firstly, with regard to personal variables (Table 4), it should be noted that although statistically significant differences have been found in all of them (self-esteem, impulsivity, assertiveness and social skills), the small estimated effect sizes show that these are not variables that can really explain cannabis use by themselves. In fact, only impulsivity and assertiveness present a clear pattern, with tobacco and cannabis users having the highest impulsivity scores and the lowest assertiveness scores. The analysis of the results by sex reveals statistically significant differences in three of the four personal variables in question (self-esteem, impulsivity and assertiveness), although the only one that continues to present a clear pattern is impulsivity. Both boys and girls who use tobacco and cannabis have the highest impulsivity scores ( $M_{\text{boys}} = 67.21$ ,  $F = 14.83$ ,  $p < 0.001$  vs  $M_{\text{girls}} = 68.31$ ,  $F = 23.05$ ;  $p < 0.001$ ). In terms of age group, impulsivity is again the most consistent variable, although in the group of 12 to 13-year olds tobacco users have higher scores in this variable, while in those older than 14 the highest impulsivity scores correspond to tobacco and cannabis users.

In addition to these variables, others were analyzed relating to the establishment of norms and limits in the family environment. Regarding coming-home time, the results collected in Table 5 reveal that the probability of belonging to the risk group increases significantly the later the adolescents arrive home, especially after 4 in the morning. ( $\chi^2 = 529.47$ ;  $p < 0.001$ ). This same trend is maintained when the results are analyzed both by sex and by age group. Finally, it has also been possible to observe statistically significant differences depending on money available (Table 6), with the likelihood of tobacco and cannabis use increasing with the amount of money adolescents have available, especially above €20 ( $\chi^2 = 126.80$ ,  $p < 0.001$ ). As in the case of coming-home time, this pattern is maintained regardless of sex and age group, although it is true that among 12 to 13-year-old adolescents, the availability of more money seems to increase the probability of tobacco use more than the likelihood of using both substances (Table 6).

Finally, in an attempt to model the data, a logistic regression analysis was carried out, with the aim of exploring to

Table 4. Use of tobacco and cannabis by mean scores for personal variables among secondary school adolescents by sex and age group. Eastern Galicia, 2016.

	GLOBAL				$p^*$	$\eta^2p$
	None (M)	Only tobacco (M)	Tobacco and cannabis (M)			
Self-esteem	31.26	29.47	30.46		< .001	.06
Impulsivity	62.63	65.95	67.78		< .001	.05
Social skills	53.14	52.98	54.61		.04	.05
Assertiveness	19.50	18.88	18.64		< .001	.03

SEX	Male				Female			
	None (M)	Only tobacco (M)	Tobacco and cannabis (M)	$p^*$	None (M)	Only tobacco (M)	Tobacco and cannabis (M)	$p^*$
Self-esteem	32.14	30.33	31.30	< .001	30.31	28.88	29.55	.004
Impulsivity	63.09	66.51	67.21	< .001	62.16	65.55	68.31	< .001
Social skills	53.01	53.05	54.72	.15	53.25	52.99	54.50	.24
Assertiveness	18.65	17.49	18.10	< .001	20.37	19.84	20.89	.02

AGE GROUP	12-13 años				14-15 años				16-18 años			
	None (M)	Only tobacco (M)	Tobacco and cannabis (M)	$p^*$	None (M)	Only tobacco (M)	Tobacco and cannabis (M)	$p^*$	None (M)	Only tobacco (M)	Tobacco and cannabis (M)	$p^*$
Self-esteem	31.60	30.90	30.82	.58	31.10	28.58	29.96	< .001	30.94	29.56	30.68	.002
Impulsivity	61.96	64.91	62.38	.003	62.82	67.98	69.29	< .001	63.27	64.60	67.81	< .001
Social skills	53.33	52.88	53.79	.78	52.88	52.19	53.10	.88	53.07	53.66	55.97	.001
Assertiveness	19.50	18.26	19.16	.01	19.32	18.42	18.24	< .001	19.74	19.53	19.10	.05

Note. \*  $p$ -values for  $F$  test.

what extent personal and family variables could jointly explain the fact that adolescents use cannabis in addition to tobacco. The results obtained, both for the global sample and stratified by sex and age group, reveal a rather poor explanatory power of the model, with Nagelkerke  $R^2$  values never exceeding 10%.

## Discussion

The present study has made it possible to confirm that the current social alarm regarding the use of cannabis among adolescents is not unfounded, insofar as the use of this substance (and in particular high-risk use) is at worrying levels. It has also been shown that adolescents who “make the leap” to cannabis use are more likely to develop a risk pattern, characterized by a more damaging repertoire of substance use and a greater likelihood of being involved in numerous risky practices online.

The results obtained reveal that the levels of consumption found in the sample of Galician adolescents aged 14 to 18 are below those recorded in ESTUDES 2014/15 for the whole of Spain and slightly higher than those obtained for Galicia (Plan Nacional sobre Drogas, 2016). Despite

the fact that once the 12-13 age range is incorporated the figures decrease markedly, the fact is that cannabis use remains at worrying levels: in Galicia more than 10,000 adolescents aged between 12 and 18 will have used cannabis in the last month; for the first time at a really very early age (14.8 years) and coinciding with getting drunk for the first time. In the case of 12 to 13-year-old adolescents, despite the fact that the percentage of those using cannabis in the previous month is “only” 2.6%, we are talking about more than 1000 children, not a negligible figure in any way, especially when taking into account the consequences that cannabis use at such early ages can lead to both physically, cognitively, emotionally and behaviorally (Brook, et al., 2008; Fergusson, Lynskey & Horwood, 1996; Filbey, McQueeney, DeWitt & Mishra, 2015). Analyzing the results by sex and age group highlights some issues that should be taken into account from a preventive point of view: a) it is necessary to start paying special attention to girls, since for some substances (for example, tobacco) the prevalence figures are already higher than among boys, and b) efforts should be initiated at a preventive level at younger ages, given the worrying levels of use among adolescents as young as 12 or 13 years.



Regarding high-risk use, the results reveal that, overall, 3.8% of adolescents aged between 12 and 18 had problematic cannabis use (positive in CAST), which means that in 1 out of 4 cases use is not occasional or anecdotal. In the 14 to 18 age range, the percentage of consumers at risk stands at 4.9%, twice the national level (Plan Nacional sobre Drogas, 2016). The fact that levels of high-risk use are higher than those obtained at national level while global levels of consumption are lower could be warning us about worsening patterns of use, compatible according to some authors with a stagnation in the use of this substance in absolute terms (Isorna, 2017).

The analysis of the relationship between tobacco and cannabis use, on the other hand, reveals that the simultaneous consumption of both substances is much more frequent than one might think. Currently, there are more adolescents who smoke tobacco and cannabis than just tobacco. In the present study, it has also been found that adolescents who consume both substances not only show greater use of alcohol (binge drinking) and more drunkenness, but also greater high-risk use, specifically detected by

AUDIT. Higher rates of use of other substances have also been observed, as well as greater comorbidity with other problem behaviors such as the problematic use of Internet, sexting, cyberbullying or online betting. All this coincides with the findings of previous studies that have shown the implications of simultaneous consumption of both substances at different levels. (Agrawal et al., 2009; Belanger, Akre, Kuntsche, Gmel & Suris, 2011; Hublet et al., 2015; Schauer, Rosenberry & Peters, 2017; Subramanian, McGlade & Yurgelun-Todd, 2016). In fact, Pinora et al. (2015) found that the endocannabinoid system plays an important role in the gratifying and motivational effects of nicotine. In addition, a recent study by Golpe et al. (2017) warned about the relationship they found with the problematic use of Internet and certain potentially risky behaviors on the Internet, and suggests, as proposed by Problem Behavior Theory (Jessor, 1991), that the different problem behaviors that often emerge jointly in adolescence may have a common etiological basis. The results obtained by sex have also served to show that the possible implications of the simultaneous use of tobacco and cannabis affect both girls and boys, with

Table 5. Use of tobacco and cannabis by coming-home time among secondary school adolescents by sex and age group. Eastern Galicia, 2016.

	GLOBAL			<i>p</i> *	CC
	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)		
Before midnight	49.1 (1385)	23.3 (95)	13.8 (68)	< .001	.35
Between midnight and 2 a.m.	21 (592)	20.9 (85)	13.2 (65)		
Between 2 and 4 a.m.	19.1 (539)	32.2 (131)	30.1 (148)		
After 4 a.m.	10.8 (305)	23.6 (96)	42.8 (210)		

SEX	Male				Female			
	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *
Before midnight	47.4 (676)	27.6 (45)	16.5 (40)	< .001	50.7 (705)	20.6 (50)	11.4 (28)	< .001
Between midnight and 2 a.m.	22 (313)	23.3 (38)	13.2 (32)		20.1 (279)	18.9 (46)	13.1 (32)	
Between 2 and 4 a.m.	19.2 (274)	27 (44)	26.3 (64)		19 (264)	35.8 (87)	34.3 (84)	
After 4 a.m.	11.4 (162)	22.1 (36)	44 (107)		10.3 (143)	24.7 (60)	41.2 (101)	

AGE GROUP	12-13 años				14-15 años				16-18 años			
	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i>	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i>	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i>
Before midnight	77.5 (845)	53.9 (41)	62.2 (28)	< .001	43.6 (446)	26.4 (39)	19.1 (27)	< .001	12.6 (87)	8.4 (15)	3.4 (10)	< .001
Between midnight and 2 a.m.	14.8 (162)	23.7 (18)	15.6 (7)		28.1 (288)	29.7 (44)	26.2 (37)		20.1 (138)	11.7 (21)	7 (21)	
Between 2 and 4 a.m.	6 (66)	18.4 (14)	15.6 (7)		21.6 (221)	31.1 (46)	32.6 (46)		36.3 (249)	39.7 (71)	31.5 (94)	
After 4 a.m.	1.6 (18)	3.9 (3)	6.7 (3)		6.7 (69)	12.8 (19)	22 (31)		31.1 (214)	40.2 (72)	58.1 (173)	

Note. \* *p*-values for Chi-square test.

Table 6. Use of tobacco and cannabis by money available among secondary school adolescents by sex and age group. Eastern Galicia, 2016.

	GLOBAL			<i>p</i> *	CC
	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)		
Under €10	50.3 (1436)	34.8 (142)	28.9 (142)	< .001	.18
Between €11-20	34.6 (988)	43.6 (178)	42.1 (207)		
Between €21-30	10.6 (303)	16.2 (66)	19.3 (95)		
Over €30	4.4 (126)	5.4 (22)	9.8 (48)		

SEX	Male				Female			
	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *
Under €10	47.1 (682)	32.3 (53)	26.7 (65)	< .001	53.5 (750)	36.6 (89)	31.3 (77)	< .001
Between €11-20	35.2 (509)	41.5 (68)	38.3 (93)		34.1 (478)	44.9 (109)	45.5 (112)	
Between €21-30	12 (173)	22 (36)	21.8 (53)		9.3 (130)	12.3 (30)	17.1 (42)	
Over €30	5.7 (83)	4.3 (7)	13.2 (32)		3.1 (43)	6.2 (15)	6.1 (15)	

AGE GROUP	12-13 years				14-15 years				16-18 years			
	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *	None %(n)	Only tobacco %(n)	Tobacco and cannabis %(n)	<i>p</i> *
Under €10	67.6 (753)	47.4 (36)	54.3 (25)	< .001	46 (475)	37.2 (55)	34.8 (49)	.02	28.9 (199)	27.9 (50)	22.1 (66)	.13
Between €11-20	23.8 (265)	31.6 (24)	28.3 (13)		38.2 (394)	43.9 (65)	39 (55)		46.9 (323)	48.6 (87)	46 (137)	
Between €21-30	5.9 (66)	15.8 (12)	10.9 (5)		10.8 (111)	11.5 (17)	16.3 (23)		18 (124)	19.6 (35)	21.8 (65)	
Over €30	2.7 (30)	5.3 (4)	6.5 (3)		5 (52)	7.4 (11)	9.9 (14)		6.2 (43)	3.9 (7)	10.1 (30)	

Note. \* *p*-values for Chi-square test.

girls in some cases registering even higher rates than boys (as is the case, for example, in high-risk alcohol use or in cyberbullying). In terms of age group, it seems that those adolescents using both tobacco and cannabis are the ones who are more likely to consume other types of substances, regardless of age group, as well as to engage in risky behavior on the Internet, although in the latter case it becomes especially visible after the age of 14.

The present work was a good opportunity to explore some of the variables that may explain the simultaneous use of cannabis and tobacco. This was of interest, given that most studies have tended to address the possible risk and protective factors associated either with each of the substances independently, or with tobacco and alcohol together, but not with cannabis and tobacco simultaneously (Álvarez et al., 2016). The results obtained reveal that the use of both substances can hardly be explained by "classical" personal variables such as self-esteem, assertiveness, impulsivity or social skills, and relate more to other variables linked to the role of parents, such as coming-home time or money available, a fact that the studies by Becoña et al. (2013), Llorens, Barrio, Sánchez, Suelves and the ESTUDES Working Group (2011) and Varela et al. (2013) had already warned of. As

a consequence, from a preventive point of view the results obtained emphasize the importance of reinforcing family prevention in general and the role of parents in particular; as suggested in the work of Burkhart (2011), it is essential to train them in monitoring their children (knowing where they are and with whom), as well as in the setting of a series of rules and limits, taking into account the repercussion that this has not only on the use of psychoactive substances, but also on their socialization in general. Finally, from an institutional point of view, it would be advisable to continue strengthening tobacco and cannabis control policies, and also to support continuous monitoring of the problem and an environmental prevention model that takes into account not only the personal characteristics of the individual, but also their cultural, social, physical and economic context (Burkhart, 2011).

Regarding the possible limitations of this work, it is important, first of all, to highlight the sample used. Despite working with data from 4000 adolescents, there is no doubt that the choice of non-probabilistic sampling and selecting exclusively from the provinces of A Coruña and Pontevedra means that the results should be interpreted with some caution. Future research will make it possible to verify to

what extent the estimated prevalence data can be generalizable to the rest of the Galician community or even to the whole of Spain. Secondly, it is possible that this study underestimates the prevalence of cannabis users among adolescents aged 17 to 18 because the two years of Baccalaureate study at high school are not compulsory and, therefore, the sample does not include adolescents of these ages who have left school or continued their education elsewhere, for example on vocational training courses. Similarly, it is important to point out the transversal nature of the study, which makes it impossible to establish causal relationships between the variables in question. Moreover, it is worth noting the limited number of variables included in the study as possible variables associated with cannabis use, although this was not the main objective of the study. Finally, we should also mention the fact that all the variables have been self-reported, so it is impossible to know definitively to what extent adolescents may have underestimated or overestimated their levels of use. Nevertheless, as previously noted by different experts in the field of addictive behaviors, self-report measures have proven to be reliable and even better than other methods when assessing the levels of alcohol and other drug use (Babor, Kranzler & Lauerman, 1989; Winters, Stinchfield, Henly & Schwartz, 1990).

Future lines of research should consider the possibility of exploring and incorporating new variables and focus their efforts on elaborating parsimonious explanatory models capable of guiding prevention effectively. Similarly, it would be of great interest to set up longitudinal studies to clarify cause and effect relationships between the variables.

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## Conflict of interests

The authors declare no conflict of interests

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