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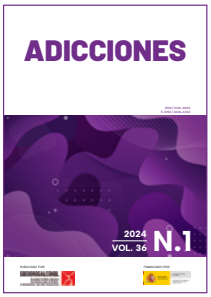

ORIGINAL

Polydrug use of tobacco and cannabis: Relationship with self-perceived health and mood state in adolescents in Central Catalonia- DESKcohort Project

Policonsumo de tabaco y cannabis: Relación con la salud autopercibida y el estado de ánimo en adolescentes de la Catalunya Central-Proyecto DESKcohort

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Abstract

The objective was to estimate the prevalence of polydrug use of tobacco and cannabis and to see its relationship with self-perceived health and mood state in adolescents from Central Catalonia in the 2019-2020 academic year. A cross-sectional study was carried out with a sample of 7,319 students, who answered a self-administered questionnaire. The dependent variables were the polydrug use of tobacco and cannabis and polydrug use of tobacco and high-risk cannabis. The main independent variables were self-perceived health status and mood state. Frequencies and percentages were analyzed for the prevalence analysis, and the Chi-square test was used. Poisson regression models were adjusted with robust variance, obtaining Prevalence Ratios. The prevalence of polydrug use of tobacco and cannabis was 3.5% and polydrug use of tobacco and high-risk cannabis was 2.5%. In boys, attending higher academic courses (4th of ESO (aPR: 3.88; 95% CI: 2.14-7.05) vs. CFGM (aPR: 8.67; CI95%: 4.51-16.67), having worse self-perceived health (aPR: 4.79; CI95%: 3.24-7.08) and worse mood state

Resumen

El objetivo fue estimar la prevalencia del policonsumo de tabaco y cannabis y ver su relación con la salud autopercibida y el estado de ánimo en los adolescentes escolarizados de la Catalunya Central en el curso 2019-2020. Estudio transversal con una muestra de 7.319 estudiantes, que contestaron un cuestionario auto administrado. Las variables dependientes fueron el policonsumo de tabaco y cannabis y policonsumo de tabaco y cannabis de riesgo. Las variables independientes principales fueron la salud autopercibida y el estado de ánimo. Para el análisis de prevalencia se analizaron frecuencias y porcentajes, y se usó la prueba de Chi-cuadrado. Se ajustaron modelos de regresión de Poisson con varianza robusta, obteniendo Razones de Prevalencia. La prevalencia del policonsumo de tabaco y cannabis fue de 3,5% y del policonsumo de tabaco y cannabis de riesgo 2,5%. En los chicos, cursar un curso académico superior (4º de ESO (RPa: 3,88; IC95%:2,14-7,05) vs. CFGM (RPa: 8,67; IC95%:4,51-16,67), tener peor salud autopercibida (RPa: 4,79; IC95%:3,24-7,08) y un peor estado de

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(aPR: 1.47; CI95%: 1.05-2.08) act as factors associated with polydrug use of tobacco and cannabis. The results for girls, and risky use of cannabis follow a similar pattern. Among the main conclusions we observe is that there are no differences in self-perceived health and mood state when comparing polydrug use of tobacco and cannabis and polydrug use of tobacco and high-risk cannabis, so risk reduction strategies must be applied whether the use of cannabis is occasional or problematic.

Keywords: polydrug use, tobacco, cannabis, mood state, self-perceived health

ánimo (RPa: 1,47; IC95%:1,05-2,08) actúan como factores asociados con el policonsumo de tabaco y cannabis. En chicas y por consumo de riesgo de cannabis siguen un patrón similar. Entre las principales conclusiones observamos que no hay diferencias en la salud autopercibida y el estado de ánimo en el policonsumo de tabaco con cannabis y con cannabis de riesgo, por lo que deben existir estrategias de reducción de riesgos tanto si el consumo de cannabis es puntual como si el consumo de cannabis es problemático.

Palabras clave: policonsumo, tabaco, cannabis, estado de ánimo, salud autopercibida

Adolescence is a stage of life in which some behavioural traits acquired during childhood are consolidated and others originating in their environments of influence are incorporated (Rodrigo et al., 2004). Some of these, including the use of tobacco and cannabis, can be considered high risk since they can lead to health, economic and social problems in later life (Suls & Rothman, 2004). According to data from the survey on drug use in secondary education in Spain (ESTUDES) 2018/2019, 26.7% of secondary school students aged 14 to 18 smoked tobacco in the last 30 days, with about a third of them smoking daily (9.8%) (Plan Nacional Sobre Drogas, 2020). Regarding the use of illicit psychoactive substances, cannabis is the most prevalent among high school students aged 14 to 18, with 19.3% having used cannabis in the last 30 days, and 3.4% of them using cannabis in a problematic way (Plan Nacional Sobre Drogas, 2020).

Previous studies have shown that tobacco and cannabis use are interrelated (Degenhardt et al., 2009). The likelihood of cannabis use is 2.8 times higher among the school population if tobacco is smoked (Plan Nacional Sobre Drogas, 2020). Traditionally, the age of onset of cannabis use has been later than that of tobacco. This is now changing, to the point where the gateway to smoked drugs is no longer tobacco but cannabis itself (Degenhardt et al., 2009). Often we also find the co-use of the two substances (Isorna & Amatller, 2017; Lanza et al., 2021; Meier & Hatsukami, 2016; Patton, Coffey, Carlin, Sawyer & Lynskey, 2005; Rial et al., 2018). In this case we are talking about polydrug use, understood as the use of several substances during the same period of time (last month) regardless of whether they were used simultaneously or alternately (Esteban, Lozano, Saltó & Zabala, 2015).

Several studies have shown that the relationship between the use of tobacco and cannabis could be partially explained by the influence of factors such as genetic predisposition, peer group influence, availability, the importance of common routes of administration, the interactions between active ingredients and additives in both products, and financial factors, among others (Agrawal, Budney & Lynskey, 2012; Llivina, 2000; Patton et al., 2005). Although physical problems are almost non-existent during adolescence (Nuviala, Cruces, Martínez & Abad, 2009; Piko, 2007), self-perception of health can provide information on it indirectly (Goldberg, Guéguen, Schmaus, Nakache & Goldberg, 2001; Tamayo-Fonseca et al., 2013). Furthermore, it is at this stage when mental health problems start to be detected (Braddick, Carral, Jenkins & Jané-Llopis, 2009; Ortuño-Sierra, Fonseca-Pedrero, Paíno & Aritio-Solana, 2014). Both self-perceived health and mental health have been related to substance use. People with current depression or a history of depression are often smokers who are more dependent on nicotine, more likely to experience negative emotional states after nicotine withdrawal, and more likely to relapse to smoking after nicotine withdrawal than the general population. In addition, a higher score on depression scales is associated with a greater likelihood of starting to smoke in adolescence (Bakhshaie, Zvolensky & Goodwin, 2015; Gurrea & Pinet, 2004; Reid & Ledgerwood, 2016; Shahab, Andrew & West, 2014). We also found a strong association between high-risk cannabis use, understood as use that creates problems for the users themselves or their environment (Plan Nacional Sobre Drogas, 2020), and poor mental health (Degenhardt et al., 2013; Hall & Degenhardt, 2009; Mangot-Sala et al., 2019; Van Gastel et al., 2013). However, most research on adolescents has focused on analyzing the effects of cannabis or tobacco separately, with few studies estimating the effects of polydrug use and high-risk cannabis use and linking polydrug use of tobacco and cannabis to physical and mental health in adolescents. Thus, the aim of this study was to estimate the prevalence of polydrug use of tobacco and cannabis and to investigate its relationship with self-perceived health and mood state in adolescents attending high school in central Catalonia in the 2019-2020 academic year.

Methods

Study design

This was a cross-sectional study based on data from the DESKcohort project (www.deskcohort.cat) with a convenience sample of 7,319 students (47.9% boys and 52.1% girls) in the 2nd and 4th years of compulsory

secondary education (ESO), 2nd year of upper secondary (Bachillerato) and 2nd year of intermediate level vocational training (CFGM) with students aged between 12 and 18 years in central Catalonia. During the 2019-2020 academic year, they completed a computerized, self-administered questionnaire (DESK questionnaire), covering aspects related to health and its determinants: sociodemographic data; state of health, sleep and mood state; eating habits; physical activity and free time; screen and new technology use; use of tobacco, cannabis, alcohol and other drugs; relationships with others and sexuality. The design of the questionnaire was based on other similar and validated questionnaires, which enables the comparability of results obtained. Completion took approximately 40 minutes, and the questionnaire was administered by personnel external to the school who also provided the instructions and answered possible doubts.

Instruments

Dependent variables:

- The dependent variable was polydrug use of tobacco and cannabis. This was measured through two patterns of cannabis use; cannabis use at 30 days and high-risk cannabis use. The polydrug use variable was constructed to cover daily tobacco smoking and cannabis use in the last 30 days. The variable polydrug use of tobacco and high-risk cannabis was constructed to cover daily smoking and the CAST score. CAST is a screening instrument shown to have good psychometric properties to assess the severity of cannabis dependence, taking into account different aspects of validity in young people. It consists of six questions seeking to identify patterns of risky behaviour associated with cannabis use in the last year. Those with a score of 7 or higher are classified as potential problem users (Cuenca-Royo et al., 2012).

Independent variables:

Health and mood state:

- To measure physical health status, the variable self-perceived health status was used. This was assessed with the following question: "How would you say your health is in general?". Five Likert-type response options were offered from excellent to poor. Given that most young people have excellent or very good health, it was dichotomised as: excellent/very good or good/fair/poor.
- To measure the state of mental health, the variable mood state was used. This was assessed with the following questions: "How often do you feel: a) too tired to do things? b) with sleeping problems? c) left out, sad or depressed? d) with no hope for the future? e) nervous or tense?". For each item, 5 Likert response options were offered from never (1) to always (5). The mood state variable was constructed as the sum of the five items mentioned above (min.=5; max.=25). The mean was calculated for the total sample and responses were dichotomised so that scores above the mean were classified as poor mood state and lower scores as good mood state.
- To determine underweight, normal weight, overweight/obesity, the body mass index (BMI) was used, which was defined using age and sex specific BMI cut-offs.To find out their weight and height, they were asked: "Approximately, how many kilos do you weigh without clothes (Kg)?" and "approximately how many centimeters tall are you without shoes (cm)?" According to the BMI result, it was classified as: underweight, normal weight, overweight/obesity.

Sociodemographic variables:

- Sex (boy, girl, other).
- Academic year (2nd year compulsory secondary education, 4th year compulsory secondary education, 2nd year upper secondary education or 2nd year vocational training).
- Neighborhood's socioeconomic status. The adolescent version of the McArthur Subjective Socioeconomic Status Scale was used. (Goodman et al., 2001). Students were asked: "Now imagine that this ladder represents the status of people in your neighbourhood. At the top of the ladder are the people who have the highest standing in their neighborhood. At the bottom are the people who have the lowest standing in their neighborhood. Considering the living standard of people in your neighborhood, where would you place yourself on this ladder? (from 1 to 10)". Based on the answers obtained, students were distributed into tertiles categorised as: disadvantaged, intermediate, advantaged).

Physical activity

- Physical activity. Students were asked: "How often do you usually do more than 10-15 minutes of physical activity at a time in your free time? This was more specifically detailed as a) vigorous physical activity: exercises that make the heart beat fast, b) moderate physical activity: exercises that are not strenuous, do not require as much effort or c) light physical activity: exercises that require minimal effort". For each item, the following response options were offered: once a day, between 4 and 6 times a week, between 2 and 3 times a week, once a week, and on no day of the week. The answers obtained were distributed according to WHO recommendations on physical activity (at least one hour a day of vigorous or moderate physical activity), being dichotomised as meeting or not meeting WHO recommendations.

Ethical considerations

When a school agreed to participate, a consent form was sent for distribution to its students. In compliance with Spanish law, parental authorization was required for the participation of students under 14 years of age. Participation in the study was voluntary and could be withdrawn whenever the participant wished without having to give explanations. The study guaranteed the ethical and legal conditions specified in the Declaration of Helsinki (Asociación Médica Mundial, 2013). The project was approved by the ethics committee of the University of Vic - Central University of Catalonia (96/2019).

Statistical analysis

First, a descriptive table was provided to show the characteristics of study participants by gender. The chi-square test was used to reveal any statistically significant differences between the characteristics of the participating boys and girls. Second, the prevalences of tobacco and cannabis use, high-risk use of cannabis, and polydrug use of tobacco and cannabis in boys and girls were calculated with confidence intervals (95% CI). To see if the prevalence of polydrug use of tobacco and cannabis, and polydrug use of tobacco and high-risk cannabis varied in relation to each independent variable, these prevalences were calculated with 95% CI, and Poisson regression models were adjusted with robust variance, obtaining prevalence ratios (PR) 95% CI (Espelt, Mari-Dell'Olmo, Penelo & Bosque-Prous, 2017). The final models included only those variables associated in a statistically significant way in the multivariate models. Analyses were performed using STATA16 software.

Results

7,319 students participated in the study, with 52.1% being girls. Students in the 2nd year of compulsory secondary education represented the 36.6%, the 36.7% were enrolled in the 4th year, 20.7% in the 2nd year of upper secondary education and the remaining 6% in vocational training. The 57.4% declared to have excellent or very good health when asked for self percieved health. In terms of mood state, 52.1% reported having a poor mood state (below average). For BMI, we found 3.0% to be underweight, 78.1% to have normal weight, and 18.9% to be overweight or obese. Finally, we found that 51.8% of students did not follow the WHO's physical activity recommendations. We found statistically significant differences between sexes in all variables except for socioeconomic status, which may have conditioned the rest of the results (Table 1).

Table 2 shows the prevalence of tobacco and cannabis use, as well as the polydrug use of these substances. Girls were more seen to smoke daily than boys [8.3% (95% CI: 7.5-9.2) vs. 6.7% (95% CI: 5.9-7.5)]. Conversely, cannabis use in the last month was higher in boys, being 9.8% (95%CI: 8.8-10.8) while in girls it was 7.4% (95%CI: 6.6-8.2).. High-risk cannabis use (CAST ≥7) was 4.3% (95% CI: 3.6-5) and 3.6% (95% CI: 3-4.2), respectively. Regarding polydrug use, 3.7% (95% CI: 3.1-4.4) of boys and 3.4% (95% CI: 2.8-4) of girls smoked tobacco daily and consumed cannabis in the last 30 days, and 2.7% (95% CI: 2.2-3.3) of boys and 2.3% (95% CI: 1.8-2.8) of girls smoked daily and had high-risk cannabis use (Table 2).

Table 3 shows each of the different factors associated with polydrug use of tobacco and cannabis and polydrug use of tobacco and high-risk cannabis. Students who reported poorer self-perceived health were found to have greater polydrug use of tobacco and cannabis than those

Table 1
General characteristics of the sample

	Boys		Girls		Total		p-value
	n	%	n	%	n	%	
	3505	47.9	3814	52.1	7319	100	
Academic year							
2nd compulsory secondary education	1296	37.0	1382	36.2	2678	36.6	
4th compulsory secondary education	1316	37.5	1374	36.0	2690	36.7	
2nd upper secondary education	649	18.5	863	22.6	1512	20.7	**<0.001**
Vocational training	244	7.0	195	5.2	439	6.0	
Socioeconomic status							
Disadvantaged	1221	34.8	1375	36.0	2596	35.5	
Intermediate	1180	33.7	1239	32.5	2419	33.1	0.465
Advantaged	1104	31.5	1200	31.5	2304	31.4	
Self perceived health							
Excellent/Very good	2290	65.3	1911	50.1	4201	57.4	**<0.001**
Good/Fair/Poor	1215	34.7	1903	49.9	3118	42.6	
Mood state							
Good	2125	60.6	1383	36.3	3508	47.9	**<0.001**
Poor	1380	39.4	2431	63.7	3811	52.1	
BMI							
Underweight	120	3.5	92	2.5	240	3.0	
Normal weight	2503	74.0	2993	81.9	5326	78.1	**<0.001**
Overweight or obese	760	22.5	569	15.6	1522	18.9	
Physical activity							
WHO recommendations	1968	60.0	1303	37.2	3271	48.2	**<0.001**
Below WHO recommendations	1310	40.0	2200	62.8	3510	51.8	

Table 2
Prevalence of tobacco and cannabis use by sex

	Boys		Girls		Total	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Regular tobacco use[a]	234	6.7 (5.9-7.5)	317	8.3 (7.5-9.2)	551	7.5 (6.9-8.1)
Cannabis last month[b]	343	9.8 (8.8-10.8)	281	7.4 (6.6-8.2)	624	8.3 (7.9-9.2)
High-risk cannabis use[c]	150	4.3 (3.6-5.0)	137	3.6 (3.0-4.2)	287	3.9 (3.5-4.4)
Polydrug use of tobacco and cannabis[d]	131	3.7 (3.1-4.4)	129	3.4 (2.8-4.0)	260	3.5 (3.1-4.0)
Polydrug use of tobacco and high-risk cannabis[e]	94	2.7 (2.2-3.3)	87	2.3 (1.8-2.8)	181	2.5 (2.1-2.8)

Note. [a] Regular tobacco: smokes tobacco habitually every day. [b]Cannabis last month: has smoked cannabis in the last 30 days. [c]High-risk cannabis use: CAST score of 7 or more. [d]Polydrug use of tobacco and cannabis: smokes tobacco habitually every day and has smoked cannabis in the last 30 days. [e]Polydrug use of tobacco and high-risk cannabis: smokes tobacco habitually every day and has a 7 or higher CAST score.

who considered that they had better health, especially boys [8.1% (95% CI: 6.7-9.7) in boys and 5.8% (95% CI: 4.9-7.0) in girls vs 1.4% (95% CI: 1.0-2.0) in boys and 0.9% (95% CI: 0.5-1.5) in girls], as well as polydrug use of tobacco and high-risk cannabis [6.3% (95% CI: 5.7-8.0) in boys and 4.2 % (95% CI: 3.4-5.3) in girls vs 0.8% (95% CI: 0.5-1.2) in boys and 0.3% (95% CI: 0.1- 0.6) in girls]. Regarding their mood state, we observed that the students with the worst mood state had higher prevalences of polydrug use of tobacco and cannabis [5.8% (95% CI: 4.7-7.2) boys and 4.3% (95% CI: 3.6-5.2) in girls], as well as in polydrug use of tobacco and high-risk cannabis [4.8% (95% CI: 3.8-6.0) in boys and 3.2% (95% CI: 2.6-4.0) in girls]. In addition, it was found that students in vocational training were those with the highest prevalence of tobacco and cannabis polydrug use [11.5% (95% CI: 8.0-16.1) in boys and 17.9% (95% CI %: 13.2-24.0) in girls], as well as polydrug use of tobacco and high-risk cannabis [9.0% (95% CI: 6.0-13.3) in boys and 12.8% (95% CI: 8.8-18.3) in girls] (Table 3).

Table 3
Prevalence of factors related to polydrug use of tobacco and cannabis[a] and polydrug use of tobacco and high-risk cannabis[b]

	Polydrug use of tobacco and cannabis[a]				Polydrug use of tobacco and high-risk cannabis[b]			
	Boys		Girls		Boys		Girls	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Self-perceived health								
Excellent/Very good	2290	1.4 (1.0-2.0)	1911	0.9 (0.5-1.5)	2290	0.8 (0.5-1.2)	1911	0.3 (0.1-0.6)
Good/Fair/Poor	1215	8.1 (6.7-9.7)	1903	5.8 (4.9-7.0)	1215	6.3 (5-7.8.0)	1903	4.2 (3.4-5.3)
Mood state								
Good	2125	2.4 (1.8-3.1)	1383	1.7 (1.1-2.5)	2125	1.3 (0.9-1.9)	1383	0.6 (0.3-4.0)
Poor	1380	5.8 (4.7-7.2)	2431	4.3 (3.6-5.2)	1380	4.8 (3.8-6.0)	2431	3.2 (2.6-4.0)
Academic year								
2nd compulsory secondary	1296	1.0 (0.5-1.7)	1382	0.8 (0.4-1.4)	1296	0.9 (0.5-1.6)	1382	0.6 (0.3-1.2)
4th compulsory secondary	1316	4.2 (3.2-5.4)	1374	3.8 (2.9-4.9)	1316	3.1 (2.3-4.2)	1374	2.5 (1.8-3.4)
2nd upper secondary	649	5.4 (3.9-7.4)	863	3.6 (2.5-5.1)	649	2.9 (1.9-4.5)	863	2.2 (1.4-3.4)
Vocational training	244	11.5 (8.0-16.1)	195	17.9 (13.2-24.0)	244	9.0 (6.0-13.3)	195	12.8 (8.8-18.3)
Socioeconomic status								
Disadvantaged	1221	4.4 (3.4-5.7)	1375	3.9 (3.0-5.0)	1221	3.8 (2.8-5.0)	1375	3.6 (2.7-4.7)
Intermediate	1180	3.7 (2.8-5.0)	1239	3.5 (2.6-4.6)	1180	2.7 (1.9-3.8)	1239	1.7 (1.1-2.6)
Advantaged	1104	3.0 (2.1-4.2)	1200	2.7 (1.9-3.7)	1104	1.4 (0.8-2.3)	1200	1.4 (0.8-2.3)
BMI								
Underweight	120	3.3 (1.2-8.6)	92	1.1 (0.1-7.4)	120	4.2 (1.7-9.6)	92	2.2 (0.5-8.3)
Normal weight	2503	3.9 (3.2-4.7)	2993	3.4 (2.8-4.1)	2503	2.9 (2.3-3.6)	2993	2.3 (1.8-2.9)
Overweight or obese	760	3.7 (2.5-5.3)	569	3.5 (2.3-5.4)	760	2.0 (1.2-3.2)	569	1.9 (1.1-3.4)
Physical activity								
WHO recommendations	1968	3.3 (2.6-4.2)	1303	2.3 (1.6-3.3)	1968	2.2 (1.6-2.9)	1303	0.9 (0.5-1.6)
Below WHO recommendations	1310	4.3 (3.4-5.6)	2200	3.8 (3.0-4.6)	1310	3.2 (2.4-4.3)	2200	2.8 (2.2-3.5)

Note. [a]Polydrug use of tobacco and cannabis: smokes tobacco habitually every day and has smoked cannabis in the last 30 days. [b]Polydrug use of tobacco and high-risk cannabis: smokes tobacco habitually every day and has a 7 or higher CAST score.

After analyzing the adjusted prevalence ratios (aPR), the factors associated with polydrug use of tobacco and cannabis in boys were found to be: being in a higher academic year, having worse self-perceived health and worse mood state (table 4). Specifically, attending the 4th year of compulsory secondary education (aPR: 3.88; 95% CI: 2.14-7.05), 2nd year upper secondary education (aPR: 4.89; 95% CI: 2.61-9.15), taking vocational training (aPR: 8.67; 95% CI: 4.51-16.67) compared to being in year 2 of compulsory secondary education; having good, fair or poor self-perceived health (aPR: 4.79; 95% CI: 3.24-7.08) compared to having excellent or very good self-perceived health; and having poor mood state (aPR: 1.47; 95% CI: 1.05-2.08), compared to having good mood state. Among the girls, we found being in a higher academic year and having poor self-perceived health as associated factors. Specifically, attending 4th year of compulsory secondary education (aPR: 4.13; 95% CI: 2.16-7.89), 2nd year of upper secondary education (aPR: 3.90; 95% CI: 1.97-7.73), taking vocational training (aPR: 15.82; 95% CI: 8.10-30.90) compared to 2nd year compulsory secondary education; and having good, fair or poor self-perceived health (RPa: 4.86; 95% CI: 2.95-8.02) compared to having excellent or very good self-perceived health.

In terms of polydrug use of tobacco and high-risk cannabis, the associated factors in boys were: being in a higher academic year, having worse self-perceived health and poor mood state. Specifically, attending 4th year of compulsory secondary education (aPR: 3.02; 95% CI: 1.60-5.70), 2nd year upper secondary education (aPR: 2.65; 95% CI: 1.29-5.44) and taking vocational training (aPR: 6.71; 95% CI: 3.35-13.43) compared to being in the 2nd

Table 4
Prevalence ratios (PR) of polydrug use of tobacco and cannabis[a] and polydrug use of tobacco and high-risk cannabis[b]

	Polydrug use of tobacco and cannabis[a]				Polydrug use of tobacco and high-risk cannabis[b]			
	Boys		Girls		Boys		Girls	
	PR (95% CI)	aPR (95% CI)	PR (95% CI)	aPR (95% CI)	PR (95% CI)	aPR (95% CI)	PR (95% CI)	aPR (95% CI)
Self-perceived health								
Excellent/Very good	1	1	1	1	1	1	1	1
Good/Fair/Poor	5.59 (3.79-8.25)	4.79 (3.24-7.08)	6.2 (3.8-10.1)	4.86 (2.95-8.02)	7.95 (4.78-13.24)	6.21 (3.73-10.34)	13.55 (5.92-30.99)	9.25 (3.97-21.53)
Mood state								
Good	1	1	1		1	1	1	1
Poor	2.41 (1.71-3.40)	1.47 (1.05-2.08)	2.62 (1.67-4.09)		3.62 (2.34-5.61)	2.23 (1.44-3.45)	4.93 (2.48-9.79)	3.05 (1.51-6.14)
Academic year								
2nd compulsory secondary	1	1	1	1	1	1	1	1
4th compulsory secondary	4.16 (2.28-7.58)	3.88 (2.14-7.05)	4.75 (2.49-9.07)	4.13 (2.16-7.89)	3.36 (1.77-6.37)	3.02 (1.60-5.70)	3.79 (1.82-7.89)	2.80 (1.33-5.86)
2nd upper secondary	5.37 (2.86-10.09)	4.89 (2.61-9.15)	4.51 (2.28-8.93)	3.90 (1.97-7.73)	3.16 (1.54-6.47)	2.65 (1.29-5.44)	3.38 (1.53-7.43)	2.21 (0.99-4.96)
Vocational training	11.44 (6.01-21.77)	8.67 (4.51-16.67)	22.55 (11.64-43.66)	15.82 (8.10-30.9)	9.73 (4.88-19.41)	6.71 (3.35-13.43)	19.68 (9.32-41.55)	11.15 (5.18-23.9)
Socioeconomic status								
Disadvantaged	1		1		1		1	
Intermediate	0.84 (0.57-1.24)		0.88 (0.59-1.30)		0.71 (0.46-1.12)		0.47 (0.28-0.78)	
Advantaged	0.67 (0.44-1.03)		0.67 (0.44-1.04)		0.38 (0.21-0.67)		0.39 (0.23-0.68)	
BMI								
Underweight	1		1		1		1	
Normal weight	1.16 (0.43-3.10)		3.16 (0.44-22.44)		0.69 (0.28-1.70)		1.07 (0.26-4.32)	
Overweight or obesity	1.10 (0.39-3.09)		3.23 (0.43-23.81)		0.47 (0.17-1.27)		0.88 (0.20-3.94)	
Physical activity								
WHO recommendations	1		1		1		1	
Below WHO recommendations	1.31 (0.92-1.86)		1.63 (1.08-2.47)		1.46 (0.96-2.23)		3.01(1.62-5.57)	

Note. [a] Polydrug use of tobacco and cannabis: smokes tobacco habitually every day and has smoked cannabis in the last 30 days. [b]Polydrug use of tobacco and high-risk cannabis: smokes tobacco habitually every day and has a 7 or higher CAST score.

year of compulsory secondary education; having good, fair or poor self-perceived health (aPR: 6.21; 95% CI: 3.73-10.34) compared to having excellent or very good self-perceived health; and having poor mood state (aPR: 2.23; 95% CI: 1.44-3.45) as opposed to good mood state. The same associated factors were found in girls and boys: being in a higher academic year, having poor self-perceived health and poor mood state. Specifically, attending the 4th year of compulsory secondary education education (aPR: 3.79; 95% CI: 1.82-7.89), 2nd year upper secondary (aPR: 3.38; 95% CI: 1.53-7.43) and taking vocational training (aPR: 19.68; 95% CI: 9.32-41.55) compared to being in the 2nd year of compulsory secondary education; having good, fair or poor self-perceived health (aPR: 9.25; 95% CI: 3.97-21.53) compared to having excellent or very good self-perceived health; and having poor mood state (aPR: 3.05; 95% CI: 1.51-6.14) compared to having a good mood state (Table 4).

Discussion

The main results of our study show that the prevalence of polydrug use of tobacco and cannabis and polydrug use of tobacco and high-risk cannabis is similar in both sexes. Attending a higher academic course (particularly vocational training), having poor self-perceived health and poor mood state could act as factors associated to polydrug use of tobacco and cannabis and also polydrug use of tobacco and high-risk cannabis. In addition, results indicate that there are no differences in the associated factors of polydrug use of tobacco and cannabis and the ones associated with polydrug use of tobacco and high-risk cannabis.

The results of this study show how polydrug use increases with age. Reports on substance use in Spain have revealed similar results, showing that the prevalence of use of the two psychoactive substances (legal and illicit) rises from 12.2% at 14 years to 21% at 18 years (Plan Nacional Sobre Drogas, 2020); specifically, in terms of the prevalence of polydrug use of tobacco and cannabis among Spanish students between the ages of 14 and 18, this has been reported as 0.3% (Álvarez et al., 2016). In our study, however, we found a higher prevalence (3.5%), coinciding with previous studies in the same area involving other substances, where higher consumption was also found. It seems that in this environment, data consistently show greater substance use (Obradors-Rial, Ariza & Muntaner, 2014). We found similar prevalences of polydrug use in both sexes. However, further studies are needed to verify the relationship between polydrug use and gender (Hernández-Serrano, Gras & Font-Mayolas, 2018). Another result that needs to be highlighted is the difference of substance use based on the type of education. Results show how students attending vocational training (specifically those in the Spanish CFGM system) report higher prevalences of polydrug use. These results may be due to the potential risk factor represented by the low level of involvement of the school and the fact that teacher follow-up is less close (Álvarez et al., 2016), these characteristics are intrinsic of training programmes involving older students.

Higher polydrug use of tobacco and cannabis has been associated with poorer self-perceived health as well as poorer mood state (Tucker et al., 2019). Other authors have shown that good self-perceived health has been linked to lower tobacco and substance use among adolescents (Johnson & Richter, 2002; Milligan et al., 1997). Regarding to self-perceived health, it has been found that tobacco use has an inverse linear effect, whereas the fewer days or fewer cigarettes smoked per day have been associated with better self-perceived health (Johnson & Richter, 2002).

Regarding mood state, there is evidence that people with poor mood state smoke more tobacco (Bakhshaie et al., 2015; Gurrea & Pinet, 2004; Shahab et al., 2014) or cannabis (Degenhardt et al., 2013; Hall & Degenhardt, 2009; Mangot-Sala et al., 2019). Although the evidence is not entirely conclusive, several publications establish significant associations between substance use and poor adaptation to situations of general anxiety and the use of deficient emotional regulation strategies (Álvarez et al., 2016; Degenhardt, Hall & Lynskey, 2003; Iglesias, 2007). Likewise, the presence of antisocial behaviours increases the likelihood of substance use (Álvarez et al., 2016; Hindocha, Brose, Walsh & Cheeseman, 2020; Blasco, Pérez, Martínez & Amado, 2019). Nevertheless, there is little evidence linking mood state to polydrug use.

Regarding physical exercise, no link was found in our study, but we did higher prevalence of polydrug use of tobacco and high-risk cannabis in that those who do not follow WHO's physical recommendations. No other indicators of physical health, such as BMI, were associated to any polydrug use.

The evidence regarding the impact of socioeconomic status on substance use in young people has been studied before, but the results have not been conclusive. The most relevant socioeconomic factors are the level of education (lower educational level increases the probability of substance use) and employment status (adolescents whose parents are unemployed are at greater risk of tobacco and cannabis use). Both variables show a clearer relationship with substance use than level of income (Esteban et al., 2015). In the present study, greater polydrug use was observed in young people with lower socioeconomic status, contrary to what was found in other studies from similar environments (Santamarina, Serral, Pérez & Ariza, 2017). More specifically, the ESTUDES survey (Plan Nacional Sobre Drogas, 2020) reported that students in families with an average financial situation were those who used the most tobacco and cannabis. The difficulty in measuring the socioeconomic status of young

people continues to be a challenge, as several authors have already pointed out (Cheng & Goodman, 2015; Ensminger et al., 2000; Hanson & Chen, 2007; Obradors-Rial, Ariza, Rajmil & Muntaner, 2018).

Among the limitations of the study, its cross-sectional nature stands out first of all. This does not allow direct causal relationships to be established from our results, only associations (Martínez et al., 2019). Another limitation to take into account is that the variables are self-reported, and social desirability or difficulty in remembering one's behaviours can have an impact on the responses, although there is evidence that the use of self-reported questionnaires is a reliable method to measure substance use in adolescents (Legleye, Piontek & Kraus, 2011; Moncada & Perez, 2001). Likewise, it should be taken into account that only CAST and the McArthur subjective socioeconomic status scale are validated instruments, the rest being questions that expert researchers have used in numerous studies for many years. No issues were detected regarding these variables and they have proven to be informative variables for the intended use in this study. Lastly, another limitation of the study is that only one variable is used to measure self-perceived health; this could be improved in future studies by adding a scale that measures more components of health in general. However, dichotomous classifications of self-perceived health and mental health (Ahonen, Nebot & Giménez, 2007; Monteagudo et al., 2013; Vázquez et al., 2013) have been shown to be good indicators of health and have been used in numerous studies. The strengths of the study are the size of the sample, the representativeness of the central Catalonia region, and the fact that this study is the first wave of the cohort and may be the basis for possible future subsequent interventions and follow-ups in this population.

Although the results should be interpreted in view of its cross-sectional design, two main conclusions may be drawn. On the one hand, there are no differences in terms of self-perceived health and mood state when comparing polydrug use of tobacco and cannabis to polydrug use of tobacco and high-risk cannabis, so risk reduction strategies should be in place whether cannabis use is occasional or problematic. On the other hand, most authors have studied substance use in young people independently. There is a lack of conclusive empirical data regarding the study of the factors associated with the simultaneous use of tobacco and cannabis, but the data shows that polydrug use at this stage is a reality and that it is necessary to continue monitoring the development of how both substances are used in order to detect changes in a timely manner, such as the gateway to smoked drugs among possible polydrug use. The present study provides new evidence that may be useful in the design of interventions to prevent the combined use of substances at this stage. Specifically, it is necessary for clinicians to incorporate preventive interventions into their daily practice, taking into account those groups that engage in more polydrug use (vocational training students) and that polydrug use increases with age.

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Conflict of interests

The authors of this manuscript declare no conflicts of interest. Albert Espelt is associate editor of the Addictions Journal but was not involved in the editorial process.

References

Agrawal, A., Budney, A. J. & Lynskey, M. T. (2012). The co-occurring use and misuse of cannabis and tobacco: A review: Cannabis and tobacco review. *Addiction, 107*, 1221-1233. doi:10.1111/j.1360-0443.2012.03837.x.

Ahonen, E. Q., Nebot, M. & Giménez, E. (2007). Negative mood states and related factors in a sample of adolescent secondary-school students in Barcelona (Spain). *Gaceta Sanitaria*, *21*, 43-52.

Álvarez, A., Amatller, O., Esteban, M., Germán, I., Grifell, M., Isorna, M.,… Zabala, J. (2016). *Informe Évict 2*. Madrid: Comité Nacional para la Prevención del Tabaquismo.

Asociación Médica Mundial. (2013). *Declaración de Helsinki. Principios éticos para las investigaciones médicas en seres humanos*. Fortaleza, Brasil: Asociación Médica Mundial.

Bakhshaie, J., Zvolensky, M. J. & Goodwin, R. D. (2015). Cigarette smoking and the onset and persistence of depression among adults in the United States: 1994–2005. *Comprehensive Psychiatry*, *60*, 142-148. doi:10.1016/j.comppsych.2014.10.012.

Blasco, V. J. V., Pérez, D. E., Martínez, A. V. & Amado, B. G. (2019). Perfiles de menores policonsumidores de drogas y su relación con la conducta antisocial: Orientaciones para la prevención. *Informació psicològica*, *117,* 17-31. doi:10.14635/IPSIC.2019.117.3.

Braddick, F., Carral, V., Jenkins, R. & Jané-Llopis, E. (2009). Child and adolescent mental health in Europe: Infrastructures, policy and programmes. *Luxembourg: European Communities*, *11*.

Cheng, T. L. & Goodman, E. (2015). Race, ethnicity, and socioeconomic status in research on child health. *Pediatrics, 135*, 225-237. doi:10.1542/peds.2014-3109.

Cuenca-Royo, A. M., Sánchez-Niubó, A., Forero, C. G., Torrens, M., Suelves, J. M. & Domingo-Salvany, A. (2012). Psychometric properties of the CAST and SDS scales in young adult cannabis users. *Addictive Behaviors*, *37*, 709-715. doi:10.1016/j.addbeh.2012.02.012.

Degenhardt, L., Hall, W. & Lynskey, M. (2003). Exploring the association between cannabis use and depression. *Addiction*, *98*, 1493-1504. doi:10.1046/j.1360-0443.2003.00437.x.

Degenhardt, L., Chiu, W. T., Conway, K., Dierker, L., Glantz, M., Kalaydjian, A.,… Kessler, R. C. (2009). Does the 'gateway' matter? Associations between the order of drug use initiation and the development of drug dependence in the National Comorbidity Study Replication. *Psychological Medicine*, *39*, 157-167. doi:10.1017/S0033291708003425.

Degenhardt, L., Coffey, C., Romaniuk, H., Swift, W., Carlin, J. B., Hall, W. D. & Patton, G. C. (2013). The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. *Addiction*, *108*, 124-133. doi:10.1111/j.1360-0443.2012.04015.x.

Ensminger, M. E., Forrest, C. B., Riley, A. W., Kang, M., Green, B. F., Starfield, B. & Ryan, S. A. (2000). The validity of measures of socioeconomic status of adolescents. *Journal of Adolescent Research*, *15*, 392-419. doi:10.1177/0743558400153005.

Espelt, A., Mari-Dell'Olmo, M., Penelo, E. & Bosque-Prous, M. (2017). Applied prevalence ratio estimation with different regression models: An example from a cross-national study on substance use research. *Adicciones*, *29*, 105-112. doi:10.20882/adicciones.823.

Esteban, A., Lozano, A., Saltó, E. & Zabala, J. (2015). *Síntesis, ideas clave y propuestas de acción*. Madrid: Comité Nacional para la Prevención del Tabaquismo.

Goldberg, P., Guéguen, A., Schmaus, A., Nakache, J.-P. & Goldberg, M. (2001). Longitudinal study of associations between perceived health status and self reported diseases in the French gazel cohort. *Journal of Epidemiology and Community Health*, *55*, 233-238. doi:10.1136/jech.55.4.233.

Goodman, E., Adler, N. E., Kawachi, I., Frazier, A. L., Huang, B. & Colditz, G. A. (2001). Adolescents' perceptions of social status: Development and evaluation of a new indicator. *Pediatrics*, *108*, 31. doi:10.1542/peds.108.2.e31.

Gurrea, A. & Pinet, M. C. (2004). Tabaco y patología afectiva. *Adicciones*, *16 (Supl. 2)*, 155- 176.

Hall, W. & Degenhardt, L. (2009). Adverse health effects of non-medical cannabis use. *Lancet*, *374*, 1383-1391. doi:10.1016/S0140-6736(09)61037-0.

Hanson, M. D. & Chen, E. (2007). Socioeconomic status and health behaviors in adolescence: A review of the literature. *Journal of Behavioral Medicine*, *30*, 263-285. doi:10.1007/s10865-007-9098-3.

Hernández-Serrano, O., Gras, M. & Font-Mayolas, S. (2018). Concurrent and simultaneous use of cannabis and tobacco and its relationship with academic achievement amongst University students. *Behavioral Sciences*, *8*, 31. doi:10.3390/bs8030031.

Hindocha, C., Brose, L. S., Walsh, H. & Cheeseman, H. (2020). Cannabis use and co-use in tobacco smokers and non-smokers: Prevalence and associations with mental health in a cross-sectional, nationally representative sample of adults in Great Britain, 2020. *Addiction*, *116*, 2209-2219. doi:10.1111/add.15381.

Iglesias, E. B. (2007). Bases psicológicas de la prevención del consumo de drogas. *Papeles del psicólogo*, *28*, 11-20.

Isorna, M. & Amatller, O. (2017). Consumo combinado de tabaco y cannabis: Una revisión de los factores de riesgo familiares. *Revista Española de Drogodependencias*, *42*, 11-28.

Johnson, P. B. & Richter, L. (2002). The relationship between smoking, drinking, and adolescents' self-perceived health and frequency of hospitalization: Analyses from the 1997 National Household Survey on Drug Abuse. *Journal of Adolescent Health*, *30*, 175-183. doi:10.1016/S1054-139X(01)00317-2.

Lanza, H. I., Bello, M. S., Cho, J., Barrington-Trimis, J. L., McConnell, R., Braymiller, J. L.,… Leventhal, A. M. (2021). Tobacco and cannabis poly-substance and poly-product use trajectories across adolescence

and young adulthood. *Preventive Medicine*, *148*, 106545. doi:10.1016/j.ypmed.2021.106545.

Legleye, S., Piontek, D. & Kraus, L. (2011). Psychometric properties of the Cannabis Abuse Screening Test (CAST) in a French sample of adolescents. *Drug and Alcohol Dependence*, *113*, 229-235. doi:10.1016/j.drugalcdep.2010.08.011.

Llivina, T. S. (2000). Avances y retos en prevención del abuso de drogas. *Papeles del Psicólogo, 77,* 18-24.

Mangot-Sala, L., Bosque-Prous, M., Bartroli, M., Teixidó-Compañó, E., Brugal, M. T. & Espelt, A. (2019). The role of individual and social mediators in the association between drug consumption and mental health among adolescents in Barcelona. *International Journal of Mental Health and Addiction*, *17*, 13744-13788. doi:10.1007/s11469-018-9879-7.

Martínez, C., Baena, A., Castellano, Y., Fu, M., Margalef, M., Tigova, O.,… Fernández, E. (2019). Prevalence and determinants of tobacco, e-cigarettes, and cannabis use among nursing students: A multicenter cross-sectional study. *Nurse Education Today*, *74*, 61-68. doi:10.1016/j.nedt.2018.11.018.

Meier, E. & Hatsukami, D. K. (2016). A review of the additive health risk of cannabis and tobacco co-use. *Drug and Alcohol Dependence*, *166*, 6-12. doi:10.1016/j.drugalcdep.2016.07.013.

Milligan, R. A. K., Burke, V., Beilin, L. J., Richards, J., Dunbar, D., Spencer, M.,… Gracey, M. P. (1997). Health-related behaviours and psycho-social characteristics of 18 year-old Australians. *Social Science & Medicine*, *45*, 1549-1562. doi:10.1016/S0277-9536(97)00092-0.

Moncada, A. & Perez, K. (2001). Reliability and validity of self-reported drug use among secondary school students. *Gaceta Sanitaria*, *15*, 406-413. doi:10.1016/s0213-9111(01)71594-4.

Monteagudo, M., Rodríguez-Blanco, T., Pueyo, M. J., Zabaleta-del-Olmo, E., Mercader, M., García, J.,… Bolíbar, B. (2013). Gender differences in negative mood states in secondary school students: Health survey in Catalonia (Spain). *Gaceta Sanitaria*, *27*, 32-39. doi:10.1016/j.gaceta.2012.01.009.

Nuviala, N., Cruces, G., Martínez, F. & Abad, B. (2009). Autopercepción de la salud, estilo de vida y actividad física organizada. *Revista internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, *9*, 414-430.

Obradors-Rial, N., Ariza, C. & Muntaner, C. (2014). Risky alcohol consumption and associated factors in adolescents aged 15 to 16 years in Central Catalonia (Spain): Differences between rural and urban areas. *Gaceta Sanitaria*, *28*, 381-385. doi:10.1016/j.gaceta.2014.04.004.

Obradors-Rial, N., Ariza, C., Rajmil, L. & Muntaner, C. (2018). Socioeconomic position and occupational social class and their association with risky alcohol consumption among adolescents. *International Journal of Public Health*, *63*, 457-467. doi:10.1007/s00038-018-1078-6.

Ortuño-Sierra, J., Fonseca-Pedrero, E., Paíno, M. & Aritio-Solana, R. (2014). Prevalence of emotional and behavioral symptomatology in Spanish adolescents. *Revista de Psiquiatría y Salud Mental*, *7*, 121-130. doi:10.1016/j.rpsm.2013.12.003.

Patton, G. C., Coffey, C., Carlin, J. B., Sawyer, S. M. & Lynskey, M. (2005). Reverse gateways? Frequent cannabis use as a predictor of tobacco initiation and nicotine dependence. *Addiction, 100*, 1518-1525. doi:10.1111/j.1360-0443.2005.01220.x.

Piko, B. F. (2007). Self-perceived health among adolescents: The role of gender and psychosocial factors. *European Journal of Pediatrics*, *166*, 701-708. doi:10.1007/s00431-006-0311-0.

Plan Nacional Sobre Drogas. (2020). *Informe 2020. Alcohol, tabaco y drogas ilegales en España*. Madrid: Ministerio de Sanidad Servicios Sociales e Igualdad.

Reid, H. H. & Ledgerwood, D. M. (2016). Depressive symptoms affect changes in nicotine withdrawal and smoking urges throughout smoking cessation treatment: Preliminary results. *Addiction Research & Theory*, *24*, 48-53. doi:10.3109/16066359.2015.1060967.

Rial, A., Burkhart, G., Isorna, M., Barreiro, C., Varela, J. & Golpe, S. (2018). Consumo de cannabis entre adolescentes: Patrón de riesgo, implicaciones y posibles variables explicativas. *Adicciones*, *31*, 64-77. doi:10.20882/adicciones.1212.

Rodrigo, M. J., Máiquez, M. L., García, M., Mendoza, R., Rubio, A. & Martínez, A. (2004). Relaciones padres-hijos y estilos de vida en la adolescencia. *Psicothema*, *16*, 203-210.

Santamarina, E., Serral, G., Pérez, C. & Ariza, C. (2017). *La salut i els seus determinants en l'alumnat adolescent de Barcelona*. Barcelona: Agència de Salut Pública de Barcelona.

Shahab, L., Andrew, S. & West, R. (2014). Changes in prevalence of depression and anxiety following smoking cessation: Results from an international cohort study (ATTEMPT). *Psychological Medicine*, *44*, 127-141. doi:10.1017/S0033291713000391.

Suls, J. & Rothman, A. (2004). Evolution of the biopsychosocial model: Prospects and challenges for health psychology. *Health Psychology*, *23*, 119-125. doi:10.1037/0278-6133.23.2.119.

Tamayo-Fonseca, N., Quesada, J. A., Nolasco, A., Melchor, I., Moncho, J., Pereyra-Zamora, P.,… Barber, X. (2013). Self-rated health and mortality: A follow-up study of a Spanish population. *Public Health*, *127*, 1097-1104. doi:10.1016/j.puhe.2013.09.00.

Tucker, J. S., Pedersen, E. R., Seelam, R., Dunbar, M. S., Shih, R. A. & D'Amico, E. J. (2019). Types of cannabis and tobacco/nicotine co-use and associated outcomes

in young adulthood. *Psychology of Addictive Behaviors*, *33*, 401-411. doi:10.1037/adb0000464.

Van Gastel, W. A., Tempelaar, W., Bun, C., Schubart, C. D., Kahn, R. S., Plevier, C. & Boks, M. P. M. (2013). Cannabis use as an indicator of risk for mental health problems in adolescents: A population-based study at secondary schools. *Psychological Medicine*, *43*, 1849-1856. doi:10.1017/S0033291712002723.

Vázquez, M. E., Muñoz, M. F., Fierro, A., Alfaro, M., Rodríguez, L. & Bustamante, P. (2013). Estado de ánimo de los adolescentes y su relación con conductas de riesgo y otras variables. *Pediatría Atención Primaria*, *15*, 75-84. doi:10.4321/S1139-76322013000400003.