



## Empirical Articles

# Drinking, Smoking and Type A Polydrug Behaviours: Psychosocial Factors Among Portuguese University Students

Comportamentos de consumo de álcool, tabaco e policonsumos do tipo A: Fatores psicossociais entre estudantes do ensino superior

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## Abstract

**Aim:** This paper aims to describe alcohol, tobacco and type A polydrug consumption among university students.

**Method:** A cross-sectional study was performed. Through a convenience sampling, a total of 338 were included (51.8% male with a mean age of 20.6 years, SD = 3.4). Data was collected using a self-reported questionnaire. The questionnaire was composed by sociodemographic and substance consumption and behaviours variables. Spearman's correlation coefficients were assessed to measure the strength and direction of the association between sociodemographic and substance consumption variables. To evaluate type A polydrug consumption, multivariate logistic regression models were performed.

**Results:** It was observed significant correlations between tobacco consumption with cannabis and alcohol involvement, and coping, conformity, social, enhancement drinking motives. About alcohol consumption, there were observed relations with students' social environment, and with enhancement, conformity and social drinking motives. Regarding sociodemographic factors on type A polydrug consumption it was verified that students who have parents and friends who smoke are more likely to polydrug.

**Conclusion:** Findings suggest that interventions focused on substance consumption may need to address descriptive and injunctive norms, drinking motives and social environment as part of the student's consumption behaviours.

*Keywords:* alcohol consumption, cigarette smoking, polydrug consumption, consumption behaviours, substance abuse, university students

## Resumo

**Objetivo:** Com o presente trabalho pretende-se descrever os comportamentos de consumos etílicos, tabágicos e de policonsumos do tipo A em estudantes do ensino superior.

**Métodos:** Realizado estudo transversal, através de uma amostragem por conveniência, obtendo-se uma amostra de 338 estudantes (51,8% do sexo masculino com uma idade média de 20,6 anos, DP 3,4). Os dados foram recolhidos com recurso a um questionário auto-reportado, composto por variáveis sociodemográficas e variáveis relativas a comportamentos de consumo. Foram calculados coeficientes de correlação de Spearman para avaliar a associação entre as variáveis de estudo. Modelos de regressão logística multivariada foram efetuados por forma a descrever os policonsumos do tipo A.

**Resultados:** Foram observadas correlações significativas entre consumo de tabaco com o envolvimento dos estudantes com o cannabis e álcool, e com os motivos de consumos etílicos (nos domínios de coping, de conformidade, social e aprimoramento). O consumo de álcool relacionou-se com o ambiente social do estudante, bem como com os motivos de consumos etílicos por aprimoramento, por conformidade e por motivos sociais. Ainda, observou-se que os estudantes que têm pais e amigos que fumam, são mais prováveis de apresentar comportamentos de policonsumo do tipo A.

**Conclusão:** Os resultados sugerem que as intervenções focadas no consumo de substâncias deverão ser direcionadas às normas descritivas e injuntivas dos estudantes, aos motivos de consumos etílicos e ao ambiente social como parte integrante dos comportamentos de consumo apresentados pelos estudantes.

*Palavras-Chave:* consumo de álcool, consumo de tabaco, policonsumos, comportamentos de consumo, abuso de substâncias, estudantes do ensino superior

Psychology, Community & Health, 2020, Vol. 8(1), 158–175, <https://doi.org/10.5964/pch.v8i1.304>

Received: 2018-09-30. Accepted: 2019-06-12. Published (VoR): 2020-04-07.

Handling Editor: Alexandra Ferreira-Valente, William James Centre for Research (WJCR), ISPA-Instituto Universitário, Lisbon, Portugal

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College represents a time of transition, where young adults, especially university students, are under a varied process of changes (Baer, Kivlahan, & Marlatt, 1995), such as the development of their autonomy and independence, the development of their personality (Arnett, 2000), the separation from their family environment and from their friends from high school, the changes in the composition of the social network (Meisel & Barnett, 2017) and the need to feel belonged in a new and unfamiliar environment, developing their social identity (Rimal & Real, 2005). At a favourable academic environment, where the consumption of tobacco products, alcoholic beverages, and illicit substances are common (Lipari & Jean-Francois, 2016; Skidmore, Kaufman, & Crowell, 2016), the changes on students' social environment may have a role on students consumption behaviours and intentions, alongside the peer influence (McGloin, Sullivan, & Thomas, 2014).

The consumption of tobacco products, like cigarettes, leads to short and long-term health, economic and social consequences (World Health Organization, 2017). Also, alcohol and illicit substances consumption, like cannabis, the illicit substance with higher prevalence of consumption among university students (Lipari & Jean-Francois, 2016), are linked to poor academic performance, absenteeism, memory and attention impairment (Houston et al., 2014; White & Hingson, 2013) and financial and authority problems (Bono, Barnes, Dick, & Kendler, 2017).

Taking into account the mortality and morbidity attributable to alcohol, tobacco and illicit drug use (McGinnis & Foege, 1999; Single, Robson, Rehm, Xie, & Xi, 1999), the evidence suggests the pertinence of the understanding of the consumption determinants/factors on these populations in order to improve and prevent the development of social, financial and health negative outcomes (Gates, Sabioni, Copeland, Le Foll, & Gowing, 2016; McKee & Weinberger, 2013).

Substance consumption, like tobacco products, such as cigarettes, and alcoholic beverages, among university students, as well Type A polydrug (consumption of both alcohol and cigarettes) (European Monitoring Centre for Drugs and Drug Addiction, 2009) are common (Martin, Clifford, & Clapper, 1992). At this academic environment, students tend to drink more often while smoking and smoke three times more in average, during drinking episodes (Witkiewitz et al., 2012). Moreover, at academic environment students present an higher risk for substance involvement (e.g. heavy drinking) (Prendergast, 1994). In Portugal, according to the National Health Survey 2014 (Inquérito Nacional de Saúde 2014), (Instituto Nacional de Estatística, 2016), a prevalence of 20.0% of smokers were 15 years old or older and 16.7% smoked daily.

Alcohol consumption is influenced by a variety of cultural norms, which are framed by beliefs, attitudes, and behaviours (Grønkjær, Curtis, De Crespigny, & Delmar, 2011), understanding what motivate university students to drink is important to identify and prevent alcohol-related problems (Neighbors, Larimer, Markman Geisner, & Knee, 2004). There have been identified four factors that can explain drinking engagement: enhancement, coping, social and conformity factors (Cooper, 1994). Furthermore, peer pressure for alcohol consumption, represents a combination of different influences: evidence shows that descriptive (perception about peers drinking behaviours) and injunctive norms (perception about peers' approval relating to drinking behaviours), explicit offers of alcohol (e.g. polite gestures, intense provoking and orders to drink) and modelling (e.g. when a student's behaviour agrees with another student's concurrent drinking behaviour) (Borsari & Carey, 2001).

Thus, with this paper, we aim to describe alcohol, tobacco and type A polydrug consumption social factors among university students, i.e. how smoking and drinking consumption of parents and friends influence the student's own consumption of alcohol, cigarettes and Type A Polydrug.

## Method

### Participants and Procedures

A cross-sectional study was performed. Graduate students from a central region Portuguese university, during the academic year of 2016/2017, composed the convenience sample. The inclusion criteria were: i) being between 18 and 27 years old, due to the fact it represents the first and second transformation stages of the young adult, when they build their own identity, autonomy and life goals (Hoffman, Paris, & Man, 1994) and ii) being a graduate student.

For the present study, before data analysis, the authors assessed the minimum number of participants required to conduct multivariate logistic regression models. Therefore, according to the review of Wilson Van Voorhis and Morgan (2007), there should be a minimum of 10 participants per predictor for regression equations using six or more predictors. The sample in the present paper is higher than the minimum assessed by this rule of thumb.

Through a convenience sampling, a 400 sample of students was composed during the period from February to May of 2017. From these, there were excluded the questionnaires that had missing answers (which were important to be assessed to respond to the aim of the present study), obtaining a total of 338 students with valid questionnaires. A sample of 51.8% male students was constituted, with a mean age of 20.6 years ( $SD = 3.4$ ) and a proportion of 54.9% and 65.9% of tobacco and alcohol consumption respectively (Table 1).

Before the data collection, ethical approval was obtained by the Scientific Commission of the Education and Psychology Department of the University of Aveiro – Portugal, and all participants provided written informed consent. It was asked permission by the authors in order to applicate the DN-DABQ and IN-DABQ (Meisel, Colder, & Read, 2016) and the Portuguese version of the Drinking Motives Questionnaire – Revised (DMQ-R) (Fernandes-Jesus et al., 2016).

## Measures

Data was collected using a self-reported questionnaire. Sociodemographic, substance consumption and behaviours variables composed the questionnaire.

Gender, age, perception of health status (on a Likert scale 1 – poor; 5 – very good), having a chronic health condition (no/yes), self-medication (no/yes), perception about their eating habits (on a Likert scale 1 – poor; 5 – very good), do physical exercise (no/yes) and physical exercise frequency (< 1 time per week; 1 time per week; 2 to 4 times per week; 5 or more times per week) were asked on sociodemographic section of the questionnaire.

Regarding the students' social context about alcohol and tobacco consumption, having a parent who drinks/smoke or has ever drunk/smoked (no/yes) and having friends who drink/smoke (no/yes) were asked.

Table 1

*Descriptive Analysis of Sociodemographic, and Alcohol and Tobacco Consumption Variables*

Question (Variable) / Description	Missings (n)	n (%)
<b>Gender</b>		
Male	0	175 (51.4)
Female		163 (48.2)
<b>Age</b>		
< 19 years	2	65 (19.3)
[19;21[ years		139 (41.4)
≥ 21 years		132 (39.3)
<b>Having a parent who drinks or has ever drunk</b>		
No	3	38 (11.3)
Yes		297 (88.7)
<b>Having a parent who smokes or ever smoked</b>		
No	4	132 (39.5)
Yes		202 (60.5)
<b>Having a friend who drinks</b>		
No	0	6 (1.8)
Yes		332 (98.2)
<b>Having a friend who smokes</b>		
No	2	21 (6.3)
Yes		315 (93.8)
<b>Physical exercise<sup>a</sup></b>		
No	2	93 (27.7)
Yes		243 (72.3)
<b>Frequency (times per week)</b>		
≤ 1	63	115 (41.8)
≥ 2		160 (58.2)

Question (Variable) / Description	Missings (n)	n (%)
<b>Substance consumption</b>		
<b>Being currently a smoker</b>		
No	1	152 (45.1)
Yes		185 (54.9)
<b>Nicotine dependence (Fagerström test)</b>		
Low	140 <sup>b</sup>	42 (93.3)
High		3 (6.7)
<b>Currently drinking consumption behaviours</b>		
No	15	110 (34.1)
Yes		213 (65.9)
<b>Alcoholic beverages consumption frequency</b>		
Never	18	33 (10.3)
≤ 1 time per week		176 (55.0)
2-3 times per week		44 (13.8)
≥ 4 times per week		6 (1.9)
1-2 times per month		48 (15.0)
3-4 times per month		13 (4.1)

<sup>a</sup>Including walk, run or do specific sports. <sup>b</sup>From those who smoke.

Concerning alcohol and tobacco consumption variables, it was assessed the students nicotine dependence ( $\geq 6$  heavy/high dependence), through the Portuguese version of the Fagerström Test (Nunes et al., 2007), is currently a smoker/drinker (no/yes) and age at which smoked/drank for the first time. Also, it was asked if ever tried cannabis (no/yes) and if they are currently consumers (no/yes). In this study, the Fagerström Test presented an adequate internal consistency (Cronbach's  $\alpha = .651$ ). Type A polydrug consumption is an *a posteriori* variable, computed as No – when the students do not present concurrent consumption and Yes – when is present the consumption of both alcohol and cigarettes, agreeing with the definition of the European Monitoring Centre for Drugs and Drug Addiction (2009).

In order to assess alcohol, tobacco and cannabis involvement, it was used the Portuguese version of the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST; Direccção-Geral da Saúde, 2014; World Health Organization, 2010). In the present sample, internal consistencies ranged between .556 and .842 (Cronbach's  $\alpha$ ). Students' motives to drink were assessed by the Portuguese version of the Drinking Motives Questionnaire – Revised (DMQ-R) (Fernandes-Jesus et al., 2016). On our sample, there were observed adequate internal consistencies ( $.748 \leq$  Cronbach's  $\alpha \leq .902$ ). This questionnaire is composed by 18 items, and is rated on a Likert scale ranging from 1 (almost never/never) to 5 (almost always/always).

With the intention to describe descriptive and injunctive norms (DN and IN respectively) regarding drinking behaviours, it was used the Portuguese version of the Drinking and Abstaining Behaviours Questionnaire (DABQ), where students completed the DN-DABQ and the IN-DABQ for 3 reference groups (typical college student, friends, and closest friends) (Meisel, Colder, & Read, 2016). For the DN-DABQ, participants were instructed to select the number of times a reference group engages each behaviour and reason for abstaining. For the IN-DABQ, students rated on a scale from 1 (strongly disapprove) to 7 (strongly approve) on how much a reference group approved the same reasons for drinking behaviours and reasons for abstaining. In the present study, there were observed internal consistencies ranging from .765 to .891 and .675 to .869, respectively DN and IN different factors.

## Data Analysis

The score for each subscale of DMQ-R and DABQ were computed into an ordinal scale ranging between 0 and 100.

Spearman's correlation coefficients ( $r_s$ ) were assessed to measure the strength and direction of the association between sociodemographic and substance consumption variables. To evaluate type A polydrug consumption, multivariate logistic regression models were performed. For data analysis, a significance level of .05 was used.

## Results

In this section, in order to describe smoking, drinking and Type A polydrug consumption factors, there were analysed the strength of the statistically significant correlations, guided by the Rule of Thumb for interpreting the size of a correlation coefficient (Hinkle, Wiersma, & Jurs, 2003): negligible (.00 to .29), low (.30 to .49), moderate (.50 to .69), high (.70 to .89) and very high (.90 to 1.00). Moreover, to assess type A polydrug consumption sociodemographic predictors, Odds Ratio from multivariate logistic regression models will be analysed.

### Smoking-Related Factors

Concerning smoking consumption (see Table 2), a moderate positive correlation was observed between smoking and tobacco involvement. Additionally, low correlations were observed between smoking with cannabis involvement and enhancement drinking motives. Negligible correlations, despite its statistical significance, were observed between smoking with age, having a parent who smoked or ever have smoked, having a smoker friend, age at which drank for the first time, frequency of physical exercise, alcohol involvement, coping, conformity and social drinking motives, and who present higher levels on drinking behaviours descriptive norms regarding friends and closest friends referent group; and those who present higher levels on drinking behaviours injunctive norms regarding friends and closest friends referent group.

### Drinking-Related Factors

About alcohol consumption among university students, there were observed low significant correlations (Table 2), with being male students, having a parent who drinks or ever have drank, having friends who smoke, poor eating habits and students who drank younger for the first time are those students who present drinking habits. Additionally, students who present drinking habits are those students who present higher levels on enhancement, coping, conformity and social drinking motives, who present lower levels on descriptive norms for reasons from abstaining from drinking regarding friends referent group, and students who present higher levels on drinking behaviours injunctive norms regarding friends and closest friends referent group.

### Polydrug (Tobacco and Alcohol) Sociodemographic Factors

Concerning type A polydrug (engage with both alcohol and cigarettes) (European Monitoring Centre for Drugs and Drug Addiction, 2009), it was observed a moderate correlation with tobacco involvement and lower correlations were observed with cannabis involvement and enhancement drinking motives (Table 2).

Table 2

*Spearman's Rank-Order Correlation Between Sociodemographic Variables With Smoking, Drinking and Type A Polydrug Consumption*

Question (Variable)	Substance consumption		
	Smoking	Drinking	Type A polydrug
Gender	.011	-.115*	.008
Age	.126*	.014	.114*
Having a parent who drinks or has ever drunk	.049	.206**	.068
Having a parent who smokes or ever have smoked	.149**	.080	.160**
Have a friend who drinks	.027	.068	.072
Have a smoker friend	.115*	.211**	.139*
Perception of health status	-.038	.017	-.036
Health chronic condition	.004	.042	-.008
Self-medication	.073	.081	.076
Eating habits	-.034	-.116*	.002
Age at which drank alcoholic beverages for the first time	-.190**	-.166**	-.217**
Age at which smoked for the first time	.148*	.002	-.054
Do physical exercise	.082	-.052	.094
Physical exercise frequency	-.169**	-.106	-.166**
Tobacco involvement (cigarettes)	.540**	.079	.547**
Alcohol involvement	.294**	.163**	.294**
Cannabis involvement	.350**	.055	.349**
Enhancement drinking motives	.361**	.244**	.366**
Coping drinking motives	.233**	.142**	.236**
Conformity drinking motives	.211**	.220**	.215**
Social drinking motives	.265**	.247**	.271**
DN of DB TS	.063	.003	.066
DN of RAD TS	-.056	-.090	-.053
DN of DB F	.119*	.010	.118*
DN of RAD F	-.047	-.114*	-.044
DN of DB CF	.112*	.108	.129*
DN of RAD CF	-.088	-.107	-.085
IN of DB TS	-.016	.016	-.024
IN of RAD TS	.009	-.015	.019
IN of DB F	.119*	.133*	.125*
IN of RAD F	-.050	-.042	-.052
IN of DB CF	.181**	.140*	.188**
IN of RAD CF	-.091	-.042	-.093

*Note.* TS = Typical Student; F = Friend; CF = Closest Friends; DN = Descriptive Norms; IN = Injunctive Norms; DB = Drinking Behaviors; RAD = Reasons from Abstaining from Drinking.

\* $p \leq .05$ . \*\* $p \leq .01$ .

## Tobacco and Alcohol Involvement Factors

Regarding tobacco involvement, moderate correlations were observed with alcohol and cannabis involvement, and lower correlations with enhancement, coping and social drinking motives. Furthermore, despite its negligible strength of correlation, there were observed significant correlations between tobacco involvement with students who have a parent who smokes or ever have smoked; who have a smoker friend; who were younger when drank for the first time; who engage drinking for conformity drinking motives; who present higher levels of descriptive norms for drinking behaviours regarding for friends and closest friends reference group; and have higher levels of injunctive norms for drinking behaviours regarding friends and closest friends reference group.

Concerning alcohol involvement, it was observed a moderate correlation with tobacco involvement and lower significant correlations with cannabis involvement, and enhancement, coping, conformity and social drinking motives. Moreover, despite its negligible strength of the correlation, there were observed significant correlations with students who have friends who drink; have higher levels of descriptive norms for drinking behaviours regarding friends and closest friends reference group; have higher levels of injunctive norms for drinking behaviours regarding friends and closest friends reference group. Also, it was verified a negative significant association between alcohol involvement with eating habits, with being younger when drank for the first time and with lower levels of injunctive norms reasons from abstaining from drinking regarding closest friends (Table 3).

Table 3

*Spearman's Rank-Order Correlation Between Sociodemographic Variables With Tobacco and Alcohol Involvement*

Question (Variable)	Substance involvement	
	Tobacco (cigarettes)	Alcohol
Gender	-.058	-.059
Age	.021	-.021
Having a parent who drinks or has ever drunk	.046	.010
Having a parent who smokes or ever have smoked	.140*	.059
Have a friend who drinks	.040	.156**
Have a smoker friend	.123*	.055
Perception of health status	-.066	-.063
Health chronic condition	-.015	.021
Self-medication	-.049	.001
Eating habits	-.025	-.118*
Age at which drank alcoholic beverages for the first time	-.140*	-.126*
Age at which smoked for the first time	-.096	-.012
Do physical exercise	-.023	.060
Physical exercise frequency	-.081	-.061
Tobacco involvement (cigarettes)	---	.511**
Alcohol involvement	.511**	---
Cannabis involvement	.542**	.423**
Enhancement drinking motives	.345**	.394**
Coping drinking motives	.355**	.353**
Conformity drinking motives	.235**	.289**
Social drinking motives	.312**	.349**
DN of DB TS	.004	.045
DN of RAD TS	.013	-.015
DN of DB F	.121*	.136*



Question (Variable)	Substance involvement	
	Tabacco (cigarettes)	Alcohol
DN of RAD F	.017	-.026
DN of DB CF	.160**	.237**
DN of RAD CF	-.024	.029
IN of DB TS	-.030	.101
IN of RAD TS	.063	-.084
IN of DB F	.174**	.209**
IN of RAD F	-.048	-.110
IN of DB CF	.248**	.296**
IN of RAD CF	-.074	-.124*

Note. TS = Typical Student; F = Friend; CF = Closest Friends; DN = Descriptive Norms; IN = Injunctive Norms; DB = Drinking Behaviors; RAD = Reasons from Abstaining from Drinking.

\* $p \leq .05$ . \*\* $p \leq .01$ .

## Polydrug (Tobacco and Alcohol) Sociodemographic Predictors

Regarding sociodemographic predictors on type A polydrug consumption, multivariate logistic regression models were performed. It was verified that students who have parents ( $OR = 1.948$ , 95% CI [1.789, 3.222]) and friends ( $OR = 2.924$ , 95% CI [1.038, 8.236]) who smoke and students who do physical exercise, without considering the frequency of this activity ( $OR = 1.947$  95% CI [1.133, 3.345]), are more likely to drink and smoke, when adjusted for age, gender, enhancement, social, conformity and coping drinking motives. Hence, concerning physical activity, taking into account of the frequency that students do physical exercise, in this model, it was verified that the physical exercise frequency presents a protective effect, this is, students who do physical exercise more frequently, are less likely to drink and smoke ( $OR = 0.539$  95% CI [0.304, 0.958]) (Table 4).

Table 4

Relations Between Type A Polydrug Consumption With Sociodemographic Characteristics (N = 338)

Variable	Model 1 <sup>a</sup>		Model 2 <sup>b</sup>	
	OR	95% CI [LL, UL]	OR	95% CI [LL, UL]
<b>Having a parent who drinks or ever drank</b>				
No	1		1	
Yes	1.544	[0.777, 3.068]	1.218	[0.569, 2.610]
<b>Having a parent who smokes or ever smoked</b>				
No	1		1	
Yes	1.933	[1.222, 3.056]	1.948	[1.178, 3.222]
<b>Having a friend who drinks</b>				
No	1		1	
Yes	3.068	[0.543, 17.314]	1.718	[0.273, 10.805]
<b>Having a friend who smokes</b>				
No	1		1	
Yes	3.563	[1.370, 9.267]	2.924	[1.038, 8.236]
<b>Physical exercise<sup>c</sup></b>				
No	1		1	
Yes	1.651	[1.000, 2.726]	1.947	[1.133, 3.345]

Variable	Model 1 <sup>a</sup>		Model 2 <sup>b</sup>	
	OR	95% CI [LL, UL]	OR	95% CI [LL, UL]
<b>Frequency (times per week)</b>				
≤ 1	1		1	
≥ 2	0.501	[0.295, 0.853]	0.539	[0.304, 0.958]

Note. LL = lower limit; UL = upper limit.

<sup>a</sup>Adjusted for age and gender. <sup>b</sup>Model 1 plus enhancement, social, conformity and coping drinking motives. <sup>c</sup>Including walk, run or do specific sports.

## Discussion

With this study, it was possible to verify significant correlations between tobacco consumption with cannabis involvement and enhancement drinking motives. Additionally, despite of the lower effect size, alcohol involvement and coping, conformity and social drinking motives were significantly correlated with smoking behaviours. Concerning the consumption of alcoholic beverages, there were observed relations with students' social environment (having a parent who drinks or has ever drunk, and having a smoker friend), and with enhancement, conformity and social drinking motives. On behalf of type A polydrug consumption, tobacco, alcohol, and cannabis involvement, as well as drinking motives were the factors with higher correlation. Also, negative correlations were found between this type of polydrug with the age at which students drank alcohol for the first time.

About alcohol and tobacco involvement, all drinking motives, cannabis involvement, tobacco involvement (for alcohol consumption), alcohol involvement (for tobacco consumption) were correlated with this involvement of substances. As well, despite the low effect size, tobacco and alcohol involvement were significantly correlated with descriptive norms regarding drinking behaviours for Friends and Closest Friends reference groups; and with injunctive norms of drinking behaviours regarding the same reference groups. Also, a negative association between alcohol involvement with reasons from abstaining from drinking regarding injunctive norms for closest friends was observed.

Concerning type A polydrug factors, students who have a parent/friend who smokes or ever have smoked, and practice physical exercise are more likely to polydrug consumption. However, the frequency of the physical exercise was presented as a protective factor, where students who engaged in physical exercise more often were less likely to present polydrug consumption.

At the academic environment, students present socially smoking behaviours, alcohol (Nolen-Hoeksema, 2004) and illicit substances consumption (e.g. cannabis) (Davoren, Shiely, Byrne, & Perry, 2015), as well as type A polydrug (McKee, Hinson, Rounsaville, & Petrelli, 2004) consumption behaviours.

Focusing on socioenvironmental factors, the age at one consumed a substance for the first time was associated with the use of specific substances (tobacco, alcohol or Type A polydrug), agreeing with the results from other studies (e.g. Hingson, Heeren, & Edwards, 2008). Also, about parental and friends' smoking behaviours with students' tobacco consumption behaviours, the evidence showed a combination of significant and non-significant associations (Lochbuehler, Schuck, Otten, Ringlever, & Hiemstra, 2016; Schultz, Nowatzki, & Ronson, 2013). However, our findings are similar to other studies, where parental and friends' smoking

attitudes were associated with smoking (Mak, Ho, & Day, 2012; McGinnis & Foege, 1999; Weiss & Garbanati, 2004). Regarding parental drinking behaviours and have a smoker friend were associated, in the present sample, with drinking behaviours. Other studies verified that parental smoking and drinking were associated with their offspring alcohol consumption (Engels, Knibbe, De Vries, Drop, & van Breukelen, 1999; McGinnis & Foege, 1999). Also, the relation observed between having a smoker friend with alcohol consumption may be due to a peer selection effect, as students nominated others as friends, based on their tobacco and alcohol consumption and by the fact that students may adapt, their drinking behaviours, to those friends (Wang, Hipp, Butts, Jose, & Lakon, 2016). However, pre-existing risky behaviours predict the closeness of their friendships (Eisenberg, Golberstein, & Whitlock, 2014).

In this context of peer selection effect, the quality of the peer relationships can influence drinking behaviours of the students due to the lack or breakdown of the quality of the relationships, to the alcohol consumption being part of peer interactions and to peers disapproval or agreement about alcohol consumption (Borsari & Carey, 2006). Also, drinking behaviours could be influenced by the perceived approval or disapproval of drinking behaviours of their peers (injunctive norms) and by the perception of peers' consumption behaviour (descriptive norms) (Cialdini, Reno, & Kallgren, 1990). Therefore, socioenvironmental factors like parental and friends consumption of alcohol and/or tobacco may influence students behaviours by social or differential reinforcement and modelling (when acquiring new behaviours by observing others) (Maisto, Carey, & Bradizza, 1999).

Regarding descriptive and injunctive norms for drinking behaviours and behaviours from abstaining from drinking, the proximity of the reference group to the student could explain the association observed between alcohol consumption involvement with descriptive and injunctive norms on drinking behaviours regarding friends and closest friends reference groups (Collins & Spelman, 2013; LaBrie, Hummer, Neighbors, & Larimer, 2010; Neighbors et al., 2008). Also, the evidence shows that students overestimate their peers' consumption behaviours and attitudes regarding frequency and amount of alcohol consumption (Borsari & Carey, 2001). This overestimation on students' norms, alongside the existence of polydrug among university students (Lee, Corte, & Stein, 2018) may explain the association, in the present sample, between descriptive and injunctive norms and the different drinking motives with tobacco consumption and tobacco involvement, where smoker students present higher levels of alcohol use, as well as being more likely to smoke to enhance reinforcement from alcohol (McKee et al., 2004).

Concerning the observed relations between cannabis involvement with tobacco/alcohol consumption and type A polydrug behaviours, the evidence showed that these consumptions are not independent with the reference group (Hernández-Serrano, Font-Mayolas, & Gras, 2015) and part of the substance's involvement could be explained by environmental factors, specially the exposure to situations where consumption is present (Myers, Doran, Edland, Schweizer, & Wall, 2013). For instance, one study showed that heavy drinking can occur when cannabis is used (Metrik, Gunn, Jackson, Sokolovsky, & Borsari, 2018) and smoker students present higher levels of alcohol use (McKee et al., 2004).

As for health behaviours and attitudes of the students on substance consumption, there are different studies suggesting significant and non-significant associations between physical activity and alcohol consumption (Buscemi, Martens, Murphy, Yurasek, & Smith, 2011; Niedermeier, Frühauf, Kopp-Wiifling, Rumpold, & Kopp, 2018). Physical activity decline is evident during young adults' transition into early adulthood, individuals

tend to increase several health risk behaviours, like binge-drinking and smoking (Kwan, Cairney, Faulkner, & Pullenayegum, 2012). The present findings may be explained by the Cognitive Dissonance (having the knowledge of the consequences from some behaviour and the contradictory desire do that specific behaviour) (Festinger & Carlsmith, 1959; Gleitman, Gross, & Reisberg, 2011; Rosenfeld, Giacalone, & Tedeschi, 1984) and the Compensatory Health Beliefs model, where students' beliefs about the negative effects regarding substance use can be compensated by engaging in a behaviour which they consider healthy (Rabia, Knäuper, & Miquelon, 2006).

Substance consumption appears to be a complex phenomenon, influenced by students' social network characteristics (DiGuseppi et al., 2018), e.g. parents and peers consumption. Thus, as suggested by Chung and Rimal (2016), it is imperious to developed studies designed to test the causal relationship between social norms and behaviours, and also, future research should be developed in order to explore the theoretical structure of the substance's consumption behaviours and their associated factors, through exploratory and confirmatory factor analysis, in Portuguese university students.

## Implications

The present results could be used to better develop, improve and manage interventions, such as health educational or psychoeducational interventions, designed and aimed to improve consumption behaviours, to demystify perceptions of students about descriptive and injunctive norms and to enhance and empower students' intentions to consume by addressing and involving their social environment concerning consumption behaviours.

Moreover, the better knowledge of the consumption factors will help healthcare workers and educators to intervene with those who are at higher risk, through the development of health strategies and policies focusing on students enhancement health-related behaviours (Grønkjær et al., 2011). In Portugal, evidence has shown that changes in rules and laws are desirable, as they lead to changes in students' social norms, regarding smoking behaviours (Luís & Palma-Oliveira, 2016). In this context, an interdisciplinary action, regarding students' consumption policies, should not be disregarded, considering that the conjoint efforts, between policymakers and health care workers, are found to be relevant and imperious, and can present a pertinent role on public policies (Wallace, 2007),

## Limitations

There are several limitations to this study and the findings should be interpreted in the context of a cross-sectional study. Tobacco, alcohol, cannabis consumption, substance involvement, drinking motives and descriptive and injunctive norms for drinking and abstaining behaviours from drinking were entirely self-reported. By applying the Drinking and Abstaining Behaviours Questionnaire (Meisel, Colder, & Read, 2016) to assess descriptive and injunctive norms, students had to answer to the same item for three different reference groups and the possibility of a not well-established definition, at that point of the time, of their social network (what is and who consider typical college student, friend, and closest friend), could increase the students' difficulty to answer the questionnaire. Nevertheless, our results are consistent with what was found in other studies concerning the relation between drinking behaviours with both descriptive and injunctive norms (Arterberry, Smith, Martens, Cadigan, & Murphy, 2014; Fitzpatrick, Martinez, Polidan, & Angelis, 2015; Rimal & Real, 2005).

Furthermore, it was not assessed the consumption behaviour of these students, regarding alcohol, tobacco and type A polydrug consumption, which could have an influence of their consumption as university students, as suggested by other studies (Hoeppner, Bidwell, Colby, & Barnett, 2014; Monteiro et al., 2018).

Additionally, the sensitive nature of the questions could lead to a social desirability bias (Bryman, 2012), where it could exist the possibility for the students give socially desirable responses, instead of answers that are reflective of their behaviours. This bias represents a major issue when the scope of the study involves socially sensitive issues such as substance consumption (Grimm, 2010). In this study, it was not possible to evaluate the presence of this bias, despite our results agree with other research, as mentioned in the discussion. However, future studies should include social desirability scales to detect and control for bias, as suggested by van de Mortel (2008).

## Conclusion

With this study it was possible to verify the relation between substance consumption with environmental factors, where is observed moderate associations with substance involvement and drinking motives and weakly associations with parental and friend consumption behaviours and, the proximity of the reference group for descriptive and injunctive norms of drinking behaviours. Also, weak associations were found between substance consumption with sociodemographic factors: age, age at which students consumed for the first time, physical exercise and its frequency. Findings suggest that substance interventions may need to address descriptive and injunctive norms of proximal reference groups, drinking motives and social environment concerning consumption behaviours as part of substance consumption and involvement of the students.

## Funding

The authors have no funding to report.

## Competing Interests

The authors have declared that no conflict of interest exist.

## Acknowledgments

The authors would like to thank to Cláudia Abreu (Universidade de Aveiro), Sara Lima (Instituto Português do Sangue e da Transplantação, IP) and Mário Pereira (Centro Hospitalar do Porto, EPE) for their availability to perform the linguistic revision of this manuscript.

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