Attitudes are associated with the drug use profiles of middle school adolescents: A latent class analysis

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ABSTRACT

The association between positive and negative attitudes and drug use profiles is examined. Participants were public middle school students ($N = 5213$; 49.9% girls; M age= 13.2 years) in three Brazilian cities. Analysis was performed using baseline surveys of a randomized controlled trial of the *#Tamojunto2.0* drug use prevention program. We validated the attitudes construct via a confirmatory factor analysis and performed a simultaneous multinomial regression with a latent class analysis. Three latent classes were identified: abstainers/low users (ABS) (63.4%), alcohol users/binge drinkers (ALC) (29.5%), and polydrug users (POL) (7.1%). An association gradient was found between attitudes and latent classes. Using ABS as reference, a direct association was identified between positive attitudes and ALC and POL. An inverse association was found between negative attitudes and POL only. Girls and older students were more likely to be ALC and POL. These findings, from a large probabilistic sample, provide guidance that drug use prevention programs should focus on deconstructing positive attitudes -mainly- and broadening negative attitudes, and should adapt their thematic content by considering the differential drug use possibilities among girls and older students.

1. Introduction

The global burden of disease attributable to the consumption of alcohol and other drugs is currently a serious health problem worldwide, with people aged between 10 and 29 years being the most affected (Whiteford et al., 2013). In this regard, adolescence has been indicated as a critical phase for the beginning and continuity of the consumption of licit and illegal substances (Kaminer, 2010), since its consumption during this stage increases the risk of dependence (Lopes et al., 2013), cognitive compromise (Meier et al., 2012), and other psychiatric conditions (James et al., 2013).

Considering that drug use initiation typically occurs during adolescence, it is very important to design effective school-based interventions to prevent substance use and delay the onset thereof. Several studies have indicated that the most effective school-based drug prevention programs address ways to resist the social influence of consumption (*e.g.*, inter- and intrapersonal skills), behavioral intention predictors (*e.g.*, attitudes and subjective norms) (Faggiano et al., 2014; Guo et al., 2015), active work methodology (allowing new skills to be tested), and are applied by teachers with the participation of students' peers (Fernández et al., 2002).

The *Tamojunto2.0* School-Based Drug Prevention Program (the second Brazilian version of the European program *Unplugged*) considers these aspects (Vadrucci et al., 2015). *Unplugged* has demonstrated effectiveness, mainly in reducing alcohol and marijuana use among European adolescents (Agabio et al., 2015; Faggiano et al., 2008; Gabrhelik et al., 2012). To evaluate the effectiveness of *Tamojunto2.0*, a controlled parallel-group cluster randomized trial was proposed (Sanchez et al., 2019). In this study, we present an analysis of the baseline data of that trial, focusing on attitudes toward drug use information.

Attitudes constitute one of the behavioral intention predictors and main mediators of the effect of the programs (Vadrucci et al., 2015). Therefore, for the purposes of this study, we define the term "attitudes" as a subjective evaluation of the consequences of a certain behavior (in this case, drug use consequences). This evaluation can be expressed as favorable or unfavorable, indicating how positively or negatively the behavior is valued after balancing the beneficial and dangerous consequences thereof (Ajzen and Fishbein, 2000; Fishbein and Ajzen, 1975; Hale et al., 2002; Vadrucci et al., 2015).

Attitude measures have been used to analyze the determinants of drug use and as a mediating variable of the effect of prevention programs. A direct association between positive attitudes toward drug use

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and drug use has been consistently identified (Atkins et al., 1987; Cabriales et al., 2013; Noonan et al., 2011; Sidani et al., 2013; Taremian et al., 2018). The need to address the issue of changing attitudes within the curricular content of drug use prevention programs has also been established (Kolp et al., 2018; Stephens et al., 2009). However, most studies of the subject do not consider the association between attitudes and the multiple patterns of drug use among adolescents, thereby failing to capture the complexity involved in the heterogeneity of drug use, which can be identified through latent classes.

Our general objective was to analyze the association between positive and negative attitudes and drug use latent classes, considering sociodemographic variables. We define the following three specific objectives to address the main objective: 1) to validate attitudes toward the drug use scale and its two latent dimensions; 2) to identify latent drug use profiles; and 3) to analyze the associations between the two attitude dimensions (positive and negative) and drug use profiles.

2. Material and methods

2.1. Study design

This study reports a cross-sectional survey that analyzed the baseline data of a cluster randomized controlled trial designed to evaluate the effectiveness of the *Tamojunto 2.0* program. This trial was registered in the Brazilian Registry of Clinical Trials (REBEC) under the number RBR-8cnkwq (the REBEC structure of contents is similar to all other national official registers of clinical trials as described by Freitas et al. (2015)). The protocol was approved by the Universidade Federal de São Paulo's Research Ethics Committee (protocol #2,806,301) and the Ethics Committee of the Municipal Health Secretariat (protocol #3,099,865) (Sanchez et al., 2019).

2.2. Population and sample size

The sample in this study comprised students in the 8th grade of public schools in three Brazilian cities: São Paulo, Fortaleza, and Eusébio. In each of the participating municipalities, 16 or 32 schools were randomly selected (according to the size of the city) from all officially registered public middle schools. In each school, all 8th-grade classes were included in the study. The school acceptance rate was 93.6% (78 schools were invited), and considering the enrollment registers, the presence of 6993 students in the participating classes was expected. However, 5371 students were presented, of whom 123 refused to participate (refusal rate of 2.2%), although the number of students absent on the day of collection represented 23% of the students enrolled in these classes. Questionnaires that were positive for the lifetime use of a fictional drug (Holoten and Carpinol) were excluded from the analysis ($n = 35$). The final sample size at the baseline included 73 schools, 205 classes, and 5213 valid questionnaires. Details of the study design and a flowchart of the sampling were presented in a prior publication (Sanchez et al., 2019).

2.3. Instrument

The data were collected through an anonymous questionnaire completed by the participants and administered by researchers without a teacher in the classroom. The questionnaire was developed by the European Union Drug Abuse Prevention Program (EU-Dap) (EU-Dap, 2004a), and was used in previous studies on the effectiveness of *Unplugged* (Faggiano et al., 2008) and the first edition of *#Tamojunto* (Sanchez et al., 2017). The translated Portuguese version used in Brazil was adapted and supplemented with questions from two questionnaires that have been widely used in many studies of Brazilian students (Carlini et al., 2010; IBGE, 2010).

2.4. Variables

The dependent variables were the lifetime use of alcohol, tobacco, inhalants, marijuana, cocaine, crack, and binge drinking (the consumption of five or more doses of alcohol in two hours (Kraus et al., 2016)). Questions were formulated dichotomously (*Yes/No*); for example, "Have you ever tried an alcoholic drink? For example, beer, draft beer, ice, wine, pinga, caipirinha, batidas, cider, or other."

The independent variables were sex, age, socioeconomic status, and attitudes toward drug use. Students' socioeconomic class was assessed using the scale of the Brazilian Association of Research Companies (ABEP), which varies from 1 to 100 points and considers the education level of the head of the household and the goods and services used, with categories ranging from A (highest) to D/E (lowest) (ABEP, 2018). The data relating to attitudes toward drug use were collected through a scale developed by the EU-Dap (EU-Dap, 2004b). This instrument defines the attitudes construct with two correlated dimensions: negative attitudes (attitudes that reflect a dislike of drug use) and positive attitudes (attitudes that reflect a certain level of acceptance of drug use). It is important to note that this scale measures attitudes toward all drugs, and is structured to have six items for negative and five for positive attitudes. The items were scored dichotomously (*I agree/I disagree*), as shown in Table 1.

2.5. Statistical analysis

Our analysis consisted of the four steps detailed below. Mplus version 7 was used for all analysis models (Muthén and Muthén, 2012).

2.5.1. Step 1: descriptive and exploratory analysis

For the descriptive analysis, we calculated the sociodemographic characteristics of the participants and the prevalence of attitudes. As an exploratory analysis, we showed the weighted results (estimated through sampling weights) of univariate and multivariate logistic regressions to evaluate the association between each attitude and each drug experienced to observe statistical trends between both variables.

The descriptive statistics are presented as weighted percentages (wgt %) based on post-stratification adjustments for nonparticipation and the expected population taken from the governmental school census. The results of the logistic regression are given as weighted odds ratios (cOR and aOR) with their *p*-values. The level of significance was set at 5%.

2.5.2. Step 2: confirmatory factor analysis

We used a confirmatory factor analysis (CFA) to confirm attitudes construct validity (EU-Dap, 2004a) and estimate two latent dimensions: positive and negative. To assess the factor loadings, we used the cutoff criteria proposed by Baker (2001). To evaluate the goodness of fit, we used the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error Approximation (RMSEA). The cutoff criteria for goodness of fit were a RMSEA near or less than 0.08, and CFI and TLI near or greater than 0.90 (Little, 2013).

2.5.3. Step 3: latent class analysis

We used a latent class analysis (LCA) to identify groups of adolescents with different profiles of drug use (alcohol, tobacco, inhalants, marijuana, cocaine, crack, and binge drinking). The enumeration process extracted from one to six classes, and to take into account the effects of multilevel sampling, the standard errors were corrected as described by Asparouhov (2006). We employed the school (second level) as a cluster variable.

The extraction of latent classes ceased when the inclusion of a class yielded little additional information. The model was adjusted based on the most consistent statistical (goodness of fit criterion) and conceptual distinctions between the groups (parsimony and interpretability of the classes). The fit indices used to choose the best statistical solution were the Akaike information criterion (AIC), Bayesian information criterion

Table 1

Sociodemographic characteristics and prevalence of attitudes about drug use of students participating in the baseline data collection of a study evaluating the *#Tamojunto2.0* school-based program, 2019 ($N = 5213$).

Variables	n	w% or mean	w95% CI
Sociodemographic characteristics			
City			
São Paulo	2376	58.53	[54.78;62.19]
Fortaleza	2051	30.37	[27.53;33.36]
Eusébio	786	11.10	[10.08;12.22]
Sex			
Boys	2578	50.06	[49.04;51.08]
Girls	2573	49.94	[48.92;50.96]
Age (years)			
11–12	647	10.76	[10.11;11.45]
13–14	4001	81.04	[79.79;82.23]
15–17	436	8.20	[7.33;9.16]
Average age		13.24±0.01	
Socioeconomic status (categorization of ABEP score)			
A (45–100)	179	3.91	[3.42;4.48]
B (29–44)	1282	27.18	[25.08;29.40]
C (17–28)	2809	54.03	[52.50;55.55]
D/E (1–16)	884	14.87	[13.45;16.42]
Average ABEP score		24.48±0.27	
Lifetime drug use			
Alcohol	2516	50.85	[49.55;52.14]
Binge drinking	1106	21.58	[20.72;22.45]
Inhalants	1026	19.68	[18.60;20.80]
Tobacco	614	11.58	[10.67;12.56]
Marijuana	424	8.41	[7.70;9.17]
Cocaine	36	0.69	[0.54;0.89]
Crack	14	0.23	[0.16;0.33]
Prevalence of attitudes about drug use			
Do you agree or disagree with the following statements about drug use?			
Negative attitudes	I disagree		
A young person should never try drugs	609	13.07	[12.23;13.95]
Everyone who tries drugs eventually regrets it	1210	25.66	[24.65;26.69]
The laws about illegal drugs should be made stronger	758	16.09	[15.20;17.02]
Drug use is one of the biggest evils in the country	1104	24.24	[22.94;25.59]
Schools should teach about the real hazards of taking drugs	664	13.43	[12.58;14.32]
To experiment with drugs is to give away control of your life	1311	27.97	[27.07;28.88]
Positive attitudes	I agree		
Using illegal drugs can be a pleasant activity	1448	30.78	[29.50;32.08]
Using drugs is fun	452	9.37	[8.78;9.99]
Many things are much more risky than trying drugs	3435	71.27	[70.21;72.31]
Drugs help people to have experience life in full	961	20.82	[19.97;21.70]
The police should not be annoying young people who are trying drugs	846	17.90	[17.10;18.74]

Abbreviations: "n": sample size; "w%": weighted percentages; "w95% CI": weighted 95% confidence intervals.

(BIC), sample-size-adjusted Bayesian information criterion (ssaBIC), Vuong-Lo-Mendell-Rubin LRT test (VLMR-LRT), and Lo-Mendell-Rubin adjusted LRT test (LMR adjusted LRT test). We used entropy to assess how well the best solution discriminated latent classes. Entropy is based on *a posteriori* probability and indicates the accuracy of the classification, such that values close to 1 indicate clear and precise classifications.

2.5.4. Step 4: multinomial logistic regression

Multinomial logistic regression was performed following the three-step approach technique for Mplus (Asparouhov and Muthén, 2014) to evaluate the association between latent drug use classes (response variable) and positive and negative attitudes (main explanatory variables, estimated via CFA). The control variables were sex, age, and socioeconomic status (ABEP score). Because of the low prevalence of crack use,

we eliminated it from the model. All variables were collected at during the baseline data collection phase and were therefore neither randomized nor influenced by the intervention.

Inferential estimates are given in odds ratios (ORs) with their respective 95% CI and *p*-values. The level of significance was set at 5%.

3. Results

3.1. Step 1: descriptive and exploratory analysis

Table 1 shows the sociodemographic characteristics and prevalence of attitudes about drug use among the surveyed students at the baseline ($N = 5213$). The proportion of boys (50.06%) was slightly higher than that of girls (49.94%). The adolescents were mostly aged 13–14 years (81.04%), with an average age of 13.24 years (SD±0.01), and they mostly belong to the middle socioeconomic class (54.03%). Moreover, the most prevalent drug they have used during their lifetime is alcohol (50.85%), and 21.58% have reported binge drinking.

For negative attitudes, less prevalent answers corresponded to the option "I disagree" (13.07% to 27.97%). For most positive-attitude items, the less prevalent response was "I agree" (9.37% to 30.78%). However, the item "*Many things are much more risky than trying drugs*" follows an opposite trend (71.27% agreed).

We present in Supplementary Table 1 and Supplementary Table 2 the results of the univariate and multivariate logistic regressions through which we assessed the association between each item of the attitude scale and the type of drug lifetime experienced. Students who responded that they disagreed with the items for negative attitudes were more likely to have used all drugs (in the univariate and multivariate regressions). Similarly, students who responded that they agreed with the items for positive attitudes were more likely to have used all the drugs evaluated (in univariate and multivariate regressions as well). In addition, we note that the highest ORs were observed for the possibility of using marijuana, and that the items "*The laws on illegal drugs should be made stronger*" and "*Using drugs is fun*" predict the highest possibilities of the use of all drugs.

3.2. Step 2: confirmatory factor analysis

Our initial model to evaluate the attitudes toward drug use scale did not show good fit indices: $\chi^2 = 586.042$ and *p*-value < 0.001, RMSEA estimate $= 0.050$, RMSEA probability $= 0.443$, CFI $= 0.868$, and TLI $= 0.831$.

After inspecting the modification indices, we found that it would improve the model's fit if we associated the observed variable "*Using illegal drugs can be a pleasant activity*" with "*Schools should teach about the real hazards of taking drugs*" and "*The police should not be annoying young people who are trying drugs*" with "*The laws about illegal drugs should be made stronger.*" In addition, we noticed that the observed variable "*Many things are much more risky than trying drugs*" had a weak factor loading (0.175); thus, we eliminated this item from the model.

After these modifications, the model improved: $\chi^2 = 224.916$ and *p*-value < 0.001, RMSEA estimate $= 0.035$, RMSEA probability $= 1.000$, CFI $= 0.954$, and TLI $= 0.935$. The final distribution of positive and negative attitude dimensions and standardized estimates are presented in Fig. 1.

3.3. Step 3: latent class analysis

Table 2 shows the six latent class models examined. The latent classes were identified based on the variables related to lifetime drug consumption (alcohol, binge drinking, tobacco, inhalants, marijuana, cocaine, and crack). The AIC values decreased as the number of classes increased in all tested models. The BIC indicator reached its lowest value for the three-class model (entropy $= 0.801$), while the minimum ssaBIC value was for the four-class model (entropy $= 0.894$). We decided to use
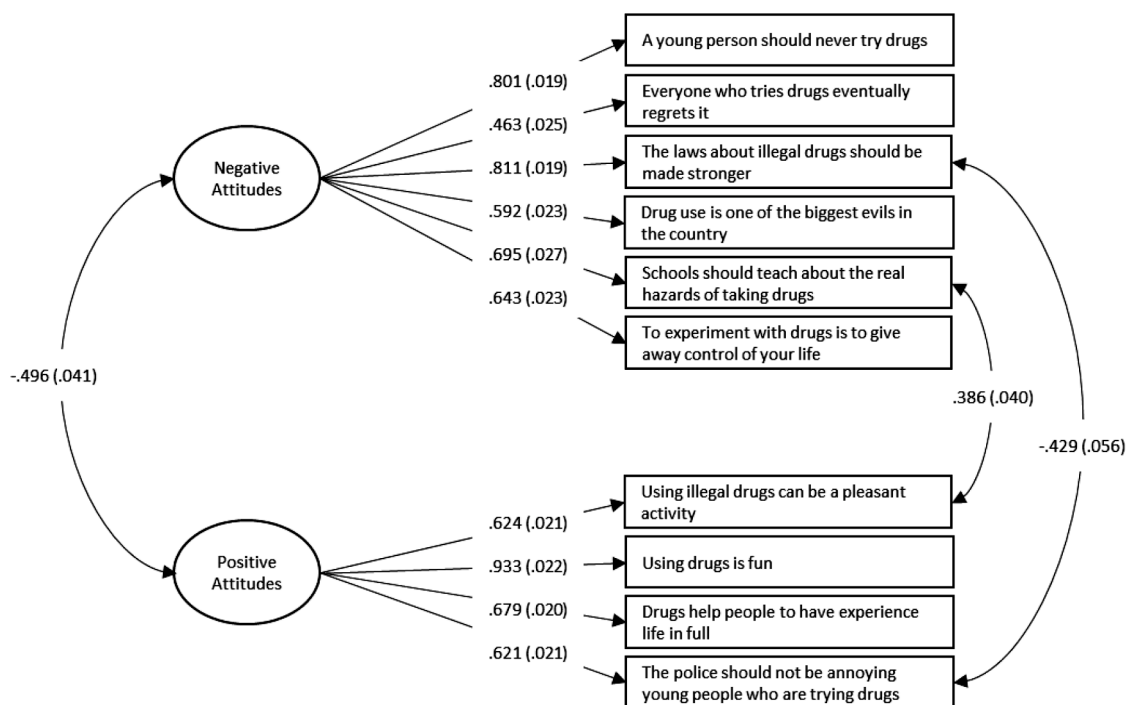
Fig. 1. Standardized factor solution of the two correlated factors of the attitudes toward drug use scale from *#Tamojunto2.0* baseline data collection, 2019 (*N* = 4996).

Table 2
Goodness-of-fit statistics for the number of latent classes in lifetime drug use among students participating in the baseline data collection of the *#Tamojunto2.0* program, 2019 (*N* = 5208).

Models	Free Parameters	Factor correction	Goodness-of-fit statistics			VLMR-LRT	LMR adjusted LRT test	Entropy
			AIC	BIC	ssaBIC			
1 class	7	2.2090	24,988.189	25,034.094	25,011.851			
2 classes	15	1.6427	20,897.581	20,995.951	20,948.286	< 0.0001	< 0.0001	0.855
3 classes	23	1.4572	20,376.769	20,527.602	20,454.516	< 0.0001	< 0.0001	0.801
4 classes	31	1.3590	20,331.022	20,534.318	20,435.810	0.0421	0.0441	0.894
5 classes	39	1.2602	20,320.148	20,575.908	20,451.979	0.1359	0.1390	0.744
6 classes	47	1.1544	20,316.035	20,624.259	20,474.908	0.0226	0.0237	0.731

Abbreviations: AIC = Akaike Information Criteria; BIC = Bayesian Information Criteria; ssaBIC = sample size adjusted BIC; VLMR-LRT = Voung-Lo-Mendell-Rubin Likelihood Ratio LRT Test; LMR adjusted LRT test = Lo-Mendell-Rubin Adjusted LRT Test.

the three-class model because the BIC indicator is the most reliable measure (Nylund et al., 2007), and because this model showed suitable interpretability from the perspective of the event and presented an acceptable entropy value. Moreover, if we had chosen the four-class model, the fourth class would have included less than 5% of the sample. In addition, the three-latent-class model is consistent with the analysis conducted by Valente et al. (2017) in which they used data from a control trial to assess the effectiveness of the first edition of the *#Tamojunto* program in 2014 with a different group of students.

In Fig. 2, we present the probabilities of lifetime drug use for each class in the three-latent-class model. The drug use profiles (classes) were named "abstainers/low users" (63.4% of the total sample), "alcohol users/binge drinkers" (29.5% of the total sample), and "polydrug users" (7.1% of the total sample). Individuals in the abstainers/low users' group had a lifetime probability of having used alcohol of 19%; no cases of binge drinking were found; 1.3% lifetime probability of having used tobacco; 10.4% of inhalant use; less than 1% of marijuana and cocaine use; and no crack use. Adolescents in the alcohol users/binge drinkers group had a high probability of drinking (100%), 51.1% of binge drinking, 15.9% of tobacco use, 29.7% of inhalant use, 6.8% of marijuana use, and no cases of cocaine and crack use. Students in the poly-drug users group had a high probability of having used alcohol in their

lives (99%), 87.3% of binge drinking, 90.1% of tobacco use, 65.9% of inhalant use, 81.4% of marijuana use, 9.3% of cocaine use, and 4% of crack use.

3.4. Step 4: multinomial logistic regression

Table 3 presents a description of the latent classes and the results of the multinomial logistic regression model (univariable and multivariable) using the abstainers/low users as the reference group. We found that boys were more prevalent in the abstainers/low users group (56.45%), but girls were more prevalent in the alcohol users/binge drinkers (62.47%) and polydrug users (53.51%) groups. Polydrug users had the highest average age and largest age variability among the three groups (13.88±1.08 years). Alcohol users/binge drinkers had the highest average of of socioeconomic status score (ABEP score) (26.12±9.60 units). Regarding positive attitudes, we found a gradient such that the average for items increased according to the quantity of substances consumed in each class. The polydrug users' group had the highest average of positive attitude items (2.34±1.30 items). In the case of negative attitudes, the gradient is in the opposite direction: Abstainers/low users have the highest average (5.10±1.24 items).

In the multivariate model, girls (compared to boys) had a 119%
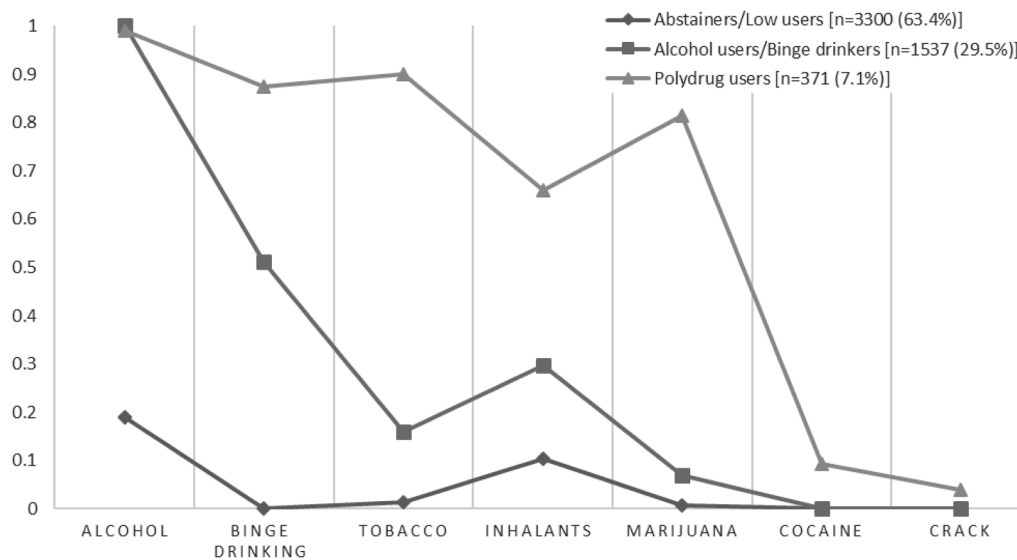
Fig. 2. Weighted probabilities associated with occurrence in lifetime alcohol use, binge drinking, tobacco use, inhalant use, marijuana use, cocaine use, and crack use given the model of the three latent classes in adolescents who participated in the baseline data collection of *#Tamojunto2.0* program, 2019 (*N* = 5208).

(aOR = 2.19, 95%CI = 2.00;2.38) greater possibility of belonging to the alcohol users/binge drinkers class and 200% (aOR = 3.00, 95%CI = 2.53;3.47) higher possibility of belonging to the polydrug user group than those in the abstainers/low users group. For each year of increasing age, adolescents had a 49% (aOR = 1.49, 95%CI = 1.36;1.62) greater possibility of belonging to the alcohol users/binge drinkers class and 224% (aOR = 3.24, 95%CI = 3.02;3.46) more likely to be polydrug users than abstainers/low users. One point on the socioeconomic status score (ABEP score) (which varied from 1 to 100) represented an increase of 2% (aOR = 1.02, 95%CI = 1.01;1.03) in the likelihood of belonging to the alcohol users/binge drinkers class compared with abstainers/low users. For each additional item showing a positive attitude, students were 90% (aOR = 1.90, 95%CI = 1.72;2.08) more likely to be in the alcohol users/binge drinkers group, and 707% (aOR = 8.07, 95%CI = 7.59;8.55) more likely to be polydrug users than abstainers/low users. With regard to negative attitudes, for each additional point on the scale, students were 30% (aOR = 0.70, 95%CI = 0.57;0.83) less likely to be in the polydrug users class than abstainers/low users.

4. Discussion

The strengths of this study are that it provides new evidence based on large data from a probabilistic sample and robust statistical methods regarding the association between attitudes and drug use latent classes in adolescents in a middle-income country. The three-latent-class model (abstainers/low users, alcohol users/binge drinkers, and polydrug users) offered the best explanation of the pattern of drug use of the surveyed students. The analysis of the association between attitudes and drug use profiles showed the predictive capacity of the attitude variables on drug use, with a gradient direct association in positive attitudes and a gradient inverse association in negative attitudes. However, we observed that the protective relationship between negative attitudes and alcohol users/binge drinkers' class was not maintained, but only held for polydrug users. Sex and age were directly associated with the possibility of being alcohol users/binge drinkers and polydrug users.

First, we confirm that the three-class solution is the best explanation of drug use profiles in our sample, which is consistent with other studies (Chung et al., 2013; Kelly et al., 2015; Valente et al., 2017). In addition, a statistically significant association between attitudes and drug use has been shown, as other studies also observed (Atkins et al., 1987; Cab-riales et al., 2013; Kolp et al., 2018; Noonan et al., 2011; Sidani et al., 2013; Stephens et al., 2009; Taremian et al., 2018). We found a direct

relationship between positive (and non-negative) attitudes and drug consumption and an inverse association for negative (and non-positive) attitudes. Although other studies confirmed this association, our contribution was to verify the correlation between attitudes and different drug use profiles. In this way, the latent class analysis allowed us to observe that abstainers/low users had the greatest number of negative attitudes, and polydrug users had the most positive attitudes. To quantify the strength of this association, we showed that individuals who evaluate drugs more negatively have a lower probability of using them, while those evaluating them more positively have a higher probability of using more drugs. This association is much stronger when comparing abstainers/low users with polydrug users on items with positive attitudes.

Furthermore, the multinomial analysis showed that increasing negative attitudes seem to protect individuals from belonging to the polydrug user class, but not from belonging to the alcohol user/binge drinker class. These results are consistent with those of Palamar (2014) that the use of alcohol did not decrease disapproval of the consumption of other drugs, while marijuana use was associated with decreased disapproval of LSD, amphetamine, and ecstasy, but not of "hard drugs" (cocaine, heroin, and crack). These findings as well as ours, could be explained by what has been called "ambivalent attitudes." This term refers to a multidimensional vision of substance use, in which it is recognized that an individual can have negative and positive attitudes toward the same drug simultaneously. The same holds true when the individual evaluates different drugs (Chang et al., 2019; Hohman et al., 2014; Kapitány-Fövény et al., 2018).

Second, we highlight the role of age in the characteristics of the latent classes. The multinomial analysis showed an association between drug use profiles and age such that as age increased, there was a greater possibility of being an alcohol user/binge drinker and polydrug user. This association is well known in the literature (Tomczyk et al., 2016). Onrust et al. (2016) even found great heterogeneity in the effectiveness of drug use prevention programs because of students' age. The effectiveness of the programs was systematically moderated by adolescents' specific cognitive development stages, and only certain contents of the programs showed effectiveness according to these stages.

Third, we highlight the results of sex and socioeconomic variables. Regarding sex, unlike the usual trends in which girls have fewer possibilities of using drugs and greater disapproval toward their use (Lewis et al., 2011; Palamar, 2014), we observed that girls had a greater probability of being alcohol users/binge drinkers and polydrug users.

Table 3
Characteristics of the three latent classes identified with LCA at the baseline in a sample of students participating in a study to evaluate the effect of the #Tamojunto2.0 program, 2019 (N = 5004).

	Description of latent classes			Univariate analysis						Multivariate analysis**					
	Abstainers/ Low users n = 3300	Alcohol users/ Binge drinkers n = 1537	Polydrug users n = 371	Abstainers/Low users versus Alcohol users/Binge drinkers			Abstainers/Low users versus Polydrug users			Abstainers/Low users versus Alcohol users/Binge drinkers			Abstainers/Low users versus Polydrug users		
	w% or mean	w% or mean	w% or mean	cOR	95%CI	p-value	cOR	95%CI	p-value	aOR	95%CI	p-value	aOR	95%CI	p-value
Sex						<0.001*									
Boys	56.42	37.12	46.61	1			1			1			1		
Girls	43.58	62.88	53.39	1.79	[1.51;2.12]	<0.001	1.36	[0.95;1.94]	0.155	2.19	[2.00;2.38]	<0.001	3.00	[2.53;3.47]	<0.001
Age	13.09±0.76	13.34±0.85	13.88±1.09	1.40	[1.23;1.59]	<0.001	2.32	[2.07;2.60]	<0.001	1.49	[1.36;1.62]	<0.001	3.24	[3.02;3.46]	<0.001
SES score	24.00±8.59	26.12±9.60	25.09±10.87	1.02	[1.02;1.03]	<0.001	1.02	[1.00;1.03]	0.036	1.02	[1.01;1.03]	<0.001	1.01	[0.99;1.03]	0.631
Attitudes															
Positive	0.44±0.75	1.00±0.99	2.34±1.30	1.81	[1.62;2.02]	<0.001	7.73	[5.44;10.99]	<0.001	1.90	[1.72;2.08]	<0.001	8.07	[7.59;8.55]	<0.001
Negative	5.10±1.24	4.73±1.39	3.38±1.76	0.81	[0.75;0.86]	<0.001	0.47	[0.41;0.54]	<0.001	0.98	[0.90;1.06]	0.512	0.70	[0.57;0.83]	<0.001

Abbreviations: "w%": weighted percentages; "cOR": crude odds ratio; "95%CI": 95% confidence intervals; "aOR": adjusted odds ratio; "SES score": socioeconomic status score.
* Chi-square test or one-way ANOVA test.
** Multivariate analysis was run considering cluster at the school level.

This finding is consistent with national Brazilian data (Carlini et al., 2010; IBGE, 2016) and with the results of other studies that found an increased rate of alcohol and other drug use problems among adolescent girls (Bolland et al., 2016; Choi et al., 2017). Our results could be explained by cultural changes related to women's social roles, where there is a more permissive perspective regarding women's drinking (Holmila and Raitasalo, 2005; Hughes et al., 2016).

Regarding socioeconomic status (measured with the ABEP score), we did not observe a clear trend among the three drug use profiles. Only a minimal effect was observed in the likelihood of alcohol users/binge drinkers with an increasing ABEP score. This is consistent with the findings of Sanchez et al. (2013) regarding binge drinking among Brazilian students. There was no effect of socioeconomic status on the probability of being polydrug users, contrary to the findings of Valente et al. (2017). A clear association between socioeconomic status and drug use has not been established in the scientific literature. For example, Marzban et al. (2017) observed that the higher the socioeconomic level, the lower the consumption of hookah and alcohol in Iranian students, but other studies have shown that the greatest drug use is among those with lower socioeconomic status in Europe and the US (Baumann et al., 2007; Helasoja et al., 2007). This ambiguity suggests that the type of association between socioeconomic status and drug use depends on the social context.

The main limitations of this study were that, first, we did not separately analyze attitudes toward each drug. This is important because individuals may have ambivalent attitudes toward the same drug and different evaluations of distinct drugs. However, we used the scale proposed by the *Unplugged* program developers to assess attitudes about drug use. Second, because this is a cross-sectional study, it is not possible to determine causality between attitudes and drug use profiles. Third, the questionnaire administered did not include information on ethnicity, so it is not possible to inquire about the differences between ethnic groups.

Given that the Brazilian National Drug Policy law (Diário Oficial da União, 2019) provides, in *article 4.2.14,* the need for the implementation of prevention programs and strategies based on scientific evidence, the implications of our results for the design, implementation, and evaluation of drug use prevention programs are as follows. First, our study offers evidence that prevention programs should focus part of their content primarily on "behavioral intention predictors" to reduce positive attitudes and broaden negative attitudes toward drug use. Second, considering the greater possibility of drug use in girls, the contents regarding "inter and intrapersonal skills" should be approached from a gender perspective to avoid gender equality manifested in the acquisition of unhealthy habits mostly associated with boys. Third, since older students have the greatest probability of using drugs, prevention programs should ideally target their content by age group, considering the different stages of cognitive development in adolescence. Finally, regarding the methodology for evaluating prevention programs, drug attitudes contents (and other "behavioral intention predictors") should be included as core elements of school-based prevention program evaluations.

Authors statement

We solemnly declare: We abide by academic ethics advocating a rigorous style of study. All authors have read and approved the submitted manuscript. All authors acknowledge that they have exercised due care in ensuring the integrity of the work. This paper does not contain any published or written content by others.

Declaration of competing interest

None.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113592.

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