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ORIGINAL ARTICLE

Belief patterns and drug use in a sample of Brazilian youth: an exploratory latent class analysis

Shannon **Healy**,[1] Silvia S. **Martins**,[1] Thiago M. **Fidalgo**,[2] Zila M. **Sanchez**[3]

[1]*Department of Epidemiology, Columbia University Mailman School of Public Health, New York, NY, USA.* [2]*Departamento de Psiquiatria, Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil.* [3]*Departamento de Medicina Preventiva, UNIFESP, São Paulo, SP, Brazil.*

Objective: Adolescent substance abuse is a public health concern worldwide, and its prevention is the subject of numerous programmatic efforts. Yet, little research exists on the structure of drug-related belief patterns in youth and their utility in preventive program planning. The aim of this study is to determine the structure of drug-related beliefs among 12-15-year-old students in Brazil using latent class analysis.
Methods: De-identified survey data were obtained from the baseline sample (n=6,176) of a randomized controlled trial on the #Tamojunto drug use prevention program in Brazilian middle schools. Using 11 survey items assessing drug-related beliefs as indicators, four models were run and assessed for goodness-of-fit. For the best fitting model, demographic variables and substance use across latent classes were assessed.
Results: Model fit statistics indicated that the best fit was a three-class solution, comprising a large Drug-Averse Beliefs class (80.9%), a smaller Permissive Beliefs class (12.7%), and an Inconsistent Beliefs class (6.4%). Respondents in the Permissive Beliefs and Inconsistent Beliefs classes reported greater past-year drug use, were slightly older and less likely to be female than those in the Drug-Averse Beliefs class.
Conclusions: These results indicate that conceptualizing drug beliefs as a categorical latent variable may be useful for informing prevention. Longitudinal studies are needed to establish temporality and assess further applicability of this construct.

Keywords: Prevention; school-based services; substance use; adolescent health; intervention; drug use

Introduction

Adolescent drug and alcohol use is a major public health concern worldwide, and its prevention is the subject of numerous programmatic efforts.[1] The risks associated with substance use are well characterized, vary by substance, and range from increased risk of injury and violence exposure to increased risk of chronic diseases such as cancer and cardiovascular disease.[2] Importantly, early initiation of substance use is a known risk factor for later substance use disorder.[1,3,4] In fact, evidence from an epidemiological study conducted in the United States suggested that, compared to those who first consumed alcohol after 20 years of age, those who initiated use prior to age 14 experienced a four-fold greater risk of lifetime dependence.[3,5] Numerous studies have identified patterns consistent with this finding, and have further linked early substance use initiation to varied adverse outcomes, such as risky sexual behaviors and difficulties in school and employment.[6] And yet, despite prolonged attention toward this issue, creating effective preventive programming for young people has proven somewhat elusive.[4]

A recent systematic review exploring the effectiveness of universal school-based drug and alcohol prevention programs found that, worldwide, less than half produced significant, positive behavior changes.[1] Another review of U.S.-based school prevention programs targeting elementary school children, found a similar rate of effectiveness, with a little over half of the programs leading to positive behavior change.[3] The relatively low effectiveness of prevention programs is even more troubling given the largely homogenous study conditions in which most trials occur. The most recent review of school-based drug prevention programs demonstrated that the overwhelming majority of published trials were conducted in high-income countries, mostly in North America and Europe.[1] Although in recent years there has been increased research focus on underserved communities, the gap in substance abuse prevention research is vast and does not address the diversity of the global issue.[7,8] This

Correspondence: Thiago M. Fidalgo, Universidade Federal de São Paulo, Departamento de Psiquiatria, Rua Major Maragliano, 241, Vila Mariana, CEP 04017-030, São Paulo, SP, Brazil.
E-mail: marquesfidalgo@yahoo.com.br
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disproportionate focus on wealthy European and North American countries is particularly relevant, given that many lower-income countries experience a significant, if not greater, burden of disease from substance use than wealthier countries.[9]

Brazil, an upper-middle-income country, experiences a high prevalence of youth substance use, alcohol use in particular, with nearly 60.3% of 13-15 year old and 27.9% of 10-12 year old public school students reporting lifetime alcohol consumption. Additionally, roughly 40.3% of the older age group and 14.1% of the younger reported past-year alcohol use.[10] Binge drinking is also an increasingly prevalent risk behavior among Brazilian youth, with nearly 32% of 14-18 year old students reporting past-year binge drinking episodes.[11] Moreover, substance use is initiated at a relatively early age in Brazil, with the average age of first use for a variety of drugs falling between 12 and 14 years.[12]

Results from a recent, nationally representative survey of high school students in Brazil demonstrated an association between onset of drinking behavior during childhood ($<$ 12 years old) and increased risk of binge drinking, heavy drinking patterns, and illegal drug use in later adolescence.[13] Nevertheless, Brazil has no long-standing tradition of evidence-based drug prevention in schools.[14] Thus, in 2014, together with the United Nations Office on Drugs and Crime, the Brazilian Ministry of Health conducted a randomized controlled trial in six Brazilian cities (São Paulo, Brasília, São Bernardo do Campo, Florianópolis, Fortaleza, and Tubarão) to determine the effectiveness of an adaptation of the European drug-prevention program Unplugged. Unplugged is an effective school-based universal prevention program used in several European nations. The Brazilian adapted version, eventually renamed #Tamojunto in 2014, was also shown to produce marginal positive effects among seventh and eighth graders in a 2013 quasi-randomized study.[14,15] This paper utilizes data from the baseline survey responses collected during the 2014 six-city randomized controlled trial, prior to randomization and program implementation.

In line with a variety of psychosocial constructs, including the Health Belief Model and the Theory of Planned Behavior, the strong relationship between personal beliefs and problem behaviors in adolescents has been previously demonstrated in regard to sexual risk behaviors and alcohol use.[16,17] And although research has shown an association between beliefs and perceptions about drugs and adolescent use, there has been very little research exists into the structure of drug-related belief patterns in youth and how these patterns predict use, especially in contexts outside of North America and Europe.[18,19] Positive drug-related beliefs have been associated with increased drug use in many cross-sectional studies and have been shown to predict initiation and adult abuse in several longitudinal studies.[20] Moreover, very little research has explored how to actually incorporate findings on unique personal beliefs into effective preventive programs. As beliefs and perceptions about drugs seem more susceptible to change in current drug-prevention programs, better and more nuanced understandings of the patterns of drug-related beliefs and how to utilize them for target populations may prove useful for designing more powerful programs.[16]

Latent class analysis (LCA) provides a novel way to explore this phenomenon and to glean clinically useful information from personally held beliefs. LCA is a modeling method that categorizes individuals based on an unobservable ''latent'' trait, using responses to more readily measure indicator variables; this type of analysis has thus far only been used in a limited way with adolescent substance use and has served primarily as a means of categorizing behavior rather than to examine how beliefs relate to real-world use.[21-24] In this study, we begin to explore beliefs as an indicator of substance use to better understand the feasibility of their use to predict future drug use in prevention programming. Conceptualizing drug-related beliefs as an underlying categorical construct may provide useful insights to help develop more effective prevention programs. In particular, if certain patterns of belief can be shown to consistently predict substance use across diverse contexts, these beliefs can be used to develop targeted interventions even before the onset of substance use behaviors. The aim of this study is to determine patterns of adolescent drug-related beliefs using cross-sectional, baseline data from a randomized controlled trial of 12-15-year-old students in Brazil and LCA, as well as to examine how socio-demographic factors and drug use vary across classes.

Methods

Study design

De-identified survey data were obtained from the baseline results of a randomized controlled trial of a Brazilian drug use prevention program. The Brazilian Ministry of Health sponsored the program #Tamojunto, which was adapted from the European program Unplugged, in 72 public middle schools across six Brazilian cities starting in February 2014. The six cities (São Paulo, Brasília, São Bernardo do Campo, Florianópolis, Fortaleza and Tubarão) were selected by the Ministry of Health and therefore represent a diverse, although perhaps not entirely representative, sample from across the country. Our survey weighting took the wide variation in sample sizes (São Paulo had the largest sample and Tubarão the smallest) into account.[15] The cities were chosen by the Brazilian Ministry of Health based on previous political pacts with the state and municipal secretary of health: São Paulo and São Bernardo do Campo are located in the state of São Paulo (southeast region); Florianópolis and Tubarão are in the state of Santa Catarina (southern region); Fortaleza is in the state of Ceará (northeast region); and Brasília is in the state of Goiânia (midwest region). Considering that our sample was not calculated to be representative of each city, a stratified analysis at this level would not be adequate. Because evidence suggests that initiation of substance use can begin as early as 12-14 years of age in Brazilian youth, the target population for this program was children in the seventh and eighth grades.[12,15] Based on results from a previously conducted pilot study and on school absence

data, we chose to increase the sample size by 50% over conservative estimates (knowing that between 20-25% of enrolled students will not be present on the day the survey is applied) to account for expected data loss and significant intra-class correlation. Thus, final sample size calculations suggested a total of 4,253 subjects in each arm.[15,25] The population flowchart and further details of the sampling method are presented elsewhere.[15] Ultimately, a total of 6,176 baseline assessments were completed and available for analysis. Students completed a survey of knowledge, beliefs, and behaviors related to alcohol and drug use at baseline, at 9 months post-intervention, and again at 21-months post-intervention. The present manuscript presents the results for the baseline data collection performed in 2014.

The randomized controlled trial was registered with the Brazilian Register of Clinical Trials (Registro Brasileiro de Ensaios Clínicos; protocol RBR-4 mnv5g).

Instrument and variables

The instrument used for data collection was developed and tested by the European Drug Abuse Prevention Trial (EU-DAP) and was used in previous studies of Unplugged's effectiveness.[26] According to previously published reports on the design of the Unplugged program, most questions from the survey are derived from the Exchange on Drug Demand Reduction Action database.[26,27] We used an adapted version of the EU-DAP questionnaire that had been translated into Portuguese.[28] In our version of the survey, some questions were replaced with items from a World Health Organization questionnaire that was adapted by the Brazilian Center for Psychotropic Drug Information (Centro Brasileiro de Informações sobre Drogas Psicotrópicas) and has been widely used in studies of Brazilian students.[10] As the primary outcomes of interest, the present study utilized baseline demographic data, responses to an 11-item scale assessing beliefs about drugs, and self-reported cigarette use, alcohol use, binge drinking, marijuana use, and inhalant drug use in the past year. The 11 item-scale contains five items to which a response of agree would constitute a ''drug-positive'' response and six items to which a response of agree would indicate a ''drug-negative'' response. The five drug-positive statements were: using drugs can be a pleasurable activity; using drugs is fun; there are many things riskier than using drugs; drugs help people experience life more intensely; and the police should ignore people who experiment with drugs. The six drug-negative items were: a young person never needs to use drugs; everyone that uses drugs will be arrested one day; drug laws should be stronger; drug use is one of the major problems of the country; schools should teach the dangers of drugs; and to experiment with drugs is to abandon control of one's life. Socioeconomic status was assessed according to a scale developed by the Brazilian Market Research Association's (Associação Brasileira de Empresas de Pesquisa), which categorizes individuals into socioeconomic status (SES) categories A1, A2, B1, B2, C1, C2, D, and E, with A1 as the highest stratum and E as the lowest. Classification is based on the education level of the head of household and other household characteristics (including the number of certain consumer goods and amenities).[29] Due to the low number of students in certain SES categories in this sample, they were collapsed for analysis to AB, C1, C2, and DE.

Descriptive analyses

Initial descriptive statistics regarding sociodemographic characteristics and reported past-year drug usage were generated in Stata.[14] The 11-item scale, with binary agree or disagree options, assessed drug-related beliefs and was broken down to sum totals of drug-positive and drug-negative beliefs. Logistic regression models using past-year drug use as an outcome were modeled, adjusting for group assignment, age, sex, and SES. A total of 1,008 (16.32%) observations were missing at least one scale item, while missingness for each individual item only ranged from between 7-9% (details on the missingness of each indicator can be found in Table 1). Consequently, missing data for items in the 11-point scale were imputed for the descriptive analysis conducted in Stata. All analyses included sample weighting to account for the multilevel structure of the data collection and student absences on the day of the survey.

Latent class analysis

An exploratory LCA was carried out in Mplus 7.4. To use all available data, Mplus employs full information maximum likelihood to handle missing data on indicator variables.[30] Using individual responses to an 11-item scale on beliefs about drugs as the class indicators, an LCA was conducted with survey data from 5,764 baseline survey responses. Drug-negative beliefs were reverse-coded for this analysis. In the LCA, 412 (6.7%) observations were excluded from the analysis by the full information maximum likelihood method due to missingness on all 11-indicator items.

Four LCA models (comprising 1, 2, 3, and 4 classes) were run and assessed for goodness-of-fit using the Akaike information criterion (AIC), the Bayesian information

Table 1 Missing data for 11 drug-related indicator items among 6,176 Brazilian seventh and eighth grade public-school students, 2014

Belief scale item	Missingness
Using drugs can be a pleasurable activity	486 (7.87)
A young person never needs to use drugs	511 (8.27)
Using drugs is fun	485 (7.85)
There are many things riskier than doing drugs	512 (8.29)
Everyone that uses drugs will be arrested one day	540 (8.74)
Drug laws should be stronger	521 (8.44)
Drug use is one of the major problems of this country	537 (8.69)
Drugs help people experience life more intensely	551 (8.92)
Schools should teach the dangers of drugs	540 (8.74)
The police should ignore people who experiment with drugs	533 (8.63)
To experiment with drugs is to abandon control of one's life	544 (8.81)

Data presented as n (% missing).

criterion (BIC), the sample-size corrected Bayesian information criterion (BIC_n), the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR LRT), and model entropy as means of comparison. Ultimately, since no concrete rule exists for LCA model selection, a variety of widely accepted indicators, along with judgment based on substantive theory about the construct, were used for final model selection.[31] For the best fitting model, differences in demographic variables and substance usage across latent classes were assessed. To that end, in the final model age, sex, and SES, as well as past year alcohol, cigarette, marijuana, inhalant drug use, and binge drinking were included as auxiliary variables to assess their means across latent classes. Overall, differences in demographic information and substance use were tested using multivariate analysis of variance (Stata version 14.2). Additionally, means across classes were tested for significant differences using an online ANOVA calculator for single comparisons between two classes, with a significance level of 1.7% in accordance with the Bonferroni correction for multiple comparisons.[32]

Table 2 Sociodemographic characteristics, beliefs about drugs, and drug usage among 6,176 Brazilian seventh and eighth grade public-school students, 2014

	n	Mean	95%CI
Age	6,176	12.6	12.6-12.7
Belief score*			
Positive	6,176	1.08	1.04-1.11
Negative	6,176	4.40	4.30-4.50
	n	Wgt%†	95%CI
Sex			
Female	3,120	50.1	34.5-65.7
Male	3,056	49.9	34.3-65.5
City			
Brasília	531	10.5	7.7-14.4
Florianópolis	840	2.4	1.8-3.2
Fortaleza	527	9.0	7.4-11.0
São Bernardo do Campo	923	5.4	3.9-7.3
São Paulo	3,035	72.1	67.5-76.3
Tubarão	320	0.6	0.4-0.8
Socioeconomic status‡			
AB	2,628	40.4	36.5-44.3
C1	2,033	33.2	31.2-35.4
C2	1,204	20.8	18.5-23.3
DE	311	5.6	4.6-6.8
Drug use§			
Alcohol	1,964	31.0	28.7-33.4
Binge drinking‖	989	16.6	15.2-18.2
Cigarettes	237	4.0	3.3-4.9
Inhalants	510	8.2	7.5-9.0
Marijuana	153	2.6	2.0-3.2

95%CI = 95% confidence interval; Wgt = weight.
* Belief score, sum of a five- (positive) or six- (negative) point scale of drug-related beliefs, further described in the Methods section.
† Survey-weighted proportions.
‡ Sociodemographic status according to the Brazilian Market Research Association's (Associação Brasileira de Empresas de Pesquisa) scale, described in Methods section.
§ Reported use in the past year.
‖ Drinking five or more standard doses of alcohol on one occasion.

Ethics statement

The Universidade Federal de São Paulo ethics committee approved the human research protocol (number 473.498).

Results

Descriptive analyses

Table 2 shows the sociodemographic characteristics of the sample at baseline. Table 3 presents the results of logistic regression models for past-year drug use in the sample, with sum scores of positive and negative beliefs as the indicators. For every drug, increasing positive-belief scores were associated with increased usage, while the reverse was true for negative-belief scores. For every drug outcome, increasing negative-belief scores were significantly associated with decreased drug use.

Exploratory latent class analysis

The fit indices for each of the four latent class models are provided in Table 4. The four-class model had the lowest AIC, BIC, and BIC_n, but also had the lowest entropy, indicating less well-defined classes. Furthermore, the VLMR LRT for the four-class model was not significant, indicating that a four-class model did not fit significantly better than a three-class model. Relatively low AIC, BIC, and BIC_n, along with relatively high entropy and favorable p-values for the VLMR LRTs indicated that a three-class solution fit the data best.

Figure 1 shows the conditional item probabilities for each class in the three-class model. The y-axis corresponds to the probability that a drug-positive interpretation of the item was endorsed. Conditional item probabilities

Table 3 Results from logistic regression models for past-year alcohol consumption, binge drinking, and tobacco, inhalant, and marijuana usage among 6,176 Brazilian seventh and eighth grade public-school students, 2014

Drug use*	OR†	95%CI	p-value
Belief score‡			
Positive			
Alcohol	1.47	1.37-1.57	< 0.0001
Binge drinking§	1.52	1.41-1.64	< 0.0001
Cigarettes	1.87	1.61-2.18	< 0.0001
Inhalants	1.71	1.52-1.92	< 0.0001
Marijuana	2.67	2.23-3.20	< 0.0001
Negative			
Alcohol	0.93	0.90-0.97	< 0.0001
Binge drinking	0.89	0.86-0.93	< 0.0001
Cigarettes	0.87	0.82-0.93	< 0.0001
Inhalants	0.95	0.91-1.00	0.0310
Marijuana	0.85	0.79-0.92	< 0.0001

95%CI = 95% confidence interval; OR = odds ratio.
* Reported use in the past year.
† Odds ratios for past-year use for each drug, from a logistic regression model controlling for group assignment, age, sex, and socioeconomic status.
‡ Sum score of a five- (positive) or six- (negative) point scale of drug-related beliefs, further described in the Methods section.
§ Drinking five or more standard doses of alcohol on one occasion.

Table 4 Fit indices for latent class models

	Goodness of fit							Class size, n (%)					
Class	BIC	BIC_n	AIC	VLMR LRT p-value	Entropy	Log likelihood	df	C1	C2	C3	C4	C5	C6
1	58544.4	58509.5	58471.2	-	1.000	-29224.6	11	5,764 (100.0)					
2	53745.1	53672.0	53591.9	< 0.0001	0.949	-26772.9	23	5,229 (90.7)	535 (9.3)				
3	**52394.7**	**52283.5**	**52161.6**	**< 0.0001**	**0.832**	**-26045.8**	**35**	**4,662 (80.9)**	**734 (12.7)**	**368 (6.4)**			
4	52148.5	51999.1	51835.5	0.0810	0.723	-25870.7	47	887 (15.4)	492 (8.5)	4,047 (70.2)	339 (5.9)		
5	52027.8	51840.3	51634.9	0.6004	0.663	-25758.4	59	185 (3.2)	337 (5.8)	525 (9.1)	1,315 (22.8)	3,402 (59.0)	
6	52023.3	51797.7	51550.4	0.7053	0.691	-25704.2	71	169 (2.9)	624 (10.8)	486 (8.4)	333 (5.8)	495 (8.6)	3,657 (6.3)

Bold indicates selected model.
AIC = Akaike information criterion; BIC = Bayesian information criterion; BIC_n = Sample-size corrected Bayesian information criterion; df = degrees of freedom; VLMR LRT = Vuong-Lo-Mendell-Rubin likelihood ratio test.

suggest that respondents in classes within the three-class model can be considered drug-averse, permissive, or inconsistent in their drug-related beliefs (classes 1, 2, and 3, respectively). The Drug-Averse Beliefs, Permissive Beliefs, and Inconsistent Beliefs classes comprised 80.9, 12.7, and 6.4% of the sample, respectively. The Drug-Averse Beliefs class was thus named because respondents in this class were the most likely to endorse drug-negative beliefs. Although the Permissive Beliefs class generally possessed fairly negative beliefs toward drugs, they were slightly more likely to hold drug-positive beliefs than respondents in the Drug-Averse Beliefs class. Respondents in the final class, Inconsistent Beliefs, demonstrated inconsistent response patterns.

Differences in demographic variables and drug use across the three latent classes are shown in Table 5. Significant cross-class differences were found for age, sex, and drug use of respondents, but not for SES. Respondents in the Drug-Averse Beliefs class reported the lowest past-year use for every drug, although there was no statistically significant difference between their reported inhalant use and that of the Inconsistent Beliefs class. Respondents in the Permissive Beliefs class, who reported slightly more positive drug-related beliefs than the students in the Drug-Averse Beliefs class, reported the highest past-year use for every drug, while those in the Inconsistent Beliefs class reported intermediate levels of past-year drug use. Respondents in the Permissive Beliefs and Inconsistent Beliefs classes were significantly older than the Drug-Averse Beliefs class and were more likely to be male. However, although the overall test of differences across groups for sex was significant, the pairwise tests were not.

Discussion

The results of this exploratory LCA suggest that overall drug beliefs can be conceptualized as a three-level categorical construct. Respondents in the largest class, Drug-Averse Beliefs, expressed the most drug-negative beliefs, while those in the second largest class, the Permissive Beliefs class, expressed slightly more moderate beliefs. Those in the smallest class, Inconsistent Beliefs, expressed a largely inconsistent belief pattern by reporting seemingly contradictory responses to scale items. Significant cross-class differences were found for age, sex, and drug use but, notably, not for SES. Respondents in the Permissive Beliefs class reported the highest past-year use for every tested drug, while respondents in the Drug-Averse Beliefs class reported the lowest past-year drug use. Students in the Permissive Beliefs and Inconsistent Beliefs classes were slightly older than those in the Drug-Averse Beliefs class and were less likely to be female.

Although to our knowledge, ours is the first study to explore latent classes of drug-related beliefs in adolescents, numerous others have classified adolescents based on substance use behaviors and have subsequently explored demographic differences across classes.[21,23,24] Our findings are consistent with those of similar studies in high-income countries, particularly regarding gender and

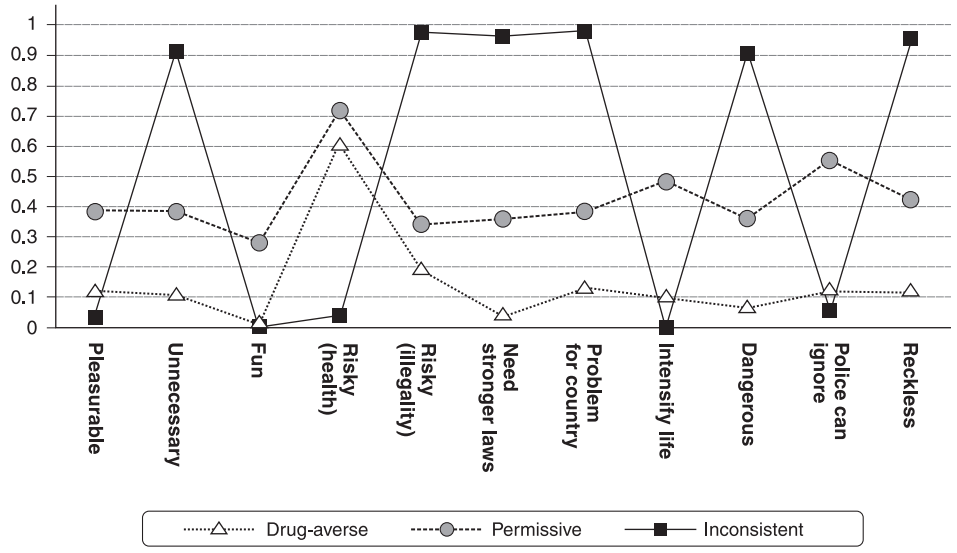

Figure 1 Conditional item probabilities for 11-drug-related statements according to latent class type. Drug-negative beliefs were reverse coded; the y-axis corresponds to probability that the drug-positive interpretation of the item was endorsed.

Table 5 Differences in demographic variables and drug usage among Brazilian seventh and eighth grade public-school students according to a 3-class model

	DAB	PB	IB	MANOVA	Overall p-value[†]	DAB vs. PB p-value	PB vs. IB p-value	DAB vs. IB p-value
Age, mean	12.5	12.9	12.9	*	< 0.001	< 0.001	0.793	< 0.001
Sex								
Male	46.9	51.6	51.8					
Female	53.1	48.4	48.2	*	0.017	0.020	0.949	0.056
Socioeconomic status[‡]								
AB	42.0	45.1	43.1					
C1	33.3	31.5	31.1					
C2	19.6	19.6	18.0					
DE	5.0	3.9	7.8	NS	0.255	0.143	0.146	0.531
Drug use[§]								
Alcohol	28.0	55.4	36.0	*	< 0.001	< 0.001	< 0.001	0.001
Binge[‖]	12.8	35.8	21.7	*	< 0.001	< 0.001	< 0.001	< 0.001
Cigarettes	2.1	14.9	5.8	*	< 0.001	< 0.001	< 0.001	< 0.001
Inhalants	6.9	18.5	7.1	*	< 0.001	< 0.001	< 0.001	0.878
Marijuana	0.7	14.7	1.9	*	< 0.001	< 0.001	< 0.001	0.009

Data presented as mean %, unless otherwise specified.
DAB = Drug-Averse Beliefs; IB = Inconsistent Beliefs; MANOVA = multivariate analysis of variance; PB = Permissive Beliefs.
* Differences were found significant using MANOVA, coefficients include Wilk's lambda, Pillai's trace, the Lawley-Hotelling trace, and Roy's largest root.
[†] Bonferroni correction.
[‡] Sociodemographic status according to the Brazilian Market Research Association's (Associação Brasileira de Empresas de Pesquisa) scale.
[§] Reported use in the past year.
[‖] Drinking five or more standard doses of alcohol on one occasion.

age.[21-23] One study of high-schoolers in New Zealand found that among current drinkers, those who engaged in the highest risk behavior also held the most positive drug-related beliefs. This study also found that being male was a significant predictor of higher risk behavior, which mirrors our finding that the classes with more positive beliefs and greater drug use had higher proportions of male students.[22] Furthermore, another LCA study among Native American youth in the southwestern United States found that the classes of students with the greatest drug use were more likely to be older than those who used less, which again aligns with our results.[21] In sum, consistent with previous studies, our study clearly establishes the link between drug-related beliefs and use and indicates the roles of sex and age in this complex relationship.

Our study took the novel approach of exploring beliefs as a correlate of drug use by using a drug-related belief scale to indicate latent class membership. In response to the inadequacy of some universal drug-prevention

programs, recent studies have been exploring the efficacy of personality-targeted prevention programs. Trials in the United Kingdom and Canada have demonstrated the efficacy of one such program, which is tailored toward students based on personal characteristics such as sensation-seeking and impulsivity traits.[33] In this randomized controlled trial, a selective intervention targeting high-risk students was shown to have beneficial effects on problematic drinking behavior and, importantly, had some protective ''herd'' effects for lower-risk students. Similarly, drug beliefs might serve as an important basis for programming in future interventions. If further research consistently supports an association between belief patterns and real-world use, belief patterns could be used as a proxy for drug use when assigning recipients to targeted programming. This might improve primary prevention programs among younger adolescents who have yet to commence drug use or among whom the prevalence of drug use is still quite low. However, although the present study has shown a strong association between beliefs and drug use, future effectiveness studies would do well to explicitly explore the role of drug-related beliefs as a mediator.

Our initial results indicate that conceptualizing drug beliefs as a categorical latent variable may benefit prevention programs, since separate classes not only hold different beliefs, but also behave differently. However, our study has important limitations that must be considered. For example, drug-related belief patterns may not be a single construct, and beliefs may vary significantly by drug type. Examining the relationship between drug use and beliefs about individual drugs or classes of drugs (e.g., licit vs. illicit) might reveal distinctive patterns. Additionally, since our study involved a cross-sectional sample, longitudinal studies of these latent classes will be necessary to determine the applicability of these findings. The possibility of reverse causality exists, in that early drug users may be biased toward reporting more positive feelings about drugs. Moreover, both pathways may exist, i.e. positive feelings drive early initiation of drug use and early drug use can lead to increased drug-positive beliefs. In particular, longitudinal studies are needed to establish temporality in order to determine whether beliefs can consistently predict use. Following the classes over time to assess changes in drug-use and drug-related beliefs could also provide deeper insight into the functioning of a program, the nature of the differences, and perhaps inform future alterations to the program. Furthermore, there was a significant portion of the sample that did not answer any of the 11 items. The inability to incorporate these observations into class estimation could introduce bias if the missing observations different regarding other important variables.

In conclusion, this study sought to elucidate the patterns of drug-related beliefs among a sample of Brazilian middle-schoolers. The best fitting latent class model reflected three classes of students with highly negative (Drug-Averse Beliefs class), moderately negative (Permissive Beliefs class), and inconsistent (Inconsistent Beliefs class) drug-related beliefs, which also corresponded to differing reports of past-year drug use. Although validation of this model in diverse samples is necessary and explicit mediational studies should be conducted, classifying participants in prevention programs based on pre-existing beliefs could prove a useful method for developing effective programs, especially in populations where the prevalence of drug use is low.

Disclosure

The authors report no conflicts of interest.

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