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Synthetic drug use among undergraduate students in a public university: prevalence and associated factors*

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Objective: to present the prevalence of synthetic drug use (lysergic acid diethylamide – LSD, and ecstasy) and associated factors among university students. **Methodology:** a quantitative and cross-sectional study, part of a research on sociodemographic profile, university life, mental health and psychosocial identity. An anonymous, face-to-face questionnaire was applied to undergraduate students at a Brazilian public university. Use of synthetics in the past year was analyzed in relation to gender, sexuality, socioeconomic status, academic performance, interpersonal/sexual violence, mental health, use of psychoactive substances and quality of life. Bivariate and multivariate analysis methods were used, employing the Statistical Package for the Social Sciences and R software packages. **Results:** 6,906 students participated in the study, of whom 8.3% used LSD, 7.9% ecstasy, and 10.8% LSD and/or ecstasy in the past year. Synthetic drug use was associated with cocaine use (OR 4.90), frequent marijuana use (OR 6.83) and solvent use (OR 8.11). There was an association with belonging to sexual minority groups, higher socioeconomic status, poorer academic performance, sexual violence while intoxicated and higher scores on the quality of life scale. There was a weaker association with male gender and poorer mental health. **Conclusion:** high synthetic drug use rates were observed in this population, and the associated factors may assist in the development of targeted intervention strategies within the university context.

Descriptors: Lysergic Acid Diethylamide; N-Methyl-3,4-methylenedioxyamphetamine; Illicit Drugs; Synthetic Drugs; Students; Universities.

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Consumo de drogas sintéticas por graduandos de uma universidade pública: prevalência e fatores associados

Objetivo: apresentar a prevalência do uso de drogas sintéticas (dietilamina de ácido lisérgico – LSD, e *ecstasy)* e fatores associados entre universitários. **Metodologia**: estudo quantitativo, transversal, recorte de pesquisa sobre perfil sociodemográfico, vida universitária, saúde mental e identidade psicossocial. Aplicou-se questionário anônimo e presencial a estudantes de graduação de uma universidade pública brasileira. O uso no último ano de sintéticos foi analisado em relação ao gênero, à sexualidade, ao nível socioeconômico, ao rendimento acadêmico, à violência interpessoal/sexual, à saúde mental, ao uso de substâncias psicoativas e à qualidade de vida. Utilizou-se método de análise bivariada e multivariada utilizando os pacotes *Statistical Package for the Social Sciences* e *R software*. **Resultados:** 6.906 estudantes participaram do estudo; destes, 8,3% usaram LSD; 7,9%, *ecstasy;* e 10,8%, LSD e/ou *ecstasy* no último ano. Uso de sintéticos associou-se ao uso de cocaína (OR 4,90), uso frequente de maconha (OR 6,83) e uso de solventes (OR 8,11). Houve associação com ser de minorias sexuais, maior nível socioeconômico, pior rendimento acadêmico, violência sexual quando intoxicado e melhor pontuação em escala de qualidade de vida. Menor associação com sexo masculino e pior saúde mental. **Conclusão:** observaram-se elevadas taxas de uso de sintéticos nesta população e os fatores associados ao uso podem auxiliar nas estratégias de abordagem dirigidas no contexto universitário.

Descritores: LSD; MDMA; Drogas Ilícitas; Medicamentos Sintéticos; Estudantes; Universidades.

Consumo de drogas sintéticas por estudiantes universitarios de una universidad pública: prevalencia y factores asociados

Objetivo: presentar la prevalencia del uso de drogas sintéticas (dietilamida del ácido lisérgico – LSD, y éxtasis) y factores asociados entre estudiantes universitarios. **Metodología:** estudio cuantitativo y transversal, recorte de una investigación sobre perfil sociodemográfico, vida universitaria, salud mental e identidad psicosocial. Se aplicó un cuestionario anónimo y presencial a estudiantes de pregrado de una universidad pública brasileña. El uso de drogas sintéticas en el último año se analizó en relación a género, sexualidad, nivel socioeconómico, rendimiento académico, violencia interpersonal/sexual, salud mental, uso de sustancias psicoactivas y calidad de vida. Se utilizó el método de análisis bivariado y multivariado empleando los paquetes *Statistical Package for the Social Sciences* y *R software*. **Resultados:** de los 6906 estudiantes que participaron del estudio, el 8.3% consumió LSD, el 7.9% éxtasis y el 10.8% LSD y/o éxtasis en el último año. El uso de sintéticos se ha relacionado con consumo de cocaína (OR 4,90), consumo frecuente de marihuana (OR 6,83) y uso de solventes (OR 8,11). Se encontró una relación con pertenecer a minorías sexuales, nivel socioeconómico más alto, peor rendimiento académico, violencia sexual bajo los efectos de drogas y mejor puntuación en la escala de calidad de vida. Se registró una menor asociación con género masculino y peor salud mental. **Conclusión:** se observaron tasas elevadas de uso de sustancias sintéticas en esta población, y los factores asociados a dicho uso podrían contribuir a diseñar estrategias de enfoque dirigidas en el contexto universitario.

Descriptores: Dietilamida del Ácido Lisérgico; N-Metil-3,4-metilenodioxianfetamina; Drogas Ilícitas; Drogas Sintéticas; Estudiantes; Universidades.

Introdução

Illicit synthetic psychoactive substances (SPAs), also known as club drugs, particularly ecstasy/MDMA (3,4 methylenedioxymethamphetamine) and LSD (lysergic acid diethylamide), are consumed all over the world. Although there are considerable regional variations, the 2023 World Drug Report showed global rates of use in the last twelve months (U12M) for ecstasy between 0.17% and 2.83% in the population aged from 15 to 64 years old[1]. A 2018 US survey indicated a U12M rate of 3.9% among young adults aged from 19 to 28 *versus* 4.3% among university students for ecstasy, and 3.9% and 4.1%, respectively, for LSD[2], highlighting higher consumption frequencies among undergraduates.

In a 2017 study conducted in Brazil, values closer to the global estimate were described, with lifetime use (LTU) and U12M prevalence of 0.7% and 0.15% for ecstasy and 1.1% and 0.29% for hallucinogens (including LSD) in the population aged from 12 to 65 years old, and slightly higher rates among young people aged from 18 to 24: LTU of 1.91% and U12M of 0.64% for ecstasy and 1.94% and 0.81% for hallucinogens[3]. Among university students, synthetic drug use is substantially higher, as indicated in the First National Survey on the Use of Alcohol, Tobacco and Other Drugs among University Students in all 27 Brazilian Capitals, carried out in 2009, with prevalence values for LTU and U12M of 7.6% and 3.1% for ecstasy and 7.6% and 4.5% for hallucinogens[4]. More recently, in 2021, a study conducted with a university population in the South of the country indicated 7.8% prevalence of U12M for *club drugs*[5]. These data corroborate the international literature, which points to greater use of synthetic drugs among young people and has especially highlighted the relevance of consumption by university students[2,6]. Academic life is usually marked by major changes, including housing, a new network of relationships, autonomy and academic pressures, among others[7]. In addition, this group has been characterized by high prevalence of consumption of licit and illicit substances[4-5], and their vulnerability to drug experimentation and abuse has been discussed, whether due to curiosity, peer pressure, low-risk perception, or the combination of these and other factors[5,8].

Given these characteristics, it is essential to know the SPA use prevalence in this population and to analyze the demographic, social and psychological factors associated with consumption, particularly the occurrence of concomitant drug use, which is a potential risk marker, defined by the use of two or more psychoactive substances in the same period[9]. There is evidence, for example, that multiple drug users have mortality rates up to three times higher than those who only use one substance[10].

Given the scarcity of recent national data on the use of synthetic drugs among university students, the potential harms associated with consumption and the recommendations that preventive measures related to psychoactive substance use should be appropriate to the context in which they live, this study aimed at gathering diverse information on the prevalence of synthetic substance consumption and the main factors associated with their use among undergraduate students at a Brazilian public university.

Methodology

Type of study

A quantitative, observational and cross-sectional study, from a matrix study entitled: "Students at the State University of Campinas (*Universidade Estadual de Campinas*, UNICAMP): Sociodemographic and cultural profile, personal and social identity, spirituality, sexuality, quality of life, use of alcohol and other psychoactive substances, physical and mental health".

Locus

Campinas – SP, Brazil.

Period

Data collection took place in 2017 and 2018.

Population and sample

The total number of undergraduate students enrolled at UNICAMP at the time of the study was 19,869[11] and it was stipulated that at least 20% (or 3,974) of them would be assessed, covering all areas of the courses and periods. The sample was obtained following the selection criteria described below.

Selection criteria

Being a regularly enrolled undergraduate student at UNICAMP, being present in the classroom during the questionnaire, being able to understand and express themselves in Portuguese, and having read, agreed to and signed the Free and Informed Consent Form (FICF).

Participants

Undergraduate students at UNICAMP of both genders, from the Barão Geraldo - Campinas, Limeira, and Piracicaba campuses, enrolled in the Exact Sciences, Arts, Humanities, Health and Biology areas, attending the daytime and evening periods, and who were present in the classroom on the day the anonymous questionnaire was applied.

Study variables

The study dependent variable was LSD and/or ecstasy use in the last 12 months (called Use of Synthetics-US).

The categorical covariates in the study were the following: gender; self-identifying as Lesbians, Gays, Bisexuals and Transgenders (LGBT); socioeconomic level (Economic Classification of the Brazilian Association of Research Companies (*Associação Brasileira de Empresas de Pesquisa*, ABEP)[12]; mother's schooling; working while studying; receiving a scholarship from the university; owning a personal car; missing any semester of the undergraduate course; self-assessment of academic performance; frequency of absences from classes; whether they had ever been victims of non-sexual violence, of rape or of sexual violence while intoxicated; history or current mental health problems; suicidal ideation; suicidal plan; suicide attempt; self-injury with no suicidal intention; risky drinking; marijuana use at least six days in the last month; cocaine use in the last 12 months; and use of solvents in the last 12 months.

The study continuous covariates were as follows: the quality of life scale in the environmental, social, psychological and physical domains.

Data collection instruments

The variables of interest from the broad questionnaire with questions on sociodemographic profile, university life, mental health and psychosocial identity were used, as well as the Alcohol Use Disorders Identification Test (AUDIT)[13] and the World Health Organization Quality of Life - BREF (WHOQOL-BREF)[14]. The AUDIT questionnaire was used to assess alcohol use in the last 12 months, with answers classified into four consumption patterns: low risk (from 0 to 7 points); risky use (from 8 to 15 points); high-risk use (from 16 to 19 points); and probable dependence (from 20 to 40 points). It was applied and its cutoff point was greater than or equal to 8, defining risky drinking. This instrument was validated in the university population in 2020 and used as a categorical variable[13].

WHOQOL-BREF consists of 26 questions: the first one refers to quality of life in general, and the second to satisfaction with one's own health. The other 24 are divided into the physical, psychological, social relations and environmental domains, and it is an instrument that can be used for healthy populations as well as those affected by chronic diseases[14]. It was validated in Portuguese in 2009[15] and used as a continuous variable in its four domains.

Data collection

Data collection took place in the university classrooms, during the daytime and evening periods, and in all of the university's institutes and campuses, using a structured questionnaire that included closed and open questions, anonymously and in person, to students in class during the periods designated for application. All participants were informed about the research scope and the FICF conditions. Those who agreed were asked to sign the FICF and were handed in the questionnaires.

Data treatment and analysis

The data generated from the questionnaires were entered into a database and initially analyzed descriptively, followed by statistical analysis to compare the variables of interest.

An interest group called Synthetic users (SU) was defined, which included participants who had used LSD, ecstasy or both in a period of 12 months prior to application of the questionnaire.

The analysis of the associated factors included the categorical and continuous variables described above.

Furthermore, the database of a previous study carried out at the same university in 2005[16], was reviewed, making new groupings that would allow for a comparison with the current results: U12M for synthetics, total and by gender; U12M for ecstasy, total and by gender; and U12M for LSD, total and by gender.

For the simple statistical analysis procedure, the Statistical Package for the Social Sciences (SPSS) for Windows, version 22, was used. Frequency tables were prepared for all the variables, followed by association analyses using the Chi-square test (bivariate or simple analysis), with a 5% (p-value < 0.05) significance level.

Linear and logistic regression analyses were subsequently carried out (multivariate analysis), only including those variables that had significant associations in the simple analyses. The dependent variable was "synthetic drug use in the last 12 months" and the covariates were those described above. At this stage, the "stepwise" selection criterion was employed, using the R computer program, version 4.1.0, and adopting a 5% (p-value < 0.05) significance level.

Ethical aspects

The project was approved by the Research Ethics Committee of UNICAMP's Medical Sciences School (opinion No. 1,903,287/2017). To guarantee anonymity, the questionnaire was stored in a separate envelope from the FICF to ensure that it could not be identified.

Results

The questionnaires were applied to 6,913 students. Seven were excluded from the sample: one for erasures that precluded understanding the answers; another

for withdrawing consent during participation; and the others for handing in blank questionnaires. Thus, the final sample consisted of 6,906 students, corresponding to 34.7% of all 19,869 enrolled (14.7% more than the intended minimum of 20%) in 2017[11]: 77.8% (N=5,376) from the Campinas campus, 18.9% (N=1,302) from the Limeira campus and 3.3% (N=228) from the Piracicaba campus, with distribution proportional to the number of students on each campus. The distribution by area was close to that of the University, namely: Exact and Technological Sciences, 33.5% in the study and 35.6% of the students at the University; Health Sciences, 23.1% and 18.9%; Arts and Humanities, 27.8% and 24.5%; and Basic Sciences, 11.1% and 15.4%, respectively. The participants' mean age was 21.33 ± 3.65 years old, with 84.3% (N=5,822) aged between 18 and 24. Table 1 shows the sociodemographic, academic and mental health characteristics of the participating undergraduate students.

Table 1 - Profile of the undergraduate students (N=6,906). Campinas, SP, Brazil, 2017-2018

Categorical variables	N* (%)	Missing (%)
Male gender	3.569 (51,7)	28 (0,4)
Female gender	3.309 (47,9)	28 (0,4)
LGBT†	1.395 (20,2)	295 (4,3)
Not LGBT†	5.216 (75,5)	295 (4,3)
Socio-economic level - Class A	2.493 (36,1)	19 (0,3)
Socio-economic level - Class B	3.449 (49,9)	19 (0,3)
Socio-economic level - Classes C/D/E	945 (13,7)	19 (0,3)
Mother's schooling - Higher Education/Graduate studies	1.384 (20,0)	27 (0,4)
Mother's schooling – Complete Elementary/Technical/High School	4.949 (71,7)	27 (0,4)
Mother's schooling - Incomplete Elementary School/None	546 (7,9)	27 (0,4)
Working while studying	2.139 (31,0)	27 (0,4)
Not working while studying	4.737 (68,6)	27 (0,4)
Owning a personal car	1.901 (27,5)	22 (0,3)
Not owning a personal car	4.983 (72,2)	22 (0,3)
Receiving a scholarship from the university	1.790 (25,9)	51 (0,7)
Not receiving a scholarship from the university	5.065 (73,3)	51 (0,7)
Has already missed an academic semester	812 (11,8)	45 (0,7)
Has never missed any academic semester	6.049 (87,6)	45 (0,7)
Self-assessment of academic performance - Mean/Above the mean	1.224 (17,7)	369 (5,4)
Self-assessment of academic performance - Below the mean	5.313 (76,9)	369 (5,4)
Missing classes - A little/Normal	6.114 (88,5)	25 (0,4)
Missing classes - Frequently/Very frequently	767 (11,1)	25 (0,4)
Has already suffered non-sexual violence	2.068 (29,9)	44 (0,6)
Has never suffered non-sexual violence	4.794 (69,4)	44 (0,6)
Has already been raped	362 (5,2)	342 (5,0)
Has never been raped	6.202 (89,8)	342 (5,0)
Has already suffered sexual violence while intoxicated	257 (3,7)	1530 (22,2)
Has never suffered sexual violence while intoxicated	5.119 (74,1)	1530 (22,2)
History of or current mental health problems	1.899 (27,5)	106 (1,5)
No history of or current mental health problems	4.901 (71,0)	106 (1,5)
Has already had suicidal ideation	1.836 (26,6)	90(1,3)
Has never had suicidal ideation	4.980 (72,1)	90(1,3)
Has already made suicidal plans	616 (8,9)	111 (1,6)

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Categorical variables	N* (%)	Missing (%)
Has never made suicidal plans	6.179 (89,5)	111 (1,6)
Has already attempted suicide	357 (5,2)	139 (2,0)
Has never attempted suicide	6.410 (92,8)	139 (2,0)
Has already self-injured without suicidal intention	1.188 (17,2)	244 (3,5)
Has never self-injured without suicidal intention	5.474 (79,3)	244 (3,5)
Risky drinking (AUDIT‡ ≥ 8)	2.321 (33,6)	181 (2,6)
No risky drinking (AUDIT‡ < 8)	4.404 (63,8)	181 (2,6)
Has used marijuana at least six days in the last month	766 (11,1)	244 (3,5)
Has not used marijuana/used it less than six days in the last month	5.896 (85,4)	244 (3,5)
Has used cocaine in the last year	162 (2,3)	283 (4,1)
Has not used cocaine in the last year	6.461 (93,6)	283 (4,1)
Has used solvents in the last year	437 (6,3)	276 (4,0)
Has not used solvents in the last year	6.193 (89,7)	276 (4,0)

*N = Number; †p = Significance level; ‡LGBT = Lesbians, Gays, Bisexuals and Transgenders; §AUDIT = Alcohol Use Disorders Identification Test

In relation to substance use, 8.3% (N=546) of the students had used LSD, 7.9% (N=520) ecstasy and 10.8% (N=707) LSD and/or ecstasy in the last 12 months before the research. Only 0.1% (N=3) used LSD exclusively and 0.1% (N=4) used ecstasy exclusively during the same period. Table 2 shows the results of the bivariate analysis corresponding to the factors associated with synthetic drug use among the students.

Table 2 - Variables associated with LSD and/or ecstasy use in the last twelve months compared to the group of non-users. Campinas, SP, Brazil, 2017-2018

Categorical variables	Users		Non-users		p†- *value*
	N*	%	N*	%	
Male gender	423	59,8	2.971	50,6	<0,001
LGBT‡	242	35	1.118	19,4	<0,001
Socio-economic level - Class A	321	45,3	2.085	35,5	<0,001
Mother's schooling - Higher Education/Graduate studies	489	69,9	3.453	59	<0,001
Owning a personal car	262	37	1.578	26,9	<0,001
Working while studying	256	36,3	1.792	30,5	0,002
Receiving a scholarship from the university	559	79,2	4.295	73,1	0,001
Has already missed an academic semester	151	21,7	616	10,5	<0,001
Self-assessment of academic performance - Below the mean	197	28,8	968	17,3	<0,001
Missing classes - Frequently/Very frequently	183	25,8	549	9,3	<0,001
Has already suffered non-sexual violence	278	39,4	1.721	29,3	<0,001
Has already been raped	85	12,4	272	4,8	<0,001
Has already suffered sexual violence while intoxicated	76	11,2	180	3,9	<0,001
History of or current mental health problems	252	35,9	1.572	26,9	<0,001
Has already had suicidal ideation	233	33	1.534	26,1	<0,001
Has already made suicidal plans	91	13	490	8,4	<0,001
Has already attempted suicide	54	7,7	281	4,8	0,001
Has already self-injured without suicidal intention	171	24,6	969	16,9	<0,001
Risky drinking (AUDIT§ ≥ 8)	535	76	1.746	29,8	<0,001
Has used marijuana at least six days in the last month	383	54,2	377	6,4	<0,001
Has used cocaine in the last year	116	16,5	46	0,8	<0,001
Has used solvents in the last year	283	40	151	2,6	<0,001

*N = Number; †p = Significance level; ‡ LGBT = Lesbians, Gays, Bisexuals and Transgenders; §AUDIT = Alcohol Use Disorders Identification Test

In terms of quality of life (WHOQOL-BREF), the group that had used synthetics in the last year had a higher mean in the Social domain, with 63.7 ± 0.77 versus 60.3 ± 0.28 (p < 0.001), and in the Environmental domain, with 62.8 ± 0.61 versus 61 ± 0.2 (p = 0.001). There were no statistically significant differences in the Psychological and Physical domains.

A review of the database from the 2005 study at the same university[16] showed a total prevalence of U12M for LSD and/or ecstasy of 4.4% (N=57), 5.6% (N=32) among men and 3.4% (N=25) among women. In the current study, the use prevalence of these substances was 10.8% (N=707), 12.5% (N=423) among men and 8.9% (N=284) among women.

Table 3 shows the results of the multivariate analysis corresponding to the factors associated with synthetic drug use in the last 12 months.

Table 3 - Multiple logistic regression model, with the "stepwise" criteria, for the variables associated with LSD and/or ecstasy use in the last twelve months. Campinas, SP, Brazil, 2017-2018

Variables	OR*	CI† (95%) for OR*	p†- value
LGBT§	1,48	1,17 ; 1,88	0,001
Working while studying	1,39	1,11 ; 1,74	0,004
Owning a personal car	1,54	1,22 ; 1,94	<0,001
Has already missed an academic semester	1,59	1,19 ; 2,10	0,002
Missing classes - Frequently/Very frequently	1,44	1,10 ; 1,88	0,007
Has already suffered sexual violence while intoxicated	1,76	1,18 ; 2,59	0,005
Social relations domain (WHOQOL - BREF)‖	1,01	1,00 ; 1,01	0,004
Environmental domain (WHOQOL - BREF)‖	1,01	1,00 ; 1,02	0,006
Risky drinking (AUDIT¶ ≥ 8)	2,27	1,78 ; 2,90	<0,001
Has used marijuana at least six days in the last month	6,83	5,44 ; 8,57	<0,001
Has used cocaine in the last year	4,90	3,13 ; 7,75	<0,001
Has used solvents in the last year	8,11	6,16 ; 10,7	<0,001

*OR = Odds Ratio; †CI = Confidence Interval; ‡p = Significance level; §LGBT = Lesbians, Gays, Bisexuals and Transgenders; ‖WHOQOL - BREF = World Health Organization Quality of Life; ¶AUDIT = Alcohol Use Disorders Indentification Test

Discussion

This study is considered one of the largest and most recent Brazilian surveys assessing synthetic drug use and the factors associated with consumption among undergraduate students. The prevalence of synthetic drug use in the last 12 months was 10.8%, much higher than the rates indicated by national studies in the last decade, both in the general population adjusted for the 18-24 age group, with prevalence values between 0.15% and 0.81%[3], and in the university population, with U12M for ecstasy of 3.1% and of 4.5% for hallucinogens (including LSD)[4]. The high use rates among university students compared to the general population were expected and corroborate data from the international and national literature[2,4]. However, there has been a substantial increase in use when compared to the 2005 survey carried out at the same university[16], which found U12M of 4.4% for synthetic drugs. The figures obtained are close to the prevalence of use in the last year for *club drugs* of 7.8% found in a recent national study among university students[5], showing a scenario of increased consumption of *club drugs* in the last decade.

It has been well-known that, both due to the historical process of their dissemination and their psychotropic effects of euphoria and socialization, synthetics are used in festive environments[17]. As shown in this study, the growth in the consumption of these substances can be related to their popularization in the university environment, which is characterized by a young population and high frequency of social events, enabling greater circulation of these drugs[5]. In addition, the prevalence of young adults who perceive it as easy to access these drugs has increased, and the risk perception regarding experimental use of both drugs has decreased, as presented in a serial American study[2].

Concerning use by gender, there was higher use prevalence among men, a fact that corroborates the data described in the literature[3-4,9], which points to a perception of easier access to illicit drugs and a lower risk perception related to their consumption by men[5]. However, the results suggest a reduction in the difference in use between men and women, when compared to a 2005 survey at the same university[16], which ratifies recent data from the international literature[10]. Thus, focus is given to the particularities

of female use in relation to the psychotropic effects, dosage and metabolization of the drug, such as women's greater susceptibility to the hallucinatory effects of ecstasy presented in a review of double-blind placebo-controlled studies, where there was higher frequency of reports of elementary hallucinations and visual pseudo-hallucinations in this group, even when administered equal doses per kilogram in both genders[18].

Regarding the use of other SPAs, it can be seen that the factor most associated with the synthetic drug consumption was the use of other drugs, increasing the use chance between 2.27 and 8.11 times, much more than any other aspect assessed. Furthermore, LSD and/or ecstasy use hardly occurred isolated in this sample. This defines a very important pattern among synthetic drug users: poly-drug consumption. This finding is in line with diverse evidence that the use of other drugs, including alcohol and tobacco, especially before the age of 21, increases the likelihood of synthetic drug use[19-20]. Concomitant consumption can be related to the behavior of testing one's own limits and seeking out risky activities[20], but it also suggests the search to potentiate the psychotropic effects and minimize the unwanted effects of drugs[20-21]. Many users report reasonable knowledge about the pharmacological mechanisms of the substances and how to make combinations to obtain the desired effects[21-22], a fact that could be considered positive under the premise of harm reduction if associated with guidelines on the increased toxicity risks due to the interaction of drugs and metabolites. However, it is known that the use of multiple substances is associated with greater chances of developing cardiovascular diseases, psychobehavioral problems, cognitive deficits, increased rates of risky sexual behavior and sexually transmitted infections[22-23], indicating the importance of addressing the risks of multiple substance use in preventive, care and research proposals.

The association between using *club drugs* and having suffered sexual violence while intoxicated and having been a victim of rape was found in both genders, with predominance among women and in proportions consistent with the literature[24-25]. Combined with the increase in synthetic drug use among women, this fact is a warning sign, as psychoactive substances are oftentimes associated with sexual abuse and have the potential to make individuals more vulnerable to this outcome[26-27].

Although Central Nervous System (CNS) depressant drugs such as gamma-hydroxybutyrate (GHB) and benzodiazepines are more commonly associated with abuse situations[26,28-29], the euphoria and disinhibition state caused by ecstasy and LSD can diminish the discernment capacity and make users more susceptible to sexual violence situations, which is exemplified by the reports of people who have engaged in sexual activities under the influence of MDMA and reported that they would not do so if they were sober[29]. In addition, stimulant and CNS-disrupting drugs have a subsequent phase of physical exhaustion, either after a binge use episode or in the withdrawal syndrome context, which, associated with concomitant use of alcohol or other depressants, can be exacerbated and lead to lowered levels of consciousness[30]. This state, similar to the one found in victims of "Good Night Cinderella", predisposes them to situations of vulnerability to sexual abuse. In addition, users oftentimes have no means of guaranteeing composition of the drugs ingested and end up consuming adulterants or other psychotropic drugs that can cause unexpected and deleterious effects[31].

Regarding gender identity and sexuality, there was an 85% increase in the likelihood of synthetic drug use among students who were part of the LGBT group. From the drug use perspective, this aspect has been explored more in recent years, not only finding high use prevalence, but also poly-consumption in this population[32]. Several characteristics are said to favor this phenomenon in young people belonging to sexual minorities, such as a greater perception of social reinforcement associated with substance use, the perception that more of their peers use drugs, and that the environment in which they live accepts SPA use more readily[33]. Another hypothesis that complements this finding is explained by the "minority stress model", which defines that various socio-cultural stressors experienced by the LGBT population, such as hostility, homophobic culture and marginalization, can lead to harassment, mistreatment and discrimination, which in turn generate negative health effects[34]. Together, the social oppression factors impose a historical perspective, in which the LGBT community has developed a culture of bars and party houses, incorporating spaces that they consider safe for socializing and expressing their gender identity and sexuality, integrating the consumption of substances present in these places into their socio-cultural dynamics[33]. Thus, with a sample comprised by more than 1/5 of LGBT students in the university population, future research is required to address the specific socio-cultural aspects of this group to better understand the logic to which this group is subjected and its consequences.

Use associated with higher socioeconomic levels has already been documented in research studies focusing on the consumption of any psychoactive substance, using income and schooling as markers[9,19,35]. For users of club drugs, this factor seems to be of major importance, with a North American study showing a change in the proportion of users in relation to schooling level, with higher use rates among people with High School and

Higher Education and lower rates of use in the population with lower schooling[19]. In addition, the study shows that police seizures of ecstasy in the city of São Paulo also follow a class-based spatial cutoff, being more frequent and in greater amounts in neighborhoods with higher Human Development Indices[36]. In the Brazilian context, the socio-economic factor may influence use prevalence due to the high prices of club drugs, as well as restricted access to the environment of the parties where consumption takes place due to the class cutoff. This analysis may partially explain the high prevalence of LSD and/or ecstasy use in this sample when compared to the literature, as nearly 86% of the respondents belong to social classes A or B.

The association between drug use and negative mental health outcomes has been widely explored for decades. There are records of high comorbidity rates between SPA use, mental disorders and suicidal ideation[37-38], and it is a bidirectional association: substance use precipitates and/or amplifies mental disorders but, among other factors, it can also be the result of an attempt to escape or reduce the distress caused by them. In the concomitant presence of both conditions, more persistent, severe and treatment-resistant symptoms are oftentimes observed when compared to isolated disorders[39]. The results corroborate the data in the literature and warn us about the possibility that university students are more vulnerable to developing and having difficulty managing psychological and psychiatric disorders due to three main factors: there are proportionally more drug users than in the general population[4]; this age group is predominantly still in the neurodevelopment process[40]; and this is a period of major changes and search for identity[5].

Another important finding was that *club drug* users scored higher in two domains from the WHOQOL-BREF quality of life questionnaire. As for the Environmental domain, the questionnaire assesses factors that are strongly influenced by socioeconomic level, such as income, access to health care and participation in recreational activities[14,41-42]. This justifies better scores among users of synthetic drugs because there is certain overlap with the group from higher social classes. Regarding the Social relations domain, the questionnaire assesses personal relationships, social support and sexual activity. In this way, better scores are hypothesized for *club drug* users due to the strict relationship between consumption and socializing environments[17]. However, the cross-sectional nature of the study precludes defining causality, and further research might clarify whether students with greater sociability are more exposed to the use of these substances, whether users find it easier to access drugs in these environments and are therefore subjected to more interpersonal interactions, or whether both factors are concomitant.

The poorer academic performance of High School and University students that use psychoactive substances has already been addressed in previous studies[43-45], and is a complex factor, possibly bidirectional. The causal relationship between drug use and academic indicators is not well established, and there is diverse evidence of poorer performance among users, but also of similar performance when compared to non-users[45-46]. It is argued that there are common factors, mainly psychosocial and physical/mental health conditions, that mediate both outcomes[46]. In the current study population, there is evidence of poorer academic performance among *club drug* users and it is noteworthy that use in the last 12 months, regardless of whether it was initiated before entering university, is an important marker of SPA consumption during academic life. This means that performance in university activities is inseparable from the university's role in teaching, and it is of utmost importance for the institution to identify these vulnerabilities in order to guide measures to reduce them.

The study results have the potential to foster spaces for listening, welcoming and raising awareness about the risks of using synthetic drugs and the importance of seeking specialized care[7]. To this end, the creation of support services for university students in Higher Education institutions is encouraged, such as the Psychological and Psychiatric Assistance Service for Students (*Serviço de Assistência Psicológica e Psiquiátrica ao Estudante*, SAPPE)[47] and the Psychopedagogical Support Group for Medical, Nursing and Speech Therapy Students (*Grupo de Apoio Psicopedagógico ao Estudante de Medicina, Enfermagem e Fonoaudiologia*, GRAPEME)[48], which already exist at UNICAMP, using surveys similar to this one as a basis for targeted care protocols.

Likewise, the data can contribute to planning harm reduction strategies, especially by groups independent of the university management, actively present at extra-curricular events not linked to the university, but predominantly attended by this community, such as parties, sports competitions and concerts. For instance, spaces for drug testing are suggested to reduce the risks of contamination and harmful pharmacological interaction, as well as welcoming committees that actively seek out risk, abuse and violence situations to mitigate them[49].

Despite the findings, this study has limitations that deserve to be highlighted. The first one refers to its cross-sectional design, which precludes establishing the causality direction of the events, with some of the relationships observed supported by the existing literature and others that will have to be assessed in further studies. Another limitation is a possible selection bias due to convenience sampling with the questionnaires applied to those present in the classroom; in addition, it is possible that there were synthetic users absent at the time of the research, or even measurement

bias since, despite anonymity and individuality of the answers, the participants may have underreported the consumption volume and its consequences. These limitations should be taken into account when analyzing the results.

In addition, the regional diversities of a country with continental dimensions like Brazil, the differences between public and private universities, and changes in the profile of new university students in recent decades due to inclusion policies and grade bonuses at public universities, indicate caution in extrapolating the findings to the universe of Brazilian university students. However, it is worth noting that most of the factors associated with the consumption of synthetic drugs are corroborated by results from international[2,6,10,19-20], national or other Brazilian[4-5,9,22-23,43] studies.

Thus, the information presented can help elucidate factors associated with the use of club drugs by university students and serve as a basis for guiding prevention and institutional intervention actions to reduce the potentially harmful consequences associated with consumption of these substances.

Conclusion

This wide-ranging study of the university population in Brazil showed a high rate of use for so-called *club drugs* or synthetic drugs among university students, a population characterized by young adults, and that the consumption pattern is predominantly concomitant with other SPAs. The main factors associated with synthetic drug use in the last 12 months are self-identifying as LGBT, higher socioeconomic status, poorer academic performance, having been victims of sexual violence while intoxicated, risky drinking, using other illicit psychoactive substances and scoring higher on quality of life markers that describe social and environmental aspects. Although to a lesser extent, there were also associations with male gender, with having worse mental health markers and with having suffered physical and sexual violence.

Acknowledgments

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