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Pattern of psychedelic substance use: a comparison between populations in Spain and South America using the Psychedelic Use Scale (PUS)

Jaime Rojas-Hernández[1,2] · Lucas F. Borkel[1] · Domingo J. Quintana-Hernández[1,3,4] · Ángelo Santana del Pino[5] · Luis Alberto Henríquez-Hernández[1,6]

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Abstract

Psychedelic use has increased in the last decade. However, it is unclear whether the cultural background of the consumers exerts any influence. The aim of the present study was to determine the pattern of psychedelic use in Spain and Spanish-speaking populations in South America and compare these consumption patterns to understand the use of these substances in two culturally distinct populations. The Psychedelic Use Scale (PUS) was administered via the Google Surveys platform between September and November 2022. 735 participants were selected using a non-probability purposive sampling technique. The study received ethics approval from the local ethics committee. Psilocybin was the most used substance. MDMA was more frequently consumed in the Spanish population (78.5 vs. 37.1%), while mescaline was more commonly used among participants from South America (31.9 vs. 24.0%), mainly among males ($P < 0.05$). Among the Spanish population, MDMA was the most commonly combined psychedelic; for the South American population, LSD was the substance most frequently combined, highlighting the predominant recreational use of this substance. DMT predicted the most adverse effects during consumption, whereas MDMA predicted the most adverse effects after consumption. Age was as a risk factor for the development of adverse effects, with a significant increase in risk observed in individuals under 30 years of age (OR = 2.01, CI95% 1.1–3.6). In conclusion, the pattern of psychedelic substance use differed between both populations, highlighting the necessity for comprehensive studies. This is especially crucial in light of the social shifts stemming from the ongoing psychedelic renaissance.

Keywords Psychedelics · Survey · Inter-cultural differences · Pattern of consumption · Set and setting

Introduction

According to the latest data published by the United Nations Office on Drugs and Crime, the estimated number of people who consume drugs of abuse grew from 240 million in 2011 to 296 million in 2021 (UNODC, 2023). However, statistics on the use of psychedelic substances apart from what refers to 3,4-methylenedioxymethamphetamine (MDMA) were not taken into account. It is estimated that over 5.5 million U.S. adults use hallucinogens, which represent an increased use rate from 0.9 to 4% between the years 2002 to 2019 (Livne et al., 2022). Data referred to hallucinogens as a group and, individually, only data on the use of MDMA, phencyclidine (PCP) and lysergic acid diethylamide (LSD) were provided. According to the European Drug Report, prevalence for LSD and hallucinogenic mushrooms was

✉ Luis Alberto Henríquez-Hernández
luis.henriquez@ulpgc.es

1 Asociación Científica Psicodélica, Canary Islands, Spain

2 Asociación Canaria para el Desarrollo de la Salud a través de la Atención, Canary Islands, Spain

3 Faculty of Psychology, Universidad del Atlántico Medio, Canary Islands, Spain

4 Insituto-AS, Cabildo de Gran Canaria, Canary Islands, Spain

5 Department of Mathematics, Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain

6 Unit of Toxicology, Clinical Science Department, Universidad de Las Palmas de Gran Canaria, Paseo Blas Cabrera Felipe, s/n., Las Palmas de Gran Canaria 35016 Canary Islands, Spain

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equal to or less than 1% (EMCDDA, 2023), but no details were provided for other substances. The latest Survey on Alcohol and Drugs in Spain (EDADES, for its acronym in Spanish), published with data collected between 1995 and 2022, showed that the prevalence of use of psychedelics increased from 2 to 5% in the last two decades, although reference was not made to psychedelic substances in particular, but to hallucinogens as a group (EDADES, 2022). It seems, therefore, that there is a lack of knowledge about the patterns of use of specific psychedelic substances. The Canadian Psychedelic Survey is the only detailed published study on the specific use of psychedelics (Lake & Lucas, 2023), reporting data about characteristics, patterns of use, and access in a large sample of people who use psychedelic drugs ($n = 2045$ respondents).

In general, an increase in the use of psychedelic substances is observed, as well as a decrease in the perception of the risk associated with taking hallucinogens (Livne et al., 2022). A plausible explanation for this pattern of behavior lies in the so-called "psychedelic revolution" that arose with the renaissance of research with psychedelic substances in the context of mental illness (Jacobs, 2021). Published studies showing a therapeutic effect of these substances in certain pathologies such as depression or post-traumatic stress disorder may suggest to the general population that these substances are harmless. Although it is true that, in general, these substances could be more effective and less toxic than most psychiatric drugs (Henriquez-Hernandez et al., 2023), in pharmacological and toxicological terms, the fact is that there is still a great deal of ignorance about the mechanisms of action and long-term effects. This way of perceiving psychedelic drugs is especially relevant among the younger population, which is oblivious to the propaganda associated to the "Acid Panic" period, defined as the period of time spanning from the late 1960s to the early years of this century, during which psychedelic substances were stigmatized despite the clinical potential they exhibited (Henriquez-Hernandez et al., 2023). This new social situation makes it relevant to know the patterns of consumption of hallucinogens, especially considering that consumption patterns may be influenced by the cultural context of each population (Bouso et al., 2023). In that sense, understanding these differences is relevant for the medical use intended for these substances, as their social reception may vary in the context of each society.

Cross-cultural differences have recently been suggested by Bouso et al., who noted that English-speaking were more regular users of hallucinogenic drugs among a series consisting of English-, Spanish, and Portuguese-speaking participants (Bouso et al., 2023). While in Europe and North America the use of psychedelics is associated with entertainment and new age spirituality, in South America their use is ritualized and associated with ancient magical and shamanic practices (Celidwen et al., 2023). These practices include the use of sacred plants (e.g. columnar cacti of the genus Echinopsis, magic mushrooms such as *Psilocybe cubensis* or *Psilocybe semilanceata*, or Ayahuasca (a cooking that combines *Psychotria viridis* and *Banisteriopsis caapi*), among others) and certain animals (e.g. *Incilius alvarius*). Contrary, the western population is historically more influenced by the use of synthetic hallucinogens (e.g. MDMA or LSD). The Canadian Psychedelic Survey showed that psilocybin, MDMA and LSD were the most used drugs. Well-being, fun and self-exploration were the most frequently self-reported motivations, reaffirming the idea of low risk from hallucinogen use (Lake & Lucas, 2023). Although most of the users surveyed reported having obtained the substance through the internet or through friends, a high percentage of them expressed a desire to obtain it through spiritual leaders, clinics or retail stores. This observation is a reflection of changing policies on the legal regulation of these substances in many parts of the World (Marks, 2023).

In the present study, the Psychedelic Use Scale (PUS) was employed to assess patterns of use of psychedelic substances in two populations that share the same language but are culturally different. Specifically, the objectives were (i) to determine the pattern of psychedelic substance use in two Spanish-speaking populations (Spain and Spanish-speaking populations in South America), and (ii) to compare these patterns of use in accordance with its socio-cultural context, with the aim of understanding the use of these substances in two culturally different populations.

Materials and methods

A correctional study design was adopted to achieve the stated objectives through the use of a survey specifically developed to understand in detail the consumption pattern and the demographic and health profile of psychedelic substance users.

Instrument

Given the lack of published scales designed to respond to the objectives of the present work, we designed a 39-item instrument aimed to measure and explore the use of psychedelic substances (Borkel et al., 2024). The Psychedelic Use Scale (PUS, by its acronym) is divided into 3 sections, as follows: sociodemographic Sect. (8 items), substance use and set and setting Sect. (19 items), and health and lifestyle Sect. (12 items). The instrument received ethics approval from the ethics committee Comité de Ética de la Investigación/Comité de Ética de la Investigación con

Medicamentos (CEI/CEIm) from Las Palmas province, Spain (code CEIm Las Palmas 2022-375-1; protocol code ACP-01), on August 26th, 2022. Data collected from the first 4 sections have been used for the present work. Details of the survey are available at https://www.asociacionpsicodelica.com/recursos-esp.

Participants

Method of Data Collection

The instrument was administered via the Google Surveys platform. The online survey link was published on social media and other platforms to reach the largest number of people. The instrument was published in Spanish and was set up to be displayed in Spanish-speaking countries (Borkel et al., 2024). Data were collected from 1 September to 30 November 2022. The sampling method used was the non-probability purposive sampling technique and was not intended to be representative of any specific population.

Sample size

At the end of the data collection period, a total of 1022 individuals responded to the survey. Of them, 651 were from Spain (64.0%) and 366 were from South America (36.0%). Five participants were discarded because origin was not available. A total of 746 reported use of psychedelic substances (433 from Spain and 313 from South America). After a thorough review of the responses, 11 participants were then excluded because they reported exclusive use of non-psychedelic drugs (e.g. exclusive use of cannabis or pharmaceuticals). Thus, the final series analyzed in the present work was composed by 735 participants: 425 from Spain (57.8%) and 310 from South America (42.2%). Figure 1 illustrates the distribution of individuals throughout the study. To provide as much information as possible, the demographic characteristics of non-users are shown in Additional file 1.

Ethical considerations

No personal identifying information was requested from participants. Thus, no data related to names, phone numbers, medical record numbers, or any similar information

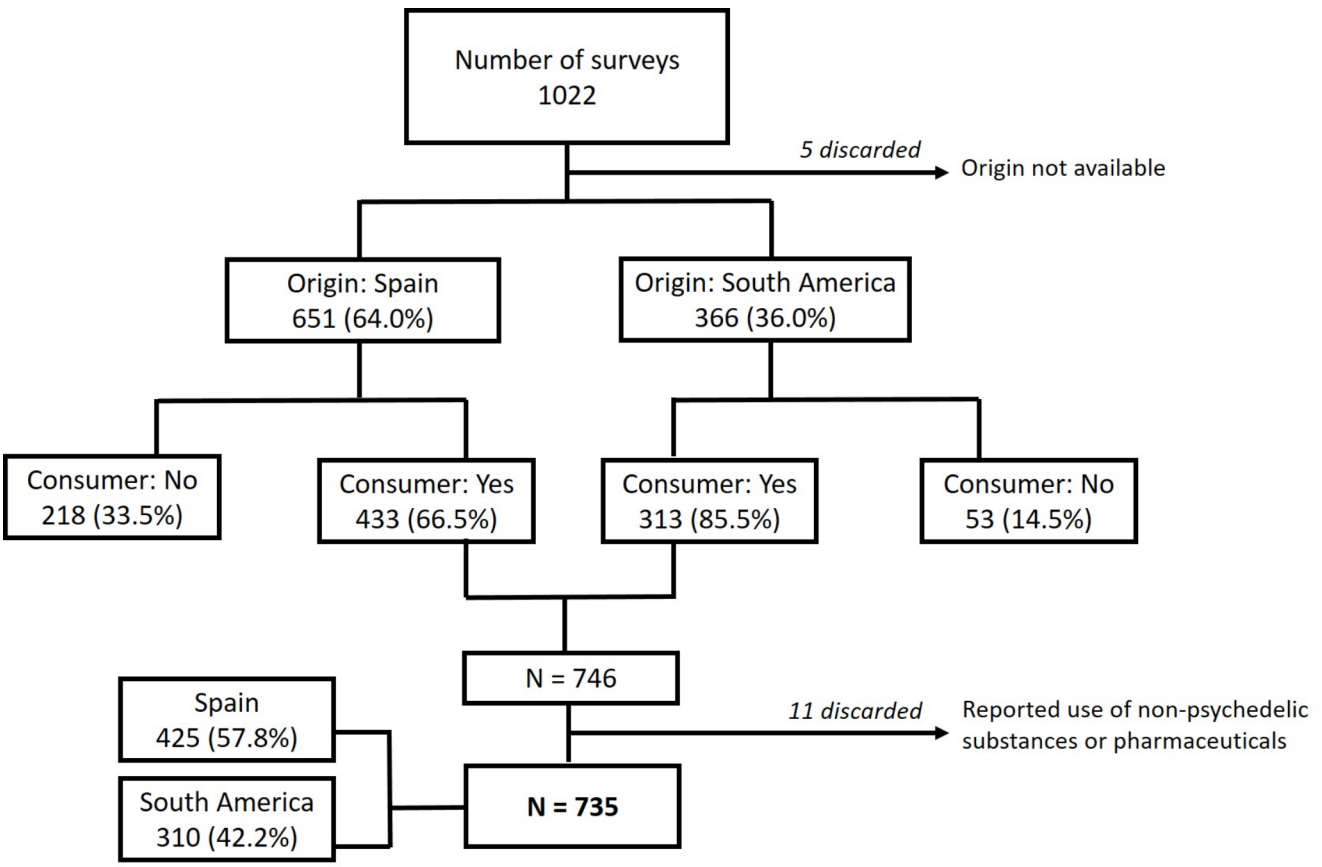

Fig. 1 Flowchart illustrating the distribution of individuals included in the present study

were collected. To ensure no duplicate responses, a thorough review of the data was conducted upon completion of recruitment.

Statistical analysis

Data were exported to Microsoft Excel 2007 (Microsoft Corporation, Albuquerque, NM, USA) and then organized and analyzed with IBM® SPSS® software v. 22 (SPSS Inc., Chicago, IL, USA). Descriptive analyses were conducted for all of the variables. Means, standard deviations, medians, and ranges were calculated for continuous variables. Proportions were calculated for categorical variables. Comparisons between groups were performed using non-parametric tests (Kruskal–Wallis and Mann–Whitney U-test). Differences in the categorical variables were tested with the Chi-square test. Univariate and multivariate analyses were done with logistic regression test. Probability levels of <0.05 (two-tailed) were considered statistically significant.

Results and discussion

Sample characteristics and psychedelic drug use

A total of 735 participants were selected for the study: 425 from Spain and 310 from South America (Fig. 1). The mean age of the respondents was 40 years, and no significant differences were observed in relation to age, gender or civil status of the individuals in both sub-series (Table 1). Although the mean age observed in our series is similar to that of other similar studies, the proportion of men in the present study was higher, contrary to what has been reported by other authors who have published a higher number of responses from women (Bouso et al., 2023; Lake & Lucas, 2023). However, the gender trend observed in the present study is consistent with that reported in a survey on psychedelics conducted among more than 57,000 people in the United States, where the majority of consumers were males (Krebs & Johansen, 2013). The majority of consumers came from an urban habitat, although the percentage was significantly higher in the South American population (86.5 vs. 69.4%; Chi square test, $P<0.001$). Educational level was significantly higher among South American individuals. Thus, while the percentage of people with less than high school level education was higher among Spanish respondents (23.2 vs. 33.7%), the proportion of graduates was higher among South American respondents (74.8 vs. 60.6%; Chi square test, $P<0.001$). These data suggest a cross-cultural difference in relation to the use of psychedelics: while in South America its use seems to be more "elitist", probably associated with university environments and

Table 1 Sociodemographic and substance use characteristics of Spanish and south American psychedelic consumers survey respondents ($n=735$)

Charactaristic	Spain ($n=425$)		South America ($n=310$)		
	N	(%)	N	(%)	P value[#]
Age (years)					
Mean (SD)	39.6	(11.6)	40.9	(14.0)	0.171*
Median (range)	40.0	(18–70)	40.0	(18–76)	0.493**
Gender					0.515
Male	253	(59.5)	185	(59.7)	
Female	172	(40.5)	125	(40.3)	
Civil status					0.301
Married/In couple	200	(47.1)	135	(43.5)	
Divorced	35	(8.2)	37	(11.9)	
Single	187	(44.0)	134	(43.2)	
Widow	3	(0.7)	4	(1.3)	
Habitat					<0.001
Urban	295	(69.4)	268	(86.5)	
Rural	130	(30.6)	42	(13.5)	
Employment status					0.432
Employed	301	(74.3)	231	(76.0)	
Unemployed	38	(9.4)	19	(6.2)	
Retired	19	(4.7)	13	(4.3)	
Others[†]	47	(11.6)	41	(13.5)	
Education level					<0.001
≤High school	142	(33.7)	72	(23.2)	
College/Technical degrees	24	(5.7)	6	(1.9)	
Graduate	255	(60.6)	232	(74.8)	
Number of lifetime psychedelic experiences					<0.001**
Median (range)	20	(1–120)	10	(1–120)	
Past-month psychedelic drug use (yes)	132	(31.1)	104	(33.7)	0.472
Past-year psychedelic drug use (yes)	268	(63.1)	211	(68.3)	0.158
Past-year psychedelic drug use frequency[a]					0.041
< Monthly	258	(78.9)	191	(78.0)	
Monthly	61	(18.7)	38	(15.5)	
≥Weekly	8	(2.4)	16	(6.5)	
Time between first and last use of a psychedelic substance					0.039
Less than one year	129	(30.4)	121	(39.0)	
More than one year	276	(64.9)	173	(55.8)	

Table 1 (continued)

Characteristic	Spain ($n=425$)		South America ($n=310$)		
	N	(%)	N	(%)	P value[#]
Last time was the first time	20	(4.7)	16	(5.2)	
Microdosification[b] (yes)	179	(42.1)	165	(53.2)	0.003

Abbreviations: SD, standard deviation

[#]Chi square test (unless otherwise specified)

*Student t-test

**Mann-Whitney U-test

[†]Housewife and students

[a]103 and 67 missed values among Spanish and South American consumers, respectively

[b]"Microdose" is defined as a small fraction of a regular dose, not enough to produce psychedelic effect but still used

educated people, in Spain it seems to be more widespread, probably due to the immersion of MDMA in Western culture (van Amsterdam et al., 2020). Moreover, the median of lifetime psychedelic experiences was twice as high among participants from Spain (20 vs. 10; Mann-Whitney U-test, $P<0.001$; Table 1), an observation that can be explained by the income difference between the two populations (Data not shown). However, there is the possibility that the rural population of South America is not well represented simply because they have less access to the internet and, therefore, to this survey. Therefore, while this result is interesting, it should be interpreted considering this limitation.

Past year psychedelic drug use was similar among both subseries (63.1 vs. 68.3%), a result close to that reported in the Canadian Psychedelic Survey (74.9%) (Lake & Lucas, 2023). In the same line, the frequency of consumption was similar to that reported in the Canadian series, with most individuals taking these substances more than once a month. Taken together, it seems that the South American population accessed psychedelics more frequently, as they not only showed a higher frequency of weekly use but also reported less time lag between the first and last use of hallucinogens (Chi square test, $P=0.041$ and $P=0.039$, respectively; Table 1).

The most frequently used substance in both populations was psilocybin (Table 2). LSD ranked second in the South American population and third among the Spanish participants, with consumption percentages above 65% in both cases. In the other hand, MDMA ranked second in the Spanish population and third among the South American participants, but there was a significant difference in the consumption (78.5 vs. 37.1; Chi square test, $P<0.001$). This result shows an important cross-cultural difference in consumption that had been suggested previously. A UNODC report from 2020 showed an expansion of the 'ecstasy' market derived from the illegal trafficking of this substance from Europe and North America (UNODC, 2020), suggesting a progressive introduction of this substance in the region. In Spain, meanwhile, ecstasy use reached an all-time high in 2022, according to official data (EDADES, 2022). However, although there are no official data from the governments of South American countries, the consumption of this substance among South American psychedelic users is far from that observed in the Spanish population (Table 2). We observed significant differences in consumption between the two populations for other psychedelic substances, including mescaline, which was significantly more consumed among South American participants (24.0 vs. 31.9%; Chi square test, $P=0.020$). The opposite scenario was observed for *Salvia divinorum*, which was significantly more consumed among participants from Spain (18.9 vs. 12.5%; Chi square test, $P=0.020$). Making a comparison between Western populations, the prevalence of the Spanish participants was almost identical to that observed by the Canadian Psychedelic Survey, where the three most prevalent substances were psilocybin, MDMA and LSD, and where, in addition, the prevalence of *Salvia divinorum* or N, N-Dimethyltryptamine (DMT) was almost identical (Lake & Lucas, 2023). This result reinforces cross-cultural differences in the use of hallucinogenic substances.

Influence of socio-demographic factors on consumption pattern

We wanted to see which socio-demographic variables were related to the prevalence of substance use and whether these variables had the same effect regardless of the cultural origin of the user.

We found that Spanish males consumed more LSD, psilocybin and *Salvia divinorum* than females (Chi square test, $P<0.001$, $P<0.05$ and $P<0.001$, respectively; Fig. 2). However, this pattern was only valid for LSD among the South American population (Chi square test, $P<0.05$). This gender difference has been observed previously, although there are studies in which the opposite trend has been reported (Bouso et al., 2023; Krebs & Johansen, 2013; Lake & Lucas, 2023; Sogaard Juul et al., 2023). In any case, except for hypnotic-type drugs and opioids, most surveys on drug abuse report higher use among males (EDADES, 2022). In our series we observed that Spanish males consumed more psilocybin and *Salvia divinorum* than South American males (Chi square test, $P<0.01$ and $P<0.001$, respectively; Fig. 2). MDMA use was higher among Spanish males and females than among South American males and females. Only mescaline showed a different pattern, with South American males reporting a higher prevalence than Spanish males (Chi square test, $P<0.05$). An increase

Table 2 Prevalence of lifetime use of psychedelic drugs among Spanish and south American psychedelic consumers survey respondents ($n = 735$)

Psychedelic	Spain ($n = 425$)		South America ($n = 310$)		
	N	(%)	N	(%)	P value[#]
LSD	296	(68.4)	208	(66.5)	0.635
Psilocybin	343	(79.2)	236	(75.4)	0.247
Mescaline	104	(24.0)	100	(31.9)	0.020
MDMA	340	(78.5)	116	(37.1)	< 0.001
DMT	130	(30.0)	110	(35.1)	0.153
5-MeO-DMT	32	(7.4)	26	(8.3)	0.679
2 C-B	16	(3.7)	2	(0.6)	0.007
Ketamine	20	(4.6)	5	(1.6)	0.024
Salvia	82	(18.9)	39	(12.5)	0.020
Others[a]	10	(2.3)	7	(2.2)	0.577

Abbreviations: LSD, lysergic acid diethylamide; MDMA, 3,4-Methylenedioxymethamphetamine; DMT, Dimethyltryptamine (ayahuasca and other presentations); 5-MeO-DMT, 5-methoxy-N, N-dimethyltryptamine (yopo and bufo); 2 C-B, 4-Bromo-2,5-dimethoxyphenethylamine

[#]Chi square test

[a]Includes: scopolamine, ibogaine, rape (nasal tobacco), psilocybin analogues (4-HO-MET and 4-AcO-DMT), Kambo, mandrake, *Amanita muscaria* and *Datura stramonium*

in *Salvia divinorum* consumption and a decrease in mescaline consumption has been previously reported in Western populations (Walsh et al., 2022), which reinforces the idea of cross-cultural divergences in hallucinogen consumption. Other factors should be taken into account when interpreting this result. On the one hand, S*alvia divinorum* is legal in Spain, and on the other hand, it should be considered that traditional mescaline consumption often induces vomiting. It is expected, to some extent, that the population with access to a greater number of substances would prefer the consumption of legal substances that also cause fewer adverse effects. In contrast, in South America, the consumption of mescaline has a long tradition of use.

To study the effect of age in relation to the prevalence of psychedelics, we segmented the variable as follows: ≤30, 31–40, 41–47, and > 47 years, accordingly to the percentiles of distribution. We have not found a detailed study of the influence of age on hallucinogen intake in the literature (Kvam et al., 2023; Lake & Lucas, 2023; Sogaard Juul et al., 2023), beyond the age of initiation of substance use. We observed significant differences between age and LSD, mescaline and MDMA, with profiles showing cross-cultural differences (Fig. 3). While mescaline was more prevalent in the

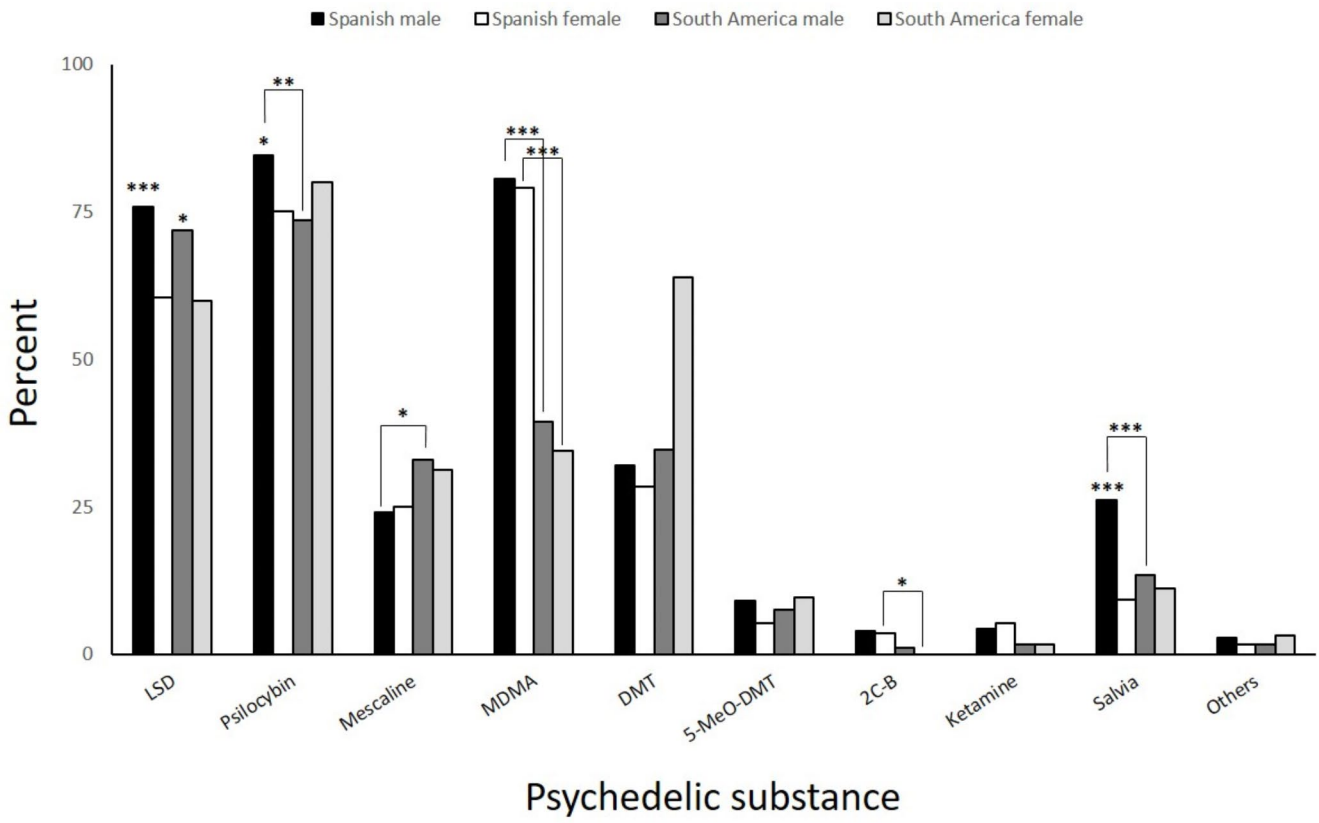

Fig. 2 Prevalence of lifetime use of different psychedelic drugs among Spanish and South American psychedelic consumers survey respondents according to gender. "Others" includes: scopolamine, ibogaine, rape (nasal tobacco), psilocybin analogues (4-HO-MET and 4-AcO-DMT), Kambo, mandrake, *Amanita muscaria* and *Datura stramonium*. Differences were calculated intra-origin and inter-origin (Chi square test). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$

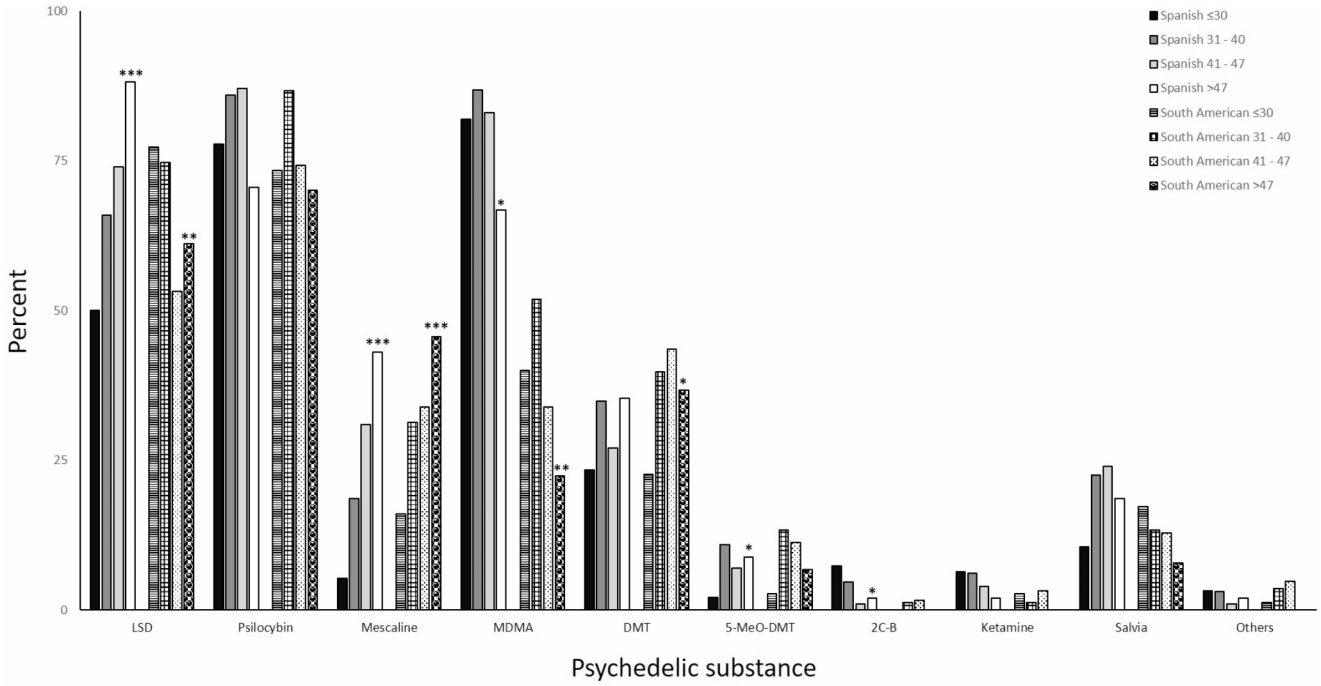

Fig. 3 Prevalence of lifetime use of different psychedelic drugs among Spanish and South American psychedelic consumers survey respondents according to age (years). Age was segmented according to the percentiles of the distributions: ≤30, 31–40, 41–47, and >47 years. "Others" include: scopolamine, ibogaine, rape (nasal tobacco), psilocybin analogues (4-HO-MET and 4-AcO-DMT), Kambo, mandrake, *Amanita muscaria* and *Datura stramonium*. Differences were calculated intra-origin (Chi square test). *, $P<0.05$; **, $P<0.01$; ***, $P<0.001$

over 47 age group, MDMA was more prevalent in younger age groups, and both patterns were similar between Spanish and South American participants. This can be explained in the intentionality of substance use: while mescaline is more likely to be taken for therapeutic and self-knowledge purposes (Uthaug et al., 2022), MDMA is generally consumed for recreational purposes (van Amsterdam et al., 2020). In the case of LSD, its prevalence among Spanish users was higher as the age of the participants increased. This trend was not replicated among the South American population, such that age groups over 40 reported lower prevalence (Fig. 3). Other cross-cultural differences were as follows: (i) DMT, the South American youth population reported lower prevalence (Chi square test, $P<0.05$); (ii) 5-MeO-DMT, the Spanish youth population reported lower prevalence (Chi square test, $P<0.05$); and (iii) 2 C-B, the Spanish youth population reported higher prevalence (Chi square test, $P<0.05$). No other significant differences were observed, including psilocybin use, whose prevalence was similar in both populations regardless of age (Fig. 3).

Other socio-demographic variables were included in Additional File 2. We highlight the following findings. First, prevalence of use among Spanish participants was higher in rural areas for LSD, mescaline, MDMA and DMT (Chi square test, $P=0.017$, $P<0.001$, $P=0.001$, and $P=0.003$, respectively). This is a surprising finding that may have to do with the greater or lesser ease of trafficking illicit substances in non-urban habitats, as previously suggested (Hoover et al., 2023; Wilkins et al., 2018). Second, while employability status was a determining factor in the Spanish population, the same was not observed for the South American population. In this context, retired participants, who are the oldest, showed the highest prevalence of LSD (Chi square test, $P=0.004$) and mescaline use (Chi square test, $P<0.001$), while the unemployed population, mostly young people, showed the highest prevalence of MDMA use (Chi square test, $P=0.021$). These findings complemented those observed in relation to age (Fig. 3). Third, participants with a lower educational level showed a higher prevalence of LSD use in both populations (Additional file 2), which outlines a profile of LSD users, at least, in the Spanish population: male over 47 years old (retired), from a rural habitat and with a low educational level, a profile that has nothing to do with the idealized vision of this drug, associated with intellectual and business environments (Korman, 2023). Finally, we observed cross-cultural differences for these demographic variables, especially for mescaline and MDMA, which seem to be the psychedelics with the greatest differences in consumption patterns between the two populations (Additional file 2).

Set and setting section

Concomitant use of other substances

Table 3 shows the distribution of psychedelics use and the concomitant use of other substances among both populations. The substance with the highest concomitant use among Spanish participants was MDMA. Specifically, 90.5% of these consumers combined MDMA with alcohol, 98.5% combined it with cocaine and 100% combined it with amphetamine, indicating a clear recreational use (Gable, 2004). Among South American participants, LSD was the most frequently combined substance: with alcohol, cannabis, and amphetamine. This is consistent with most of the recreational use of this substance observed in this population (Additional file 3).

The data referring to alcohol deserve to be highlighted since psychedelic use has been associated with hazardous use of alcohol (Kervadec et al., 2023; Sogaard Juul et al., 2023). In the case of mescaline and DMT, two substances commonly used for therapeutic purposes, alcohol consumption in combination with these hallucinogens was lower (17.4 vs. 26.4%, $P=0.043$ and 22.4 vs. 40.0, $P=0.001$, respectively; Chi square test). To understand this result, not only the type of psychedelic must be taken into account but also the more or less widespread use of alcohol, something that depends intensely on the cultural origin of the individual (Sudhinaraset et al., 2016). Unlike other psychedelics, mescaline and DMT are usually used in a protocolized manner in organized retreats, given the complexity of the preparation of the substance (Ruffell et al., 2021). In these cases, individuals are advised to prepare prior to taking the substance and, there is no concomitant consumption of alcohol and other drugs during these practices. However, the fact that this has been observed only in the Spanish population highlights the inter-cultural difference with the South American population (Table 3), which is undoubtedly more familiar with the use of these natural psychedelics (Carod-Artal & Vazquez-Cabrera, 2006).

Set, setting and outcome in psychedelic users

Additional file 3 shows the set, setting and outcome in psychedelic users according to origin. The Spanish participants followed a specific diet before the consumption of psilocybin, DMT and 5-MeO-DMT (Chi square test, $P=0.001$, $P<0.001$, and $P=0.009$, respectively), which coincides with the majority therapeutically and religious purpose of taking these specific substances. Although there are no pharmacokinetic studies on the subject, the psychedelic community values preparation before to consumption, including a specific diet consisting in reducing the consumption of coffee, animal fats and even fasting on the day of intake. Beyond the pharmacokinetic effect derived from these practices, this behavior reaffirms the transformative intentionality of the use (Pilger, 2023). This profile was similar among the South American participants except for LSD. In this case, the majority of users reported significantly no dieting before to consumption, which also coincides with the majority of recreational intent in the use of this particular substance.

The three most frequent environments for taking psychedelics were nature (77.6 and 76.1%), home (69.4 and 71.3%) and parties/festivals/concerts (66.1 and 34.8%) for consumers from both origins. Despite legal restrictions, a percentage of participants reported taking these substances in consultation (3.8 and 4.2%, respectively). Psilocybin was the most widely used substance in nature for both the Spanish and South Americans (88.2 and 81.4%). At parties, the most commonly used substance was MDMA among Spanish participants (93.2%) and LSD among South Americans (96.3%), showing an important cross-cultural difference in the setting. The proportion of Spanish and South American participants who reported taking psychedelics on spiritual retreats was 19.5% and 23.9%, respectively. Among Spanish users, mescaline, DMT and 5-MeO-DMT were mostly consumed in spiritual retreats (Chi square test, $P<0.001$ in all cases). Among the South American population, this profile was observed only for mescaline and DMT (Additional file 3). Beyond the recreational use of some of these substances (mainly MDMA and LSD), it seems to be deduced from these results that participants opted for the use of natural substances in natural, friendly and supervised environments, as suggested in recent studies (Kruger et al., 2023). In this sense, despite some differences expressed above, there are no obvious cross-cultural differences.

As regards to the outcome of the psychedelic experience, DMT showed significant differences in the occurrence of adverse effects during the experience in both populations (Additional file 3). Nausea/vomiting, diarrhea/stomachache, and anxiety were the three most common adverse effects for both Spanish (53.8, 35.4, and 32.3%, respectively) and South American (50.0, 31.8, and 32.7%, respectively) participants (Data not shown). Our results coincide with those reported by other authors. According to data from an online Global Ayahuasca Survey, with almost 11,000 participants, acute adverse effects (primarily vomiting) were reported by 69.9% of the sample, a lower percentage than that observed in our series (Bouso et al., 2022).

MDMA showed significant differences in the occurrence of adverse effects after the experience in both populations (Additional file 3). Depression and anxiety were the two most common adverse effects for both Spanish (24.4, and 18.5%, respectively) and South American (28.4, and 19.0%,

Table 3 Distribution of psychedelic use and the concomitant use of other substances (N, %)

	Spanish consumers ($n=335$)											South American consumers ($n=240$)										
	N	LSD	Psilocybin	Mescaline	MDMA	DMT	5-MeO-DMT	2 C-B	Ketamine	Salvia	Others	*N*	LSD	Psilocybin	Mescaline	MDMA	DMT	5-MeO-DMT	2 C-B	Ketamine	Salvia	Others
Caffeine																						
No	241	178 (73.9)	197 (81.7)	46 (19.1)	208 (86.3)	66 (27.4)	17 (7.1)	8 (3.3)	13 (5.4)	49 (20.3)	4 (1.7)	191	144 (75.4)	138 (72.3)	54 (28.3)	77 (40.3)	64 (33.5)	10 (5.2)	0	3 (1.6)	24 (12.6)	2 (1.0)
Yes	94	72 (76.6)	83 (88.3)	23 (24.5)	83 (88.3)	31 (33.0)	5 (5.3)	6 (6.4)	5 (5.3)	27 (28.7)	2 (2.1)	49	38 (72.6)	43 (87.8)	20 (40.8)	25 (51.0)	20 (40.8)	9 (18.4)	1 (2.0)	1 (2.0)	10 (20.4)	5 (10.2)
P value		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns		ns	0.026	ns	ns	ns	0.002	ns	ns	ns	0.004
Alcohol																						
No	125	100 (80.0)	107 (85.6)	33 (26.4)	101 (80.8)	50 (40.0)	15 (12.0)	3 (2.4)	6 (4.8)	30 (24.0)	2 (1.6)	155	106 (68.4)	114 (73.5)	47 (30.3)	54 (34.8)	60 (38.7)	13 (8.4)	0	0	18 (11.6)	2 (1.3)
Yes	210	150 (71.4)	173 (82.4)	36 (17.1)	190 (90.5)	47 (22.4)	47 (22.4)	11 (5.2)	12 (5.7)	46 (21.9)	4 (1.9)	85	76 (89.4)	67 (78.8)	27 (31.8)	48 (56.5)	24 (28.2)	6 (7.1)	1 (1.2)	4 (4.7)	16 (18.8)	5 (5.9)
P value		ns	ns	0.043	0.018	0.001	0.002	ns	ns	ns	ns		<0.001	ns	ns	0.001	ns	ns	ns	0.006	ns	0.043
Antidepressants and anxiolytics																						
No	303	228 (75.2)	256 (84.5)	61 (20.1)	263 (86.8)	90 (29.7)	20 (6.6)	13 (4.3)	16 (5.3)	70 (23.1)	5 (1.7)	219	165 (75.3)	165 (73.5)	69 (31.5)	91 (41.6)	75 (34.2)	16 (7.3)	1 (0.5)	3 (1.4)	31 (14.2)	5 (2.3)
Yes	32	22 (68.8)	24 (75.0)	8 (25.0)	28 (87.5)	7 (21.9)	2 (6.3)	1 (3.1)	2 (6.3)	6 (18.8)	1 (3.1)	21	17 (81.0)	16 (76.2)	5 (23.8)	11 (52.4)	9 (42.9)	3 (14.3)	0	1 (4.8)	3 (14.3)	2 (9.5)
P value		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Cannabis																						
No	80	47 (58.8)	55 (68.8)	9 (11.3)	69 (86.3)	17 (21.3)	3 (3.8)	4 (5.0)	2 (2.5)	8 (10.0)	1 (1.3)	22	12 (54.5)	17 (77.3)	6 (27.3)	8 (36.4)	5 (22.7)	1 (4.5)	0	1 (4.5)	3 (13.6)	0
Yes	255	203 (79.6)	255 (88.2)	60 (23.5)	222 (87.1)	80 (31.4)	19 (7.5)	10 (3.9)	16 (6.3)	68 (26.7)	5 (2.0)	218	170 (78.0)	164 (75.2)	68 (31.2)	94 (43.1)	79 (36.2)	18 (8.3)	1 (0.5)	3 (1.4)	31 (14.2)	7 (3.2)
P value		<0.001	<0.001	0.018	ns	ns	ns	ns	ns	0.001	ns		0.014	ns	ns	ns	ns	ns	ns	ns	ns	ns
Cocaine																						
No	267	197 (73.8)	222 (83.1)	54 (20.2)	224 (83.9)	82 (30.7)	20 (7.5)	11 (4.1)	13 (4.9)	59 (22.1)	6 (2.2)	215	160 (74.4)	161 (74.9)	67 (31.2)	86 (40.0)	77 (35.8)	17 (7.9)	0	2 (0.9)	29 (13.5)	5 (2.3)
Yes	68	53 (77.9)	58 (85.3)	15 (22.1)	67 (98.5)	15 (22.1)	2 (2.9)	3 (4.4)	5 (7.4)	17 (25.0)	0	25	22 (88.8)	20 (80.0)	7 (28.0)	16 (64.0)	7 (28.0)	2 (8.0)	1 (4.0)	2 (8.0)	5 (20.0)	2 (8.0)
P value		ns	ns	ns	<0.001	ns	ns	ns	ns	ns	ns		ns	ns	ns	0.031	ns	ns	ns	ns	ns	ns
Amphetamine																						
No	263	187 (71.1)	216 (82.1)	53 (20.2)	219 (83.3)	77 (29.3)	16 (6.1)	8 (3.0)	9 (3.4)	58 (22.1)	5 (1.9)	229	171 (74.7)	172 (75.1)	68 (29.7)	96 (41.9)	80 (34.9)	18 (7.9)	1 (0.4)	4 (1.7)	29 (12.7)	7 (3.1)
Yes	72	63 (87.5)	64 (88.9)	16 (22.2)	72 (100)	20 (27.8)	6 (8.3)	6 (8.3)	9 (12.5)	18 (25.0)	1 (1.4)	11	11 (100)	9 (81.8)	6 (54.5)	6 (54.5)	4 (36.4)	1 (9.1)	0	0	5 (45.5)	0

Table 3 (continued)

	Spanish consumers ($n = 335$)											South American consumers ($n = 240$)										
	N	LSD	Psilocybin	Mescaline	MDMA	DMT	5-MeO-DMT	2 C-B	Ketamine	Salvia	Others	*N*	LSD	Psilocybin	Mescaline	MDMA	DMT	5-MeO-DMT	2 C-B	Ketamine	Salvia	Others
P value		0.005	ns	ns	< 0.001	ns	ns	0.047	0.002	ns	ns		0.044	ns	ns	ns	ns	ns	ns	ns	0.011	ns
Others																						
No	308	228 (74.0)	256 (83.1)	62 (20.1)	266 (86.4)	87 (28.2)	21 (6.8)	10 (3.2)	16 (5.2)	67 (21.8)	6 (1.9)	229	175 (76.4)	171 (74.7)	69 (30.1)	96 (41.9)	77 (33.6)	16 (7.0)	1 (0.4)	3 (1.3)	32 (14.0)	5 (2.2)
Yes	27	22 (81.5)	24 (88.9)	7 (25.9)	25 (92.6)	10 (37.0)	1 (3.7)	4 (14.8)	2 (7.4)	9 (33.3)	0	11	7 (63.6)	10 (90.0)	5 (45.5)	6 (54.5)	7 (63.6)	3 (27.3)	0	1 (9.1)	2 (18.2)	2 (18.2)
P value		ns	ns	ns	ns	ns	ns	0.019	ns	ns	ns		ns	ns	ns	ns	0.041	0.046	ns	ns	ns	0.035

Abbreviations: ns, not significant

Other psychedelics include: scopolamine, ibogaine, rape (nasal tobacco), psilocybin analogues (4-HO-MET and 4-AcO-DMT), Kambo, mandrake, *Amanita muscaria* and *Datura stramonium*

Other substances for combination include: mambe, N_2O, tobacco/rape/ambil/, poppers, heroin, ketamine, pain killers, antipsychotics, other legal drugs (immusuppressors), and antiepileptics

Differences were calculated intra-origin and inter-origin (Chi square test). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$. The distribution of data refers to the subgroup of people who use other substances while using psychedelics

respectively) participants (Data not shown). The presence of panic and paranoia after MDMA use was 5.9% among Spaniards and 12.9% among South Americans. LSD showed significant results only among South American participants (Chi square test, $P = 0.008$; Additional file 3), probably due to the recreational use of LSD in that population. Depression and anxiety were reported by 19.2 and 16.8% of these participants. Low mood and anxiety are common late effects associated to MDMA, even in clinical treatments (Breeksema et al., 2022). Such late effects have not been reported when LSD is taken in controlled environments (Breeksema et al., 2022), suggesting a relevant role of the set and setting (parties) and the combinations with other substances: cannabis, alcohol and amphetamines (as shown in Table 3).

Most Spanish users of LSD, psilocybin, mescaline, DMT and 5-MeO-DMT reported having a deeply meaningful experience. This pattern was less clear for MDMA (Additional file 3). For the South American participants, only psilocybin and DMT showed significant results. As reported by the Canadian Psychedelic Survey, psilocybin and LSD were the substances associated not only with the most intense, but also the most transformative experiences (Lake & Lucas, 2023). Something similar was reported in other epidemiological studies (Kvam et al., 2023). We observed this pattern in our series, mainly among Spanish users, which again suggests a cross-cultural difference with the South American population especially regarding LSD use.

Conditioning factors of psychedelic experience

As previously published, most users reported improvements in their mental health condition after the intake of hallucinogens, mainly associated to mystical elements within the experience, in such a way that the intensity of the experience conditions the therapeutic outcome (Zuljevic et al., 2023). In general, the adverse effects of psychedelic use are usually mild and short-lived. However, a small percentage of users experience adverse effects up to a year after use (Walsh et al., 2022). In that sense, we analyzed which factors were associated with the adverse effects of the experience and which ones conditioned the meaningfulness of the experience (Table 4). We found that having suffered adverse effects during the psychedelic experience increased the risk of suffering adverse effects after substance use, and vice versa (Odds ratio (OR) = 3.60, Confidence Interval (CI) 2.3–5.6, $P < 0.001$). Moreover, we observed that there was a higher risk of adverse effects during the experience in those individuals who had had more intense experiences (OR = 2.73, CI 1.2–6.1, $P < 0.05$), although only among Spanish users. This finding is confirmed by other studies in which it was observed that negative feelings increased,

Table 4 Univariate correlations of adverse effects and intensity of the experience among Spanish and south American psychedelic survey respondents

	Spanish consumers				South American consumers			
	Adverse effects during the consume	Adverse effects after the consume	Intense Experience†	Grade of intensity#	Adverse effects during the consume	Adverse effects after the consume	Intense Experience†	Challenging experience#
Variables	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Age (years)								
≤30	1.68 (0.9–3.1)	2.01 (1.1–3.6)*	0.92 (0.3–2.9)	0.94 (0.5–1.8)	2.32 (1.1–4.7)*	2.15 (1.1–4.1)*	5.35 (0.6–45.5)	1.06 (0.5–2.2)
30–40	0.83 (0.5–1.4)	1.76 (1.0–3.0)*	1.28 (0.4–4.1)	1.12 (0.6–2.1)	1.14 (0.6–2.1)	1.12 (0.6–2.1)	1.43 (0.4–5.2)	1.00 (0.5–2.0)
41–47	0.89 (0.5–1.6)	1.58 (0.9–2.8)	0.72 (0.2–2.1)	0.94 (0.5–1.8)	1.31 (0.7–2.6)	1.35 (0.7–2.7)	4.41 (0.5–37.6)	1.07 (0.5–2.3)
> 47	Ref. category				Ref. category			
Gender								
Male	Ref. category				Ref. category			
Female	0.95 (0.6–1.4)	0.95 (0.6–1.4)	1.30 (0.6–3.0)	0.93 (0.6–1.5)	1.84 (1.1–3.1)*	0.79 (0.5–1.3)	1.37 (0.4–4.7)	0.57 (0.3–0.9)*
Civil status								
Married/In couple	Ref. category				Ref. category			
Divorced	0.86 (0.4–1.8)	1.14 (0.6–2.4)	2.36 (0.3–18.7)	1.52 (0.6–3.9)	0.66 (0.3–1.4)	1.50 (0.7–3.2)	0.39 (0.1–1.4)	0.49 (0.2–1.1)
Single	1.22 (0.8–1.8)	1.29 (0.8–1.9)	1.03 (0.5–2.3)	1.02 (0.6–1.6)	1.19 (0.7–2.0)	1.68 (1.1–2.8)*	3.19 (0.6–16.1)	0.99 (0.5–1.8)
Habitat								
Urban	Ref. category				Ref. category			
Rural	0.96 (0.6–1.5)	1.03 (0.7–1.6)	3.58 (1.1–12.1)*	1.63 (0.9–2.7)	0.86 (0.4–1.7)	0.80 (0.4–1.6)	1.76 (0.2–14.0)	1.11 (0.5–2.5)
Employment status								
Employed	Ref. category				Ref. category			
Unemployed	1.94 (0.9–4.2)	1.15 (0.6–2.3)	0.47 (0.1–1.5)	1.26 (0.5–3.0)	1.80 (0.6–5.6)	1.54 (0.6–3.4)	2.1 (0.4–3.5)	2.48 (0.5–11.1)
Retired	1.03 (0.4–2.7)	1.28 (0.5–3.2)	1.01 (0.1–8.0)	2.61 (0.6–11.6)	1.08 (0.3–3.6)	1.33 (0.4–4.2)	0.50 (0.1–4.2)	0.78 (0.2–3.0)
Student/Housewife	1.97 (0.9–4.0)	1.49 (0.8–2.8)	0.60 (0.2–1.9)	0.84 (0.4–1.7)	1.49 (0.7–3.2)	2.02 (1.1–3.9)*	0.22 (0.1–2.6)	0.56 (0.3–1.2)
Education level								
≤High school	Ref. category				Ref. category			
College/Technical degrees	1.35 (0.5–3.6)	1.09 (0.5–2.6)	0.47 (0.1–1.9)	1.03 (0.3–3.3)	2.06 (0.2–18.7)	0.33 (0.1–2.9)	NA	0.68 (0.1–4.0)
Graduate	0.73 (0.5–1.1)	0.68 (0.4–1.0)	1.16 (0.5–2.8)	0.68 (0.4–1.1)	0.89 (0.5–1.6)	0.99 (0.6–1.7)	2.38 (0.7–7.7)	0.61 (0.6–2.2)
Past-year drug use								
No	Ref. category				Ref. category			
Yes	1.06 (0.7–1.6)	0.81 (0.5–1.2)	2.47 (1.1–5.5)*	1.07 (0.7–1.7)	1.06 (0.6–1.8)	0.75 (0.5–1.2)	2.25 (0.7–7.2)	1.35 (0.7–2.4)
Combination								
No	Ref. category				Ref. category			
Yes	1.74 (1.1–2.8)*	4.54 (2.5–8.2)***	0.92 (0.3–2.5)	0.60 (0.3–1.1)	1.00 (0.6–1.8)	2.09 (1.1–3.9)*	1.81 (0.5–6.2)	1.22 (0.6–2.3)
Diet								
No	Ref. category				Ref. category			
Yes	1.60 (1.1–2.4)*	0.77 (0.5–1.1)	5.73 (1.9–16.9)**	2.82 (1.7–4.6)***	1.64 (0.9–2.7)	0.78 (0.5–1.3)	4.95 (1.3–19.0)*	1.81 (1.1–3.1)*
Adverse effects after								
No	Ref. category				Ref. category			

Table 4 (continued)

	Spanish consumers				South American consumers			
	Adverse effects during the consume	Adverse effects after the consume	Intense Experience†	Grade of intensity[#]	Adverse effects during the consume	Adverse effects after the consume	Intense Experience†	Challenging experience[#]
Yes	3.60 (2.3–5.6)***	NA	1.43 (0.6–3.3)	1.06 (0.7–1.7)	3.43 (1.9–6.2)***	NA	2.77 (0.6–12.9)	0.73 (0.4–1.3)
Adverse effects during								
No	Ref. category				Ref. category			
Yes	NA	3.60 (2.3–5.6)***	2.73 (1.2–6.1)*	1.85 (1.2–3.0)**	NA	3.43 (1.9–6.2)***	2.34 (0.7–7.4)	0.69 (0.4–1.3)
Grade of intensity								
Subtle– Moderate	Ref. category				Ref. category			
Fairly– Extreme	1.85 (1.2–2.9)**	1.05 (0.7–1.7)	NA	NA	0.69 (0.4–1.3)	0.73 (0.4–1.3)	NA	NA
Intense experience								
No	Ref. category				Ref. category			
Yes	2.73 (1.2–6.1)*	1.43 (0.6–3.3)	NA	NA	2.34 (0.7–7.4)	2.77 (0.6–12.9)	NA	NA

Abbreviations: NA, not aplicable

†Yes vs. No

[#]Subtle– Moderate vs. Fairly - Extreme

*$P<0.05$, **$P<0.01$, ***$P<0.001$ (Binary Logistic Regression test)

and positive feelings decreased as self-reported psychedelic experience intensity increased (Zuljevic et al., 2023).

The combination of psychedelics with other substances was a risk factor associated with adverse effects, both during (OR = 1.74, CI 1.1–2.8, $P<0.05$) and after the experience (OR = 4.54, CI 2.5–8.2, $P<0.001$), being more striking among Spanish users. Combining drugs is always a dangerous practice, also in the context of relatively safe substances such as psychedelics. In this regard, most serious events related to hallucinogens have involved the combined use of other drugs, mainly alcohol, cannabis, cocaine and amphetamine (Henriquez-Hernandez et al., 2023).

According to the Canadian Psychedelic Survey, mean age of psychedelic drug initiation was 21.8 ± 9.3 years (Lake & Lucas, 2023). According to the 2018 National Survey on Drug Use and Health, approximately 15.9% of the U.S. population over 12 had used a hallucinogen at some point in their lifetime (Jahn et al., 2021). Our results show that age is a risk factor for adverse effects both during and after the experience (Table 4). Spanish participants under 30 years of age and those in the 30–40 age group had twice the risk of suffering adverse effects after hallucinogen use than participants over 47 years of age (reference population). South American participants under 30 years of age had twice the risk of suffering adverse effects during and after hallucinogen use compared to the reference population (oldest people). This result can be explained by several reasons: firstly, young individuals engage in a higher combined use of these substances with others such as alcohol or non-psychedelic drugs; secondly, young individuals engage in a higher recreational use, implying an inappropriate setting for psychedelic substance intake; and lastly, young individuals consume psychedelics without a specific purpose to a greater extent than oldest individuals, which implies an inappropriate set. Furthermore, the fact that age correlated negatively with the intensity of the experience allows us to assume that the degree of maturity, both cerebral and personality, is a determining element in the outcome of the psychedelic experience (Ko et al., 2023).

The intensity of the experience was mainly determined by the diet in both populations. The possibility of having intense experiences increased 5-fold among those participants who reported eating a specific diet prior to consumption (Table 4), something that is likely to be directly related to the set and setting of the experience. In this sense, the relationship between intensity of experience and set and setting has been reported by the Canadian Psychedelics Survey, where greater intensity was observed for use at home, in company and for therapeutic purposes (Lake & Lucas, 2023). However, while they observed that the use of psychedelics was negatively associated with the intensity of the experience, we observed the opposite in the Spanish population (OR = 2.47, CI 1.1–5.5, $P<0.05$). This discrepancy can be explained, at least partially, by other socio-demographic variables such as gender or habitat, which seem to condition the use and intentionality of use.

We explored which psychedelic substances were associated with a higher risk of adverse effects and which

were linked to more intense or transformative experiences (Table 5). Our findings indicate that LSD, MDMA, Mescaline, and DMT were more likely to be associated with adverse effects and more profound experiences. Furthermore, we observed population-specific differences in these outcomes. Of particular note, LSD, consumed differently across the two populations, was linked to a higher incidence of post-consumption adverse effects in the South American sample (OR = 2.08, CI 1.2–3.5, $P < 0.01$) and to more intense experiences among Spanish participants (OR = 4.84, CI 2.1–11.2, $P < 0.001$). Conversely, no significant differences were observed between the Spanish and South American populations regarding the association between MDMA and post-consumption adverse effects, or between DMT and adverse effects experienced during consumption (Table 5).

Strengths and limitations

Strengths

The Psychedelic Use Scale (PUS) is the first of its kind in Spanish, which has allowed for an understanding of the use of these substances in the Spanish-speaking population. Due to its characteristics, it enables the assessment of consumer profiles, substances consumed, set & setting characteristics, which are crucial in the consumption of these substances, as well as the main associated adverse effects. Despite its length, it has proven to be understandable for respondents. Evidence of this is the widespread acceptance of it among respondents. This has allowed for the inclusion of a high number of responses, facilitating the performance of robust statistical analyses.

Limitations

Regarding the limitations of the current study, one significant constraint is its correlational design, which precludes making causal inferences. Another notable limitation is the lack of dose measurement, as doses were not quantified and thus not incorporated as variables in the data analysis. Unlike other substances, there are no validated scales for measuring psychedelic use. Given the diverse forms (including plants, mushrooms, blotter, pills, beverages, etc.) and units of measurement (e.g., µg, mg, mL) for psychedelics, it is challenging, if not impossible, to accurately estimate retrospectively the dose of active ingredients and substance intake.

Additionally, grouping psychedelic substances in the data analysis presents another limitation, as it prevents discerning whether specific effects of set and setting are associated with particular substances. Subsequent studies should conduct separate analyses for each substance to determine whether the effects of set and setting are substance-independent or substance-specific.

Conclusions

The Psychedelic Use Scale (PUS), developed specifically for this study, provides initial insights into psychedelic use patterns and sociodemographic correlates. While requiring further development and validation, the PUS effectively assesses hallucinogen consumption frequency across cultures, despite its limitations.

This study has shown that cultural context significantly influences psychedelic use. Cultural differences impacted psychedelic use patterns, with age, gender, and substance combinations influencing outcomes. Unlike prior research focusing on interracial disparities (Jahn et al., 2021), this study highlights intercultural variations. LSD use was prevalent among South American recreational users, while Spanish consumption was more influenced by habitat. Psilocybin was popular among Spanish males, mescaline among South American males, and MDMA among both Spanish genders. Substance combinations differed between cultures. Older individuals reported more LSD and mescaline use, while younger individuals favored MDMA. Age was a risk factor for adverse effects.

Set and setting significantly influenced psychedelic experiences, informing future research directions. Rising psychedelic use necessitates further investigation and societal preparedness for evolving consumption patterns.

Table 5 Univariate correlations examining the relationships between adverse effects and experience intensity for each substance, comparing both populations

	Spanish consumers				South American consumers			
	Adverse effects during the consume	Adverse effects after the consume	Intense Experience†	Grade of intensity[#]	Adverse effects during the consume	Adverse effects after the consume	Intense Experience†	Challenging experience[#]
Substance	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
LSD								
No	Ref. category				Ref. category			
Yes	1.48 (0.9–2.3)	1.44 (0.9–2.2)	4.84 (2.1–11.2)***	1.52 (0.9–2.5)	1.13 (0.7–1.9)	2.08 (1.2–3.5)**	1.01 (0.3–3.4)	1.08 (0.6–1.9)
Psilocybin								
No	Ref. category				Ref. category			
Yes	1.42 (0.8–2.3)	0.88 (0.5–1.4)	2.84 (1.2–6.5)*	2.47 (1.4–4.3)**	1.03 (0.6–1.8)	0.68 (0.4–1.2)	3.37 (1.1–10.8)*	1.80 (0.9–3.3)
Mescaline								
No	Ref. category				Ref. category			
Yes	1.20 (0.7–1.9)	2.32 (1.4–3.7)**	4.12 (0.9–17.7)	1.78 (0.9–3.2)	1.39 (0.8–2.4)	0.69 (0.4–1.3)	2.46 (0.5–11.4)	1.91 (1.1–3.5)*
MDMA								
No	Ref. category				Ref. category			
Yes	1.50 (0.9–2.4)	2.92 (1.7–5.0)***	3.22 (1.4–7.3)**	0.94 (0.5–1.7)	1.18 (0.7–1.9)	2.20 (1.4–3.6)**	3.11 (0.7–14.5)	1.49 (0.8–2.6)
DMT								
No	Ref. category				Ref. category			
Yes	2.36 (1.5–3.8)***	0.68 (0.4–1.1)	11.9 (1.6–89.1)*	2.68 (1.5–4.7)**	2.30 (1.3–3.9)***	1.08 (0.7–1.8)	2.86 (0.6–13.3)	2.54 (1.4–4.8)**
5-MeO-DMT								
No	Ref. category				Ref. category			
Yes	1.66 (0.9–3.8)	0.79 (0.4–1.7)	1.13 (0.5–2.7)	3.23 (0.9–10.8)	1.95 (0.7–5.3)	0.53 (0.2–1.3)	1.01 (0.1–8.2)	3.83 (0.9–16.7)
2 C-B								
No	Ref. category				Ref. category			
Yes	8.42 (1.1–64.3)*	4.26 (1.3–13.4)*	2.6 (0.3–4.1)	4.88 (0.3–37.4)	1.11 (0.33–1.66)	1.85 (0.1–29.9)	1.3 (0.6–2.6)	0.30 (0.1–4.9)
Ketamine								
No	Ref. category				Ref. category			
Yes	2.21 (0.7–6.7)	1.11 (0.5–2.7)	1.25 (0.2–9.7)	1.70 (0.5–5.9)	0.66 (0.1–4.0)	1.23 (0.2–7.5)	1.11 (0.2–10.1)	1.24 (0.1–11.2)
Salvia								
No	Ref. category				Ref. category			
Yes	1.37 (0.8–2.3)	0.88 (0.5–1.4)	1.00 (0.4–2.7)	2.40 (1.2–4.9)*	1.83 (0.8–4.1)	1.69 (0.8–3.3)	0.78 (0.3–1.3)	1.23 (0.5–2.8)
Others								
No	Ref. category				Ref. category			
Yes	2.17 (0.4–10.3)	1.36 (0.4–4.7)	0.22 (0.1–2.3)	1.26 (0.3–6.0)	0.95 (0.3–1.3)	2.51 (0.6–11.4)	0.17 (0.1–2.5)	1.01 (0.5–4.1)

Abbreviations: OR, odds ratio; CI, confidence interval

Others include: scopolamine, ibogaine, rape (nasal tobacco), psilocybin analogues (4-HO-MET and 4-AcO-DMT), Kambo, mandrake, Amanita muscaria and Datura stramonium

†Yes vs. No

[#]Subtle– Moderate vs. Fairly - Extreme

[*]P<0.05, **P<0.01, ***P<0.001 (Binary Logistic Regression test)

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