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Tripping to Cope: Coping Strategies and Use of Hallucinogens during the COVID-19 Pandemic in Three Cultural Contexts

Genís Ona [1,2], Dóra Révész [1,3], Maja Kohek [1], Giordano N. Rossi [4], Juliana M. Rocha [4], Rafael G. dos Santos [1,4,5], Jaime E. C. Hallak [4,5], Miguel Ángel Alcázar-Córcoles [6] and José Carlos Bouso [1,2,4,*]

1 ICEERS—International Center for Ethnobotanical Education, Research, and Service, 08015 Barcelona, Catalunya, Spain
2 Medical Anthropology Research Center (MARC), Universitat Rovira i Virgili, 43005 Tarragona, Catalunya, Spain
3 Institute for Globally Distributed Open Research and Education (IGDORE)
4 Department of Neurosciences and Behavior, Ribeirão Preto Medical School, University of São Paulo, Ribeirão Preto 14049-900, Brazil
5 National Institute of Science and Technology—Translational Medicine, São Paulo, Brazil
6 Department of Biological and Health Psychology, School of Psychology, Autonomous University of Madrid (UAM), 28049 Madrid, Spain
* Correspondence: jcbouso@iceers.org; Tel.: +34-931882099

Abstract: The COVID-19 pandemic has made evident the need to develop effective strategies to cushion the psychological consequences of social catastrophes. Preliminary evidence suggests that the use of hallucinogens is a protective factor that mitigates against such stressors. However, the underlying mechanisms must be further explored. This study specifically focused on the potential role of coping strategies in this regard, analyzing them through an online survey completed by a total of 2971 subjects who were followed up with from the beginning of the COVID-19 pandemic until six months after baseline. The survey was published in three different cultures (English, Spanish, and Portuguese), allowing for the collection of data from three different cultural contexts. The results show that coping strategies were generally more related to psychological well-being and psychopathology than to hallucinogenic drug use. However, regarding the latter, users of hallucinogens had higher scores on problem-focused engagement and disengagement and lower scores on wishful thinking than non-users. Longitudinally, while most baseline coping scores were associated with psychological distress and the severity of psychological symptoms, some coping strategies were related to the use of hallucinogens. These results show an adaptive pattern of coping strategies among hallucinogen users. Further research should take into account that coping strategies are only marginally associated with hallucinogenic drug use. Other underlying mechanisms explaining the better adjustment of users of hallucinogens to pandemics should be explored.

Keywords: hallucinogens; psychedelic drugs; coping; mental health; COVID-19

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1. Introduction

Since early 2020, the global community has been facing the COVID-19 pandemic, which—apart from creating serious physiological issues—poses a great threat to the mental health of the world population. The fear of being infected or losing a loved one as a consequence of the infection, along with financial and employment insecurity and social isolation as consequences of long-lasting confinement, are major stressors that potentially contribute to mental health issues that might persist long after the outbreak and its restrictions. Recent studies assessing mental health in relation to the COVID-19 pandemic have reported significantly higher levels of depression and anxiety among different populations and cultures worldwide [1–7].

To understand how stressful situations, such as the COVID-19 pandemic, can be better managed in the future, it is necessary to identify the factors that might counteract their

potential negative consequences. Among them, coping strategies are highly relevant from a psychological perspective. These strategies include thoughts and behaviors that can be either conscious or unconscious, individual or social. Typically, people use a number of behavioral and cognitive tactics to manage internal and external distress [8]. Two general types of coping can be described: problem-focused coping is directed at problem solving or taking action to change the source of the stress or to change the relationship with the stressful environment; emotion-focused coping is directed at reducing or managing the emotional distress that results from the crisis or changing the interpretation of the environment [9]. Another important dimension of coping is person- or task-oriented avoidant behavior [10]. Determining whether a coping strategy has protective (adaptive) or damaging (maladaptive) effects for the individual's mental health depends on several factors, such as the person's subjective experience and its long-term consequences [11–13]. Studies exploring the different categories of coping strategies have shown that avoidance, denial, rumination, self-blame, self-isolation, negative social interactions, lack of social support, behavioral disengagement, and alcohol use are associated with negative impacts on mental health, while positive thinking, acceptance, humor, planning, positive reframing, and social support are associated with beneficial and protective effects on mental health and well-being [14–19].

Similarly, studies assessing coping strategies during the COVID-19 pandemic found that positive reframing, acceptance, humor, and social support were associated with better mental health, while self-blame, venting, substance use (particularly alcohol and tobacco), denial, behavioral disengagement, and self-distraction were associated with poorer mental health [20–25]. Maladaptive coping strategies showed a negative effect on mental health and well-being (e.g., more severe anxiety and depression) [26–30]. In particular, women, younger people, caregivers, those with underlying medical conditions, people with low income or low education, and less physically active people showed high levels of psychological distress during the pandemic and used emotion-focused strategies to cope with stressful situations [2,5,6,20,23,27,29,31,32]. Contrasting results have been reported concerning the association between mental health and religiosity. Despite the number of studies suggesting that religion or spirituality might contribute to better mental health and well-being [33–36], studies on religious coping during the COVID-19 pandemic have reported negative effects on mental health [24,37].

The coping strategies that an individual employs depends on several factors. The individual's experiences, their immediate environment, their interactions with family at home, and socio-economic and cultural influences all play a role in how people adjust to and cope with stress [38]. Remarkably, the 5-HT_{1A} and 5-HT_{2A} receptors are suggested to be involved in the mediation of passive and active coping, respectively [39]. Thus, classic hallucinogens can play a role in coping strategies due to their agonistic activity at those receptors, primarily the 5-HT_{2A}, and they are being increasingly investigated in that regard. For instance, the use of ibogaine is suggested to be positively associated with the capacity for coping with stress [40], and the use of other hallucinogens, such as lysergic acid diethylamide (LSD) and psilocybin, has been associated with a better coping ability [41–43]. The entactogen 3,4-Methylenedioxymethamphetamine (MDMA) is suggested to enhance coping strategies by managing internal mood states and reducing emotional distress [44–46]. It should be noted that hallucinogens affect the amygdala in different ways and that further studies should clarify the relationship since this brain region is highly involved in fear processing and coping behaviors [21,47]. In the case of patients with major depressive disorder, for instance, contrasting findings have been observed regarding amygdala activation after psilocybin administration [48,49]. However, when administering psilocybin to a healthy population, it seems that amygdala reactivity is reduced in response to negative stimuli [50,51]. Differences between hallucinogens should also be noted and further explored, since certain substances—such as salvinorin-A—may exert more consistent effects, such as enhancing amygdala activation [52].

Recent research suggests that the use of hallucinogens has a positive effect on how people cope with the pandemic [53,54]. However, the exact mechanisms through which this putative protective effect is exerted are still largely unknown. This study represents a first key step towards shedding light on this phenomenon. Appropriate coping strategies during the pandemic, apart from the previous ones mentioned (e.g., acceptance, humor) [20–25], have been described in relation to personal care-based measures, social connectedness, and activity-based measures [55]. Reasonably, we expect hallucinogenic drug users to use those healthier coping strategies to a greater degree than non-users, as this might partially explain their better scores on mental health and well-being during the COVID-19 pandemic [53,54]. Indeed, in previous research conducted by our group, it has been observed that regular assistants to ayahuasca ceremonies displayed better coping strategies than the general population [56,57]. However, we should not forget that the directionality of these findings is still uncertain, as it is possible that those engaging in positive coping strategies are precisely the individuals who regularly use hallucinogens.

Mental health issues are one of the greatest challenges that the healthcare system currently faces, and the pandemic has worsened this situation. There is an urgent need for an appropriate support system, and the research on coping strategies may offer helpful tools to improve and protect mental health and well-being. Studying coping strategies that people use to adapt their lives and habits to a uniquely difficult situation, such as the COVID-19 pandemic, is key to establishing a mental health support system that can address the needs of the global population.

This study aimed to evaluate the use of coping strategies and its association with hallucinogenic drug use in a sample drawn from three cultural and linguistic areas: Portuguese-speaking Brazil and Portugal, Spanish-speaking Spain, and the English-speaking USA and Europe. The study was conducted during the global social confinement measures related to the COVID-19 pandemic (April–September 2020). The data regarding coping strategies and the use of hallucinogens will support the development of better strategies for stress management and the protection of mental health during and following future events like pandemic outbreaks, wars, and various other social stressors we have witnessed over the years.

2. Materials and Methods

2.1. Sample

We used data from a previous longitudinal study that was launched through an online survey in April 2020, with two follow-ups at two and six months after baseline (see Supplementary File S1 for entire questionnaire). The main objective of the survey was to collect information about the relationship between the detrimental effects of the COVID-19 pandemic and the use of hallucinogenic drugs. Additionally, other relevant measures were included, such as personality, psychopathology, and coping strategies. The first cross-sectional results of this study were published, and the methods can be consulted there for more detail [53]. The survey was launched in Spanish, Portuguese, and English. Through snowball sampling, questionnaires were disseminated among direct contacts and through social media. The questionnaire was also shared on the websites of the Mental Health Post-Graduate Program of the Ribeirão Preto Medical School at the University of São Paulo, in the scientific journal Archives of Clinical Psychiatry, and on websites offering information about psychedelics and cannabis (Lasdrogas.info, Cannabis Magazine, social media pages of ICEERS, and local community websites). The three versions of the questionnaire remained open for a period of six weeks. The survey took 20–30 min to complete. At baseline, 2971 participants were recruited, followed by 1024 subjects at the first follow-up and 455 subjects for the second one. The same sample was used in the present study.

2.2. Instruments

In order to assess the most common coping strategies used by the sample, we selected culturally specific tools that were locally validated in each sociocultural context, as coping strategies may differ between different cultures and linguistic areas. Therefore, there were differences between the questions used in each version of the questionnaire (Spanish, Portuguese, and English).

Spanish Coping Strategies Inventory [58]. The validated Spanish version [59] of this questionnaire was used. It contains 40 Likert-type items (ranging from 0, "not at all," to 4, "absolutely") and eight sub-scales (problem resolution, self-criticism, emotional experience, desiderative thinking, social support, cognitive restructuring, problem assessment, and social withdrawal).

Portuguese Coping Strategies Inventory [60]. The validated Portuguese version [61] was used. It contains 66 Likert-type items (ranging from 0, "did not use this strategy," to 3, "I used this strategy very often") classified according to eight sub-scales (confrontation, avoidance, self-control, social support, acceptance of responsibility, withdrawal, problem resolution, and positive re-evaluation).

English Coping Strategies Inventory (short-form) [58]. The validated English version [62] was used. This questionnaire contains 16 Likert-type items (ranging from 1, "never," to 5, "almost always") classified according to four sub-scales (problem-focused engagement, problem-focused disengagement, emotion-focused engagement, and emotion-focused disengagement).

2.3. Other Psychometric Measures

The following validated questionnaires were included in the survey. First, the General Health Questionnaire (GHQ-12), including 12 items, was used to screen for psychological distress at all time points in its validated Spanish [63], English [64], and Portuguese versions [65]. A higher score represents greater psychological distress.

We also used the 53-item Brief Symptom Inventory (BSI) in its validated English [66], Portuguese [66], and Spanish [67] versions. For the current study, we used the General Severity Index (GSI), with a higher score indicating more severe symptoms.

2.4. Hallucinogenic Drug Use

Participants were asked about their lifetime use of hallucinogenic drugs. We included the use of the following psychedelic drugs: MDMA, LSD, plant-derived hallucinogens (ayahuasca), fungi-derived hallucinogens (psilocybin-containing mushrooms), hallucinogenic cacti (peyote, San Pedro), animal-derived hallucinogens (*Incilius alvarius* or "bufo", 5-MeO-DMT), and other hallucinogens. For each of them, participants were asked to select one of the following options: I have not tried it; I have tried it, but I do not regularly consume it; I take it 1 to 2 times every 6 months; I take it between 3 and 5 times every 6 months; I take it more than 6 times every 6 months (at least once per month). Exclusively at baseline, we categorized participants as (a) regular users (more than once per 6 months), (b) occasional users (tried it, but do not use it regularly), and (c) never-users. During the follow-up measurements, we did not ask the specific frequency and only recoded each participant as user of hallucinogenic drugs or not (yes/no).

2.5. Covariates

We recorded age, gender (male vs. female vs. other), and the language of the participant (Spanish, English, or Portuguese). For each participant, we recorded whether participants had a partner (yes/no). We asked for their religion (subsequently classified as atheist, agnostic, or religious) and whether they practice their religion. Each person was asked whether they had any physical or psychological conditions. At each time point, we defined non-hallucinogenic drugs as alcohol, tobacco, cannabis, cocaine, amphetamines, and MDMA when not used in rituals or therapeutic settings.

2.6. Statistical Analysis

All variables were described as percentages or means with standard deviations. Baseline characteristics were compared among the English, Spanish, and Portuguese speakers with one-way ANOVA for continuous variables and Chi square analyses with LSD post-hoc analyses for categorical variables. We first did this analysis for the sociodemographic factors, religion, health factors, and both non-hallucinogenic and hallucinogenic substance use. We then ran linear regression to assess baseline associations between each coping mechanism and occasional and regular users of hallucinogenic substances as compared to never-users, using the frequency of hallucinogen use as the predictor variable. We corrected for age, gender, and religious group.

Next, in order to determine longitudinal associations between baseline coping mechanisms (four for the English speakers, eight for the Spanish, and eight for the Portuguese speakers) and the (a) general health score, (b) general severity index, and (c) use of hallucinogens over time (users/non-users), we used generalized estimating equations (GEE) with an exchangeable correlation structure, which take into account intrapersonal correlations when examining multiple observations per subject and can handle missing values [68]. We corrected these GEE models for age, gender, religious group, and psychedelic substance use (only in the models of the General Health score and the GSI). All analyses were conducted using SPSS version 24.0 (IBM Corp., Armonk, NY, USA). After Bonferroni correction (p-value of 0.05 divided by 20), we set the significant p-value at 0.003, two-tailed.

2.7. Ethics

This study was approved by the Research Ethics Committee of the Universidad Autónoma de Madrid (Autonomous University of Madrid, Madrid, Spain). All experimental procedures were performed in accordance with the relevant guidelines and regulations, and all respondents gave informed consent.

3. Results

The participants recruited for this study consisted of 2971 subjects at baseline (671 English speakers; 1609 Spanish; 691 Portuguese), 1024 subjects at the 2-month follow-up (228 English; 586 Spanish; 210 Portuguese), and 455 subjects at the 6-month follow-up (16 English; 305 Spanish; 134 Portuguese). The characteristics of the sample divided by language can be seen in Table 1. For further details regarding the sample, see Révész et al. [53].

Table 1. Baseline characteristics of English, Spanish, and Portuguese speakers.

	English Questionnaire (n = 671)	**Spanish Questionnaire (n = 1609)**	**Portuguese Questionnaire (n = 691)**	**p-Value [b]**
	Sociodemographics, n (%)			
Age (years, mean (SD))	36.2 (12.7)	36.2 (13.9)	36.9 (12.9)	0.43
	Gender			
Men	217 (32.3)	461 (28.7)	174 (25.2)	**<0.001** [c,d]
Women	436 (65.0)	1135 (70.5)	516 (74.7)	
Queer/Androgynous/other	15 (2.2)	2 (0.1)	1 (0.1)	
Having a partner	377 (56.2)	825 (51.3)	362 (52.4)	0.11
	Religion, n (%)			
	Religion groups			
Atheist	209 (31.1)	540 (33.6)	96 (13.9)	**<0.001** [c,d,e]
Agnostic	223 (33.2)	355 (22.1)	117 (16.9)	
Religious	229 (34.1)	573 (35.6)	477 (69.0)	
Practitioner of religion	194 (28.9)	419 (26.0)	318 (46.0)	**<0.001** [d,e]
	Health factors, n (%)			
Chronic diseases	174 (25.9)	356 (22.1)	206 (29.8)	**<0.001** [e]
Mental diseases	251 (37.4)	229 (14.2)	190 (27.5)	**<0.001** [c,d,e]

Table 1. *Cont.*

	English Questionnaire (n = 671)	Spanish Questionnaire (n = 1609)	Portuguese Questionnaire (n = 691)	p-Value [b]
Lifetime substance use, n (%)				
Non-psychedelic				
Alcohol	442 (65.9)	853 (53.0)	388 (56.2)	**<0.001** [c,d,e]
Tobacco	120 (17.9)	464 (28.8)	97 (14.0)	**<0.001** [c,e]
Cannabis	408 (60.8)	464 (37.6)	199 (28.8)	**<0.001** [c,d,e]
Cocaine	110 (16.4)	605 (37.6)	43 (6.2)	**<0.001** [c,d,e]
Amphetamines	90 (13.4)	178 (11.1)	34 (4.9)	**<0.001** [c,d,e]
Hallucinogens				
MDMA, ecstasy, molly [a]	202 (30.1)	428 (26.6)	71 (10.3)	**<0.001** [d,e]
Ayahuasca	197 (29.4)	357 (22.2)	55 (8.0)	**<0.001** [c,d,e]
Magic mushroom	378 (56.3)	420 (26.1)	43 (6.2)	**<0.001** [c,d,e]
LSD	303 (45.2)	355 (22.1)	79 (11.4)	**<0.001** [c,d,e]
Other hallucinogens	183 (27.3)	286 (17.8)	18 (2.6)	**<0.001** [c,d,e]
All hallucinogens	428 (63.8)	557 (34.6)	118 (17.1)	**<0.001** [c,d,e]
Frequency				
Never user	243 (36.2)	1052 (65.4)	573 (82.9)	**<0.001** [c,d,e]
Occasional user	205 (30.6)	331 (20.6)	70 (10.1)	
Regular user	223 (33.2)	226 (14.0)	48 (6.9)	

[a] Is only taken as a psychedelic drug when used for rituals or therapeutic settings; [b] one-way ANOVA was performed for continuous variables and Chi square analyses with LSD post-hoc analyses for categorical variables; [c] significant difference between English and Spanish speakers; [d] significant difference between English and Portuguese speakers; [e] significant difference between Spanish and Portuguese speakers. p-values ≤ 0.003 are shown in bold.

Our cohort had a 65.5% drop-out rate at follow-up 1 and then a 55.6% drop-out rate at follow-up 2. We found that at follow-up 1, never-users of psychedelic drugs more often dropped out than occasional or regular users (68% vs. 65% vs. 59%, respectively). At follow-up 1, persons with missing values, as compared to those without missing values, had higher psychological distress scores (3.1 vs. 2.7) and higher severity of psychological symptoms (59.5 vs. 58.6). At follow-up 2, we did not find any differences between persons without missing values and those with complete data.

3.1. Linear Regressions between Baseline Coping Measures and Frequency of Hallucinogen Use

When comparing users of hallucinogens (regular and occasional) vs. non-users at baseline, different significant differences were obtained with regards to their most-used coping strategies (Table 2).

Table 2. Baseline means and standard deviations for coping in the entire sample, and linear regressions showing associations between baseline coping scores in regular and occasional users vs. never-users of psychedelic substances.

Coping Mechanisms Means (Standard Deviation)	Total Sample	Frequency of Psychedelic Substance Use			
		Occasional B (SE)	p [a]	Regular B (SE)	p [a]
English questionnaire	n = 671	n = 205		n = 223	
Emotion-focused engagement	10.8 (30.0)	−0.68 (0.30)	0.02	−0.28 (0.30)	0.35
Emotion-focused disengagement	13.5 (2.7)	−0.03 (0.26)	0.90	−0.54 (0.26)	0.04
Problem-focused engagement	14.2 (3.4)	0.74 (0.33)	0.03	10.02 (0.33)	**0.002**
Problem-focused disengagement	14.7 (2.7)	0.89 (0.26)	**0.001**	0.89 (0.26)	**0.001**
Spanish questionnaire	n = 1609	n = 331		n = 227	
Cognitive restructuring	13.2 (3.7)	0.24 (0.26)	0.36	0.54 (0.32)	0.09
Emotional experience	11.8 (4.2)	0.60 (0.29)	0.04	0.85 (0.35)	0.02
Problem assessment	6.3 (3.3)	−0.35 (0.23)	0.13	−0.34 (0.28)	0.22

Table 2. *Cont.*

Coping Mechanisms Means (Standard Deviation)	Total Sample	Frequency of Psychedelic Substance Use			
		Occasional B (SE)	p [a]	Regular B (SE)	p [a]
Problem solving	15.2 (3.3)	−0.49 (0.23)	0.04	−0.65 (0.29)	0.02
Self-criticism	10.2 (4.7)	0.75 (0.33)	0.02	0.01 (0.40)	0.98
Social support	13.8 (4.4)	0.04 (0.31)	0.89	0.61 (0.37)	0.10
Social withdrawal	8.9 (4.1)	−0.05 (0.29)	0.86	−0.58 (0.36)	0.10
Wishful thinking	12.7 (4.4)	−0.73 (0.30)	0.02	−2.18 (0.37)	**<0.001**
Portuguese questionnaire	n = 691	n = 70		n = 48	
Acceptance of responsibility	5.6 (2.5)	0.39 (0.31)	0.20	0.15 (0.37)	0.68
Confrontation	5.9 (2.7)	0.71 (0.35)	0.04	−0.05 (0.42)	0.91
Escape-avoidance	8.1 (4.7)	1.16 (0.56)	0.04	0.44 (0.66)	0.51
Positive reappraisal	9.2 (4.1)	0.09 (0.50)	0.87	0.31 (0.60)	0.61
Problem solving	8.5 (3.3)	0.77 (0.43)	0.08	0.27 (0.52)	0.60
Self-control	9.5 (3.2)	−0.17 (0.41)	0.68	−0.72 (0.48)	0.14
Social support	8.5 (3.7)	1.24 (0.47)	0.01	−0.20 (0.56)	0.72
Withdrawal	6.4 (2.9)	−0.10 (0.37)	0.78	−0.07 (0.45)	0.88

[a] Linear regressions were adjusted for age, gender, and religious group, and all p-values $\leq$ 0.003 are shown in bold.

In the case of English speakers, linear regressions showed a higher problem-focused engagement among the regular users of hallucinogens as compared to non-users. Higher scores for problem-focused disengagement were also found among the occasional and regular users of hallucinogens, as compared to never-users. However, there were no significant differences in terms of emotion-focused engagement or disengagement (See Table 2).

Among the Spanish speakers, regular users of hallucinogens scored significantly lower, as informed by ANOVA, than non-users on the wishful thinking scale. For all other coping mechanisms, we did not observe significant differences (See Table 2).

We did not find any significant differences between the Portuguese speakers with regards to coping strategies and hallucinogen use.

3.2. Longitudinal Associations between Coping Strategies, Psychological Measures, and Use of Hallucinogens

According to data collected using the English questionnaire, both emotion-focused coping strategies were related to lower general health, and only emotion-focused disengagement was associated to higher GSI scores, whereas problem-focused strategies were only associated with better scores in general health in the case of problem-focused disengagement. Regarding hallucinogenic drug use, both scales of problem-focused strategies were associated with a higher use of these drugs.

Regarding the data collected using the Spanish questionnaire, higher scores on the scales of cognitive restructuring, emotional experience, problem assessment, problem solving, and social support were related to higher general health scores. In contrast, higher scores on self-criticism, social withdrawal, and wishful thinking were related to lower general health scores. Similarly, higher scores on cognitive restructuring, emotional experience, problem solving, and social support were associated with lower GSI scores, whereas higher scores on problem assessment, self-criticism, social withdrawal, and wishful thinking predicted higher GSI scores. Lastly, only emotional experience and wishful thinking were associated with greater use of hallucinogens at the first and second follow-ups.

In terms of the Portuguese questionnaire data, coping strategies involving acceptance of responsibility and escape-avoidance predicted lower general health scores, while positive reappraisal, problem solving, and social support were related to higher general health scores. Regarding the GSI, higher scores for the scales of acceptance of responsibility, escape-avoidance, and self-control were associated with higher scores. In contrast, higher scores for positive reappraisal and problem solving were associated with lower GSI scores.

Among the participants who completed this questionnaire, no coping measure was related to the use of hallucinogenic drugs (See Table 3).

Table 3. Longitudinal associations between baseline coping scores and General Health scores, the General Severity Index, and the use of hallucinogenic drugs over time.

	General Health Score/Psychological Distress		**General Severity Index/More Severe Psychological Symptoms**		**Lifetime Use of Psychedelic Drugs**	
	B (SE)	***p***	**B (SE)**	***p***	**OR (95% CI)**	***p***
English questionnaire						
Emotion-focused engagement	0.29 (0.04)	**<0.001**	0.16 (0.08)	0.04	0.96 [0.91–1.01]	0.10
Emotion-focused disengagement	0.47 (0.04)	**<0.001**	0.37 (0.09)	**<0.001**	0.97 [0.91–1.03]	0.27
Problem-focused engagement	−0.27 (0.04)	**<0.001**	−0.05 (0.07)	0.42	1.09 [1.03–1.14]	**0.001**
Problem-focused disengagement	−0.60 (0.04)	**<0.001**	−0.25 (0.09)	0.004	1.13 [1.06–1.21]	**<0.001**
Spanish questionnaire						
Cognitive restructuring	−0.26 (0.02)	**<0.001**	−0.34 (0.04)	**<0.001**	1.03 [1.00–1.07]	0.08
Emotional experience	−0.09 (0.02)	**<0.001**	−0.06 (0.04)	0.11	1.05 [1.02–1.08]	**0.001**
Problem assessment	−0.06 (0.02)	0.02	0.02 (0.05)	0.75	0.97 [0.94–1.01]	0.11
Problem solving	−0.27 (0.03)	**<0.001**	−0.39 (0.05)	**<0.001**	0.95 [0.92–0.98]	0.004
Self-criticism	0.25 (0.02)	**<0.001**	0.46 (0.03)	**<0.001**	1.02 [0.99–1.05]	0.13
Social support	−0.21 (0.02)	**<0.001**	−0.34 (0.04)	**<0.001**	1.01 [0.98–1.04]	0.49
Social withdrawal	0.22 (0.02)	**<0.001**	0.41 (0.04)	**<0.001**	0.98 [0.96–1.01]	0.23
Wishful thinking	0.20 (0.02)	**<0.001**	0.41 (0.03)	**<0.001**	0.93 [0.90–0.95]	**<0.001**
Portuguese questionnaire						
Acceptance of responsibility	0.29 (0.05)	**<0.001**	0.65 (0.10)	**<0.001**	1.03 [0.94–1.13]	0.53
Confrontation	0.04 (0.05)	0.44	0.24 (0.09)	0.01	1.04 [0.97–1.12]	0.30
Escape-avoidance	0.39 (0.03)	**<0.001**	0.84 (0.05)	**<0.001**	1.03 [0.99–1.09]	0.18
Positive reappraisal	−0.20 (0.03)	**<0.001**	−0.31 (0.07)	**<0.001**	1.01 [0.95–1.06]	0.87
Problem solving	−0.29 (0.04)	**<0.001**	−0.42 (0.08)	**<0.001**	1.04 [0.98–1.11]	0.16
Self-control	0.09 (0.04)	0.03	0.26 (0.07)	**<0.001**	0.95 [0.90–1.01]	0.10
Social support	−0.13 (0.03)	**<0.001**	−0.12 (0.07)	0.09	1.05 [0.99–1.11]	0.11
Withdrawal	0.05 (0.04)	0.30	0.09 (0.09)	0.30	0.97 [0.90–1.04]	0.37

GEE analyses were corrected for age, gender, religious group, and psychedelic substance use (only in models of General Health and General Severity Index). *p*-values ≤ 0.003 are shown in bold.

4. Discussion

Research on the potential therapeutic use of hallucinogens is currently growing at a quick pace. Among the mechanisms proposed to explain their alleged efficacy, psychological factors are thought to play a central role. For instance, psychological processes such as decentering [69] and reappraisal [70] have been associated with therapeutic outcomes. Similarly, high scores for psychological traits such as absorption and acceptance seem to predict positive and mystical experiences associated with hallucinogenic drug use [71]. Research on other personality traits has focused on longitudinal assessments after participation in rituals, retreats, or clinical studies, as well as cross-sectional comparisons between users and non-users, often leading to contradictory results. Probably the most consistent finding in this regard is that regular users of hallucinogens tend to have higher scores for the self-transcendence trait [72–74]. The study of coping strategies might be another important factor that modulates the psychedelic experience and, therefore, associated outcomes in terms of therapeutic effects. This study explored potential associations between the use of hallucinogens and the prevailing coping strategies of individuals, a subject that has not previously received much attention in the literature.

It has been well recognized that cultural factors influence how individuals cope with certain stressors [75]. Accordingly, in this study—which collected data from participants

from three cultural contexts—different instruments were used, and separate analyses were performed for each culture.

Certain diffuse patterns were observed regarding the results of this study. In the case of English speakers, users of hallucinogens seemed to display problem-focused strategies to a larger degree than non-users. This might be surprising given the existing evidence suggesting that hallucinogens shift emotion processing to the positive [75,76]. Thus, emotion-focused strategies might be more feasible among these subjects because of the positive bias in emotional processing, making emotional processing "easier". In that sense, the effects of hallucinogens on emotion processing have been tested in both healthy [51] and clinical [77] populations, showing a reduction in amygdala reactivity up to one week after a single dose of psilocybin in the former and improvements in emotion recognition detectable after one month of psilocybin use in the latter. However, it should be noted that contradictory evidence also exists, as described above. In addition, certain studies have shown that ayahuasca does not induce changes in the recognition of facial expressions [78]. Nevertheless, the fact that hallucinogens could facilitate emotional processing does not necessarily mean that coping strategies will focus more on emotions than the problem itself. Importantly, acute effects should be separated from subacute and long-term effects. In addition, we must not forget that at the core of the dichotomy that places cognitive and emotional processing in opposition with regards to coping, we might find reconciling views [79,80]. In conclusion, this preliminary research focusing on coping strategies should be interpreted with caution, considering the complexities associated with emotional/cognitive performance and their connections to predominant coping strategies. Another important point to consider in the case of English speakers is that a high percentage (37.4%) reported having mental disorders. This could affect the results obtained in terms of coping strategies and the way in which individuals deal with the experiences elicited by hallucinogenic drugs.

The Spanish speakers who regularly used hallucinogens less frequently used coping strategies based on wishful thinking. This finding is surprising given the associations found to exist between the subjective effects of hallucinogens and psychotic states. Indeed, even nowadays, distinct hallucinogens are being used as alleged models of psychosis, both in preclinical and clinical research [81]. Wishful thinking is a highly present trait in subjects experiencing psychotic symptoms or those with schizotypal traits, which are considered indicators of being "at risk" of developing psychotic disorders [82]. Notably, coping strategies have been extensively studied in people with schizophrenia and subjects with schizotypal traits. These populations tend to display inflexible coping strategies that are more focused on the emotions and less on the problem [83,84]. The deficits in terms of appropriate coping strategies tend to be very similar between subjects with schizophrenia and those with schizotypal traits who have not yet been diagnosed with a psychotic disorder [85,86]. This maladaptive pattern of coping strategies was not observed in our sample of hallucinogenic drug users. Additionally, it should be noted that regular exposure to hallucinogens does not seem to increase schizotypal traits [87]. Thus, the low prevalence of wishful thinking as a coping strategy among regular hallucinogenic drug users, together with the overall adaptive pattern of coping strategies, as well as the absence of a relationship between hallucinogenic drug use and the development of schizotypal traits might constitute preliminary evidence supporting a clear distinction between psychosis and psychedelic states, as some authors have argued [88,89]. This might have implications beyond the scope of this manuscript, such as regarding the stigmatization of both hallucinogens and hallucinations, and the use of hallucinogens to model psychosis in research, which, in our opinion, must be seriously reconsidered.

Lastly, a non-significant trend was observed among the Portuguese-speaking subjects who occasionally use hallucinogens, as they scored higher than non-users in confrontation and escape-avoidance. While the high score in confrontation follows the trend observed in other cultural groups involved in this study, the high score in escape-avoidance suggests the use of less effective strategies. Although this difference was observed with occasional users rather than regular users, and also without statistical significance, it should be

taken into account in further studies, including, at the least, those performed within the Brazilian population.

Regarding the longitudinal analyses, in the English questionnaire the use of emotion-focused coping strategies was associated with poorer general health and higher scores on the GSI, indicating a greater presence of psychopathology according to the study assessments. In contrast, the use of problem-focused strategies was associated with better general health and GSI scores, except for the specific scale of problem-focused engagement in the latter, and with more frequent use of hallucinogens. It should be noted that it has been generally stated in the literature that problem- and emotion-focused strategies are difficult to discriminate, as they may be used simultaneously and constitute parts of the whole coping process [90]. Thus, the following discussion about our findings should not be interpreted dichotomously. There is likely a mix of problem/emotion orientation in most cases, although a clearer trend can occasionally be drawn. The results observed are consistent with previous findings, as some research reported that emotion-oriented strategies may be less adaptive in the long-term than problem-oriented ones [91]. Nonetheless, the stressor that activates such strategies is also important. For instance, people diagnosed with chronic illnesses tend to adopt emotion-focused strategies [92,93], since problem-focused ones are intended to intervene in the problem, but in the case of suffering diseases without a cure, it is common to ascribe them to uncontrollable factors.

Among Spanish speakers, positive coping strategies (e.g., cognitive restructuring, social support) were associated with better general health and GSI scores, whereas negative strategies (e.g., self-criticism, social withdrawal, wishful thinking) were related to worse general health and GSI scores. This is in line with a robust body of research about coping strategies [90].

In the case of Portuguese speakers, the trend is also similar to the one observed in the literature [90]. The use of strategies like acceptance of responsibility and escape-avoidance were related to poorer general health and GSI scores, while using strategies like problem solving and social support was related to better scores at both measures according to the study assessments.

A diffuse pattern of adaptive coping strategies adopted by hallucinogen users can be observed. The frequency at which hallucinogen users used most of the coping strategies was equal to non-users across the three cultures, with the exception of problem-focused coping in English speakers and wishful thinking in Spanish speakers. None of the coping strategies were associated with hallucinogen use in the longitudinal analyses. Hallucinogen users have shown better health status and well-being during the COVID-19 pandemic [53,54,94,95]. Coping strategies could be one of the psychological factors involved in these preliminary findings. However, in the present study, we found significant associations between problem-focused coping (English speakers) and emotional experience and wishful thinking (Spanish speakers) and hallucinogenic drug use over time. The use of hallucinogens might relate to coping strategies displayed by subjects due to various reasons. One reason that was proposed is the association between the serotonin receptors and passive and active coping [39]. However, this represents a remarkable exercise of biological reductionism, as it assumes a direct relationship between the regular use of certain substances (and their effect on brain receptors) and the development of complex behavior/cognitive patterns that are activated when dealing with problems in daily life. Moreover, the directionality of this association remains obscure. The negative results obtained in the present study might reflect this reductionistic way of thinking, inviting further research to adopt more complex approaches.

This study has some limitations that should be taken into account. First, it suffered from a high dropout rate, and, therefore, the changes observed when performing longitudinal analyses can be attributed to other variables not related to hallucinogenic drug use. In addition, the English- and Portuguese-speaking samples were smaller than the Spanish-speaking one, so the results could be more reliable in the latter case. Furthermore, there were some crucial differences between the samples from different cultures (e.g., a

higher presence of mental disorders among the English speakers) that could have affected our results. It should be noted that different instruments for data collection about coping strategies were used. Even though this strategy responded to the selection of validated measures in each cultural context, it limited the comparison across cultures. Lastly, online questionnaires have their own limitations in terms of reliability. In that regard, having disseminated the survey through the networks of our organization, or the self-selection nature of recruitment, could have also biased the profile of participants towards hallucinogenic drug users.

5. Conclusions

This is the first study to assess the potential effect of coping strategies on the modulation of the putative benefits of hallucinogenic drug use at the population level and across different cultural contexts. When comparing hallucinogenic drug users and non-users, two main findings were observed: the former used problem-focused coping strategies more often and used the strategy based on wishful thinking less often. Besides these findings, users of hallucinogens were not found to differ from non-users in other coping strategies. This suggests that coping strategies are only a marginal factor distinguishing hallucinogen users from non-users in terms of explaining the better scores obtained by the former in mental health and well-being in studies assessing the impact of the COVID-19 pandemic. Other underlying mechanisms explaining the better adjustment of users of hallucinogens to pandemics should be explored.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/psychoactives1010003/s1, Supplementary File S1: Psychological impact of the COVID-19 crisis—Information for participants.

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