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Research paper

Examining differences in the effects and contexts of naturalistic psilocybin use for White participants vs. Participants of Color: A longitudinal online survey study

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ABSTRACT

Background: Psilocybin (a psychoactive compound found in "magic mushrooms" or "shrooms") has been gaining increased attention in research and popular culture as a number of clinical and observational studies have demonstrated that it may have potential for improving mental wellbeing. Relatedly, there has been a substantial uptick in naturalistic (e.g., real-world, non-clinical) psilocybin use in the United States. While a number of longitudinal studies have demonstrated that naturalistic psilocybin use is linked to positive mental health outcomes on average, few studies have examined how the effects of psilocybin and contexts for psilocybin use may differ for White populations compared to Populations of Color.

Objective: To examine differences in health outcomes, subjective effects, and contexts of naturalistic psilocybin use in White participants compared to Participants of Color.

Methods: This study used data from a large, online longitudinal study of individuals who planned to engage in naturalistic psilocybin use ($N = 2833$). We used mixed-effects models to assess whether race/ethnicity (White vs. Participant of Color) moderated associations between time (Time 2 [initial assessment point for longitudinal measures], Time 5 [2–4 weeks post-psilocybin experience, and Time 6 [2–3 months post-experience]) and outcomes related to mental health (depression, anxiety, spiritual wellbeing, cognitive flexibility, emotion regulation [expressive suppression + cognitive reappraisal]). We also used exploratory chi-squared tests to examine differences in contexts for psilocybin use as well as differences in subjective effects related to the psilocybin experience.

Results: Race/ethnicity moderated the associations between time for predicting spiritual wellbeing (beta = −1.8; 95 % CI [−3.4, −0.17]; $p < 0.05$), cognitive flexibility (beta = −1.5 [−2.7, −0.26]; $p < 0.05$), and emotion regulation – expressive suppression (beta = 0.25 [0.06, 0.44]; $p < 0.05$) at Time 6 (but not Time 5). Additionally, Participants of Color reported minor differences in subjective effects and context for use compared to White participants (e.g., more likely to have set an intention prior to use, report time speeding up during the experience, etc.). We found reductions in anxiety and depression for both Participants of Color and White participants, and our moderation tests for these outcomes were not significant.

Conclusion: Race/ethnicity impacts the associations between psilocybin use and various markers of mental wellbeing. Future longitudinal studies and experimental studies with larger samples of color can further elucidate the preliminary findings from this study.

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1. Introduction

Throughout history, various societies have ingested substances with hallucinogenic properties from natural sources (e.g., plants, fungi). Ritualistic use of these naturally occurring psychedelic substances for healing and religious purposes has existed for thousands of years in many ancient civilizations (e.g., Olmec, Zapotec, Maya and Aztec) (Carod-Artal, 2015; Jay, 2019; Schultes et al., 2001), and recent years have seen increased focus on potential applications of psychedelics in the treatment of mental health conditions. Growing research on psilocybin, a naturally occurring serotonergic psychedelic found in >200 species of fungi, primarily from the genus *Psilocybe* (Stamets and Weil, 1996), has demonstrated notable therapeutic potential for a range of mental health conditions, including existential distress (Griffiths et al., 2016; Grob et al., 2011; Ross et al., 2016), mood (Carhart-Harris et al., 2021; Davis et al., 2021; Goodwin et al., 2022; Gukasyan et al., 2022; Raison et al., 2023; von Rotz et al., 2023), and substance use disorders (Bogenschutz et al., 2022; Johnson et al., 2014, 2017). Increased lifetime use of psilocybin in the general population (Global Drug Survey, 2022) has led to greater need for expanded data on the public health impact of psilocybin use.

The vast majority of psychedelic use occurs in naturalistic (i.e., non-laboratory) contexts (Winstock et al., 2021). Yet few studies have investigated changes in major psychiatric symptom domains such as depression and anxiety before versus after a naturalistic psychedelic experience in a prospective fashion (Nygart et al., 2022). Given the effects of naturalistic psychedelic use may differ from those observed in clinical or therapeutic settings (Carhart-Harris et al., 2018; Glynos et al., 2023), an important question in psychedelic research is to what extent acute and long-term effects of psychedelic use in controlled clinical settings apply to using psychedelic substances in real-world environments. This question is especially relevant due to the substantial underrepresentation of People of Color (i.e., Non-White populations) in clinical trial data and the lack of generalizability of findings to racial and ethnic minorities in the general population (Michaels et al., 2018; Thrul and Garcia-Romeu, 2021; Hughes and Garcia-Romeu, 2024).

In a recent large-scale prospective, longitudinal survey of adults who used psilocybin in naturalistic settings, Nayak et al. (2023) found lasting improvements in mental health symptoms related to anxiety, depression, and substance misuse; additionally, this study found psilocybin use was linked to enduring changes in psychological functioning and personality factors such as increased cognitive flexibility, emotion regulation, and extraversion, and reduced neuroticism. However, this paper did not directly examine how such changes may differ for racial and ethnic minorities, underscoring a lack of knowledge and understanding regarding psychedelic use patterns and outcomes in Participants of Color.

Few empirical investigations have examined psychedelic compounds in racial and ethnic minority populations. For example, Williams et al. (2020) recruited a sample of Black, Indigenous, and People of Color (BIPOC) and found that naturalistic use of psychedelic compounds promoted significant reductions in symptoms of racial trauma, depression, anxiety, and stress in this population. More recently, Jones and Nock (2022) and Jones (2023) found that psychedelic use was consistently associated with lowered odds of distress, suicidality, and depression for White participants, and inconsistently associated with lowered odds of these outcomes among Participants of Color based on nationally representative survey data. Furthermore, Jones et al. (2023) found that psilocybin use was associated with lowered odds of crime arrests for all racial and ethnic groups aside from Black and Hispanic populations. Jones et al. (2024) also found psilocybin use to be associated with lowered odds of hypertension for only White participants.

Although evidence indicates a relationship between racial and ethnic identity and health and behavioral outcomes of psychedelic use, a methodological review of psychedelic studies from 1993 to 2017 found that the large majority of participants were non-Hispanic White individuals (82 %) with low percentages of BIPOC individuals (Michaels et al., 2018). In the United States, data indicate the lowest prevalence of lifetime and past-year psychedelic use among Hispanic, Black, and Asian individuals (Shalit et al., 2019), and a much greater perception of risk among Black and Hispanic individuals (Barnett et al., 2024). This disparity in psychedelic use and outcomes across ethnic and racial groups raises important questions regarding the sociocultural status of psychedelics, equity of access to clinical trials, the underrepresentation of BIPOC participants, and the generalizability of findings to non-White populations (Thrul and Garcia-Romeu, 2021). The inclusion of minority groups in psychedelic studies therefore remains pivotal to understanding the potential role of psychedelic-assisted treatments in ameliorating mental health disparities among diverse populations. Such inclusion is also pivotal as researchers have posited that the impacts of psychedelics on health may differ for racial and ethnic minority communities. Such differences may be due to factors including distinct environmental and sociocultural contexts of psychedelic use for non-White populations, existing socioeconomic, criminal justice, and health disparities among these groups (Bailey et al., 2017; O'Brien et al., 2020), and disproportionate stigma regarding psychedelic use and mental health in these communities. Differences in the public health impact of other drugs, such as opioids, have also been observed across ethnoracial lines; for example, opioid overdose deaths among Black Americans have exceeded those of White Americans more than fourfold in recent years (Gondré-Lewis et al., 2022; Kyei and Leveille, 2023). Therefore, the current study seeks to inform such differences regarding psychedelic use.

Relatedly, several possible reasons have been proposed in the literature for why People of Color in the United States are less likely to use psilocybin relative to White adults (Yockey and King, 2021), both in naturalistic and clinical settings. These include stigma related to mental disorders, lack of access to treatment and trial enrollment, a lack of cultural inclusivity and racial diversity within the research community, recruitment procedures that fail to emphasize racially and ethnically diverse populations, as well as differences in attitudes surrounding psychedelic use (Michaels et al., 2018). For Black Americans in particular, a history of racist and unethical research practices may underlie mistrust in biomedical research institutions (Thrul and Garcia-Romeu, 2021). Regardless of the possible reasons for the low prevalence of non-White participants in psychedelic studies, increasing diversity remains a research priority to address the potential impact, both in terms of benefits and harms, of psilocybin in racially and ethnically diverse samples (Molumby et al., 2022).

To address the lack of knowledge and understanding of psychedelic use patterns and outcomes in racial minority populations, the present study utilized longitudinal survey data collected by Nayak et al. (2023) to examine potential differences in health outcomes as well as acute and persisting effects of psilocybin use for White participants vs. Participants of Color.

2. Methods

The current study uses longitudinal data gathered from individuals who planned to take psilocybin in non-clinical, real-world contexts. In general, the individuals in this study had experience with psychedelics and had used psilocybin an average of 16–17 times prior to their participation in the current study. The average age of participants in this study is 40 years old; additionally, 54 % of the sample identified as male and 81 % of the sample identified as White. Additional details on our sample are provided in Table 2, which details the demographic characteristics of participants in this study.

Data were gathered in a series of sequential online surveys that were collected at the following six time points: informed consent (Time 1; $N = 8006$), 2–3 weeks prior to one's psychedelic experience (Time 2 [initial assessment point for longitudinal measures]; $N = 2833$), 1 day pre-experience (Time 3; $N = 1802$), 1–3 days post-experience (Time 4; $N = 1551$), 2–4 weeks post-experience (Time 5; $N = 1182$), and 2–3

months post-experience (Time 6; $N = 657$) (Fig. 1). As this study aimed to assess the impact of racial identity on psychedelic use and mental wellbeing, we excluded individuals who reported that they would "Prefer not to say" what their racial identity was from this study (Time 1 $N = 99$; Time 2 $N = 29$; Time 3 $N = 16$; Time 4 $N = 12$; Time 5 $N = 7$; Time 6 $N = 5$).

The Institutional Review Board at Johns Hopkins University School of Medicine approved this study, and additional details on this study can be found in Nayak et al. (2023).

2.1. Core analyses

This study uses a similar methodology to Jones and Nock (2022), Jones (2023), Jones et al. (2023), and Jones et al. (2024) to assess the impact of race on the associations between psychedelic use and wellbeing. We used mixed-effects regression models – an approach suitable for the repeated measures included within longitudinal studies – to conduct moderation tests and assess how race impacts the relationship between psychedelic use and mental wellbeing in this study. All models include a random intercept for each participant, allowing the model to adjust for individual differences in baseline levels of the outcome. Specifically, we assessed whether interactions between race (White [reference category] vs. Participant of Color) and time (three levels: Time 2, Time 5, Time 6) were significant for outcomes related to mental health (depression + anxiety) as well as putative mechanisms that may underlie the link between psychedelic use and improvements in mental wellbeing (spiritual wellbeing, emotion regulation, and cognitive flexibility).

We used a two-level race variable (White vs. Participant of Color) as a moderator instead of the 8-level race variable originally included in Nayak et al. (2023) (White, Black, Native Hawaiian/Pacific Islander, Native American, Mixed Race, Asian, Other, "Prefer Not to Say") due to the limited number of Participants of Color within this sample. For example, there were only 5 Native Hawaiian/Pacific Islander participants at the initial longitudinal assessment timepoint [Time 2]; thus, using an 8-level moderator would have sharply limited the fidelity of our results. Thus, by including all Participants of Color in one group, we increase power for our analyses. Furthermore, our time variable includes three levels (Time 2, Time 5, Time 6) as longitudinal data on the outcomes in question were collected at these timepoints.

2.1.1. Divide sample + conduct stratified mixed-effects models

If any moderation tests were significant, we would then divide the overall sample into two groups – one group for White participants and another for Participants of Color – and conduct additional mixed-effects models to assess the relationship between time (Independent Variable) and any outcomes for which there were significant moderation tests (i.e., models for Participants of Color, and separate models for White participants). The goal of this step was to facilitate further comparison between White participants and Participants of Color on the impact of psychedelics on our outcomes of interest. This step is also in line with Jones and Nock (2022), Jones (2023), and Jones et al. (2023). We used the lme4 package in R to conduct all mixed-effects models (Bates et al., 2015).

2.1.2. Dependent variables + assessments

Our study featured the following six dependent variables (all measures used to assess these constructs are listed here in parentheses): depression (modified version of the Beck Depression Inventory-II [BDI-II]), anxiety (Short State Trait Anxiety Inventory [STAI]), spiritual wellbeing (Functional Assessment of Chronic Illness Therapy Spiritual Wellbeing [FACIT-Sp]), emotion regulation – expressive suppression (Emotion Regulation Questionnaire [ERQ]), emotion regulation – cognitive reappraisal (ERQ), and cognitive flexibility (Cognitive Flexibility Scale [CFS]). The BDI-II was modified to exclude a question about suicidality due to the study team's inability to respond adequately to participants at imminent risk of suicide.

2.1.3. Covariates

Our models controlled for the following covariates: age, gender, income, education level, prior psychedelic use, and marital status.

2.2. Exploratory descriptive statistics – analyses + assessments

In this study, we also used exploratory descriptive statistics to understand whether White participants differ from Participants of Color on a host of factors related to the psychedelic experience as assessed at Time 3 (1 day pre-experience), including: one's mindset heading into the experience, whether one set an intention before the psychedelic experience (yes/no), whether a sitter was present for the experience (yes/no), and scores on the State of Surrender (SOS) scale, a 10-item scale that assesses the extent to which one has psychologically surrendered before the psychedelic experience.

Additionally, we also assessed factors related to the setting within which one took psychedelics and subjective elements of the psychedelic experience as assessed at Time 4 (1–3 days post-experience), including: who one took psilocybin with, the location of the psychedelic experience, who the psilocybin was administered by, whether one revisited

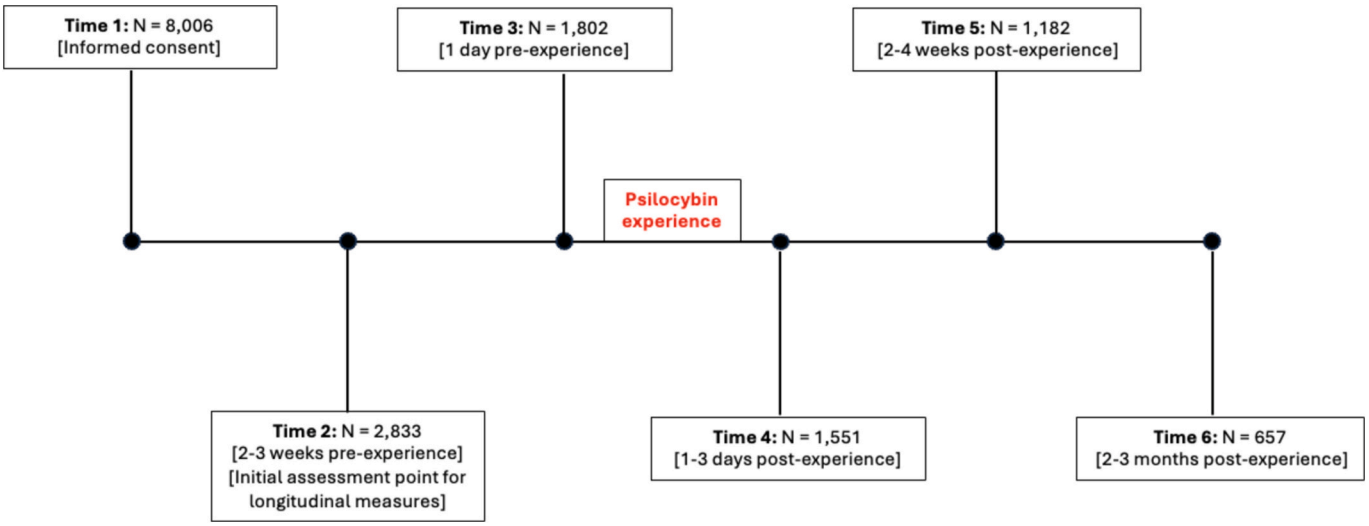

Fig. 1. Overview of the study timeline.

scenes from the past (yes/no), changes in one's perception of time, whether one's thoughts sped up during the experience, whether one's senses were more vivid during the experience, one's overall rating of the psychedelic experience as positive or negative, scores on the Mystical Experience Questionnaire (MEQ), and scores on the Challenging Experience Questionnaire (CEQ). The Mystical Experience Questionnaire is a 30-item scale that is used to assess the extent to which the psychedelic experience contained mystical-type qualities (e.g., feelings of oneness with the universe, feeling like one has transcended time and space, etc. [Barrett et al., 2015]). The Challenging Experience Questionnaire is a 26-item scale that evaluates the extent to which one had a difficult psychedelic experience across seven domains: fear, death, grief, insanity, physical distress, isolation, and paranoia (Barrett et al., 2016). Both the MEQ and the CEQ are scaled from 0 to 1, with higher scores indicating greater degrees of mystical experience and challenging experience, respectively. Finally, we examined persisting negative effects due to psychedelic use at Time 5.

To assess whether there were significant differences between the two groups within each of these domains, we used Wilcoxon rank sum tests (for continuous variables) and Pearson's Chi-squared tests (for categorical variables). Due to the exploratory nature of these analyses and the small sample sizes included in some of the cells for these analyses, we did not correct for multiple comparisons. Therefore, all results are preliminary and tentative and should be interpreted with caution.

3. Results

Table 1 provides the Ns at each timepoint for each assessment category (depression, anxiety, putative mechanisms [spiritual well-being, emotion regulation, cognitive flexibility]), stratified by race and ethnicity.

Table 2 provides an overview of the demographics of the sample at Time 2, the initial assessment time point for our longitudinal measures. Participants of Color were slightly younger than White participants, and featured a slightly lower proportion of male participants as well as a slightly higher share of participants who identified as "other" for their gender. Participants of Color were slightly lower income than White participants, and a much higher proportion of Participants of Color identified as Hispanic.

Tables 3 and 4 detail the results of the moderation tests. The moderation tests between time and race were significant at time 6 (but not time 5) for expressive suppression (beta = −1.8; $p < 0.05$), spiritual wellbeing (beta = 0.25; $p < 0.05$), and cognitive flexibility (beta = −1.5; $p < 0.05$). No other moderation tests were significant. As a result of the significant moderation tests, we divided our sample into two groups (White participants and Participants of Color) to conduct additional mixed-effects models and assess the relationship between time and spiritual wellbeing, expressive suppression, and cognitive flexibility for each group.

Table 5 provides the results of the stratified models. For White

Table 1
Total N by timepoint (Time 2, Time 5, Time 6) and race (White vs. Participant of Color) for depression, anxiety, and our putative mechanism outcomes (spiritual wellbeing, emotion regulation, cognitive flexibility).

Race	Timepoint	Depression	Anxiety	Putative mechanisms
White	Time 2 (2 wks pre)	1980	1897	2306
White	Time 5 (2–4 wks post)	819	809	995
White	Time 6 (2–3 mo. post)	442	442	568
Participant of Color	Time 2 (2 wks pre)	436	411	498
Participant of Color	Time 5 (2–4 wks post)	149	138	180
Participant of Color	Time 6 (2–3 mo. post)	68	67	84

Table 2
Demographics of our sample (Time 2).

Demographic variables	White, N = 2306[1]	Participant of Color, N = 498	p-value[2]
Age			<0.001
Mean (SD)	41 (13)	35 (11)	
Range	18, 89	18, 77	
Education			>0.9
No high school diploma	29 (1 %)	8 (2 %)	
HS diploma/GED	165 (7 %)	34 (7 %)	
Some college	438 (19 %)	101 (20 %)	
Trade/technical school	163 (7 %)	40 (8 %)	
Associate's degree	157 (7 %)	28 (6 %)	
Bachelor's degree	737 (32 %)	153 (31 %)	
Master's degree	432 (19 %)	94 (19 %)	
Terminal degree (e.g., PhD, MD)	185 (8 %)	40 (8 %)	
Gender			<0.001
Female	1000 (43 %)	231 (46 %)	
Male	1264 (55 %)	244 (49 %)	
Transgender	13 (1 %)	5 (1 %)	
Other	29 (1 %)	18 (4 %)	
Income			<0.001
$0–9.9 k	235 (10 %)	91 (18 %)	
$10 k–24.9 k	353 (15 %)	89 (18 %)	
$25 k–49.9 k	481 (21 %)	113 (23 %)	
$50 k–74.9 k	422 (18 %)	77 (15 %)	
$75 k–99.9 k	280 (12 %)	42 (8 %)	
$100 k–149.9 k	228 (10 %)	37 (7 %)	
$150 k+	183 (8 %)	25 (5 %)	
Prefer not to answer	124 (5 %)	24 (5 %)	
Race			<0.001
White	2306 (100 %)	0 (0 %)	
Black	0 (0 %)	45 (9 %)	
Native Hawaiian/Pacific Islander	0 (0 %)	5 (1 %)	
Native American	0 (0 %)	28 (6 %)	
Mixed Race	0 (0 %)	215 (43 %)	
Other	0 (0 %)	109 (22 %)	
Prefer not to say	0 (0 %)	0 (0 %)	
Asian	0 (0 %)	96 (19 %)	
Hispanic	106 (5 %)	186 (37 %)	<0.001
Prior psychedelic use	1978 (86 %)	420 (84 %)	0.4
Number of Prior Psilocybin Experiences			0.058
Mean (SD)	17 (22)	16 (21)	
Range	0, 100	0, 100	
Prior mental health diagnosis	1608 (70 %)	339 (68 %)	0.5

[1] n (%).
[2] Wilcoxon rank sum test; Pearson's Chi-squared test.

Table 3
Moderation tests assessing an interaction between race (White vs. Participant of Color) and time (Time 2, Time 5, Time 6) for predicting depression and anxiety.

Interaction test	Depression		Anxiety	
	Beta (95 % CI)[1]	p-value	Beta (95 % CI)	p-value
White [ref. category] vs. Participant of Color * timepoint				
Time 5 (2–4 wks post)	0.64 (−0.88, 2.2)	0.4	0.30 (−1.4, 2.0)	0.7
Time 6 (2–3 mo. post)	0.70 (−1.4, 2.8)	0.5	0.78 (−1.4, 3.0)	0.5
Random effects	*Std. deviation*		*Std. deviation*	
Intercept	8.0		10	
Residual	6.5		6.7	

[1] *p < 0.05; **p < 0.01; ***p < 0.001.

Table 4
Moderation tests assessing an interaction between race (White vs. Participant of Color) and time (Time 2, Time 5, Time 6) for predicting spiritual wellbeing, emotion regulation – cognitive reappraisal, emotion regulation – expressive suppression, and cognitive flexibility.

Interaction test	Spiritual wellbeing		Cog. reappraisal		Exp. suppression		Cog. flexibility	
	Beta (95 % CI)[1]	p-value	Beta (95 % CI)	p-value	Beta (95 % CI)	p-value	Beta (95 % CI)	p-value
White [ref. category] vs. Participant Of Color * timepoint								
Time 5 (2–4 wks post)	0.00 (−1.2, 1.2)	>0.9	0.00 (−0.14, 0.14)	>0.9	0.10 (−0.05, 0.24)	0.2	−0.06 (−0.98, 0.86)	>0.9
Time 6 (2–3 mo. post)	−1.8* (−3.4, −0.17)	0.030	−0.07 (−0.26, 0.12)	0.5	0.25* (0.06, 0.44)	0.011	−1.5* (−2.7, −0.26)	0.018
Random effects	*Std. deviation*		*Std. deviation*		*Std. deviation*		*Std. deviation*	
Intercept	9.5		0.91		1.1		6.1	
Residual	5.4		0.66		0.66		4.3	

[1] *p < 0.05; **p < 0.01; ***p < 0.001.

Table 5
Stratified models assessing the relationships between time (independent variable) and spiritual wellbeing, emotion regulation – expressive suppression, and cognitive flexibility (dependent variables) for White participants and Participants of Color.

Putative mechanism variables		White		Participant of Color	
		beta (95 % CI)[1]	p-value	beta (95 % CI)	p-value
	Timepoint				
	Time 2 (2 wks pre)	–		–	
	Time 5 (2–4 wks post)	4.1*** (3.7, 4.6)	<0.001	4.1*** (3.0, 5.2)	<0.001
Spiritual wellbeing	Time 6 (2–3 mo. post)	4.5*** (3.9, 5.1)	<0.001	2.7*** (1.2, 4.2)	<0.001
	Random Effects	*Std. Deviation*		*Std. Deviation*	
	Intercept	9.4		9.7	
	Residual	5.4		5.5	
	Timepoint				
	Time 2 (2 wks pre)	–		–	
	Time 5 (2–4 wks post)	−0.06* (−0.11, 0.00)	0.048	0.04 (−0.11, 0.18)	0.6
Expressive suppression	Time 6 (2–3 mo. post)	−0.10** (−0.17, −0.03)	0.004	0.15 (−0.04, 0.35)	0.13
	Random Effects	*Std. Deviation*		*Std. Deviation*	
	Intercept	1.1		1.1	
	Residual	0.65		0.73	
	Timepoint				
	Time 2 (2 wks pre)	–		–	
	Time 5 (2–4 wks post)	1.9*** (1.5, 2.2)	<0.001	1.8*** (0.95, 2.7)	<0.001
Cognitive flexibility	Time 6 (2–3 mo. post)	2.0*** (1.5, 2.4)	<0.001	0.47 (−0.73, 1.7)	0.4
	Random Effects	*Std. Deviation*		*Std. Deviation*	
	Intercept	6.0		6.2	
	Residual	4.3		4.4	

[1] *p < 0.05; **p < 0.01; ***p < 0.001.

participants, time was associated with significant improvements in each of the three outcomes at Time 5 and Time 6 (Spiritual Wellbeing – beta range: 4.1 to 4.5, $p < 0.001$; Expressive Suppression – beta range: −0.10 to −0.06; $p < 0.05$; Cognitive Flexibility – beta range: 1.9 to 2.0; $p < 0.001$). For Participants of Color, time was associated with improvements in spiritual wellbeing at Time 5 and Time 6 (beta range: 2.7 to 4.1; $p < 0.001$) as well as with cognitive flexibility at Time 5 only (beta = 1.8; $p < 0.001$); however, time did not share a relationship with expressive suppression for Participants of Color.

Tables 6–9 detail the exploratory descriptive statistics related to the nature of the psychedelic experience.

Table 6 details mindset factors related to the psychedelic experience. Participants of Color were more likely to report having set an intention than were White participants; no other comparisons were significant.

Table 7 provides information regarding the setting of the psychedelic experience. There were no differences between the two groups on any of these domains, with most participants taking psilocybin at home, either alone or with friends who were also using psilocybin.

Table 8 provides information related to the subjective elements of the psychedelic experience, including information about the number of individuals who had "complete mystical experiences," a designation for participants who provided scores ≥60 % of the maximum score on each of the four subscales of the MEQ (ineffability, positive mood, transcending space or time, and unitive experience). Participants of Color were more likely to report greater degrees of mystical experience and report their thoughts speeding up during the experience.

Table 9 details persisting negative effects of the psychedelic experience, including depressive notions, loneliness, and mood fluctuations. There were no differences between the two groups on the frequency of persisting negative effects.

Table 6
Mindset factors related to the psychedelic experience (Time 3).

Mindset variables	White, N = 1,492[1]	Participant of Color, *N* = 294	p-value[2]
State of surrender			0.2
Mean (SD)	2.97 (0.45)	3.01 (0.47)	
Set an intention	1091 (73 %)	235 (80 %)	0.018
Presence of a sitter	521 (35 %)	108 (37 %)	0.6

[1] n (%).
[2] Wilcoxon rank sum test; Pearson's Chi-squared test.

Table 7
Setting factors related to the psychedelic experience (Time 4).

Setting variables	White, N = 1,297[1]	Participant of Color, *N* = 242	p-value[2]
Who one took psilocybin with			0.4
Alone	561 (43 %)	102 (42 %)	
With a friend guiding (sober)	206 (16 %)	47 (19 %)	
With friend(s) also consuming psilocybin	332 (26 %)	61 (25 %)	
With a group being guided through the session	20 (2 %)	2 (1 %)	
With a certified therapist	17 (1 %)	0 (0 %)	
With a shaman or other guide	18 (1 %)	5 (2 %)	
Other	143 (11 %)	25 (10 %)	
Location of psychedelic experience			0.14
At home	907 (70 %)	169 (70 %)	
At a party	10 (1 %)	1 (0 %)	
At a concert or festival	18 (1 %)	0 (0 %)	
Outdoors in nature	199 (15 %)	42 (17 %)	
In a religious or spiritual setting (e.g., ceremony)	35 (3 %)	4 (2 %)	
Other public place (e.g., shopping mall)	6 (0 %)	4 (2 %)	
Other	122 (9 %)	22 (9 %)	
Who psilocybin was administered by			0.6
Yourself	1192 (92 %)	224 (93 %)	
A friend	50 (4 %)	10 (4 %)	
A ceremonial guide	37 (3 %)	5 (2 %)	
A trained therapist	14 (1 %)	1 (0 %)	
Other	4 (0 %)	2 (1 %)	

[1] n (%).
[2] Pearson's Chi-squared test.

Table 8
Subjective elements of the experience (Time 4).

Subjective elements variables	White, N = 1,297[1]	Participant of Color, N = 242	p-value[2]
Overall rating of psychedelic experience			0.4
Extremely positive	603 (46 %)	129 (53 %)	
Moderately positive	421 (32 %)	70 (29 %)	
Slightly positive	156 (12 %)	22 (9 %)	
Neither positive nor negative	74 (6 %)	16 (7 %)	
Slightly negative	26 (2 %)	2 (1 %)	
Moderately negative	9 (1 %)	2 (1 %)	
Extremely negative	8 (1 %)	1 (0 %)	
Mystical Experience Questionnaire			0.047
Mean (SD)	0.50 (0.25)	0.53 (0.25)	
Complete mystical experience	276 (21 %)	54 (22 %)	0.8
Challenging Experience Questionnaire			0.8
Mean (SD)	0.71 (0.68)	0.74 (0.71)	
Revisited scenes from past	493 (38 %)	107 (44 %)	0.081
Changes in perception of time			0.14
No	314 (24 %)	43 (18 %)	
Faster than usual	120 (9 %)	22 (9 %)	
Slower than usual	537 (41 %)	115 (48 %)	
Time lost meaning	326 (25 %)	62 (26 %)	
Thoughts sped up			0.002
No	804 (62 %)	124 (51 %)	
Faster than usual	378 (29 %)	98 (40 %)	
Incredibly fast	115 (9 %)	20 (8 %)	
Senses more vivid			0.11
No	141 (11 %)	18 (7 %)	
More vivid	711 (55 %)	127 (52 %)	
Incredibly more vivid	445 (34 %)	97 (40 %)	

[1] n (%).
[2] Pearson's Chi-squared test; Wilcoxon rank sum test.

Table 9
Persisting negative effects of the experience (Time 5).

Negative effects variables	White, N = 995[1]	Participant of Color, N = 180	p-value[2]
None	895 (90 %)	153 (85 %)	0.066
Depressive notions	29 (3 %)	8 (4 %)	0.4
Loneliness	22 (2 %)	6 (3 %)	0.5
Mood fluctuations	42 (4 %)	13 (7 %)	0.12

[1] n (%).
[2] Pearson's Chi-squared test.

4. Discussion

The present study characterized the differential effects of naturalistic psilocybin use over time among a sample of anonymous respondents, focusing on Participants of Color compared to White respondents.

Overall, we found significant differences in persisting psilocybin effects in the domains of spiritual wellbeing, cognitive flexibility, and expressive suppression (a facet of emotion regulation) for White participants vs. Participants of Color. These results suggest that although both White respondents and Participants of Color showed improved spiritual wellbeing after naturalistic psilocybin use, these improvements were not as pronounced or durable in Participants of Color through the study's final time point (2–3 months after psilocybin use). Similarly, though both groups exhibited increased cognitive flexibility to a similar degree in the initial 2–4 weeks after psilocybin use, this increase was sustained in White participants, but was no longer significantly increased in Participants of Color at the 2–3 month follow-up survey. Finally, in the present sample, White participants showed reduced expressive suppression after psilocybin use, while Participants of Color showed no significant changes in this construct. Interestingly, this latter finding mirrors one from Lowe et al. (2024), which found no significant changes in expressive suppression from baseline to follow-up in a sample of Middle Eastern and North African (MENA) individuals ($N = 15$) who recently engaged in ceremonial Ayahuasca use.

Additionally, moderation tests found no differences in depression and anxiety between Participants of Color and White respondents in the present sample. These results stand in contrast to earlier findings from nationally representative data showing that in White participants, lifetime psilocybin and MDMA use were associated with significantly lowered odds of past-month psychological distress and past-year suicidal thinking and planning; yet, for Black, Indigenous, and Multiracial psychedelic users, these protective associations did not exist (Jones and Nock, 2022). Similarly, Jones (2023) found that while lifetime psilocybin use was associated with lower odds of lifetime, past year, and past year severe major depressive episodes in White participants, these findings did not generalize to Non-Hispanic Racial Minority participants. Notably, in both of these studies, Hispanic respondents demonstrated protective associations between psilocybin use and mental health, although such associations were not apparent for Non-Hispanic Racial Minority participants (Jones and Nock, 2022; Jones, 2023).

Mindset and subjective effects data related to psilocybin use found that a higher proportion of Participants of Color went into their psilocybin experience with a premeditated intention compared to White respondents, and Participants of Color experienced a more pronounced sense that their thoughts sped up during psilocybin use, and exhibited marginally higher ratings of acute mystical-type effects. However, environmental variables such as where and with whom psilocybin was taken, and subjective effects such as emotionally challenging experiences, autobiographical content, perceptual alterations, and overall evaluation of the experience showed no differences between groups. Additionally, prevalence of persisting negative effects such as depressed mood and loneliness did not differ between groups. Future qualitative studies can shed light on why we may have observed such differences in this study.

Taken together, the data suggest that although participants on average showed some reduction in depression and anxiety regardless of ethnoracial background, particular facets of psychological and psychospiritual functioning were impacted differently between White respondents and Participants of Color, with Participants of Color overall showing less magnitude and duration of benefits in spiritual wellbeing and cognitive flexibility, and no improvements in expressive suppression relative to baseline. Interestingly, expressive suppression is conceptualized as an emotion regulation strategy of concealing or restricting one's outward emotional expression, and greater expressive suppression is generally associated with negative wellbeing outcomes (Haga et al., 2009). Therefore, reduced expressive suppression in White participants is congruent with improved wellbeing and mental health outcomes, but may also serve as an important mechanism by which psychedelic use outcomes manifest differently in Participants of Color. Furthermore, it is conceivable that individuals from minoritized groups may find expressive suppression a necessary or protective manner of interacting in a largely White-dominated society, consistent with practices such as code-switching (i.e., mirroring dominant cultural norms to achieve socially desirable outcomes) (McCluney et al., 2021). Future longitudinal studies can further examine this potential driver of our results.

There are a number of notable limitations to this study. First, the study was conducted anonymously online, meaning veracity of data cannot be confirmed. Second, the sample was self-selected and therefore not representative of the wider population, limiting the generalizability of this study. Third, response bias may have shaped participant responses in various ways such as leading people to provide responses they considered socially desirable, or responding in ways that were congruent with pre-existing cognitive biases about psychedelics or mental health. Fourth, this analysis primarily hinges on a small sample of Participants of Color who completed the survey study, thereby limiting statistical power. Finally, due to the small sample size, the present study was constrained to comparing Participants of Color as a single group vs. White respondents. However, this confounds people from various races and ethnicities (e.g., Black, Asian, Indigenous, Hispanic), each with their own nuanced and distinct backgrounds, thereby losing ability to consider these groups separately.

In conclusion, despite minor differences in set and setting variables between groups, there were generally more similarities than differences in these areas, and the main distinctions seemed to lie in persisting effects in psychological functioning and spiritual wellbeing. Although it is impossible to draw decisive conclusions from the present study, the evidence to date indicates that psychedelics' effects may vary along ethnic and racial lines, though the underlying reasons for these differences remain unclear. It is possible that unobserved demographic factors (e.g., parental education, rural vs. urban living setting) could play a role in creating more stressful living circumstances for Participants of Color that thereby mitigate positive effects of psychedelic use. Other contextual and cultural influences that were not accounted for in the present survey may also be at play, such as criminal justice disparities, limited healthcare access, systemic racism and discrimination, and social stigma around mental health concerns.

With increasing recreational psychedelic use, and growing interest in the development of psychedelic therapies for mental healthcare, more data will be needed to inform the differential effects of psychedelics in individuals from diverse backgrounds and how their use as mental health interventions may be optimized in culturally appropriate ways. In particular, it will be critical to increase our understanding of how public perceptions around psychedelics and sociocultural factors such as health and criminal justice disparities may influence psychedelics' utility and outcomes both in naturalistic and clinical settings. Ultimately, this can lead us to more balanced and effective public policies and clinical implementation strategies to benefit People of Color equitably and maximally reduce public health risks associated with psychedelic use.

CRediT authorship contribution statement

Grant Jones: Writing – review & editing, Writing – original draft, Supervision, Formal analysis, Conceptualization. **Matthew X. Lowe:** Writing – review & editing, Writing – original draft, Conceptualization. **Sandeep Nayak:** Writing – review & editing, Formal analysis. **Nathan Sepeda:** Writing – review & editing. **Hannes Kettner:** Writing – review & editing, Conceptualization. **Robin Carhart-Harris:** Writing – review & editing. **Heather Jackson:** Writing – review & editing. **Albert Garcia-Romeu:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

Declaration of competing interest

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