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# Contextual Parameters Associated with Positive and Negative Mental Health in Recreational Psychedelic Users

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## ABSTRACT

Growing research exploring the utility of psychedelic substances suggests that they not only hold promise for clinical practice but may enhance mental health through recreational use as well. However, given the importance of set and setting for maximizing benefits and minimizing harms of drug use, it is important to develop a foundational understanding of the contextual factors associated with positive and negative mental health in psychedelic users. Accordingly, data were collected using an internet-based survey of psychedelic drug users ( $n = 511$ ). Hierarchical regression analyses were used to explore to what degree life-time use, frequency of use, dose size, group use, intentions for use, and post-use integration predict mental health in psychedelic users. In particular, using psychedelics with high frequency and to cope with negative affect were found to predict negative mental health. Conversely, using psychedelics in a group setting, with self-expansive intentions, and integrating post-use were found to predict positive mental health. Findings suggest that recreational psychedelic use may either enhance or diminish mental health depending on the contextual parameters of use. Limitations and areas for further research are discussed.

## ARTICLE HISTORY

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## KEYWORDS

Psychedelics; harm reduction; drug policy; positive drug use; entheogens; recreational drug use

Research into the utility of psychedelics, such as psilocybin, lysergic acid diethylamide (LSD), and dimethyltryptamine (DMT) is returning after decades of moratorium (Johnson, Richards, and Griffiths 2008). Recent studies indicate that these substances hold significant potential to treatment various psychological disorders (Johnson, and Griffiths 2017). However, positive outcomes are frequently associated with recreational psychedelic use as well, with users often reporting improved mental health, enhanced well-being, and greater spirituality (Carhart-Harris and Nutt 2010; Lerner and Lyvers 2006; Lyvers and Meester 2012; Móró et al. 2011; Nour et al. 2016; Stasko, Rao, and Pilley 2012). Given prevailing societal narratives concerning the dangers of psychoactive substances, however, it remains controversial to suggest that certain patterns of recreational drug use may be beneficial. Nonetheless, one objective for drug researchers should be to understand the contextual factors associated with positive drug use. Without this understanding we foreclose an opportunity to enhance mental health and are less able to intervene before use becomes problematic (Hammersley and Reid 2002; Peele 1999). The present research thus explored use factors associated with positive and negative mental health in recreational psychedelic users.

To predict the influence of recreational drug use on mental health various contextual factors should be considered (see Müller and Schumann 2011). One key factor is total life-time use. Krebs and Johansen (2013) and Hendricks et al. (2015) found that life-time psychedelic use was associated with a reduced likelihood of mental distress. Similarly, Carhart-Harris and Nutt (2010) found that most psychedelic users reported enhanced well-being and attenuated mental health problems, while some reported reduced problems with addiction.

Frequency of use is another relevant contextual factor. Zinberg, Jacobson, and Harding (1975) and Johnstad's (2018) findings suggest that although *controlled* psychedelic use (non-harmful utilization of a licit or illicit drug [Institute of Medicine 1996]) entails infrequent use, problematic or abusive use entails high frequency of use. Similarly, Peele and Brodsky (2000) and Clifford et al. (1991) reported curvilinear relationships between frequency of drug use and mental health, although psychedelics were not assessed. These studies suggest that moderate psychedelic use frequency (occasional versus everyday use) may be optimal for enhancing mental health and well-being.

Dose size and social context similarly influence outcomes. Zinberg (1984) reported that controlled psychedelic users tended to stabilize or reduce their typical

dosage, whereas problematic users often escalated to very large doses. A group context may provide greater control and reduces problematic abuse (Grund 1993). Harding and Zinberg (1977) found that controlled psychedelic users approached use as a planned group activity with a deliberate intention. Kettner et al. (2021) found that *communitas*, the sense of intersubjective connection amongst those who use psychedelics in a group, partially mediated the beneficial effects of psychedelic use.

The importance of intention, set, setting, and other non-pharmacological factors are also critical to understanding use outcomes (Carhart-Harris et al. 2018; Hartogsohn 2016). Zinberg (1984) reported that controlled psychedelic users often approached use with the intention of expanding consciousness, whereas problematic users often sought the stimulating effects. Similarly, Móró et al. (2011) found that *autognostic* psychedelic use (e.g., self-insight, growth, spirituality) was associated with intrinsic spirituality, while Simons et al. (1998) noted that psychedelic compounds are often used for psychospiritual expansion. Haijen et al. (2018) report that using psychedelics for *spiritual connection* was positively associated with well-being, whereas Russ et al. (2019) found that spiritual motivations for using psychedelics were related to an increased likelihood of beneficial, mystical experiences. Comparably, Girn et al. (2020) contend that psychedelics may promote creative thought, while Prochazkova et al. (2018) report that micro-dosing psychedelics may indeed enhance creativity.

In comparison, using psychoactive substances to assuage boredom is associated with problematic abuse (Iso-Ahola and Crowley 1991), while using drugs to cope with negative affect is associated with mental distress (Cooper et al. 1995). However, Iso-Ahola and Crowley (1991), and Cooper et al. (1995), did not investigate psychedelic users. Nonetheless, Aday et al. (2021) found that using psychedelics in a negative mind-set or state of distress predicted adverse outcomes. Finally, post-use integration of insights gained through drug experiences maximizes the benefits of psychedelic-assisted psychotherapy (Breeksema et al. 2020; Walsh 2003), though this relationship has not been studied in recreational users.

Accordingly, the present study explored various relationships between contextual parameters of psychedelic use and mental health in recreational users. Mental health is here conceptualized as the absence of *mental distress* or *disorder* (e.g., problematic drug abuse, depression) and the presence of *psychological well-being* – consisting of *adjustment*, the capacity to function adaptively in society and a sense of life satisfaction, and

*growth*, the degree to which one develops self-actualization and self-transcendence (Staudinger and Kessler 2009).

Based on the presented literature, we expected lifetime psychedelic use to be associated with psychological well-being, and negatively associated with mental distress. We expected frequency of use would show a positive association with problematic psychedelic use, a positive curvilinear relationship with mental distress, and a negative curvilinear relationship with psychological well-being. We expected dose size to be associated with mental distress and problematic abuse, and negatively associated with psychological well-being. We expected group use to be associated with psychological well-being and negatively associated with mental distress and problematic abuse. We expected spiritual, autognostic, or creative psychedelic use to be associated with psychological well-being and negatively associated with mental distress and problematic abuse. Conversely, we expected using psychedelics to forget one's worries to be associated with mental distress and problematic abuse, and negatively associated with psychological well-being. Finally, we expected post-use integration to be associated with psychological well-being, and negatively associated with mental distress and problematic abuse.

## Methods

### Participants and procedures

Participants from online communities of drug users and non-drug users were recruited for an online survey (e.g., Multidisciplinary Association for Psychedelic Studies (MAPS), The Psychedelic Society, Erowid, Bluelight, Reddit). Individuals who did not finish the survey had their data removed from the sample. In total, 684 surveys were completed – defined as participants reaching the end of the survey. Because less than one percent of data was missing from the completed surveys, data expectation maximization was used for imputation (Gold and Bentler 2000). This method is one of various maximum-likelihood approaches in which observed data are used to estimate parameters, which are then used to estimate missing values. Of the 684 participants, 511 reported having previous experience with psychedelics.

### Measures

Demographic characteristics included age, gender, education, location and financial stability.

### Drug use patterns and problematic psychedelic abuse

The *Alcohol, Smoking, and Substance Involvement Screening Test* (ASSIST) was used to measure psychedelic use (World Health Organization [WHO] 2020). Participants were asked about Life-Time Use (from *Never* to *More than 100 times*), Frequency of Use (from *I no longer use this drug* to *Once or more per day*), Dosage (from *Very small* to *Very large*), and Group Use (from *Always or almost always alone* to *Always or almost always in a group*). The ASSIST measures problematic abuse with eight items. For example, “During the past three months, how often have you failed to do what was normally expected of you because of your use of classic psychedelics?” Responses range on a five-point scale from: *Never* to *Daily*. Internal consistency was  $\alpha = 0.54$ .

### Drug use intentions

A use intentions scale was developed based on the literature (e.g., Móró et al. 2011). Twelve intentions for using psychedelics were assessed: 1) boredom; 2) spirituality; 3) to enhance socializing; 4) to enjoy the sensation; 5) to understand things differently; 6) creativity; 7) to fit in with a group; 8) curiosity; 9) to forget my worries/relieve negative emotions; 10) introspection; 11) relaxation; 12) to party or get “messed up.” Participants were asked to rate how frequently their use was motivated by each intention on a five-point scale from: *Never or almost never* to *Always or almost always*.

### Post-use integration

A post-use integration scale comprised three items: 1) Overall, I try to reflect on my drug experiences, 2) Overall, I try to integrate new perspectives gained through my drug experiences into my day-to-day life, 3) Overall, I try to learn from my drug experiences. Each item was responded to on a five-point scale from: *Never or almost never* to *Always or almost always*. Internal consistency was  $\alpha = 0.88$ .

### Mental distress

The *K-6* is a six-item scale that screens for transdiagnostic symptoms of psychological distress indicative of non-specific mental disorder (Kessler et al. 2002, 2003). Participants are asked to rate how often they experienced mental distress symptoms over the past month. For example, one item asks, “In the past month, how often have you felt so depressed that nothing could cheer you up?” Responses range on a five-point scale from: *None of the time* to *All of the time*. Internal consistency was  $\alpha = 0.88$ .

### Adjustment

Adjustment was assessed as a composite of two scales: The *Satisfaction with Life Scale* (Diener et al. 1985) includes five-items rated on a seven-point scale ranging from *Strongly Disagree* to *Strongly Agree*; an example item reads, “In most ways my life is close to my ideal.” The *Scales of Psychological Well-Being* includes six, three-item subscales. Three subscales measure adjustment (environmental mastery, positive relations with others, and self-acceptance) and three subscales measure growth (personal growth, purpose in life, and autonomy; Ryff and Keyes 1995). Each of the 18 items are rated on a seven-point scale ranging from *Strongly Disagree* to *Strongly Agree*. An example item reads, “In many ways, I feel disappointed about my achievements in life.” Consistent with previous research (Mickler and Staudinger 2008; Wink and Staudinger 2016), all items from the *Satisfaction with Life Scale* and the *environmental mastery, positive relations with others, and self-acceptance* subscales of the *Scales of Psychological Well-Being* were combined into a 14-item adjustment scale with an internal consistency of  $\alpha = 0.92$ .

### Growth

Growth was assessed as a composite of three scales. The *Quiet Ego Scale* (Wayment, Bauer, and Sylaska 2015) includes 14-items rated on a seven-point scale ranging from *Strongly Disagree* to *Strongly Agree*. An example item reads, “I have the sense that I have developed a lot as a person over time.” The *Adult Self-Transcendence Inventory* (Koller, Levenson, and Glück 2017) includes 24-items rated on a seven-point scale ranging from *Strongly Disagree* to *Strongly Agree*. An example item reads, “I feel that my individual life is a part of a greater whole.” Consistent with previous research (Mickler and Staudinger 2008; Wink and Staudinger 2016), all items from the *Quiet Ego Scale*, the *Adult Self-Transcendence Inventory*, and the *personal growth, purpose in life, and autonomy* subscales of the *Scales of Psychological Well-Being* were combined in a 44-item growth scale with an internal consistency of  $\alpha = 0.92$ .

### Social desirability bias

The *Marlowe-Crowne Social Desirability Scale – Short Form* (Vésteinsdóttir et al. 2017) was used to measure social desirability bias. The MCSDS-SF contains 10 true/false items, with a maximum score of 10 indicating positive bias. Internal consistency was  $\alpha = 0.60$ .

### Data analysis

An exploratory factor analysis was conducted on the 12 use intentions. The factor analysis was followed by curve analyses to investigate non-linear relationships between

frequency of use and three mental health criterion variables (mental distress, adjustment, growth). Finally, hierarchical regression analyses were conducted using all four mental health variables as outcome variables. Analyses were performed using SPSS Version 27. The Research Ethics Office at the University of Alberta approved this study.

## Results

Participant characteristics can be viewed in Table 1. The median age of the sample was 25–34 years, with 38.2% of participants identifying as female, and 77.5% located in North America. The majority (81%) had at least some college education, and most rated their financial stability as average (38%) or secure (30.6%). Of the 684 participants, 511 reported ever using psychedelics.

### Factor analysis

The exploratory factor analysis (principal axis factoring, promax rotation) of the 12 psychedelic use intentions ( $n = 511$ ) found three factors with an

eigenvalue greater than one. Items that loaded greater than .30 on a factor were retained. The first factor, *self-expansion*, accounted for 18.95% of variance, and comprised four items: spirituality, creativity, to understand things differently, and introspection ( $\alpha = .72$ ). The second factor, *social/recreational*, accounted for 16.68% of the variance, and comprised four items: boredom, socializing, fit in with the group, and to party ( $\alpha = .69$ ). The third factor, *coping with negative affect*, accounted for 4.5% of the variance, and comprised two items: forget my worries and relaxation ( $\alpha = .61$ ). These factors parallel the findings of Simons et al. (1998), Terry-McElrath, O'Malley, and Johnston (2009), and Haijen et al. (2018).

### Curvilinear relationships between frequency of use and criterion variables

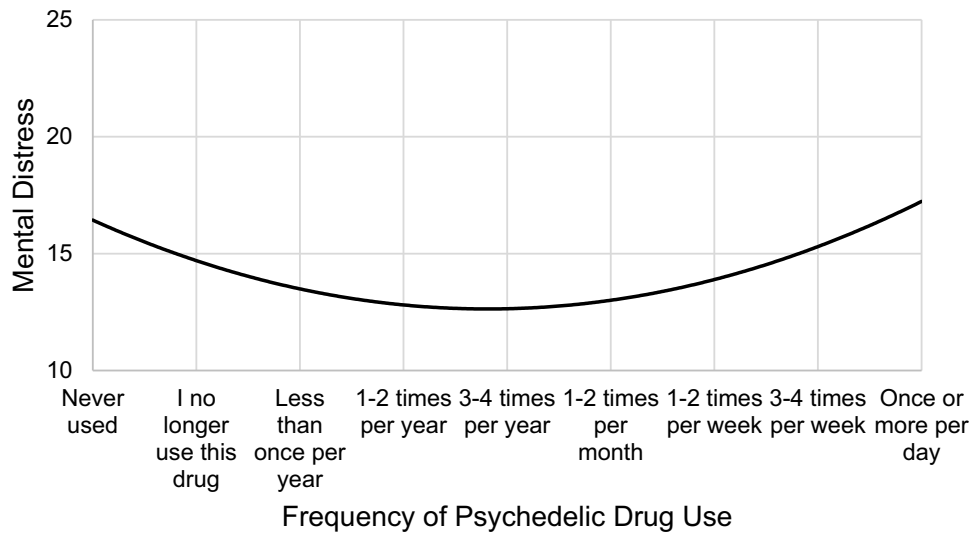
Prior research (e.g., Clifford et al. 1991; Peele and Brodsky 2000) suggests that frequency of use might display a curvilinear relationship with mental distress, adjustment, and growth. The decision not to test a curvilinear relationship with the fourth criterion variable, problematic abuse, is due to the assumption that frequency of use is linearly related to problematic abuse outcomes (WHO 2020). All 684 participants (511 psychedelic users and 173 non-users) were used in the analyses given that *never* using psychedelics constitutes no frequency of use. Mental distress: linear  $F(1, 682) = 18.11, p = .001, R^2 = .026$ , and quadratic  $F(2, 681) = 12.22, p = .001, R^2 = .035$ . Adjustment: linear  $F(1, 682) = 22.45, p = .001, R^2 = .032$ , and quadratic  $F(2, 681) = 13.76, p = .001, R^2 = .039$ . Growth: linear  $F(1, 682) = 61.01, p = .001, R^2 = .082$ , and quadratic  $F(2, 681) = 36.99, p = .001, R^2 = .098$ . See Figures 1–3.

### Psychedelic use parameters predicting positive and negative mental health

Each hierarchical regression equation included four steps. In Step 1, each criterion variable (problematic abuse, mental distress, adjustment, and growth) was regressed on age, education, financial stability, and social desirability to adjust for these variables. Lifetime use, frequency of use, and frequency of use squared were entered in Step 2 for mental distress, adjustment, and growth. Life-time use and frequency of use were entered in Step 2 for problematic use. Group use and dose were entered in Step 3. Intentions and post-use integration were entered in Step 4. All assumptions of regression (e.g., linearity, normality) were met.

**Table 1.** Participant characteristics.

Characteristic	<i>n</i>	%
Age Range		
18–24	270	39.5
25–34	247	36.1
35–44	86	12.6
45–54	34	5.0
55–64	25	3.7
65–74	15	2.2
75–84	3	0.4
Prefer not to say	4	0.6
Gender		
Female	261	38.2
Male	394	57.5
Other	25	3.7
Prefer not to say	4	0.6
Education		
Less than high school	18	2.6
High school or equivalent	103	15.1
Some college	206	30.1
Associate degree/two-year diploma	57	8.3
Bachelor's degree	195	28.5
Master's degree	65	9.5
Professional degree	19	2.8
Doctorate	13	1.9
Prefer not to say	8	1.2
Location		
Africa	3	0.4
Asia	9	1.3
Australia/Oceania	20	2.9
Europe	109	15.9
North America	530	77.5
South America	10	1.4
Prefer not to answer	3	0.4
Financial Stability		
Very poor	28	4.1
Poor	141	20.6
Average	260	38
Secure	207	30.3
Very secure	48	7.0



**Figure 1.** Frequency of psychedelic use and mental distress. Increased frequency of psychedelic use is associated with lower mental distress, peaking at roughly 3–4 times per year. Beyond this, increased frequency is associated with higher mental distress.

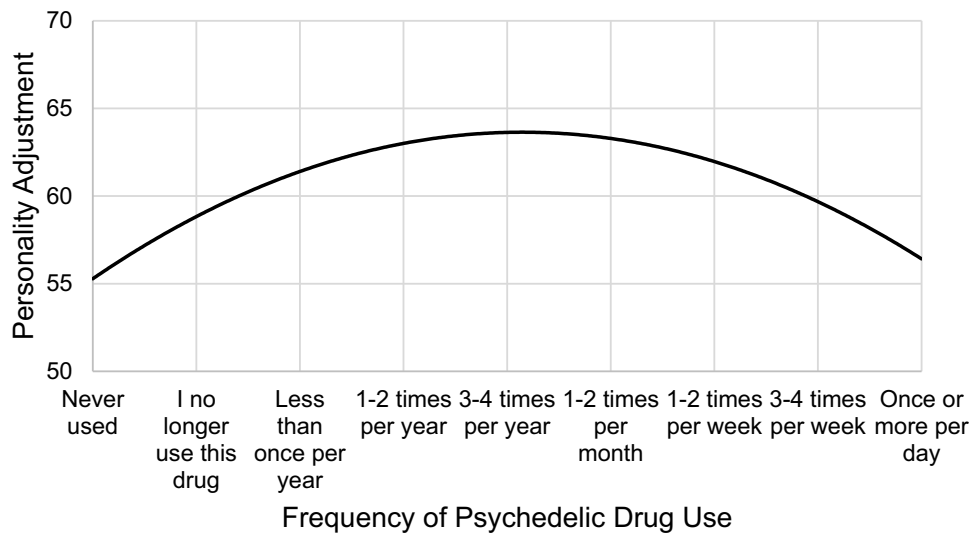
**Psychedelic use parameters predicting problematic use**

Step 1 included age, education, financial stability, and social desirability bias, and predicted problematic psychedelic abuse,  $F(4, 506) = 3.09, p = .016, R^2 = .024$ . Age ( $\beta = -.116, p = .014$ ) was the only statistically significant predictor. Step 2 added life-time use and frequency of use, and resulted in a statistically significant model,  $F(6, 504) = 48.98, p = .001, R^2 = .368$ , and improvement from Step 1,  $\Delta F(2, 504) = 137.42, p = .001, \Delta R^2 = .344$ . The new statistically significant predictor in Step 2 was frequency of use ( $\beta = .605, p < .001$ ). Step 3 added dose size and group use, and was statistically significant,  $F(8, 502) = 36.71, p = .001, R^2 = .369$ , though not an

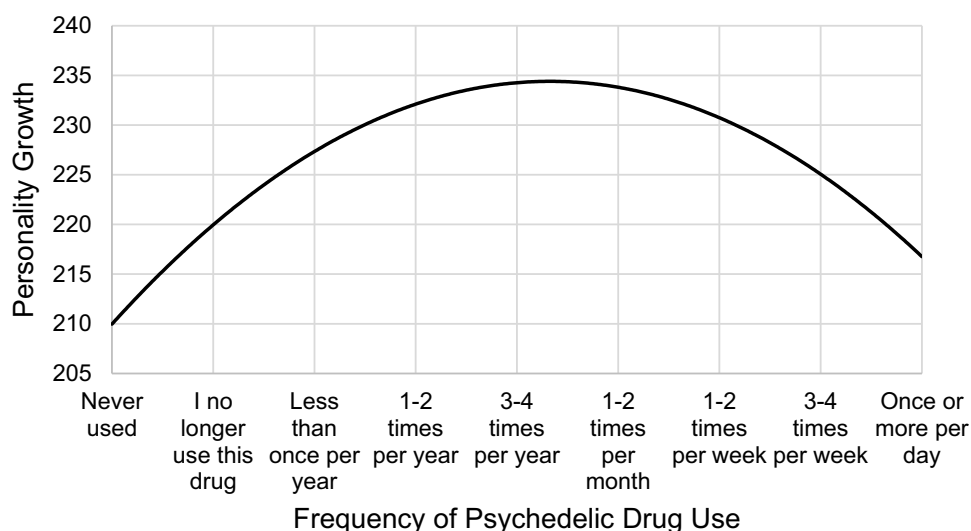
improvement from Step 2,  $\Delta F(2, 502) = .311, p = .733, \Delta R^2 = .001$ . Step 4 added the three use intention factors and post-use integration and was both statistically significant,  $F(12, 498) = 25.55, p = .001, R^2 = .381$  and an improvement from Step 3,  $\Delta F(4, 498) = 2.41, p = .048, \Delta R^2 = .012$ . In the final model, frequency of use ( $\beta = .607, p = .001$ ) and social/recreational intentions ( $\beta = .113, p = .006$ ) were statistically significant predictors of problematic use (see Table 2).

**Psychedelic use parameters predicting mental distress**

Step 1 included the demographic variables and predicted mental distress,  $F(4, 506) = 22.56, p = .001, R^2 = .151$ . Financial stability ( $\beta = -.313, p = .001$ ) and social



**Figure 2.** Frequency of psychedelic use and adjustment. Increased frequency of psychedelic use is associated with higher adjustment, peaking at roughly 3–4 times per year. Beyond this, increased frequency is associated with lower adjustment.



**Figure 3.** Frequency of psychedelic use and growth. Increased frequency of psychedelic use is associated with higher growth, peaking at roughly 3–4 times per year. Beyond this, increased frequency is associated with lower growth.

desirability ( $\beta = -.115, p = .006$ ) were statistically significant. Step 2 added life-time use, frequency of use, and frequency of use squared, and was statistically significant,  $F(7, 503) = 14.05, p = .001, R^2 = .164$ , though not an improvement from Step 1,  $\Delta F(3, 503) = 2.44, p = .063, \Delta R^2 = .012$ . New statistically significant predictors in Step 2 were frequency of use ( $\beta = -.364, p = .027$ ) and frequency of use squared ( $\beta = .364, p = .026$ ). Step 3 added dose size and group use and was statistically significant,  $F(9, 501) = 11.24, p = .001, R^2 = .168$ , but not an improvement from Step 2,  $\Delta F(2, 501) = 1.34, p = .262, \Delta R^2 = .004$ . Step 4 added the three use intention factors and post-use integration and was both statistically significant,  $F(13, 497) = 10.81, p = .001, R^2 = .22$  and an improvement from Step 3,  $\Delta F(4, 497) = 8.35, p = .001, \Delta R^2 = .052$ . In the final model, age ( $\beta = -.09, p = .043$ ), financial stability ( $\beta = -.306, p = .001$ ), social desirability ( $\beta = -.102, p = .013$ ), and coping with negative affect ( $\beta = .234, p = .001$ ) were statistically significant predictors of mental distress (Table 2).

#### Psychedelic use parameters predicting adjustment

Step 1 included the demographic variables and predicted adjustment,  $F(4, 506) = 39.19, p = .001, R^2 = .237$ . Statistically significant predictors included education ( $\beta = .09, p = .032$ ), financial security ( $\beta = .400, p = .001$ ) and social desirability ( $\beta = .174, p = .001$ ). Step 2 added life-time use, frequency of use, and frequency of use squared, and resulted in a statistically significant model,  $F(7, 503) = 24.62, p = .001, R^2 = .255$ , and improvement from Step 1,  $\Delta F(3, 503) = 4.20, p = .006, \Delta R^2 = .019$ . New statistically significant predictors in Step 2 were life-time use ( $\beta = .112, p = .009$ ), frequency

of use ( $\beta = .336, p = .031$ ), and frequency of use squared ( $\beta = -.353, p = .022$ ). Step 3 added dose size and group use and was both statistically significant,  $F(9, 501) = 21.427, p = .001, R^2 = .278$  and an improvement from Step 2,  $\Delta F(2, 501) = 7.89, p = .001, \Delta R^2 = .023$ . The new statistically significant predictor in Step 3 was group use ( $\beta = .158, p = .001$ ). Step 4 added the three use intention factors and post-use integration, and was statistically significant,  $F(13, 497) = 20.00, p = .001, R^2 = .343$ , and an improvement from Step 3,  $\Delta F(4, 497) = 12.40, p = .001, \Delta R^2 = .066$ . In the final model, financial stability ( $\beta = .384, p = .001$ ), social desirability ( $\beta = .158, p = .001$ ), life-time use ( $\beta = .104, p = .02$ ), group use ( $\beta = .173, p = .001$ ), self-expansion ( $\beta = .141, p = .002$ ), coping with negative affect ( $\beta = -.173, p = .001$ ), and post-use integration ( $\beta = .145, p = .001$ ), were statistically significant predictors of adjustment (Table 2).

#### Psychedelic use parameters predicting growth

Step 1 included the demographic variables and predicted growth,  $F(4, 506) = 24.28, p = .001, R^2 = .161$ . Statistically significant predictors included financial security ( $\beta = .163, p = .001$ ) and social desirability ( $\beta = .321, p = .001$ ). Step 2 added life-time use, frequency of use, and frequency of use squared, and was both statistically significant,  $F(7, 503) = 16.59, p = .001, R^2 = .188$ , and an improvement from Step 1,  $\Delta F(3, 503) = 5.47, p = .001, \Delta R^2 = .026$ . The new statistically significant predictor in Step 2 was life-time use ( $\beta = .164, p = .001$ ). Step 3 added dose size and group use and was both statistically significant,  $F(9, 501) = 13.70, p = .001, R^2 = .198$ , and an improvement from Step 2,  $\Delta F(2, 501) = 3.13, p = .045, \Delta R^2 = .010$ . The new statistically significant predictor in



**Table 2.** Associations between psychedelic use parameters and positive and negative mental health outcomes.

Outcome Variable	Predictor	b	SE	$\beta$	r
Problematic Use	Intercept	2.19	1.164	–	–
	Age	–.057	.132	–.017	–.139
	Education	–.191	.102	–.073	–.101
	Financial Stability	–.081	.165	–.018	.017
	Social Desirability	–.081	.077	–.039	.018
	Life-time Use	–.107	.103	–.044	.191
	Frequency of Use	1.835	.127	.607***	.597
	Dose Size	.132	.173	.031	.231
	Group Use	–.124	.119	–.039	–.149
	Self-Expansion	.009	.045	.009	.179
	Social/Recreational	.173	.062	.113**	.068
	Coping with Negative Affect	–.009	.083	–.004	.111
	Post-Use Integration	–.037	.062	–.024	.136
Mental Distress	Intercept	24.53	1.691	–	–
	Age	–.361	.178	–.092	–.107
	Education	–.178	.137	–.057	–.177
	Financial Stability	–1.625	.223	–.306***	–.352
	Social Desirability	–.257	.104	–.102*	–.170
	Life-time Use	–.160	.139	–.055	–.062
	Frequency of Use	–.941	.599	–.26	–.070
	Frequency of Use Squared	.128	.087	.239	–.044
	Dose Size	–.120	.233	–.024	–.050
	Group Use	–.275	.161	–.073	–.061
	Self-Expansion	–.115	.061	–.091	–.085
	Social/Recreational	.003	.084	.002	.102
	Coping with Negative Affect	.588	.111	.234***	.223
Post-Use Integration	.023	.084	.012	–.084	
Adjustment	Intercept	6.650	5.227	–	–
	Age	–.121	.551	–.009	.019
	Education	.517	.424	.049	.174
	Financial Stability	6.876	.688	.384***	.447
	Social Desirability	1.333	.320	.158***	.242
	Life-time Use	1.018	.430	.104*	.084
	Frequency of Use	1.944	1.851	.160	.103
	Frequency of Use Squared	–.307	.270	–.169	.074
	Dose Size	–.938	.721	–.055	.031
	Group Use	2.200	.499	.173***	.152
	Self-Expansion	.600	.188	.141**	.184
	Social/Recreational	.109	.261	.018	–.076
	Coping with Negative Affect	–1.464	.344	–.173***	–.153
Post-Use Integration	.893	.258	.145***	.253	
Growth	Intercept	125.561	9.030	–	–
	Age	.388	.952	.017	.040
	Education	.850	.733	.046	.129
	Financial Stability	4.552	1.188	.144***	.233
	Social Desirability	4.397	.553	.295***	.351
	Life-time Use	1.403	.743	.082	.160
	Frequency of Use	–2.478	3.197	–.115	.111
	Frequency of Use Squared	.037	.467	.012	.091
	Dose Size	.041	1.245	.001	.124
	Group Use	1.751	.861	.078*	.011
	Self-Expansion	1.990	.325	.265***	.376
	Social/Recreational	.449	.450	.041	–.068
	Coping with Negative Affect	–1.578	.594	–.105**	–.053
Post-Use Integration	3.147	.446	.289***	.422	

\*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

Step 3 was dose size ( $\beta = .101, p = .026$ ). Step 4 added the three use intention factors and post-use integration, and was both statistically significant,  $F(13, 497) = 22.50, p = .001, R^2 = .371$ , and an improvement from Step 3,  $\Delta F(4, 497) = 34.14, p = .001, \Delta R^2 = .173$ . In the final model, financial stability ( $\beta = .144, p = .001$ ), social desirability ( $\beta = .295, p = .001$ ), group use ( $\beta = .078, p = .043$ ), self-expansion ( $\beta = .265, p = .001$ ), coping with negative affect ( $\beta = -.106, p = .008$ ), and post-use integration ( $\beta = .289, p = .001$ ), were statistically significant predictors of growth. See Table 2.

### Discussion

Results suggest that various contextual use parameters should be considered when assessing the likely association between an individual’s psychedelic use and their mental health and wellness. Life-time psychedelic use did not predict problematic use, suggesting that using psychedelics numerous times across the lifespan is not associated with a greater likelihood of abuse. In addition, life-time use did not predict mental distress or growth, although it did predict adjustment. This expands upon previous literature (e.g., Carhart-Harris and Nutt 2010; Lerner and Lyvers 2006) and indicates that life-time psychedelic use is not necessarily associated with a reduced likelihood of psychological distress, though it is associated with the adjustment facet of psychological well-being.

Frequency of use was the central predictor of problematic psychedelic use. Thus, when assessing the likelihood that an individual may be suffering from an abusive pattern of psychedelic use, a key criterion to consider is how often the individual uses the substance. Curve analysis, and Step 2 of the regression equation for mental distress, revealed a curvilinear relationship, with 3–4 uses per year predicting the lowest levels of mental distress. However, frequency of use did not retain significance in the full model. Similarly, curve analysis, and Step 2 of the regression equation for adjustment, revealed a curvilinear relationship between frequency of use and adjustment, with 3–4 uses per year optimally predicting adjustment. Again, this finding was also not retained in the full model. Finally, curve analysis showed 3–4 uses per year optimally predicting growth, though this finding was not retained in the full model. Thus, when dose size, group use, intentions for use, and post-use integration were considered, frequency of use became less integral to predicting mental distress or well-being. However, given that these findings show *partial* congruence with Peele and Brodsky’s (2000)

and Clifford et al.'s (1991) findings of curvilinear relationships, additional research is needed to clarify these results.

Dose size did not predict problematic use or mental distress in the full regression models. Thus, contrary to Zinberg (1984), this suggests that using very large doses does not implicate a problematic pattern of abuse nor mental health problems in the user. Dose size did not predict adjustment, however it did predict growth in the third step of the growth model, though it did not retain statistical significance when intentions and post-use integration were included in Step 4. Given that dose size was positively correlated with both post-use integration and self-expansion motives, we surmise that when large doses are used with self-expansion intentions and integrated post-use, *then* larger doses may contribute to the types of experiences conducive to psychological development. This parallels Nour et al.'s (2016) report of a dose-response relationship between psychedelic dose and mystical experiences, which predicted well-being.

Group use did not predict problematic psychedelic use in the full model. However, group use was *negatively* correlated with both problematic use and frequency of use. This suggests that, as in Zinberg (1984), group use may protect against problematic use inasmuch as one's social context regulates the *frequency* of use. In addition, group use was not predictive of psychological distress. Thus, whether one uses psychedelics alone or in a group does not appear related to the likelihood of the user suffering from mental health problems. However, group use predicted both facets of psychological well-being – adjustment and growth – in the full models. This is congruent with Kettner et al.'s (2021) work on *communitas*, in which the sense of interpersonal connection during one's psychedelic experience partially mediated the benefits of the experience.

Self-expansion motives for use did not predict problematic psychedelic use or mental distress. However, self-expansion motivations did predict psychological adjustment and growth. These results support the findings of Móró et al. (2011), Lerner and Lyvers (2006), and Haijen et al. (2018). Comparably, using psychedelics to cope with negative affect did not predict problematic use, though it predicted mental distress and negatively predicted adjustment and growth. These findings parallel studies of both cannabis and alcohol use (e.g., Cooper et al. 1995; Simons et al. 1998) and are consistent with Aday et al.'s (2021) finding that approaching psychedelic use in a distressed state is associated with adverse outcomes. Social/recreational

intentions predicted problematic use, which suggests that using psychedelics out of boredom, to party, or socialize may predict a greater likelihood of an abusive pattern of use.

Finally, post-use integration did not predict problematic use or mental distress, though it predicted adjustment and growth. Among all predictors, integration showed the strongest associations with growth, which speaks to its importance (Walsh 2003). These findings are congruent with research on psychedelic-assisted therapy, which describe the importance of integration for maximizing the benefits of a given psychedelic experience (Breeksema et al. 2020).

Taken together, two use profiles can be tentatively established. When used with excessive frequency solely for social/recreational purposes, psychedelic use is likely to be associated with a problematic or abusive pattern of use. Relatedly, when used to cope with negative affect, the use of psychedelic is likely to be associated with mental distress and low levels of psychological well-being. Conversely, when used with moderate frequency, in a group setting, with spiritual, mind-expansive, introspective, or creative intentions, and integrated post-use, psychedelic use is likely to be associated with psychological well-being and psychospiritual development.

The web-based, cross-sectional design of the current study entailed several limitations. Given that a random, probability sample was not used, we must remain cautious as to the generalizability of these findings. The cross-sectional design also precludes causal interpretations. For example, these findings cannot determine whether using psychedelics with self-expansive intentions *causes* an individual to have higher psychological adjustment and growth. Instead, individuals with high levels of adjustment and growth may also tend to use psychedelics with self-expansive intentions, or some complex bidirectional relationship could also be involved. Thus, due to the exploratory nature of this study, all results must be viewed as tentative, with further replication needed. In particular, additional research using prospective and experimental designs is needed to establish those use parameters that bear causal relationships with mental health outcomes.

Nonetheless, this study suggests that with care, moderation, and thoughtfulness, recreational psychedelic use may be associated with positive mental health and well-being. Conversely, when used to excess and without deliberate self-expansive intentions or integrated post use, the use of psychedelic substances may predict adverse mental health. Although these results are tenta-

tive, this study hopes to contribute to our understanding of how psychedelics may be optimized to enhance the mental health of users in recreational contexts.

### Data availability statement

Interested parties should contact the lead author if they would like access to the dataset used to produce the findings reported in this article.

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