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RESEARCH

Beyond psychedelic exceptionalism: how people combine meditation with psychoactive substances, and how this relates to well-being

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Abstract

Background Combining meditation with psychoactive substances is often assumed to be a niche practice centred on classic psychedelics. We sought to broaden this narrative in two cross-sectional studies.

Methods Study 1 used a broad naturalistic sample (N = 1,391) to examine the prevalence of substance use, meditation, and their simultaneous combination, as well as associations with subjective happiness. Study 2 used a stratified subsample (n = 397) focusing on classic psychedelic and cannabis users, the most common psychedelic-type substances combined with meditation, to assess associations with mental well-being, peace of mind, psychological flexibility, depression, and anxiety.

Results Contrary to prevailing assumptions, alcohol (29%), cannabis (19%), and nicotine (16%) were far more commonly combined with meditation than classic psychedelics (6%). Classic psychedelic use was also embedded within a pattern of pronounced polysubstance use, suggesting that it may reflect a broader substance-use profile rather than an isolated behavioural practice. Regression analyses found no consistent associations between psychedelic or cannabis use, with or without meditation, and any outcome. However, an unexpected pattern emerged for other drugs and alcohol. Other- drug use without meditation was associated with poorer well-being outcomes relative to no other-drug use, whereas other-drug use combined with meditation was not. Alcohol combined with meditation was associated with better well-being outcomes relative to alcohol use without meditation.

Conclusions These findings suggest that combining meditation with substance use is not limited to psychedelics and should be studied within broader patterns of polysubstance use and meditation practice.

Keywords Psychedelics · Meditation · Well-being · Psychological flexibility · Synergy · Polysubstance use · Well-being

Introduction

Some people intentionally combine meditation with psychoactive substances, either by meditating while under the influence of a substance or by using meditation to shape an ongoing psychoactive experience (Osto 2016; Azmoodeh et al. 2023; Jiwani et al. 2024). Consistent with this, survey studies indicate that psychedelic use and meditation frequently co-occur, with many psychedelic users reporting meditation practice and a substantial proportion intentionally combining the two (Azmoodeh et al. 2023; Krabbe et al. 2026; Simonsson et al. 2023a, 2025a). Yet comparatively little attention has been paid to meditation as occurring within broader patterns of psychoactive substance use. Existing work has focused mainly on classic serotonergic psychedelics, leaving it unclear how often meditation is combined with other substances in naturalistic settings (Griffiths et al. 2018; Smigielski et al. 2019; Singer et al. 2024; Meling

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et al. 2024). This is an important gap, because psychoactive substance use rarely occurs in isolation, and examining substances outside their broader behavioural context may obscure meaningful associations with well-being and mental health. The present study therefore examines which substances are combined with meditation practice in a naturalistic sample and whether these combinations are associated with psychological well-being and ill-being.

Interest in this topic has been driven in part by suggestions that combining meditation with psychoactive substances may produce synergistic effects. In relation to classic psychedelics, this possibility has been examined in controlled experimental studies suggesting that meditation may influence the quality, interpretation, and integration of the experience, while psychedelics may in turn deepen aspects of contemplative practice (Griffiths et al. 2018; Smigielski et al. 2019; Singer et al. 2024; Meling et al. 2024). Observational research likewise points to meaningful links between meditation and psychedelic use in naturalistic settings. Cross-sectional studies suggest that meditation may account for part of the association between psychedelic use and well-being, and qualitative reports indicate that users often experience the combination as complementary (Azmoodeh et al. 2023; Krabbe et al. 2026). Longitudinal surveys further indicate that psychedelic use may be associated with subsequent increases in meditation practice, while prior meditation practice may shape the quality of psychedelic experiences (Simonsson et al. 2025a; Simonsson and Goldberg 2022). At the same time, longitudinal evidence also suggests possible challenges: among those already practicing meditation, psychedelic use has been associated with greater difficulties in loving-kindness or compassion practices (Simonsson et al. 2025a).

Beyond classic psychedelics, other substances have also been associated with contemplative practice. Cannabis, for example, has a long history of use in contemplative and spiritual contexts, including in South Asia, and contemporary survey research suggests that some users are motivated by spiritual aims (Johnstad 2020; Ferrara 2021; Heide et al. 2022). MDMA, although pharmacologically distinct from classic psychedelics, has also been examined in relation to contemplative practices and compassion-based imagery in both conceptual and experimental work (Kamboj et al. 2018; Dines 2025). Ketamine has likewise been paired with mindfulness- or meditation-based interventions in clinical trial contexts, including randomized studies testing whether the combination can shape subjective experience and improve clinical outcomes (Dakwar et al. 2019; Kheirkhah et al. 2025). However, these clinical and experimental findings say little about whether and how often people combine meditation with other psychoactive substances in their everyday lives.

Discussion of this topic should not be framed solely in terms of potential benefits. There is ongoing debate regarding whether psychedelic use is associated with beneficial, neutral, or adverse outcomes, with existing evidence yielding inconsistent findings. Some population-based cross-sectional studies report poorer mental health among psychedelic users relative to non-users (Matzopoulos et al. 2022; Abramsky-Sze et al. 2025), whereas others report no association with mental health problems (Krebs and Johansen 2013; Johansen and Krebs 2015). In addition, long-term adverse experiences following psychedelic use have been documented in self-selected samples (Evans et al. 2023), while population-based evidence also suggests that a meaningful minority of users report functional impairment lasting more than one day after a psychedelic experience (Simonsson et al. 2023b). Longitudinal studies likewise show heterogeneous results, with some linking psychedelic use to improvements in mood and well-being (Nygart et al. 2022; Nayak et al. 2023) and others suggesting possible adverse associations, such as increased depressive symptoms under certain conditions (Simonsson et al. 2025b). A similar contrast is seen in (Bălăeț et al. 2023; Bălăeţ et al. 2025) cross-sectional analyses suggested worse mood and resilience among psychedelic and cannabis users, whereas longitudinal analyses in the same sample indicated improvements in mental health over time, bringing them closer to non-users.

For cannabis, whether use is associated with benefit or harm depends on context, population, and type of use. In clinical populations, evidence from longitudinal observational studies and randomized controlled trials suggests possible benefits for selected conditions and outcomes, including improved quality of life and symptom relief, although these findings remain condition-specific and adverse effects remain notable (Solmi et al. 2023; Tait et al. 2026). In psychiatric populations, broad therapeutic benefit is less consistently supported and harms or adverse effects often at least as prominent as benefits. In this context, self-medication and shared vulnerability models further suggest that the association between cannabis use and psychiatric symptoms may not be strictly unidirectional (Lowe et al. 2019; Wilson et al. 2026). In non-clinical populations, longitudinal evidence indicates that cannabis use may precede later depression, although causality remains uncertain because residual confounding cannot be ruled out (Churchill et al. 2025).

Meditation, too, has been associated with both psychological benefits and adverse effects. Observational and some longitudinal research suggests that greater practice, particularly more frequent practice, is associated with greater well-being and lower distress (Birtwell et al. 2019; Smith et al. 2019; Bowles et al. 2022). By contrast, cross-sectional studies, population-based surveys, qualitative research, and

reviews have documented adverse meditation-related experiences, including increased anxiety, emotional distress, and perseverative or ruminative thinking (Farias and Wikholm 2016; Lindahl et al. 2017; Schlosser et al. 2019; Farias et al. 2020; Goldberg et al. 2022). Thus, neither meditation nor psychoactive substance use should be assumed to be uniformly beneficial or harmful. This makes it especially important to study their simultaneous combination rather than assuming that effects will be additive or synergistic.

Several conceptual and methodological issues further complicate the interpretation of existing literature. First, substances like MDMA, ketamine, and cannabis are classified inconsistently across studies as "psychedelic-like" or "psychedelic," contributing to conceptual and methodological heterogeneity (Révész et al. 2021; Kelmendi et al. 2022; Nichols et al. 2023; Holas and Kamińska 2023; Wolinsky et al. 2024; Jylkkä et al. 2025). This inconsistency makes it difficult to compare findings across studies and to determine whether observed associations are attributable to serotonergic mechanisms, contextual factors, or broader patterns of psychoactive substance use. Second, polysubstance use complicates causal attribution, as individuals who use one controlled substance are more likely to use others, particularly in naturalistic and uncontrolled settings (Quek et al. 2013; De Jonge et al. 2022; Bălăeț et al. 2023; Lake and Lucas 2025; Meacham et al. 2025; Bălăeţ et al. 2025). Research focusing on psychedelics in isolation may therefore provide an incomplete account of real-world use patterns (Krebs and Johansen 2013; Nesvåg et al. 2015). Third, study sampling and design may impact findings. Many studies have relied on recruitment through psychedelic-oriented social media platforms, raising concerns about representativeness and self-selection bias. Such strategies may disproportionately attract individuals with positive prior experiences or strong expectancies regarding mental health benefits, potentially inflating positive associations (Haijen et al. 2018; Van Elk and Fried 2023; Noorani et al. 2023). Moreover, although many previous studies have reported improvements relative to participants' own baseline in within-subject designs (e.g., Nayak et al. 2023; Nygart et al. 2022), such findings do not by themselves establish that psychedelic use is associated with superior well-being in broader cross-sectional populations or relative to no use (although see Johansen and Krebs 2015; Krebs and Johansen 2013).

Taken together, prior literature points to two related gaps. First, research has focused mainly on classic psychedelics, leaving it unclear how often meditation is combined with other psychoactive substances in naturalistic settings. Second, although polysubstance use is well-documented in the literature, comparatively little attention has been paid to meditation as a co-occurring behaviour within those patterns. Examining substance use, substance–meditation combined use, and meditation practice itself across a broader range of psychoactive substances may help clarify whether associations with well-being are specific to particular substances or reflect a more general pattern of substance use and meditation practice. Such an approach may also provide a more ecologically valid understanding of real-world use and its relationship with mental health and well-being.

Aims of the present study

The present research consisted of two preregistered studies examining associations between meditation, psychoactive substance use, their simultaneous combined use, and psychological well-being. Study 1 used a broad naturalistic sample ($N=1391$) to address two research questions (RQ). The first (RQ1) explored the prevalence and characteristics of simultaneously combining meditation with psychoactive substances during the last 12 months, including which substances and meditation practices were most commonly combined. The second (RQ2) examined whether meditation, psychoactive substance use, or their combined use during the last 12 months were associated with subjective happiness. Study 2 extended these analyses to a broader set of mental health and well-being outcomes (i.e., mental well-being, peace of mind, psychological flexibility, depression and anxiety) using a stratified subsample of Study 1 participants ($n=397$). This subsample was constructed through stratified random sampling to ensure adequate representation of users of classic psychedelics and cannabis (the most common psychedelic-type substances in Study 1), those who combined each of these substances with meditation, meditators who did not use these substances, and controls who did neither meditate nor use substances. Study 2 thus constitutes an extension of Study 1 designed to examine a broader range of outcomes in greater detail, rather than an independent replication.

Study 1: patterns of combining substance use with meditation and associations with happiness in a broad naturalistic sample

Methods

Participants and Procedure

Participants ($N=1,500$) were recruited via the crowdsourcing platform Prolific. They completed a brief survey called "Survey study on meditation and substance use" which assessed the use of psychoactive substances, meditation practice, and instances of simultaneously combining meditation with psychoactive substances during the past 12

months as well as subjective happiness. Eligibility criteria required participants to be at least 18 years of age. The survey took approximately two minutes to complete, and participants received £0.20 as compensation. The order of the survey items was counterbalanced using a simple ABBA procedure. The survey was programmed using a required-response format, such that participants were required to provide a response to all survey items in order to complete the survey. When participants discontinued the survey before completion, recruitment continued to obtain the intended number of completed responses. Consequently, there was no item-level missingness in the final analytic dataset. Responses were excluded if they were inconsistent, defined as reporting that a particular substance had been combined with meditation while reporting no use of that same substance on the corresponding general substance-use frequency item. These data-quality exclusions were not replaced. Study 1 did not include a separate attention-check item because of the brevity of the survey. The final analytic sample consisted of $N = 1{,}391$ participants.

Data collection adhered to GDPR regulations and was carried out in compliance with the Declaration of Helsinki. The study received approval from the Ethics Board of the Departments of Psychology and Logopedics at the Abo Akademi University, Finland (decision number 10/2025). The data collection procedure, measures, and analyses were preregistered at https://osf.io/486tg/overview.

Measures

Demographic and Background Information Before completing the questionnaires, participants provided demographic data, including age, sex, employment status, and country ofresidence. The full survey questionnaire is accessible on the Open Science Framework (OSF; https://osf.io/bv59z/overview).

Substance use Past 12-month psychoactive substance use was assessed with the following prompt: "During the past 12 months, how many times haveyou used any of the following substances? (We are only interested in doses where you feel noticeable subjective effects)." Participantsreported their use of nine substances classes: classic psychedelics (e.g., "magic mushrooms", LSD, ayahuasca), ketamine, MDMA (or"Molly", "Ecstasy"), cannabis, stimulants (e.g., cocaine, amphetamine, and ADHD medication), opioids (e.g., fentanyl, heroin, andnarcotic analgesics), benzodiazepines and barbiturates, nicotine products, and alcohol. Participants indicated frequency of use on a scalefrom 0 ("No use in the past 12 months") to 8 ("More than once a day").

Combined use The frequency of simultaneously combining psychoactive substance use with formal meditation practice during the past 12 months wasassessed with the prompt: "During the past 12 months, how many times have you simultaneously combined formal meditation with anyof the following substances?", followed by the same list of nine substance classes. As in the substance use measure, participants wereinstructed to report only such substance use where they felt noticeable subjective effects. The response scale ranged from 0 ("Notcombined in the past 12 months") to 8 ("More than once a day").

Weekly meditation frequency Participants reported how often they had meditated during an average week over the past 12 months in response to the question: "Duringthe past 12 months, how often did you meditate on average per week?" Responses ranged from 0 ("0 times per week") to 7 ("19–21times per week or more").

Meditation session duration The average length of meditation sessions was assessed with the question: "How long does your average meditation session last?"Response options ranged from 0 ("0 minutes") to 6 ("51–60 minutes or more").

Weekly meditation experience To create a single index of weekly meditation practice, average weekly meditation frequency was multiplied by average session duration (dose).

General happiness General happiness was assessed using the single item "In general, how happy are you?", adapted from the Flourish measure(VanderWeele 2017). Participants responded on an 11-point scale ranging from 0 ("Extremely unhappy") to 10 ("Extremely happy"),with higher scores indicating greater subjective happiness.

Statistical analyses

All analyses were preregistered at https://osf.io/486tg/overview, and any deviations from the preregistration are described below.

For RQ1, to describe the phenomenon of simultaneously combining psychoactive substance use with meditation practice, descriptive statistics were calculated for all substance use, combination practice, and meditation variables. Bivariate associations among these variables and with general happiness were examined using Spearman correlation analyses.

For RQ2, to examine the associations between substance use, meditation practice, combination practice and happiness, we used ordinary least squares (OLS) multiple regression

with happiness as the dependent variable. The preregistered model included the following independent variables: past-12-month substance-use frequencies for all nine substance classes (9 variables), past-12-month combined substance–meditation frequencies for all nine substance classes (9 variables), and weekly meditation experience, with age and sex (dichotomous) entered as covariates (total 21 independent variables). We also preregistered interaction terms between weekly meditation experience and use of classic psychedelics, cannabis, ketamine, and MDMA. The final analyses deviated from the preregistration as follows.

First, substance use and combined use variables were highly zero-inflated, and several categories were sparse, rendering interaction terms unstable and difficult to interpret. Accordingly, we omitted all interaction terms and focused on main-effect models only. Second, in the preregistration we did not take into account that combined use is nested within substance use (i.e., every instance of combination use also constitutes substance use), creating collinearity between the two sets of variables. To resolve this, the substance use and combined use variables were recoded into a single three-level categorical variable for each substance class as follows: *No use (0)* (substance use = 0 and combined use = 0), *Use without simultaneous meditation (1)* (substance use > 0 and combined use = 0, non-simultaneous meditation was allowed to vary freely), and *Use with simultaneous meditation* (2) (combined use > 0). This coding was applied to classic psychedelics, cannabis, alcohol, and nicotine. Third, for lower-frequency substances, we created an other-drugs composite comprising ketamine, MDMA, stimulants, opioids, and benzodiazepines, and applied the same three-level logic at the composite level: use with meditation if any other drug combined use indicator was endorsed, use without meditation if any other drug use indicator was endorsed in the absence of combined use, and no use otherwise. Thus, in the final regression analyses, all five substance variables represented past-year behavioural categories rather than frequency or dose. Participants were classified as having no use, use without simultaneous meditation, or use with simultaneous meditation based on whether these behaviours occurred at all during the past year, irrespective of how frequently substance use or combined use occurred.

In addition, to compare all three levels directly, we re-specified the reference category as needed to obtain all three possible pairwise contrasts from each three-level substance factor. These contrasts are alternative comparisons within the same categorical factor, rather than separate independent variables entered simultaneously. In the final model, all five substance factors were entered together with weekly meditation experience, age, and sex; thus, each substance contrast was adjusted for the other four substance factors and these three additional variables (seven variables in total). The final model therefore comprised eight independent variables. To examine whether adjustment for the other substance factors substantially affected the findings, we also estimated five sensitivity models in which each substance factor was entered separately while retaining weekly meditation, age, and sex.

Given evidence of heteroskedasticity, statistical inference was based on HC3 heteroskedasticity-consistent standard errors and robust Wald F tests (White 1980; MacKinnon and White 1985). Multicollinearity was evaluated using variance inflation factors (VIFs), with values above 5 considered indicative of potentially problematic multicollinearity (Field et al. 2012). See Supplementary Table S1 for VIF and GVIF values for all models. All analyses were conducted in R (Version 2025.09.2+418).

Sensitivity and power

Although the preregistration proposed stratifying the sample into five experience-based subgroups to increase statistical power, and the original power calculation was based on that assumption, we ultimately conducted the analyses on the full sample, to more closely reflect the composition of the sampled population. It also better suited our aim of mapping the broader terrain of combined psychedelic and meditation use. We therefore conducted a sensitivity power analysis based on the final sample size and revised analytic models. A stratified sample was instead used in Study 2 to better represent the more common substances (see Method, Study 2). Using G*Power 3.1 and the standard multiple-regression approximation (R^2 increase), the sensitivity analysis showed that with $N = 1391$ and 13 predictor degrees of freedom, the minimum detectable unique effect was $f^2 \approx 0.0057$ ($\Delta R^2 \approx 0.006$) for a 1-df predictor and $f^2 \approx 0.0070$ ($\Delta R^2 \approx 0.007$) for a 3-level substance factor tested jointly (2-df), at 80% power and $\alpha = 0.05$. Although overall power was high for small unique effects, some substance levels were relatively small (e.g., psychedelics: $n = 74$ use without meditation; $n = 87$ use with meditation), whereas the corresponding alcohol groups were substantially larger ($n = 741$ and $n = 406$, respectively). Accordingly, psychedelic-related contrasts were estimated less precisely and were interpreted cautiously.

Results

Sample characteristics

The sample consisted of adults with a mean age of 37 years (SD = 13). Sex was approximately evenly distributed, with 708 participants identifying as female (51%) and 683 as male (49%). The majority of participants were employed full-time ($n = 764$, 55%). The sample was concentrated in

a limited number of countries, with the largest proportions residing in the United Kingdom (26%) and South Africa (24%), while the remaining participants were distributed mostly across North America and Europe. Full demographic details are presented in (Table 1).

Descriptive statistics: happiness ratings

General happiness had a mean of 6.27 ($SD = 2.10$), with an observed range of 0–10 corresponding to the full possible scale range and showed modest negative skew (skewness = −0.60). There was no substantial evidence of floor or ceiling concentration, with 0.93% and 4.89% of participants scoring at the minimum and maximum, respectively.

Descriptive statistics: other-drugs category

To further characterize the heterogeneous other-drugs category, we examined its constituent substance classes. Among participants classified as other-drug use without meditation ($N = 175$), stimulant use was reported by 84 (48.0%), MDMA by 60 (34.3%), benzodiazepines by 50 (28.6%), ketamine by 33 (18.9%), and opioids by 30 (17.1%); 52 participants (29.7%) had used at least two of these substance classes. Among combined users ($N = 130$), stimulant use was reported by 86 (66.2%), benzodiazepines by 72 (55.4%), MDMA by 66 (50.8%), ketamine by 60 (46.2%), and opioids by 46 (35.4%); 76 participants (58.5%) had used at least two classes. Thus, neither group was dominated by a single substance, and substantial polysubstance involvement was evident, particularly among combined users.

Descriptive statistics and correlations: substance use, meditation, and combination practices

Prevalence was low for classic psychedelics, ketamine, MDMA, stimulants, opioids, and benzodiazepines (5–12% of the sample). When use was reported, it was typically infrequent, occurring only once or 2–3 times per year. By contrast, cannabis, nicotine, and alcohol were far more prevalent (37%, 36%, and 82%, respectively), reflecting their legal availability and social acceptability relative to controlled substances. Cannabis occupied an intermediate position as its legal status varies across jurisdictions (Ransing et al. 2021).

Strikingly, the same pattern was evident for combined substance–meditation use. Combining classic psychedelics with meditation was relatively rare (6%), whereas combining meditation with alcohol (29%), cannabis (19%), and nicotine (16%) was much more common. This suggests that meditation is combined with a wide range of substances in everyday life, with legally available psychoactive

Table 1 Sample characteristics of study 1

Measure	Category	M(SD)/*n* (%)
Age (years)		37 (13)
Sex	Female	708 (51)
	Male	683 (49)
Employment status	Full-time employed	764 (55)
	Part-time employed	219 (16)
	Unemployed (job seeking)	134 (10)
	Not in paid work	84 (6)
	Other / data expired	190 (14)
Country of residence	United Kingdom	359 (26)
	South Africa	340 (24)
	Canada	81 (6)
	United States	69 (5)
	Portugal	70 (5)
	Poland	65 (5)
	Mexico	54 (4)
	Italy	53 (4)
	Spain	40 (3)
	Germany	31 (2)
	Greece	31 (2)
	Kenya	23 (2)
	Netherlands	13 (1)
	France	12 (1)
	Sweden	4 (< 1)
	Other countries	147 (10)

Note. Age is reported as mean (SD). All other values are n (%). Percentages are rounded to whole numbers and may not sum to 100 due to rounding. Other countries, each contributing fewer than 1% of the total sample and only one participant ($n = 1$), were aggregated for clarity

substances and cannabis dominating these patterns. However, when considered relative to the number of users of each substance, 54% of psychedelic users reported combining psychedelics with meditation, compared with 51% of cannabis users, 44% of nicotine users, and 35% of alcohol users. For the other-drugs composite, 43% of participants with any other-drug use were classified as having combined such use with meditation. Thus, alcohol–meditation combination was more prevalent in the sample overall, whereas psychedelic and cannabis users were proportionally more likely than alcohol users to report combining their substance use with meditation.

Regarding meditation practice overall, 40% of participants reported no practice in the past 12 months and another 40% meditated 1–3 times per week with most sessions lasting 30 min or less. For full frequencies (see Tables 2, 3 and 4).

Spearman correlation analyses (Table 5) revealed positive intercorrelations among substance use variables, consistent with pronounced polysubstance use. Classic psychedelic use was moderately to strongly correlated with use of other substances, including ketamine, MDMA, opioids, stimulants, and benzodiazepines (ρs = 0.33 to 0.58), indicating that psychedelic use tended to co-occur with broader substance use rather than occurring in isolation. Nicotine and alcohol showed comparatively weaker associations with other substances (ρs = 0.09 to 0.43), suggesting a partially distinct pattern of use. Similarly, weekly meditation experience showed small-to-moderate positive associations with substance use variables (ρs = 0.08 to 0.39). The weakest association was for alcohol use alone (ρ = 0.08), whereas the strongest was for alcohol use combined with meditation (ρ = 0.39); the remaining substance variables showed broadly similar positive associations, (ρs = 0.16 to 0.37). Happiness showed only weak significant associations with substance use (ρs = − 0.09 to 0.11), with the strongest substance-related association again observed for combined alcohol-meditation practice (ρ = 0.11), whereas its strongest correlation overall was a positive association with weekly meditation experience (ρ = 0.20).

Associations between substance use, meditation, and combination practice with subjective happiness

A multiple linear regression model examined associations between happiness and five three-level substance-use factors (psychedelics, cannabis, alcohol, nicotine, and an aggregated other drugs variable combining ketamine / MDMA / stimulants / opioids / benzodiazepines) along with weekly meditation experience, age, and sex. Each substance variable was coded as No use, Substance use (use without meditation), and Combined use (use with meditation). Full regression coefficients are presented in (Table 6).

Table 2 Past-12-month substance use frequencies. Study 1

Frequency category	Classic psychedelics	Ketamine	MDMA	Cannabis	Stimulants	Opioids	Benzodiazepines	Nicotine	Alcohol
No use in past 12 months	1230 (88)	1298 (93)	1265 (91)	880 (63)	1221 (88)	1315 (95)	1269 (91)	888 (64)	244 (18)
1 time	64 (5)	30 (2)	51 (4)	100 (7)	37 (3)	17 (1)	26 (2)	34 (2)	53 (4)
2–3 times	42 (3)	23 (2)	34 (2)	129 (9)	39 (3)	22 (2)	26 (2)	84 (6)	163 (12)
About once a month or less	12 (1)	9 (1)	10 (1)	59 (4)	13 (1)	7 (< 1)	17 (1)	44 (3)	166 (12)
About once or twice a month	16 (1)	7 (1)	11 (1)	53 (4)	16 (1)	6 (< 1)	14 (1)	34 (2)	195 (14)
About once a week	8 (1)	6 (< 1)	5 (< 1)	53 (4)	10 (1)	4 (< 1)	9 (< 1)	37 (3)	253 (18)
Several times a week	12 (1)	8 (1)	6 (< 1)	47 (3)	23 (2)	7 (< 1)	8 (< 1)	61 (4)	237 (17)
About daily	5 (< 1)	5 (< 1)	5 (< 1)	39 (3)	23 (2)	10 (1)	13 (1)	78 (6)	50 (4)
More than once a day	2 (< 1)	5 (< 1)	4 (< 1)	31 (2)	9 (1)	3 (< 1)	9 (1)	131 (9)	30 (2)

Note. Values are *n* (%). All substance-use variables refer to the past 12 months. MDMA = 3,4-methylenedioxymethamphetamine

Table 3 Past-12-month frequencies of simultaneously combining meditation with substance use. Study 1

Frequency category	Comb. Classic psychedelics	Comb. ketamine	Comb. MDMA	Comb. cannabis	Comb. stimulants	Comb. opioids	Comb. benzodiazepines	Comb. nicotine	Comb. alcohol
No use in past 12 months	1304 (94)	1336 (96)	1336 (96)	1132 (81)	1312 (94)	1349 (97)	1324 (95)	1170 (84)	985 (71)
1 time	26 (2)	13 (1)	12 (1)	47 (3)	13 (1)	6 (<1)	16 (1)	24 (2)	47 (3)
2–3 times	22 (2)	9 (1)	8 (1)	58 (4)	14 (1)	6 (<1)	10 (1)	35 (3)	66 (5)
About once a month or less	8 (1)	8 (1)	6 (<1)	32 (2)	4 (<1)	6 (<1)	11 (1)	18 (1)	48 (3)
About once or twice a month	7 (1)	7 (1)	8 (1)	26 (2)	9 (1)	9 (1)	6 (<1)	25 (2)	59 (4)
About once a week	5 (<1)	6 (<1)	4 (<1)	33 (2)	10 (1)	1 (<1)	6 (<1)	22 (2)	72 (5)
Several times a week	9 (1)	6 (<1)	8 (1)	33 (2)	13 (1)	7 (<1)	6 (<1)	29 (2)	71 (5)
About daily	6 (<1)	5 (<1)	5 (<1)	22 (2)	13 (1)	6 (<1)	5 (<1)	32 (2)	26 (2)
More than once a day	4 (<1)	1 (<1)	4 (<1)	8 (1)	3 (<1)	1 (<1)	7 (1)	36 (3)	17 (1)

Note. Values are *n* (%). All substance-use variables refer to the past 12 months. MDMA = 3,4-methylenedioxymethamphetamine

Comb. denotes combined use

The overall model was statistically significant ($p < .001$), but explained only 6% of the variance in happiness, indicating modest overall explanatory power. Weekly meditation frequency was positively associated with happiness ($b = 0.09$, $p < .001$), while age ($b = 0.003$, $p = .533$) and sex ($b = 0.12$, $p = .283$) were not. A consistent pattern emerged across substance categories: substance use without meditation was negatively associated with happiness, whereas combining substance use with meditation was not. In particular, relative to no nicotine use, nicotine use without meditation was associated with lower happiness ($b = -0.49$, $p = .002$), whereas combining nicotine use with meditation was not ($b = -0.25$, $p = .206$). Similarly, relative to no other drug use, other drug use without meditation was associated with lower happiness ($b = -0.37$, $p = .043$), whereas combining other drug use with meditation was not ($b = -0.04$, $p = .867$). Alcohol showed a different pattern: alcohol use without meditation did not significantly differ from no use ($b = 0.29$, $p = .070$), whereas combining alcohol with meditation was positively associated with happiness relative to no use ($b = 0.52$, $p = .005$). All remaining contrasts were non-significant.

The substance-specific sensitivity models were broadly consistent with the primary model, with some exceptions. Nicotine use without meditation and other-drug use without meditation remained associated with lower happiness relative to no use of the respective substance. Cannabis use without meditation was also significantly associated with lower happiness relative to no cannabis use, an association that was not statistically significant in the primary model. For alcohol, the positive combined-use versus no-use association remained in the same direction but was attenuated and no longer statistically significant, while the combined-use versus alcohol-use-without-meditation contrast remained non-significant. Thus, the positive association between combined alcohol use and happiness relative to no alcohol use was sensitive to model specification. Weekly meditation remained positively associated with happiness across all five sensitivity models. Full results are provided in Supplementary Table S2.

Study 2: associations between meditation, psychoactive substance use, and psychological well-being in a stratified subsample

Study 2 extended Study 1 by addressing the preregistered question of whether frequencies of psychoactive substance use, meditation, and their combination over the past 12 months were associated with current psychological well-being, ill-being, and psychological flexibility. To this end,

Table 4 Past 12-month meditation practice: frequency and session duration

Measure	Category	*n* (%) / M (SD)
Weekly meditation frequency	0 times	558 (40)
	1–3 times	550 (40)
	4–6 times	142 (10)
	7–9 times	63 (5)
	10–12 times	30 (2)
	13–15 times	28 (2)
	16–18 times	20 (1)
Meditation session duration	0 min	558 (40)
	1–10 min	291 (21)
	11–20 min	267 (19)
	21–30 min	189 (14)
	31–40 min	53 (4)
	41–50 min	14 (1)
	51–60 min or more	19 (1)
Weekly meditation experience	—	2.53 (4.75)

Note. Values are *n* (%). Weekly meditation experience was operationalized by multiplying average weekly meditation frequency with average session duration (dose). Weekly meditation experience ranged from 0 to 42, corresponding to the full possible range of the composite, and was strongly positively skewed (skewness = 4.29), with 40.12% of participants scoring zero

Study 2 used a stratified subsample drawn from the Study 1 participant pool. This approach was intended to improve representation of the substance use and combination practices most relevant to the research question, and thereby to increase statistical power given the strong zero inflation of many use variables. In addition, unlike Study 1, Study 2 adjusted for psychiatric diagnoses and other covariates in order to examine these associations under more stringent controls (see preregistration at https://osf.io/68e4a/overview).

Methods

Participants and sampling

Study 2 drew a stratified subsample from the Study 1 participant pool. Stratification was informed by the frequencies observed in Study 1 indicating that, after excluding the commonly used legal psychoactive substances (i.e., nicotine and alcohol), meditation was most frequently combined with cannabis ($n = 263$; 19%) and classic psychedelics ($n = 87$; 6%). The stratification therefore focused on these two substances as the most prevalent forms of combined use practices in naturalistic settings.

The six preregistered strata were defined as follows: (a) meditators, who reported at least 4–6 weekly meditation sessions of at least 11–20 min per session, with no cannabis or classic psychedelic use; (b) psychedelic users, who reported at least one instance of classic psychedelic use during the past 12 months without combining it with meditation, while meditation frequency and cannabis use were allowed to vary due to limited availability of psychedelic users without these behaviours; (c) psychedelic–meditation combiners, who reported at least one instance of combining classic psychedelic use with meditation during the past 12 months, with both meditation frequency and cannabis use permitted to vary; (d) cannabis users, who reported at least one instance of cannabis use during the past 12 months without combining it with meditation and without classic psychedelic use, while meditation practice was allowed to vary; (e) cannabis–meditation combiners, who reported at least one instance of combining cannabis use with meditation during the past 12 months, with no classic psychedelic use and freely varying meditation practice; and (f) a control group, reporting no meditation practice, no cannabis use, and no classic psychedelic use. From each stratum, 70 participants were randomly invited, yielding a total sample of 420 participants.

As in Study 1, the survey was programmed using a required-response format. When participants discontinued the survey before completion, recruitment continued to obtain the intended number of completed responses within the preregistered sampling strata. Consequently, there was no item-level missingness in the final analytic dataset. Responses were considered inconsistent when combined use of a particular substance with meditation was reported despite no use of that substance being reported on the corresponding general substance-use frequency item. In addition, inattentiveness was assessed using the attention-check item, "This question is an attention check. Please select 'Agree'." Failure to select "Agree" resulted in exclusion. Responses excluded for inconsistency or attention-check failure were not replaced. Following these exclusions, the final analytic sample consisted of $N = 397$ participants.

With the exception of the control group, meditation was not treated as absent or uniform but was intentionally allowed to vary in frequency and/or duration by design.

Table 5 Spearman correlations among substance use and combination variables, weekly meditation, and happiness. Study 1

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Classic psychedelics	—																			
2. Ketamine	0.56***	—																		
3. MDMA	0.58***	0.63***	—																	
4. Cannabis	0.41***	0.28***	0.34***	—																
5. Stimulants	0.44***	0.42***	0.51***	0.29***	—															
6. Opioids	0.39***	0.54***	0.45***	0.25***	0.43***	—														
7. Benzos	0.33***	0.41***	0.36***	0.27***	0.38***	0.47***	—													
8. Nicotine	0.28***	0.22***	0.27***	0.43***	0.29***	0.19***	0.20***	—												
9. Alcohol	0.18***	0.15***	0.17***	0.28***	0.15***	0.09**	0.10***	0.35***	—											
10. Comb. Psychedelics	0.73***	0.53***	0.56***	0.33***	0.36***	0.43***	0.36***	0.21***	0.11***	—										
11. Comb. Ketamine	0.49***	0.77***	0.58***	0.26***	0.39***	0.58***	0.48***	0.19***	0.11***	0.65***	—									
12. Comb. MDMA	0.53***	0.65***	0.66***	0.27***	0.40***	0.56***	0.43***	0.20***	0.12***	0.67***	0.82***	—								
13. Comb. Cannabis	0.46***	0.34***	0.41***	0.70***	0.30***	0.30***	0.31***	0.35***	0.24***	0.43***	0.38***	0.40***	—							
14. Comb. Stimulants	0.38***	0.44***	0.42***	0.21***	0.68***	0.49***	0.40***	0.21***	0.09***	0.46***	0.55***	0.57***	0.34***	—						
15. Comb. Opioids	0.45***	0.61***	0.52***	0.24***	0.44***	0.74***	0.55***	0.21***	0.10***	0.56***	0.77***	0.75***	0.36***	0.65***	—					
16. Comb. Benzodiazepines	0.35***	0.46***	0.40***	0.23***	0.38***	0.53***	0.73***	0.18***	0.09***	0.43***	0.60***	0.56***	0.34***	0.53***	0.71***	—				
17. Comb. Nicotine	0.32***	0.32***	0.32***	0.32***	0.31***	0.29***	0.27***	0.59***	0.24***	0.30***	0.35***	0.36***	0.47***	0.37***	0.39***	0.32***	—			
18. Comb. Alcohol	0.28***	0.29***	0.27***	0.27***	0.24***	0.22***	0.22***	0.25***	0.40***	0.24***	0.30***	0.30***	0.45***	0.33***	0.28***	0.28***	0.52***	—		
19. Weekly meditation	0.30***	0.26***	0.25***	0.24***	0.18***	0.20***	0.16***	0.17***	0.08**	0.27***	0.27***	0.26***	0.37***	0.23***	0.23***	0.19***	0.31***	0.39***	—	
20. Happiness	0.02	0.07*	0.03	−0.06*	−0.02	0.02	−0.01	−0.09**	0.03	0.02	0.08**	0.06*	0.02	0.03	0.05	0.01	0.04	0.11***	0.20***	—

Note. Spearman's rho. * $p < .05$, ** $p < .01$, *** $p < .001$. Comb. = combined use

Table 6 Regression coefficients for the happiness model. Study 1

						95%	
	Variable	Contrast	b	SE HC3	Robust *p*	LL	UL
Happiness	(Intercept)		5.841	0.238	< 0.001	5.374	6.308
($F(13, 1377) = 6.34$, $p < .001$, $R^2 = 0.060$)	Age		0.003	0.005	0.533	-0.006	0.012
	Sex (Male)		0.118	0.11	0.283	-0.097	0.333
	Weekly meditation		0.093	0.014	< 0.001	0.065	0.122
	Psychedelics	Substance use vs. no use	0.157	0.274	0.567	-0.381	0.694
	Psychedelics	Combined use vs. no use	-0.087	0.299	0.772	-0.672	0.499
	Psychedelics	Combined use vs. substance use	-0.243	0.354	0.491	-0.937	0.450
	Cannabis	Substance use vs. no use	-0.271	0.153	0.077	-0.571	0.029
	Cannabis	Combined use vs. no use	-0.201	0.194	0.303	-0.58	0.180
	Cannabis	Combined use vs. substance use	0.071	0.211	0.735	-0.343	0.485
	Alcohol	Substance use vs. no use	0.285	0.157	0.07	-0.023	0.592
	Alcohol	Combined use vs. no use	0.518	0.183	0.005	0.158	0.877
	Alcohol	Combined use vs. substance use	0.233	0.146	0.110	-0.052	0.518
	Nicotine	Substance use vs. no use	-0.485	0.159	0.002	-0.797	-0.173
	Nicotine	Combined use vs. no use	-0.245	0.193	0.206	-0.623	0.134
	Nicotine	Combined use vs. substance use	0.240	0.217	0.269	-0.186	0.667
	Other drugs	Substance use vs. no use	-0.366	0.180	0.043	-0.72	-0.012
	Other drugs	Combined use vs. no use	-0.042	0.253	0.867	-0.539	0.454
	Other drugs	Combined use vs. substance use	0.324	0.279	0.247	-0.224	0.872

Note. Substance use = use without meditation. Combined use = use with meditation. No use = no use of the substance. Each substance is represented by a single three-level variable. The three rows are the three possible contrasts among its levels and are not independent variables

Stratification was used solely for recruitment purposes to ensure sufficient representation of meditation practice, cannabis use, psychedelic use, and their combinations. All statistical analyses pooled participants across strata. The predefined strata were not used as explanatory factors in the present analyses and are reserved for a future preregistered study involving direct comparisons of phenomenology of different types of non-ordinary experience. Accordingly, the results describe associations observed within a behaviour-enriched sample and do not provide population-representative estimates.

Procedure

Participants were invited to complete a survey via Prolific (https://www.prolific.com/) described as follows: "This study explores the relationships between substance use, meditation practice, and well-being. It builds upon a previous pre-screening phase with the same objectives. If you have received this link, it means you have already participated in the pre-screening phase." The survey took approximately 20 min to complete, and participants received £2.00 for full completion. All participants received the same survey and identical instructions describing the study objectives and the voluntary nature of participation. To reduce potential order effects, survey items were presented using a simple ABBA counterbalancing procedure.

Data collection adhered to GDPR regulations and was carried out in compliance with the Declaration of Helsinki. The study received approval from the Ethics Board of the Departments of Psychology and Logopedics at the Abo Akademi University, Finland (decision number 10 /2025).

Measures

Study 2 employed the same measures of substance use, combined-use, meditation frequency, meditation session duration, and the composite measure of weekly meditation experience as Study 1, covering the same nine substance classes and using the same response scales. The following additional measures were also included.

Lifetime meditation practice The duration of accumulated meditation experience was assessed using the question, "If you meditate, for how long have you practiced meditation?" Responses ranged from 0 ("I do not meditate") to 7 ("Over 10 years").

Types of meditation Participants were also asked to report the types of meditation practices they typically engaged in. These included focusing and calming practices (e.g., breath meditation or body scan), open monitoring, loving-kindness meditation, self-transcending or insight-based practices, movement-based meditation (e.g., yoga or tai chi), and other forms of meditation. Participants could select several types.

Peace of mind Peace of mind was assessed using the Peace of Mind Scale (PoMS; Lee et al. 2013), which measures the

extent to which individuals experience internal peace and harmony. Although originally developed within a Chinese cultural context, the PoMS has demonstrated validity in Western populations (Sikka et al. 2018, 2023; Sophie et al. 2022). Previous studies have also associated peace of mind with both psychedelic use and meditation (Krabbe et al. 2024, 2026). The scale consists of seven items (e.g., "I have peace and harmony in my mind"), including two reverse-coded items (e.g., "It is difficult for me to feel settled"). Items are rated on a five-point Likert scale ranging from 1 ("Not at all") to 5 ("All of the time"). Items were averaged to create a composite score, with higher scores indicating greater peace of mind. Cronbach's α = 0.91, McDonald's ω = 0.91.

Mental well-being Overall mental well-being was assessed using the Warwick–Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al. 2007). The WEMWBS comprises 14 items (e.g., "I've been feeling optimistic about the future") capturing both hedonic and eudaimonic aspects of well-being. Participants rated how often they experienced each item over the past two weeks using a five-point Likert scale ranging from 1 ("None of the time") to 5 ("All of the time"). A mean composite score was computed, with higher scores reflecting greater mental well-being. Cronbach's α = 0.90, McDonald's ω = 0.91.

Symptoms of depression Symptoms of depression were assessed using the depression module of the Patient Health Questionnaire (PHQ-9; Kroenke et al. 2001). The PHQ-9 consists of nine items corresponding to the diagnostic criteria for major depressive disorder as outlined in the DSM-5 (American Psychiatric Association, 2013). Participants rated how frequently each symptom (e.g., "Little interest or pleasure in doing things") had bothered them over the past two weeks on a scale from 0 ("Not at all") to 3 ("Nearly every day"). Item scores were summed to yield a total severity score. Standard cut-off scores classify depression severity as minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). Cronbach's α = 0.91, McDonald's ω = 0.91.

Anxiety symptoms Anxiety symptoms were assessed using the Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al. 2006). The GAD-7 includes seven items reflecting DSM-5 diagnostic criteria for generalized anxiety disorder. Participants indicated how often each symptom (e.g., "Worrying too much about different things") had bothered them over the past two weeks using a scale from 0 ("Not at all") to 3 ("Nearly every day"). Item scores were summed to produce a total anxiety severity score, with standard cut-offs indicating minimal (0–4), mild (5–9), moderate (10–14), and severe anxiety (15–21). Cronbach's α = 0.92, McDonald's ω = 0.92.

Psychological flexibility Psychological flexibility was assessed using the Multidimensional Psychological Flexibility Inventory (MPFI-24; Rolffs et al. 2018). The MPFI-24 consists of 24 items (e.g., "I was receptive to observing unpleasant thoughts and feelings without interfering with them") measuring six processes of psychological flexibility; Acceptance, Present-Moment Awareness, Self-as-Context, Defusion, Values, and Committed Action; and six corresponding processes of psychological inflexibility. In the present study, we focused only on the six psychological flexibility processes, as previous studies have not found clear associations between psychological inflexibility items and psychedelic use or meditation (Krabbe et al. 2024, 2026). Participants rated how frequently they experienced each item over the past two weeks on a six-point Likert scale ranging from 1 ("never true") to 6 ("always true"). For the regression analyses, an aggregated psychological flexibility score was computed by averaging across all items assessing the six flexibility processes, with higher scores indicating greater overall psychological flexibility Cronbach's α = 0.91, McDonald's ω = 0.92.

For the post hoc analyses, mean scores were computed separately for each psychological flexibility process by averaging the two items per process, yielding six distinct psychological flexibility variables. Because each process-level score comprised two items, inter-item correlations were used as indices of internal consistency: Acceptance, r = .56; Present-Moment Awareness, r = .70; Self-as-Context, r = .68; Defusion, r = .74; Values, r = .62; and Committed Action, r = .80.

Presence of psychiatric or neurological diagnoses To account for the presence of psychiatric or neurological diagnoses, participants were asked the following: "Do you currently have a mental health or neurological diagnosis determined by a professional (medical doctor, psychologist)? (Select all that apply.)" Response options included: 1 = I do not wish to give this information, 2 = Major depression, 3 = Bipolar disorder, 4 = Psychosis or schizophrenia, 5 = Anxiety disorder, 6 = Autism spectrum disorder, 7 = Obsessive-compulsive disorder, 8 = Attention deficit hyperactivity disorder (ADHD), 9 = Post-traumatic stress disorder (PTSD), 10 = I do not currently have a mental health or neurological diagnosis, and 11 = Other (please specify in the next question). For the purposes of analysis, the presence of any of the listed diagnoses was dummy-coded as 0 = no diagnosis and 1 = presence of at least one diagnosis to increase statistical power.

Statistical analyses

The full preregistration is available on OSF: https://osf.io/68e4a/overview. Any deviations from the preregistered analyses are described below. All analyses were conducted in R (Version 2025.09.2+418).

Descriptive statistics and bivariate correlations were computed for all variables. The primary analyses consisted of ordinary least squares (OLS) multiple regression models estimated in the full sample (N=397), with separate models specified for depression, anxiety, psychological flexibility, mental well-being, and peace of mind. Each model included an identical set of substance use variables, meditation variables, and covariates. Before analyses, regression assumptions were examined.

The initial preregistered analytic plan specified five outcome-specific regression models including past-12-month frequency indicators for the nine substance classes, the nine corresponding combined-use frequency indicators, weekly meditation experience (frequency × session duration), lifetime meditation practice and covariates (age, sex and psychiatric/neurological diagnosis), yielding 23 variables total. The covariate set was preregistered and intentionally kept parsimonious. Age, sex, and psychiatric/neurological diagnosis were included as adjustment variables rather than variables of substantive interest, with diagnosis included because psychiatric conditions and substance use are closely interrelated and may reflect multiple pathways, including self-medication, substance-related effects, and shared underlying vulnerabilities (Turner et al. 2018). Given the number of substance-use and meditation variables already included in the models, we did not expand the covariate set further. As in Study 1, due to nested substance variables, the substance use and combined use variables were aggregated into categorical variables with three levels (substance-use, combined-use, no-use), and the other controlled drugs besides classic psychedelics and cannabis were aggregated into a single variable.

Thus, in the primary regression models, substance use was represented by five categorical variables: classic psychedelics, cannabis, alcohol, nicotine, and the other drugs composite. Each was coded from the original past-12-month frequency items as follows: *no use* (substance use=0 and combined use=0), *use without meditation* (substance use>0 and combined use=0), and *use with meditation* (combined use>0), as in Study 1. These variables therefore represented past-year behavioural categories rather than frequency or dose. Participants were classified as having no use, use without simultaneous meditation, or use with simultaneous meditation based on whether these behaviours occurred at all during the past year, irrespective of how frequently substance use or combined use occurred. Also as in Study 1, the models were re-specified to change the reference category from no use to use without meditation, allowing direct comparison between combined use and substance use occurring without any simultaneous meditation. As in Study 1, these three contrasts are alternative comparisons within the same categorical factor rather than separate independent variables entered simultaneously. All five substance factors, weekly meditation, lifetime meditation, age, sex, and psychiatric/neurological diagnosis were entered simultaneously; thus, each substance contrast was adjusted for nine other model variables.

Weekly and lifetime meditation were included together because they capture different aspects of meditation experience. Weekly meditation reflects the intensity of recent practice during the past 12 months, whereas lifetime meditation reflects accumulated experience over a longer period. These measures are not interchangeable: for example, someone may currently meditate frequently despite having relatively little lifetime experience, whereas someone with extensive lifetime experience may currently practice less often. Including both measures therefore allowed the association of recent meditation practice to be estimated while accounting for accumulated experience, and vice versa.

To determine whether the findings were sensitive to the model specification, two sets of sensitivity analyses were conducted. First, as in Study 1, each substance factor was first examined separately while both meditation variables and the three covariates were retained. In a second set of sensitivity analyses, weekly and lifetime meditation were examined in separate models while all five substance factors and the covariates were retained, with only the other meditation variable omitted.

We also preregistered a mixed network model (18 nodes) linking the six psychological flexibility processes and mental health variables with meditation experience, classic psychedelic use, cannabis use, and combined-use practice, as prior evidence suggests that these behaviours, especially psychedelics and meditation, may be differentially associated with specific psychological flexibility processes (Rogge et al. 2022; Krabbe et al. 2024). However, when writing the preregistration, we did not account for the nested structure of the substance-use and combined-use variables. This was addressed by recoding them into the categorical variables described above. However, because several categories remained highly zero-inflated, the effective sample size within categories was too small to yield stable and reliable network estimates, and the preregistered network analysis was therefore not conducted (Epskamp et al. 2018). Instead, post hoc regressions were conducted with each psychological flexibility process as the outcome using the revised variable set described above (Tables 7, 8, 9, 10, 11 and 12).

Multicollinearity was assessed using (adjusted) GVIF/VIF, with values above 5 considered indicative of potentially

problematic multicollinearity (Field et al. 2012). See Supplementary Table S1 for VIF and GVIF values for all models. Because several variables showed evidence of heteroskedasticity, inference was based on HC3 heteroskedasticity-consistent standard errors and robust Wald F tests (White 1980; MacKinnon and White 1985). To facilitate comparison of effect magnitudes across outcomes measured on different scales, predictor coefficients were also expressed in outcome-standardized units by dividing each coefficient by the standard deviation of the corresponding outcome in the analytic sample, while independent variables retained their original coding. These coefficients are reported in Table 13 as $b_{y.}$ Statistical significance was evaluated at $\alpha = 0.05$.

As preregistered, no formal correction for multiple comparisons was applied. Instead, results were interpreted in light of effect sizes, confidence intervals, prior evidence, and theoretical coherence, consistent with recommendations emphasizing pre-specification where possible and transparent interpretation over rigid error control (Rothman 1990; Wasserstein et al. 2019; Hooper 2025). This approach was also adopted because the definition of the relevant family of tests for family-wise error correction is often arbitrary and context-dependent, which may itself produce misleading adjustments (García-Pérez 2023). Accordingly, emphasis was placed on the magnitude, precision, and consistency of observed associations rather than on blanket multiplicity correction. Associations that were consistent across multiple outcomes were therefore given greater interpretive weight than isolated statistically significant contrasts, which were interpreted cautiously.

Table 7 Demographic characteristics of the stratified subsample in Study 2

Measure	Category	M(SD)/*n* (%)
Age (years)		36 (13)
Sex	Female	211 (53)
	Male	186 (47)
Employment status	Full-time employed	262 (66)
	Part-time employed	56 (14)
	Unemployed (job seeking)	21 (5)
	Not in paid work	16 (4)
	Other / data expired	42 (11)
Self-reported mental health or neurological diagnosis	I do not wish to give this information	15 (4)
	Major depressive disorder	52 (13)
	Bipolar disorder	5 (2)
	Psychosis or schizophrenia	1 (< 1)
	Anxiety disorder	90 (23)
	Autism spectrum disorder	15 (4)
	Obsessive–compulsive disorder	11 (3)
	Attention-deficit/hyperactivity disorder (ADHD)	39 (10)
	Post-traumatic stress disorder (PTSD)	29 (7)
	I do not currently have a mental health or neurological diagnosis	245 (62)
	Other (self-specified)	5 (1)
Country of residence	South Africa	171 (43)
	United Kingdom	76 (19)
	Poland	18 (5)
	Italy	17 (4)
	Portugal	15 (4)
	Kenya	14 (4)
	Canada	11 (3)
	Spain	10 (3)
	Germany	9 (2)
	Netherlands	7 (2)
	Sweden	6 (2)
	Finland	6 (2)
	United States	5 (1)
	France	4 (1)
	Other countries	18 (5)

Note. Age is reported as mean (SD). All other values are n (%). Mental health and neurological diagnoses were self-reported, and participants could endorse more than one diagnosis; therefore, percentages may exceed 100%. Percentages are rounded to whole numbers and may not sum to 100 due to rounding. Other countries, each contributing fewer than 1% of the total sample and only one participant ($n = 1$), were aggregated for clarity

Table 8 Descriptive statistics for psychological well-being, ill-being, and psychological flexibility outcomes in Study 2

Variable	*N*	Mean	SD	Obs._min	Obs._max	Min	Max	Skewness	Floor %	Ceiling %
Depression (PHQ-9)	397	7.64	6.34	0	26	0	27	0.85	10.33	0.00
Anxiety (GAD-7)	397	6.62	5.4	0	21	0	21	0.77	12.34	1.51
Psychological flexibility	397	4.09	0.89	1.71	6	1	6	-0.15	0.00	1.75
Mental well-being (WEMWBS)	397	3.65	0.79	1	5	1	5	-0.38	0.25	6.05
Peace of mind	397	3.32	0.95	1	5	1	5	-0.25	1.01	4.79

Note. *N* sample size, *M* mean, *SD* standard deviation. Obs. min and Obs. max indicate the minimum and maximum values observed in the sample; Min and Max indicate the theoretical possible range of each measure. PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7; WEMWBS = Warwick–Edinburgh Mental Well-Being Scale. Higher scores indicate higher levels of the respective constructs

Table 9 Past-12-month substance use frequencies. Study 2 stratified sample

Frequency category	Classic psychedelics	Ketamine	MDMA	Cannabis	Stimulants	Opioids	Benzodiazepines	Nicotine	Alcohol
No use in past 12 months	277 (70)	338 (85)	325 (82)	158 (40)	316 (80)	350 (88)	340 (86)	189 (48)	51 (13)
1 time	44 (11)	19 (5)	25 (6)	43 (11)	16 (4)	9 (2)	15 (4)	13 (3)	13 (3)
2–3 times	33 (8)	14 (4)	18 (5)	45 (11)	19 (5)	12 (3)	9 (2)	35 (9)	40 (10)
About once a month or less	12 (3)	7 (2)	7 (2)	29 (7)	9 (2)	6 (2)	7 (2)	19 (5)	35 (9)
About once or twice a month	10 (3)	4 (1)	7 (2)	31 (8)	6 (2)	5 (1)	7 (2)	17 (4)	54 (14)
About once a week	7 (2)	4 (1)	5 (1)	31 (8)	6 (2)	3 (1)	6 (2)	18 (5)	90 (23)
Several times a week	10 (3)	6 (2)	6 (2)	23 (6)	11 (3)	4 (1)	4 (1)	29 (7)	81 (20)
About daily	3 (1)	3 (1)	2 (1)	22 (6)	9 (2)	7 (2)	6 (2)	34 (9)	20 (5)
More than once a day	1 (0)	2 (1)	2 (1)	15 (4)	5 (1)	1 (0)	3 (1)	43 (11)	13 (3)

Note. Values are *n* (%). All substance-use variables refer to the past 12 months. MDMA = 3,4-methylenedioxymethamphetamine

Table 10 Past-12-month frequencies of simultaneously combining meditation with substance use. Study 2 stratified sample

Frequency category	Comb. Classic psychedelics	Comb. ketamine	Comb. MDMA	Comb. cannabis	Comb. stimulants	Comb. opioids	Comb. benzodiazepines	Comb. nicotine	Comb. alcohol
No use in past 12 months	333 (84)	358 (90)	358 (90)	251 (63)	352 (89)	366 (92)	358 (90)	286 (72)	231 (58)
1 time	19 (5)	10 (3)	7 (2)	29 (7)	7 (2)	4 (1)	8 (2)	8 (2)	9 (2)
2–3 times	14 (4)	8 (2)	7 (2)	28 (7)	8 (2)	5 (1)	5 (1)	19 (5)	28 (7)
About once a month or less	7 (2)	5 (1)	4 (1)	17 (4)	2 (1)	5 (1)	6 (2)	12 (3)	18 (5)
About once or twice a month	6 (2)	4 (1)	6 (2)	13 (3)	3 (1)	6 (2)	5 (1)	15 (4)	17 (4)
About once a week	5 (1)	4 (1)	4 (1)	19 (5)	7 (2)	1 (0)	4 (1)	10 (3)	37 (9)
Several times a week	8 (2)	5 (1)	5 (1)	19 (5)	8 (2)	4 (1)	5 (1)	16 (4)	36 (9)
About daily	3 (1)	3 (1)	3 (1)	18 (5)	7 (2)	5 (1)	3 (1)	19 (5)	13 (3)
More than once a day	2 (1)	0(0)	3 (1)	3 (1)	3 (1)	1 (0)	3 (1)	12 (3)	8 (2)

Note. Values are *n* (%). All substance-use variables refer to the past 12 months. MDMA = 3,4-methylenedioxymethamphetamine

Comb. denotes combined use

Sensitivity and power

Although the preregistration specified a minimum sample of 167 for the planned regression analyses and aimed to recruit as many participants as possible from each pre-screened stratum, the final analyses differed from those originally planned. Because the revised analytic approach involved different model specifications and corresponding degrees of freedom, we conducted a sensitivity power analysis based on the final sample size. The analysis was conducted in G*Power 3.1 using the linear multiple regression: fixed model, R^2 increase procedure. With $N = 397$ and 15 model degrees of freedom, the minimum detectable effect at 80% power and $\alpha = 0.05$ was $f^2 = 0.021$ for a 1-df term, corresponding to $\Delta R^2 \approx 0.020$. For a 3-level substance factor tested jointly (2-df test), the minimum detectable effect was $f^2 = 0.026$, corresponding to $\Delta R^2 \approx 0.025$.

Although stratified sampling increased representation of psychedelic use and psychedelic–meditation combined use, these groups remained smaller than the corresponding alcohol groups (psychedelics: $n = 56$ use without meditation, $n = 64$ combined use; alcohol: $n = 180$ use without meditation, $n = 166$ combined use). Accordingly, psychedelic contrasts generally remained less precisely estimated, as reflected in their wider confidence intervals (see Table 13).

Results

Sample characteristics

The stratified subsample consisted of adults with a mean age of 36 years ($SD = 13$) and an approximately even sex distribution (53% female, 47% male). Most participants were employed full-time and reported no current mental health or neurological diagnosis. Participants were primarily resident in South Africa and the United Kingdom. Full demographic details are presented in (Table 7).

Descriptive statistics: well-being, ill-being, and psychological flexibility

Descriptive statistics for psychological well-being, ill-being, and psychological flexibility outcomes are presented in (Table 8). Depression and anxiety showed modest positive skew and some floor concentration, with 10.33% and 12.34% of participants scoring at the minimum, respectively; the remaining outcome distributions showed little floor or ceiling concentration.

Substance use, meditation, and combination practices: frequencies and correlations

Because Study 2 used a stratified, behaviour-enriched sample, all descriptive frequencies reflect the sampling design rather

Table 11 Meditation experience. Study 2 stratified subsample

Measure	Category	*n* (%) / M (SD)
Meditation frequency (per week)	0 times	122 (31)
	1–3 times	121 (30)
	4–6 times	72 (18)
	7–9 times	40 (10)
	10–12 times	16 (4)
	13–15 times	16 (4)
	16–18 times	4 (1)
	19–21 times or more	6 (2)
Meditation session duration	0 min	122 (31)
	1–10 min	46 (12)
	11–20 min	97 (24)
	21–30 min	86 (22)
	31–40 min	27 (7)
	41–50 min	9 (2)
	51–60 min or more	10 (3)
Lifetime meditation practice	I do not meditate	101 (25)
	Less than a month	35 (9)
	1–6 months	63 (16)
	7–12 months	26 (7)
	Between 1 and 2 years	51 (13)
	Between 2 and 5 years	59 (15)
	Between 5 and 10 years	28 (7)
	Over 10 years	34 (9)
Meditation type	I do not meditate	99 (25)
	Focusing and calming (e.g., breath meditation, body scan, mantra repetition, counting breath)	244 (61)
	Open monitoring (e.g., aware of thoughts, emotions, sensations without judgment)	93 (23)
	Loving-kindness / compassion meditation	82 (21)
	Self-transcending / insight practices	60 (15)
	Movement-based meditation (e.g., yoga, tai chi, qigong)	108 (27)
	I don't know	1 (1)
	Other	6 (2)
Weekly meditation experience	—	4.40 (6.48)

Note. Values are *n* (%), except for the weekly meditation composite, which is reported as *M* (*SD*). Participants could endorse more than one meditation type; therefore, percentages do not sum to 100 in that section. Weekly meditation experience ranged from 0 to 42, corresponding to the full possible range of the composite, and was strongly positively skewed (skewness = 3.09), with 30.73% of participants scoring zero

than population prevalence. With this caveat in mind, the overall pattern broadly resembled Study 1: use of most substances and their combined use with meditation was relatively uncommon, whereas cannabis, nicotine, and alcohol use were more prevalent. Meditation practice was also common (see Tables 9, 10 and 11). When considered relative to the number of users of each substance, 53% of psychedelic users, 61% of cannabis users, 53% of nicotine users, and 48% of alcohol users were classified as having combined that substance with meditation. For the other-drugs composite, 53% of participants with any other-drug use were classified as having combined such use with meditation. These proportions should be interpreted descriptively given the stratified sampling design, which intentionally increased representation of psychedelic use, cannabis use, meditation, and their combinations. Correlational patterns likewise broadly resembled those observed in Study 1, with positive intercorrelations among substance-use variables consistent with polysubstance use (see Table 12).

Descriptive statistics: other-drugs category

As in Study 1, to further characterize the heterogeneous other-drugs category, we examined its constituent substance classes. Among participants classified as other-drug use without meditation ($N = 62$), stimulant use was reported by 31 (50.0%), MDMA by 26 (41.9%), ketamine by 15 (24.2%), benzodiazepines by 15 (24.2%), and opioids by 14 (22.6%); 24 participants (38.7%) had used at least two of these substance classes. Among combined users ($N = 71$), stimulant use was reported by 50 (70.4%), MDMA by 46 (64.8%), ketamine by 44 (62.0%), benzodiazepines by 42 (59.2%), and opioids by 33 (46.5%); 53 participants (74.6%) had used at

Table 12 Spearman correlations between substance use, combined use, meditation, psychological flexibility, peace of mind, mental well-being, anxiety, and depression. Study2, stratified subsample

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Classic psychedelics	—																								
2. Ketamine	.63***	—																							
3. MDMA	.63***	.73***	—																						
4. Cannabis	.42***	.32***	.30***	—																					
5. Stimulants	.52***	.53***	.58***	.28***	—																				
6. Opioids	.38***	.57***	.51***	.27***	.55***	—																			
7. Benzodiazepines	.40***	.52***	.48***	.33***	.54***	.60***	—																		
8. Nicotine	.29***	.25***	.26***	.47***	.39***	.24***	.25***	—																	
9. Alcohol	.20***	.16**	.16**	.31***	.23***	.07	.16**	.39***	—																
10. Comb. Psychedelics	.73***	.59***	.62***	.37***	.44***	.43***	.43***	.20***	.12*	—															
11. Comb. Ketamine	.52***	.81***	.67***	.28***	.49***	.61***	.59***	.20***	.10*	.67***	—														
12. Comb. MDMA	.54***	.72***	.74***	.27***	.49***	.58***	.52***	.18***	.10*	.67***	.84***	—													
13. Comb. Cannabis	.43***	.38***	.37***	.75***	.32***	.33***	.35***	.36***	.30***	.44***	.40***	.40***	—												
14. Comb. Stimulants	.43***	.56***	.51***	.23***	.75***	.61***	.56***	.27***	.14**	.52***	.64***	.66***	.38***	—											
15. Comb. Opioids	.45***	.65***	.59***	.27***	.58***	.81***	.68***	.24***	.10*	.55***	.77***	.74***	.39***	.76***	—										
16. Comb. Benzodiazepines	.41***	.56***	.52***	.24***	.52***	.65***	.82***	.18***	.12*	.50***	.68***	.65***	.34***	.64***	.80***	—									
17. Comb. Nicotine	.32***	.38***	.35***	.33***	.41***	.39***	.37***	.61***	.30***	.31***	.41***	.39***	.46***	.46***	.46***	.40***	—								
18. Comb. Alcohol	.29***	.35***	.30***	.29***	.33***	.26***	.32***	.26***	.47***	.26***	.35***	.34***	.49***	.40***	.34***	.36***	.57***	—							
19. Weekly meditation	.25***	.28***	.25***	.12*	.18***	.20***	.14**	.06	-.01	.25***	.28***	.29***	.28***	.27***	.26***	.20***	.26***	.38***	—						
20. Lifetime meditation	.19***	.12*	.17***	.13**	.09	.09	.03	.06	.02	.16**	.10	.08	.16**	.10	.06	.02	.13*	.18***	.51***	—					
21. Psychological flexibility	.08	.08	.10*	.10*	.00	.02	.01	.01	.01	.12*	.17***	.18***	.16**	.08	.10	.06	.11*	.23***	.32***	.25***	—				
22. Peace of mind	-.06	.03	.00	.00	-.10	.03	-.03	-.07	-.05	.00	.11*	.10*	.04	-.01	.07	.00	.03	.12*	.24***	.16**	.59***	—			
23. Mental well-being	-.03	.05	.02	.01	-.05	.03	-.02	-.08	-.04	.01	.12*	.12*	.07	.05	.07	.01	.03	.14**	.27***	.13*	.64***	.81***	—		
24. Anxiety	.13**	.07	.08	.13**	.15**	.07	.12*	.10	.08	.05	.01	.01	.13*	.11*	.04	.09	.08	.10*	.00	-.01	-.18***	-.62***	-.50***	—	
25. Depression	.18***	.13*	.12*	.13**	.20***	.12*	.17***	.15**	.10*	.12*	.05	.04	.13*	.16**	.07	.13**	.14**	.10*	-.05	-.02	-.27***	-.63***	-.55***	.80***	—

Note. Spearman's ρ. * p < .05, ** p < .01, *** p < .001. Comb. = combined use

least two classes. Thus, neither group was dominated by a single substance, and substantial polysubstance involvement was evident, particularly among combined users.

Associations with psychological well-being, ill-being and psychological flexibility

All five regression models were statistically significant (all *p*s < 0.001), with explained variance ranging from 15% to 28% (see Table 13 for full results). Across all outcomes, after controlling for the other independent variables in the model, psychiatric or neurological diagnosis emerged as the most consistent and strongest independent variable, being associated with higher depression ($b = 5.84$, $p < .001$) and anxiety ($b = 5.14$, $p < .001$) and with lower psychological flexibility ($b = -0.20$, $p = .046$), mental well-being ($b = -0.38$, $p < .001$), and peace of mind ($b = -0.62$ $p < .001$). Age was negatively associated with depression ($b = -0.07$, $p < .001$) and anxiety ($b = -0.05$ $p = .022$), suggesting somewhat better emotional functioning in older participants. Lifetime meditation practice was weakly positively associated with psychological flexibility ($b = 0.07$, $p < .001$) and peace of mind ($b = 0.05$, $p = .018$), but not with depression ($b = -0.08$, $p = .47$), anxiety ($b = -0.10$, $p = .39$) or mental well-being ($b = 0.02$, $p = .22$).

Two consistent cross-outcome patterns emerged for the substance-related associations. Relative to no use, other drug use without meditation was associated with lower psychological flexibility ($b = -0.43$, $p = .002$), mental well-being ($b = -0.33$, $p = .005$), and peace of mind ($b = -0.40$, $p = .004$), whereas other drug use combined with meditation was not significantly associated with any of these outcomes. Alcohol showed a somewhat different pattern: combining alcohol with meditation was associated with higher psychological flexibility ($b = 0.32$, $p = .003$), mental well-being ($b = 0.28$, $p = .008$), and peace of mind ($b = 0.34$, $p = .004$), relative to alcohol use without simultaneous meditation. Importantly, combining alcohol with meditation did not differ significantly from the no-alcohol-use group on any of the outcomes. The outcome-standardized estimates were fairly consistent in magnitude across these three outcomes: other-drug use without meditation was associated with 0.42–0.48 SD lower scores, whereas alcohol combined use relative to use without meditation was associated with 0.35–0.36 SD higher scores (Table 13).

The substance-specific sensitivity analyses were broadly consistent with the full models. The alcohol combined-use versus use-without-meditation associations with higher psychological flexibility, mental well-being, and peace of mind were closely replicated. Other-drug use without meditation versus no use remained associated with lower psychological flexibility, mental well-being, and peace of mind relative to no other-drug use. Additionally, combined other-drug users scored higher on these outcomes than other-drug users who did not combine use with meditation. Combined cannabis

Table 13 Regression coefficients. Study 2

Model	Variable	Contrast	b	b_y	SE HC3	Robust *p*	95% LL	95% UL
Anxiety	(Intercept)		7.723		1.248	<0.001	5.270	10.177
($F(15, 381) = 8.88$, $p < .001$, $R^2 = 0.271$)	Age		-0.066	-0.012	0.020	<0.001	-0.105	-0.028
	Sex Male		-0.418	-0.077	0.489	0.393	-1.380	0.544
	Diagnoses		5.138	0.952	0.554	<0.001	4.050	6.227
	Weekly meditation		-0.094	-0.017	0.050	0.061	-0.192	0.004
	Lifetime meditation		-0.081	-0.015	0.112	0.470	-0.301	0.139
	Psychedelics	Substance use vs. No use	0.602	0.112	0.748	0.421	-0.868	2.073
	Psychedelics	Combined use vs. No use	-0.706	-0.131	0.807	0.382	-2.292	0.880
	Psychedelics	Combined use vs. Substance use	-1.308	-0.242	0.906	0.149	-3.089	0.473
	Cannabis	Substance use vs. No use	-0.194	-0.036	0.708	0.785	-1.586	1.199
	Cannabis	Combined use vs. No use	0.522	0.097	0.703	0.458	-0.860	1.904
	Cannabis	Combined use vs. Substance use	0.716	0.133	0.773	0.355	-0.803	2.235
	Alcohol	Substance use vs. No use	0.338	0.063	0.805	0.675	-1.245	1.920
	Alcohol	Combined use vs. No use	0.132	0.024	0.850	0.876	-1.540	1.804
	Alcohol	Combined use vs. Substance use	-0.205	-0.038	0.670	0.759	-1.522	1.111
	Nicotine	Substance use vs. No use	-0.516	-0.096	0.667	0.439	-1.827	0.795
	Nicotine	Combined use vs. No use	-0.200	-0.037	0.781	0.798	-1.735	1.335
	Nicotine	Combined use vs. Substance use	0.317	0.059	0.728	0.664	-1.116	1.749
	Other drugs	Substance use vs. No use	0.550	0.102	0.719	0.445	-0.863	1.964
	Other drugs	Combined use vs. No use	0.843	0.156	1.010	0.404	-1.142	2.829
	Other drugs	Combined use vs. Substance use	0.293	0.156	1.011	0.772	-1.695	2.282
Model	**Variable**	**Contrast**	***b***	***b_y***	***SE HC3***	***Robust p***	***LL***	***UL***
Depression	(Intercept)		7.636		1.386	<0.001	4.912	10.36
($F(15, 381) = 9.57$, $p < .001$, $R^2 = 0.275$)	Age		-0.051	-0.008	0.022	0.022	-0.095	-0.007
	Sex Male		-0.570	-0.09	0.572	0.320	-1.694	0.555
	Diagnoses		5.842	0.921	0.664	<0.001	4.537	7.148
	Weekly meditation		-0.116	-0.018	0.063	0.064	-0.24	0.007
	Lifetime meditation		-0.104	0.016	0.121	0.389	-0.341	0.133
	Psychedelic	Substance use vs. No use	0.605	0.095	0.947	0.524	-1.258	2.467
	Psychedelic	Combined use vs. No use	0.062	0.01	1.012	0.950	-1.904	2.029
	Psychedelic	Combined use vs. Substance use	-0.542	-0.086	1.177	0.645	-2.857	1.772
	Cannabis	Substance use vs. No use	-0.376	-0.059	0.856	0.661	-2.058	1.307
	Cannabis	Combined use vs. No use	-0.330	-0.052	0.819	0.687	-1.941	1.281
	Cannabis	Combined use vs. Substance use	0.046	0.007	0.909	0.960	-1.741	1.833
	Alcohol	Substance use vs. No use	0.570	0.09	0.865	0.511	-1.131	2.270
	Alcohol	Combined use vs. No use	-0.254	-0.04	0.957	0.791	-2.135	1.627
	Alcohol	Combined use vs. Substance use	-0.823	-0.13	0.73	0.260	-2.259	0.612
	Nicotine	Substance use vs. No use	0.172	0.027	0.837	0.837	-1.473	1.818
	Nicotine	Combined use vs. No use	0.988	0.156	0.845	0.243	-0.674	2.650

Table 13 (continued)

Model	Variable	Contrast	b	b_y	SE HC3	Robust *p*	95% LL	95% UL
	Nicotine	Combined use vs. Substance use	0.816	0.129	0.875	0.352	-0.904	2.535
	Other drugs	Substance use vs. No use	1.237	0.195	0.886	0.164	-0.506	2.98
	Other drugs	Combined use vs. No use	2.128	0.335	1.209	0.079	-0.25	4.505
	Other drugs	Combined use vs. Substance use	0.891	0.14	1.262	0.481	-1.591	3.372
Model	**Variable**	**Contrast**	***b***	***b*** $_y$	***SE HC3***	***Robust p***	***LL***	***UL***
Psychological flexibility	(Intercept)		4.137		0.211	<0.001	3.723	4.552
($F(15, 381) = 4.57$, $p < .001$, $R^2 = 0.162$)	Age		-0.004	-0.004	0.004	0.293	-0.011	0.003
	Sex Male		-0.191	-0.214	0.087	0.029	-0.362	-0.019
	Diagnoses		-0.198	-0.222	0.099	0.046	-0.392	-0.004
	Weekly meditation		0.010	0.011	0.009	0.282	-0.008	0.027
	Lifetime meditation		0.074	0.083	0.019	<0.001	0.036	0.111
	Psychedelic	Substance use vs. No use	-0.108	-0.121	0.127	0.395	-0.357	0.141
	Psychedelic	Combined use vs. No use	0.096	0.108	0.162	0.554	-0.223	0.415
	Psychedelic	Combined use vs. Substance use	0.204	0.229	0.159	0.201	-0.109	0.517
	Cannabis	Substance use vs. No use	0.076	0.085	0.118	0.522	-0.156	0.307
	Cannabis	Combined use vs. No use	0.154	0.173	0.119	0.198	-0.081	0.389
	Cannabis	Combined use vs. Substance use	0.078	0.088	0.131	0.549	-0.179	0.336
	Alcohol	Substance use vs. No use	-0.207	-0.233	0.155	0.183	-0.513	0.098
	Alcohol	Combined use vs. No use	0.110	0.124	0.156	0.479	-0.196	0.416
	Alcohol	Combined use vs. Substance use	0.317	0.357	0.107	0.003	0.107	0.528
	Nicotine	Substance use vs. No use	0.156	0.175	0.113	0.168	-0.066	0.378
	Nicotine	Combined use vs. No use	0.068	0.076	0.129	0.598	-0.185	0.321
	Nicotine	Combined use vs. Substance use	-0.088	-0.099	0.127	0.489	-0.338	0.162
	Other drugs	Substance use vs. No use	-0.429	-0.482	0.139	0.002	-0.702	-0.155
	Other drugs	Combined use vs. No use	-0.103	-0.116	0.173	0.551	-0.443	0.237
	Other drugs	Combined use vs. Substance use	0.325	0.366	0.18	0.072	-0.029	0.680
Model	**Variable**	**Contrast**	***b***	***b*** $_y$	***SE HC3***	***Robust p***	***LL***	***UL***
Peace of mind	(Intercept)		3.28		0.214	<0.001	2.859	3.702
($F(15, 381) = 6.02$, $p < .001$, $R^2 = 0.199$)	Age		0.005	0.005	0.004	0.188	-0.002	0.012
	Sex Male		-0.164	-0.173	0.095	0.084	-0.351	0.022
	Diagnoses		-0.617	-0.652	0.101	<0.001	-0.814	-0.42
	Weekly meditation		0.022	0.023	0.011	0.051	0.000	0.044
	Lifetime meditation		0.048	0.051	0.020	0.018	0.008	0.088
	Psychedelic	Substance use vs. No use	-0.121	-0.128	0.142	0.395	-0.401	0.158
	Psychedelic	Combined use vs. No use	-0.030	-0.032	0.155	0.845	-0.336	0.275
	Psychedelic	Combined use vs. Substance use	0.090	0.095	0.169	0.594	-0.242	0.423
	Cannabis	Substance use vs. No use	0.116	0.123	0.133	0.383	-0.145	0.377
	Cannabis	Combined use vs. No use	0.113	0.119	0.122	0.357	-0.127	0.352
	Cannabis	Combined use vs. Substance use	-0.003	-0.004	0.140	0.981	-0.279	0.272

Table 13 (continued)

Model	Variable	Contrast	b	b_y	SE HC3	Robust *p*	95% LL	95% UL
	Alcohol	Substance use vs. No use	-0.237	-0.251	0.150	0.115	-0.533	0.058
	Alcohol	Combined use vs. No use	0.101	0.107	0.153	0.510	-0.201	0.402
	Alcohol	Combined use vs. Substance use	0.338	0.358	0.117	0.004	0.109	0.568
	Nicotine	Substance use vs. No use	0.092	0.097	0.122	0.449	-0.147	0.332
	Nicotine	Combined use vs. No use	0.032	0.034	0.131	0.805	-0.225	0.289
	Nicotine	Combined use vs. Substance use	-0.060	-0.063	0.132	0.649	-0.319	0.199
	Other drugs	Substance use vs. No use	-0.402	-0.424	0.137	0.004	-0.671	-0.132
	Other drugs	Combined use vs. No use	-0.168	-0.178	0.173	0.331	-0.509	0.172
	Other drugs	Combined use vs. Substance use	0.233	0.246	0.173	0.177	-0.106	0.572
Model	**Variable**	**Contrast**	***b***	***b*** $_y$	***SE HC3***	***Robust p***	***LL***	***UL***
Mental well-being	(Intercept)		3.749		0.193	<0.001	3.370	4.127
($F(15, 381) = 4.46$, $p < .001$, $R^2 = 0.149$)	Age		0.001	0.001	0.003	0.865	-0.006	0.007
	Sex Male		-0.123	-0.155	0.078	0.118	-0.277	0.031
	Diagnoses		-0.378	-0.477	0.09	<0.001	-0.554	-0.202
	Weekly meditation		0.020	0.025	0.01	0.055	0.000	0.040
	Lifetime meditation		0.020	0.026	0.017	0.216	-0.012	0.053
	Psychedelic	Substance use vs. No use	-0.076	-0.096	0.124	0.541	-0.321	0.169
	Psychedelic	Combined use vs. No use	-0.032	-0.04	0.134	0.813	-0.296	0.232
	Psychedelic	Combined use vs. Substance use	0.044	0.056	0.142	0.755	-0.235	0.323
	Cannabis	Substance use vs. No use	0.063	0.079	0.116	0.588	-0.165	0.290
	Cannabis	Combined use vs. No use	0.101	0.128	0.107	0.346	-0.11	0.312
	Cannabis	Combined use vs. Substance use	0.038	0.049	0.122	0.753	-0.201	0.278
	Alcohol	Substance use vs. No use	-0.201	-0.252	0.130	0.125	-0.455	0.055
	Alcohol	Combined use vs. No use	0.076	0.095	0.139	0.586	-0.197	0.348
	Alcohol	Combined use vs. Substance use	0.275	0.347	0.103	0.008	0.073	0.478
	Nicotine	Substance use vs. No use	0.048	0.061	0.106	0.649	-0.16	0.257
	Nicotine	Combined use vs. No use	-0.039	-0.049	0.109	0.725	-0.253	0.176
	Nicotine	Combined use vs. Substance use	-0.087	-0.11	0.112	0.440	-0.308	0.134
	Other drugs	Substance use vs. No use	-0.330	-0.417	0.116	0.005	-0.558	-0.103
	Other drugs	Combined use vs. No use	-0.039	-0.049	0.160	0.808	-0.352	0.275
	Other drugs	Combined use vs. Substance use	0.292	0.368	0.158	0.065	-0.019	0.602

Note. Combined use = substance use with meditation, Substance use = substance use without meditation, No use = No substance-use. b_y denotes the outcome-standardized coefficient, obtained by standardizing each outcome variable while retaining independent variables in their original units. Thus, coefficients are expressed in standard-deviation units of the outcome; for categorical independent variables, a value of 0.35 indicates an adjusted group difference of 0.35 SD in the outcome, whereas for continuous independent variables it indicates the change in outcome SDs associated with a one-unit increase in the independent variable. Each substance is represented by a single three-level variable. The three rows are the three possible contrasts among its levels and are not independent variables

use was associated with higher psychological flexibility relative to both no cannabis use and cannabis use without meditation, while combined psychedelic use showed a borderline association with higher psychological flexibility relative to psychedelic use without meditation. For depression, combined other-drug use and combined nicotine use were each associated with higher depressive symptoms relative to no use of the respective substance. Each of the associations that reached significance only in these models was in the same direction in the final models, where it was smaller or less precisely estimated. No association changed sign across the two specifications. No substance contrasts emerged for anxiety. For full results see (Supplementary Table S3).

The second set of sensitivity analyses, omitting one meditation measure at a time while retaining all five substance factors, showed some changes from the final models. When lifetime meditation was omitted, weekly meditation became significantly associated with all five outcomes, with lower anxiety and depression and higher psychological flexibility, mental well-being, and peace of mind. Several of these associations had been close to statistical significance in the final models. When weekly meditation was omitted, lifetime meditation remained significantly associated with higher psychological flexibility and peace of mind and also became significantly associated with higher mental well-being; its associations with anxiety and depression remained non-significant. The direction of all meditation coefficients was unchanged across the final and sensitivity models. Full results are provided in (Supplementary Table S4).

Post Hoc regressions on psychological flexibility processes

Post hoc regressions decomposing the psychological flexibility composite into its six constituent processes suggested that the observed associations were not attributable to any single process but were instead broadly distributed across the subprocesses. Lifetime meditation practice was positively associated with all six processes (bs = 0.06 to 0.10, ps ≤ 0.017). Other drug use without meditation, relative to no use, was negatively associated with awareness (b= -0.57, p<.001), b= -0.57, p<.001), self-as-context (b= -0.40, p = .038), values (b = -0.66, p < .001), and committed action (b =-0.51, p = .004). In contrast, alcohol use combined with meditation, relative to alcohol use without meditation, was positively associated with awareness (b=0.44, p < .001), self-as-context (b=0.31, p = .038), defusion (b=0.40, p = .008), values (b=0.35, p = .013), and committed action (b=0.36, p = .013). Covariate associations were more process-specific: male sex was associated with lower awareness (b = -0.29, p = .006), psychiatric diagnosis with lower self-as-context (b = -0.28, p = .031), defusion (b = -0.29, p = .037), and values (b = -0.30, p = .021), and weekly meditation experience with higher self-as-context (b=0.02, p = .026). For full regression coefficients, see (Supplementary Table S5).

Discussion

Prior research has focused primarily on classic psychedelics when examining the combination of meditation with psychoactive substances, implicitly positioning psychedelics as somewhat exceptional in relation to contemplative practice. The present findings offer a more nuanced picture on two fronts. First, meditation was combined with a wide range of psychoactive substances, not only psychedelics, and participants also endorsed a wide range of meditation practices. Second, we found no evidence that psychedelic–meditation combinations were associated with better well-being, although meditation appeared to mitigate risk associated with the use of other drugs. Taken together, these findings suggest that accounts of psychedelic exceptionalism may warrant some caution, as they may overstate both the specificity of this combination and its psychological benefits. However, these patterns may also partly reflect methodological and selection-related factors, as discussed below.

Combining meditation with psychoactive substances: a broader phenomenon than assumed

The most striking descriptive finding was that meditation was combined with alcohol, nicotine, and cannabis far more commonly than with classic psychedelics. This suggests that the phenomenon of combining substances with meditation is not primarily driven by the specific pharmacology of psychedelics (e.g., their serotonergic mechanisms, capacity for mystical experience, or neuroplastic effects) but by something more general, most plausibly the availability and social acceptability of different substances. One interpretation is that combined use reflects a broader psychonautic orientation: a general disposition toward deliberately modifying one's own consciousness, pursued through multiple routes. A more parsimonious interpretation is that much of the combined use may be incidental. Even though we explicitly asked the participants whether they had combined formal meditation with any of the substances assessed, someone who drinks socially and meditates regularly might appear as a "combined user" simply by engaging in both practices simultaneously, but not intentionally. This distinction between intentional and incidental combinations is arguably crucial, yet it cannot be resolved with the current data (Pepping et al. 2016; Haijen et al. 2018; Neitzke-Spruill and Glasser 2018; Reddy and Roy 2019; Russ et al. 2019; Pallavicini et al. 2021; Jiwani et al. 2022; Laird et al. 2026). Future research should directly assess whether participants

intentionally combined meditation with a given substance or whether the co-occurrence was coincidental.

The polysubstance pattern further underlines the problem of treating psychedelics in isolation. Psychedelic users in the present naturalistic sample were embedded within broader substance use repertoires, and there were few "pure" psychedelic users. This pattern is consistent with emerging evidence from other survey and latent class analysis studies showing that psychedelic or hallucinogen use often occurs as part of broader polydrug profiles rather than as an isolated exposure (Quek et al. 2013; De Jonge et al. 2022; Bălăeț et al. 2023; Lake and Lucas 2025; Meacham et al. 2025; Bălăeţ et al. 2025) and has a direct methodological implication: associations attributed to psychedelic use in naturalistic research may partly reflect shared variance with broader substance engagement rather than anything specific to psychedelics. Similarly, positive correlations between substance use variables and both weekly and lifetime meditation frequency suggest that these practices are intertwined not only through deliberate simultaneous combination but at the level of general lifestyle. People who use more substances also tend to meditate more, and vice versa (Osto 2016; Simonsson and Goldberg 2022; Simonsson et al. 2023a, 2025a; Azmoodeh et al. 2023; Jiwani et al. 2024; Krabbe et al. 2026). Whether this reflects a psychonautic orientation, openness to non-ordinary experiences or simply that these behaviours occur more likely within certain demographic and cultural groups remains an open question, but it underscores the importance of studying substance use and meditation within broader behavioural repertoires rather than isolating any single substance or practice.

No consistent advantage of psychedelic or cannabis combined use

Neither psychedelic use, cannabis use, nor their combination with meditation showed consistent associations with well-being or ill-being across the two studies. This overall pattern contrasts with controlled experimental studies reporting beneficial effects when psychedelics are combined with meditation under supervised conditions (Griffiths et al. 2018; Smigielski et al. 2019; Singer et al. 2024; Meling et al. 2024). But this contrast is not surprising given that those studies involved highly structured intentional settings that are unlikely to reflect the typical experiences of average naturalistic users. The null result also contrasts with some naturalistic studies. Krabbe et al. (2026) reported a synergistic association between meditation and psychedelic use in relation to mental well-being, and Simonsson et al. (2024) found that loving-kindness or compassion meditation may buffer against certain challenging psychedelic experiences. However, Krabbe et al. used cross-sectional samples based on personally meaningful experiences, and recruited some of the sample through social media, meditation and psychedelic societies, which may overrepresent individuals with positive prior experiences and strong expectancies, potentially inflating apparent benefits (Haijen et al. 2018; Van Elk and Fried 2023; Noorani et al. 2023). The present study did not specifically aim to recruit through psychedelic- or meditation-oriented platforms, which may partly account for the contrasting findings and may offer a more ecologically valid picture of naturalistic substance use in the broader population.

The substance-specific sensitivity analyses added some nuance to this overall pattern. Participants who combined cannabis use with meditation showed higher psychological flexibility than both those who did not use cannabis and those who used cannabis without meditation, while participants who combined psychedelic use with meditation showed a borderline association with higher psychological flexibility relative to psychedelic users who did not combine use with meditation. These associations were not evident in the primary models, indicating that the findings were sensitive to adjustment for other substance use. As they were also limited to psychological flexibility, they should be interpreted cautiously.

Other-drug use without meditation and poorer well-being

What did emerge consistently was a pattern with clearer implications. Relative to no use, the use of other-drugs without meditation was associated with poorer well-being outcomes (i.e., lower psychological flexibility, mental well-being, and peace of mind), whereas use of other-drugs combined with meditation was not associated with these same outcomes. The substance-specific sensitivity analyses strengthened this pattern, as participants who combined other-drug use with meditation also scored higher on these outcomes than those who used other drugs without meditation. This pattern is consistent with population-based evidence linking controlled substance use to lower life satisfaction, even after accounting for alcohol consumption (Maccagnan et al. 2020; Kang 2023), and suggests that meditation may play a protective role for some outcomes. However, the sensitivity analyses also showed that other-drug use combined with meditation and nicotine use combined with meditation were associated with higher depressive symptoms relative to no use of the respective substance, indicating that combining substance use with meditation was not uniformly associated with better psychological functioning. In Study 1, nicotine use without meditation was also associated with lower happiness, which is broadly consistent with evidence linking cigarette smoking to greater depression and anxiety, and with findings that smoking cessation is associated with

improvements in mental health (Fluharty et al. 2017; Taylor et al. 2021; Wu et al. 2023). However, this association was not replicated consistently across studies or outcomes.

Several explanations may account for these differing patterns. One possibility is that simultaneously combining meditation with substance use may support self-regulation, acceptance, and present-moment awareness in ways that buffer against the psychological costs of substance use (Priddy et al. 2018; Garland and Howard 2018; Garland and Fredrickson 2019; Garland 2021). Alternatively, individuals with greater psychological resources may be both more capable of sustaining meditation practice and better equipped to use substances without adverse psychological consequences. The opposite direction is also plausible. Individuals experiencing poorer psychological functioning may be more likely to use substances as a means of coping or self-medication and may also engage in meditation in an effort to manage distress. This could partly account for the higher depressive symptoms observed in some substance-use-with-meditation groups in the sensitivity analyses, rather than indicating that combining the behaviours itself contributes to depression. Given the cross-sectional design, these explanations cannot be distinguished in the present data and require testing in future longitudinal or experimental studies.

A further caveat is that the other-drugs composite comprised a heterogeneous mix of substances with varied pharmacological and legal profiles (i.e., ketamine, MDMA, stimulants, opioids, and benzodiazepines). The composition analyses indicated substantial overlap between these substance classes rather than dominance by any single substance. The composite should therefore be interpreted as an indicator of broader other-drug or polysubstance involvement rather than as an effect attributable to any specific substance or pharmacological class.

Alcohol use combined with meditation: selection, experience, and risk

Alcohol produced one of the most distinctive and consistent patterns. In Study 2, combining alcohol with meditation was associated with greater psychological flexibility, mental well-being, and peace of mind than alcohol use without meditation, and these associations were closely replicated in the substance-specific sensitivity analyses. However, combining alcohol with meditation did not differ from no alcohol use on these outcomes, and in Study 1 the combined-use versus no-use association with happiness was attenuated and no longer statistically significant in the substance-specific sensitivity analysis.

At face value, this pattern could suggest that combining alcohol with meditation is associated with more favourable well-being than alcohol use alone. A more parsimonious explanation is again selection: people who drink moderately enough to also maintain a meditation practice are likely to represent a distinct subset of alcohol users, namely those whose drinking is compatible with psychological stability and self-regulation, thereby excluding heavier or more dysregulated use. The apparent advantage of combined users may therefore reflect moderation and better overall functioning rather than any beneficial interaction between alcohol and meditation.

The pattern may also reflect methodological aspects. Alcohol-related contrasts were estimated more precisely than those for rarer substances, particularly psychedelics, because both alcohol use and alcohol combined use were relatively common in the sample. This difference is also reflected in the wider confidence intervals for the psychedelic contrasts (see Tables 6 and 13). However, differences in prevalence and precision are unlikely to fully explain the pattern, as sensitivity power analyses indicated adequate power to detect small unique effects, and cannabis combined use was similarly prevalent yet not consistently significant.

Beyond selection and methodological factors, an experiential account is also plausible. Meditation may change the subjective experience of alcohol in ways that enhance positive affect or enjoyment. For example, mindfulness may heighten attention to ongoing sensory experience and thereby amplify perceived reward value and positive affect (Garland and Fredrickson 2019). Consistent with this possibility, neuroimaging evidence suggests that even brief mindfulness practice can increase responsivity to natural rewards (Froeliger et al. 2017) and recent experimental work indicates that mindfulness can increase alcohol enjoyment without increasing consumption (Ma et al. 2026).

These findings should not be interpreted as suggesting that alcohol use is safe or health-promoting. Alcohol is classified as a Group 1 carcinogen by the International Agency for Research on Cancer, the same highest-risk category as tobacco smoke and asbestos, and WHO guidance emphasizes that no level of alcohol consumption is safe from a health perspective (Anderson et al. 2023; WHO 2024). More generally, combined use should not be assumed to be inherently protective. If meditation or mindfulness heightens attention to ongoing sensory and affective experience, it may in some contexts amplify the subjective reward value of a substance without necessarily strengthening reflective or health-protective responses to craving (Lindsay and Creswell 2017; Garland and Fredrickson 2019; Garland 2021). Combined use may therefore not always buffer against substance-related risks and may even reinforce approach tendencies toward the substance (Ma et al. 2026). In addition, combined use may reflect compensatory health beliefs or self-licensing for some individuals. Although these

mechanisms have not, to our knowledge, been examined directly in relation to meditation and substance use, prior work on compensatory beliefs and moral self-licensing suggests that individuals may sometimes interpret one positively valued behaviour as offsetting or permitting another, potentially conflicting behaviour (Rabia et al. 2006; Merritt et al. 2010). Applied to the present context, meditation could therefore be construed either as offsetting the harms of substance use or as a health-promoting practice that makes indulgence feel more permissible. This may be especially plausible when meditation and substance use are treated as belonging to different behavioural domains, making the compensation seem less contradictory (Effron and Monin 2010; Prinsen et al. 2018). Such beliefs may reduce guilt, cognitive dissonance, or motivational conflict and thereby provide short-term psychological relief, without necessarily reducing substance-related risk (Zhao et al. 2021). However, because compensatory beliefs were not directly assessed, future studies should examine whether such beliefs help explain associations between meditation practice, substance use and well-being.

Meditation practice and well-being / ill-being outcomes

The meditation findings differed depending on whether weekly and lifetime practice were considered together or separately. In the final models, cumulative lifetime meditation was positively associated with psychological flexibility and peace of mind, whereas weekly meditation was not significantly associated with the outcomes. However, when lifetime meditation was omitted in the sensitivity analyses, greater weekly meditation practice was associated with lower anxiety and depression and with higher psychological flexibility, mental well-being, and peace of mind. When weekly meditation was omitted, lifetime meditation remained positively associated with psychological flexibility and peace of mind and was also associated with mental well-being. These findings suggest that some associations with weekly meditation are attenuated when cumulative lifetime experience is taken into account. At the same time, retaining both measures is conceptually important because they capture different aspects of meditation practice: weekly meditation reflects recent practice intensity during the past 12 months, whereas lifetime meditation reflects accumulated experience over a longer period. Someone may currently meditate frequently despite having relatively little lifetime experience, while someone with extensive lifetime experience may currently practise less often. The two measures therefore provide complementary information rather than interchangeable measures of the same exposure.

These findings are broadly consistent with previous research linking meditation practice with well-being and mental health. More frequent current meditation practice has been associated with greater well-being (Birtwell et al. 2019), while sustained or accumulated meditation practice has been associated with well-being and related outcomes (Smith et al. 2019; Bowles et al. 2022; Bowles and Van Dam 2025). The present findings therefore suggest that both recent practice intensity and cumulative lifetime experience may be relevant, although their associations depend partly on whether they are considered together or separately.

With regard to well-being and ill-being, most substance-use contrasts were not significantly associated with the outcomes examined. In the primary models of Study 2, the significant substance-use and meditation associations that did emerge were found for psychological flexibility, mental well-being, and peace of mind rather than depression or anxiety. Although the relevant contrasts differed across substances, they showed a similar underlying pattern. Combined alcohol use was associated with higher scores on all three outcomes relative to alcohol use without meditation, whereas other-drug use without meditation was associated with lower scores on all three outcomes relative to no other-drug use. Thus, in both cases, substance use without simultaneous meditation was the category associated with less favourable scores on these positively valenced outcomes. A related pattern was evident in Study 1 for nicotine and other-drug use, where use without meditation was associated with lower happiness relative to no use. Alcohol differed from this pattern: combined alcohol use was associated with higher happiness relative to no alcohol use in the primary model, although this association was attenuated and no longer statistically significant in the sensitivity analysis.

More generally, the pattern was less clear in the sensitivity analyses, in which some associations with depression and anxiety also emerged. The findings therefore do not indicate uniformly favourable associations with well-being, but they do highlight the value of assessing well-being alongside measures of psychological distress, as these may capture different aspects of mental health. This is consistent with frameworks emphasising that well-being is more than simply the absence of distress and that well-being and ill-being represent partially distinct dimensions (Sikka et al. 2018; Wood and Joseph 2010; Pellerin et al. 2022; VanderWeele et al. 2026).

The findings involving peace of mind are particularly noteworthy, as peace of mind remains a relatively underexamined outcome in studies of meditation, substance use, and their combination, despite its conceptual relevance to contemplative practice and, to some extent, psychedelic use (Liu et al. 2015; Pandya 2020; Azmoodeh et al. 2023; Krabbe et al. 2026).

Limitations and strengths

The cross-sectional design limits causal inference for the well-being associations. Directionality cannot be established, and residual confounding by unmeasured third variables, such as lifestyle and social factors, as well as selection effects, may have contributed to the observed patterns. For example, better psychological functioning may increase the likelihood of engaging in or sustaining meditation or combined substance-meditation use, whereas psychological difficulties may increase the likelihood of substance use or meditation as a means of coping. Self-report introduces further uncertainty, particularly for substance use frequency. In Study 2, psychiatric/neurological diagnosis was included as a covariate, but collapsing heterogeneous diagnoses into a single indicator to preserve statistical power may not fully capture diagnosis-specific variation. Given the number of contrasts examined without formal multiplicity correction, isolated statistically significant associations should also be interpreted cautiously, with greater weight placed on the magnitude, precision, and consistency of findings across outcomes. The sample was not geographically representative, and findings may be shaped by the cultural and legal contexts in which participants live.

The categorical coding of substance use represents an additional limitation. Collapsing substance-use and combined-use frequency into three-level categorical variables necessarily removed variation in frequency within each behavioural category and therefore did not distinguish occasional from frequent combined use. As a result, the analyses could not directly examine dose–response associations based on frequency of substance use or combined use (MacCallum et al. 2002), although this was necessary to address multicollinearity and to distinguish substance use with versus without simultaneous meditation (Field et al. 2012). This approach is also broadly consistent with observational substance use research using simplified exposure contrasts in large survey datasets (Krebs and Johansen 2013; Johansen and Krebs 2015).

Study 1 also relied on a single-item measure of subjective happiness, which does not permit estimation of internal consistency and provides less measurement precision than a multi-item measure. This limitation may have contributed to the relatively modest proportion of variance explained by the Study 1 model.

There are also two distinct limitations concerning the assessment of simultaneous substance-meditation use. First, although participants were explicitly asked how many times they had "simultaneously combined" formal meditation with each substance, and were instructed to report only substance use involving noticeable subjective effects, the survey did not define a precise temporal window for "simultaneously". Participants may therefore have interpreted this term somewhat differently and some reported instances may reflect meditation and substance use occurring close together rather than overlapping. Future research should specify the intended time window explicitly.

Second, the design could not distinguish intentional from incidental simultaneous use. Participants who both used a substance and meditated may have reported instances of simultaneous use even when the two activities were not deliberately combined. This distinction is important because intention and related contextual factors have been associated with outcomes in psychedelic research, while meditation scholars have argued that motives and intent shape the effects of practice (Pepping et al. 2016; Haijen et al. 2018; Neitzke-Spruill and Glasser 2018; Reddy and Roy 2019; Russ et al. 2019; Pallavicini et al. 2021; Jiwani et al. 2022; Laird et al. 2026). Future studies should therefore assess both the temporal relationship between substance use and meditation and whether their co-occurrence was intentional.

A notable strength in the present research is the recruitment approach. Study 1 advertised a general survey on meditation and substance use to a broad Prolific sample without mentioning psychedelics or implying expected benefits, thereby reducing the self-selection bias that has affected much psychedelic research (Payton et al. 2025). The comprehensive assessment of nine substance classes and their combinations, rather than psychedelics alone, is a further strength, enabling a broader characterization of the phenomenon without presupposing psychedelic exceptionalism. Study 2 added depth by using stratified sampling within the Study 1 participant pool, preserving the broader recruitment context while ensuring adequate representation of the behaviours of interest and enabling examination of a wider range of psychological outcomes.

Conclusion

Taken together, the findings suggest that combining meditation with psychoactive substances is a broader real-world phenomenon than the psychedelic-focused literature implies. Alcohol, nicotine, and cannabis were more commonly combined with meditation than psychedelics, and psychedelic use itself appeared embedded within broader polysubstance patterns rather than occurring in isolation. This may reflect a broader orientation toward consciousness modification rather than anything specific to psychedelics. The well-being findings showed no consistent associations between psychedelic or cannabis use, with or without simultaneous meditation, and the psychological outcomes examined. Instead, two different patterns emerged across multiple outcomes. First, other-drug use (apart from psychedelics and cannabis) without meditation was associated

with poorer well-being, whereas other-drug use combined with meditation was not. Second, alcohol combined use was associated with better well-being relative to alcohol use without meditation. These findings should not be interpreted as evidence of a beneficial interaction between meditation and substance use. Rather, individuals who combine substance use with meditation may differ systematically from those who use substances without meditation in ways that are also related to psychological well-being. Overall, the findings highlight the importance of studying meditation, substance use, and their combinations within broader behavioural repertoires rather than examining specific substance–meditation combinations in isolation. Future research should move beyond psychedelic-centric frameworks and examine these practices within broader naturalistic behavioural repertoires, distinguishing intentional from incidental combination and attending carefully to polysubstance use, concurrent meditation practice, and selection effects.

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Data availability The datasets generated and/or analysed during the current study, together with the surveys and codebooks used in the analyses, are available in the Open Science Framework repository: (https://osf.io/bv59z/overview.). The preregistrations for Study 1 and Study 2 are available in the Open Science Framework repository at (https://osf.io/486tg/overview) and (https://osf.io/68e4a/overview), respectively.

Declarations

Ethical considerations Studies 1 and 2 were conducted in accordance with the Declaration of Helsinki and adhered to the General Data Protection Regulation. Both studies were approved by the Ethics Board of the Departments of Psychology and Logopaedics at Åbo Akademi University, Finland, under decision number 10/2025, on April 7, 2025.

Consent to participate All participants in Studies 1 and 2 provided written informed consent to participate prior to.

Consent for publication All participants in Studies 1 and 2 were informed that anonymous research data would be.

Clinical trial number Not applicable.

Competing interests The authors declare no competing interests.

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