

Insights on psychedelics: A systematic review of therapeutic effects

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ABSTRACT

Background: Insight – a sudden change in understanding or perspective that feels true or reliable – is a common occurrence during psychedelic experiences, and often considered by clinicians and patients to be central to their therapeutic value. However, their occurrence and role has not been systematically assessed.

Objectives: We reviewed all peer-reviewed studies that published data on insight catalysed by a classic psychedelic at psychoactive levels to elucidate several aspects of psychedelic-catalysed insight, including its prevalence, relationship to dose, time-course, and relationship to therapeutic outcomes. Risk of bias was assessed regarding selection, reliability, causality, and transparency. PROSPERO registration: CRD42023405854

Findings: The final database and key bibliography searches were completed on July 13, 2024. We screened 741 abstracts and included 98 studies (40 survey, 58 interventional). Insight was positively correlated with psychedelic dose, and was significantly higher following psychedelics in 43 of 46 (93%) studies that presented a comparison to a placebo condition. Crucially, 25 of 29 studies (86%) found that insight was associated with therapeutic improvement, and this relationship was often stronger than mystical-type experience, which has received more research attention.

Interpretation: This review indicates that psychedelic-catalysed insight is associated with therapeutic improvement, suggesting its importance for clinical practice and for understanding the mechanisms of psychedelic therapy.

Limitations: Heterogeneous study designs and operationalisations of insight precluded a meta-analytic summary. Publication bias and selective reporting is possible, given insight was typically not a primary outcome of the included studies.

1. Introduction

High doses of classic psychedelics¹ produce many different acute subjective effects, which predict therapeutic benefit to varying degrees (Yaden et al., 2024). These include feelings of connectedness (Watts

et al., 2017), awe (Hendricks, 2018), emotional breakthrough (Roseman et al., 2019), ego-dissolution (Nour et al., 2016) and mystical-type experiences² (Griffiths et al., 2006). Similarly, many people, across a diversity of contexts – from indigenous cultural practices to clinical trials – commonly report gaining new knowledge or understandings from their

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¹ “Classic psychedelics” refer to the most commonly used compounds that produce substantially altered states of consciousness via agonism of 5-HT_{2A} receptors. The primary examples include psilocybin, LSD (lysergic acid diethylamide), mescaline, and DMT (N,N-dimethyltryptamine). The term “classic” is used to differentiate these substances from other types of psychoactive drugs, such as MDMA and ketamine, which are sometimes referred to as psychedelic due to the similarity of their acute effects, but differ from classic psychedelics in their pharmacological mechanisms of action, acute effects, or histories of use.

² “Mystical experience” is a term popularised by Williams James (1902)/(2008) that referred to a broad range of intense and extraordinary experiences associated with religious belief and practice, but that in psychedelic research has, through psychometric refinement of the Mystical Experience Questionnaire, come to be operationalised as feelings of unity, positive mood, ineffability, transcendence of time and space. Due to the association of this term with supernatural belief systems, there has been a recent movement to instead use the term “mystical-type experience” (Sanders and Zijlmans, 2021) or to capture the related narrower construct of ego-dissolution (Nour et al., 2016).

use of psychedelics. Modern psychedelic research tends to use the word *insight* to refer to this phenomenon, and specifically to acquisition of new understandings that are grasped suddenly and are accompanied by a feeling of certainty or confidence (we discuss formal definitions of *insight* below).

Recently, insight has been highlighted as a therapeutic mechanism of psychedelics and psychedelic-assisted therapies (Noorani et al., 2018; Watts et al., 2017). Several studies have found a correlation between acute ratings of psychedelic-catalysed insight and therapeutic benefits, including increased wellbeing (Peill et al., 2022) reduced depressive symptoms (Roseman et al., 2018), reduced anxiety and stress (Williams et al., 2021), and reduced problematic alcohol consumption (Garcia-Romeu et al., 2019) and substance use (Garcia-Romeu et al., 2020). For example, Carhart-Harris et al. (2018) found that Insightfulness scores on the 11D-ASC were correlated with reductions in depression scores five weeks later ($r = -.57$, $p = .01$), and that out of all self-report items administered, an item from the Insightfulness factor ("I felt particularly profound") was the most highly correlated with clinical benefit ($r = .581$, $p = .0005$; Roseman et al., 2018). Recently, several new measures have been developed to specifically assess aspects of psychedelic-catalysed insight (Davis, Barrett, So, et al., 2021; Peill et al., 2022; Wolff et al., 2022). Here we conduct the first systematic review of empirical findings relating to insight catalysed by therapeutic doses of psychedelics, including its prevalence, relationship to dose, time-course and relationship to therapeutic outcomes. By doing so, we aim to improve our understanding of the mechanisms underlying psychedelic-assisted therapy and thereby improve therapeutic interventions.

1.1. What is Insight?

Insight has been the subject of scientific study for over 100 years, and appears in various domains, including problem-solving and creativity research, psychotherapeutic research, contemplative science, and cognitive neuroscience (Tulver et al., 2023). In all these fields, insight is defined not just in the colloquial sense of an accurate and deep understanding, but as a particular type of cognitive process accompanied by a particular phenomenology. Some approaches have focused on phenomenological aspects, defining insight as the immediate certainty or confidence in the veridicality of a new understanding, exemplified by "aha", "Eureka" or "lightbulb" moments. Other approaches have focused on cognitive aspects, defining insight by the sudden restructuring of mental representations that permit a new interpretation or solution to emerge (Ohlsson, 1984, 1992; Wertheimer, 1959). While the relationship between the cognitive and affective aspects of insight remains a topic of ongoing study in problem-solving research (Wiley and Danek, 2024), cross-disciplinary studies suggest that the affective aspects of insights are less variable across contexts than the cognitive aspects (Tulver et al., 2023). As such, in this review, we focus on insight phenomenology, defining insight as the sudden emergence of a change in understanding or perspective accompanied by a feeling of clarity or certainty (Kounios and Beeman, 2014; Tulver et al., 2023; Webb et al., 2018).

Insight phenomenology is central to its definition and identification in all domains where insight is studied (Laukkonen et al., 2023; Tulver et al., 2023). In the problem-solving literature, where insight has been most rigorously studied, researchers have increasingly moved towards identifying insight on the basis of self-reported phenomenology, rather than the type of problem used to elicit it (i.e., insight occurs when a problem, identified *a priori* as requiring insight, is solved). Further, insight problem-solving research is increasingly capturing the different affective dimensions of the insight, rather than unidimensional global reports of whether an insight was experienced (Bowden et al., 2005; Danek et al., 2014; Shen et al., 2016; Webb et al., 2018). This literature shows that insight is typically accompanied by a sense of surprise, positive emotionality, and a sense that the insight was induced by subconscious processes, rather than resulting from effortful or intentional

cognition alone (Kounios and Beeman, 2014; Webb et al., 2018).

As we define it, insight is not just an improved understanding or a subjective component of correct problem-solving, but an important type of cognitive process. In the problem-solving literature, insight is generally considered to be a distinct cognitive process, and is contrasted with analytical, incremental, problem-solving processes (Metcalfe and Wiebe, 1987; Ohlsson, 2018). More generally, the feeling of insight has been proposed to act as a metacognitive heuristic, capturing attention and thereby aiding the selection of ideas or perspectives based on prior learning and context (Laukkonen et al., 2023). Insight may also lead a person to change which aspects of a problem or situation they find salient (sometimes described as seeing the problem through "new eyes"), and increase motivation for action (Danek and Wiley, 2017; Kounios and Beeman, 2014).

Insight, and related processes, appear in various domains of cognitive science. Insight is described both in (a) psychotherapeutic research, where distinct moments of insight are common, regardless of whether the theoretic approach of the therapist emphasises insight (Carey et al., 2007; Jennissen et al., 2018), and in (b) contemplative or meditative traditions, where it refers to the often sudden feeling of realisation of certain predefined teachings (Ireland, 2012; Tulver et al., 2023). Analogous processes are also described in learning (e.g., the notion of "conceptual change"; Mintzes and Quinn, 2007), flow states (Vervaeke et al., 2018), and cognitive development (e.g., Piaget's notion of accommodation; Piaget, 1951).

1.2. Insight and psychedelics

Insight is a regularly reported feature of psychedelic experiences. Insight is a common motivation for naturalistic psychedelic use (Johnstad, 2023; van Oorsouw et al., 2022), and people often credit the improvements in wellbeing or behaviour following psychedelic use to the insights they gain (Carhart-Harris and Nutt, 2010; Sandison, 1954). The affective aspects of insight, highlighted within the problem-solving literature, are often experienced intensely following the administration of psychedelics (Vervaeke et al., 2018; Yaden et al., 2017). People often report gaining new understanding (i.e., clarity) in a way that is felt to be directly perceived or received rather than intellectually worked out (i.e., sudden), and accompanied by such a sense of authority that the new understanding can be held with almost unshakable conviction (i.e., certainty). These aspects of acute psychedelic experience are sometimes referred to as the *noetic quality* (Cole-Turner, 2021; James, 1902/2008).

Reflecting the centrality of insight to psychedelic experience, all the most prominent scales used to assess psychedelic phenomenology include items referring to insight and related subjective elements (see Table 1 for example items), including the Altered States of Consciousness Rating Scales (all versions: APZ, OAV, 5D-ASC and 11D-ASC), Phenomenology of Consciousness Inventory, Hallucinogen Rating Scale, and Mystical Experience Questionnaires (MEQ43 and MEQ30). Additional measures have recently been developed to assess certain types of insight that are occasioned by psychedelics. The Psychological Insight Scale (PIS; Peill et al., 2022) and the Psychological Insight Questionnaire (PIQ; Davis et al., 2021) are both measures of "psychological insights" catalysed by psychedelic experiences. Similarly, the Acceptance/Avoidance-Promoting Experiences Questionnaire (Wolff et al., 2022) captures psychedelic-catalysed insights related to alterations in psychological flexibility.

insight vs clarity

1.3. The scope of this review

There is a need for a comprehensive and integrated review of research on psychedelic-catalysed insight for two main reasons. First, despite the high level of academic interest in psychedelic-catalysed insight, there has been no comprehensive review of the empirical research to date. Second, psychedelic research has increasingly focused on specific types of insights (e.g., "psychological insights" about one's

Table 1

Insight-related scales included in this review.

Scale name (Acronym)	Number of included studies	Number of insight-related items (Total items)	Insight-related factor	Sample item
11-Dimension Altered States of Consciousness Rating Scale (11D-ASC) ^a and 5-Dimension Altered States of Consciousness Rating Scale (5D-ASC) ^b	60	3 (42–94)	Yes (<i>Insightfulness</i>)	"I gained clarity into connections that puzzled me before".
Mystical Experience Questionnaire (MEQ43) ^c	11	6 (43)	Yes (<i>Noetic Quality</i>) ^d	"Gain of insightful knowledge experienced at an intuitive level".
Hood Mysticism Scale ^e	1	5 (32)	Yes (<i>Noetic Quality</i>)	"I have had an experience in which a new view of reality was revealed to me".
Psychological Insight Scale (PIS)	5	7 (7)	Yes - Total score	"I have had important new insights about how past events have influenced my current mental health and behaviour".
Psychological Insight Questionnaire (PIQ)	14	23 (23)	Yes - Total score and both subscales (<i>Avoidance and Maladaptive Patterns Insights</i> ; <i>Goals and Adaptive Patterns Insights</i>).	"Realized how current feelings or perceptions are related to events from my past".
Johns Hopkins University – Psychologically Insightful (JHU-PI)	15	1 (1)	Single-item	"How personally psychologically insightful was your experience?", rated from 1 to 8, with 1 = <i>no more than routine</i> , and 8 = <i>the single most psychologically insightful experience of my life</i> .
VAS – Insight	2	1 (1)	Single-item	"Insight" or "Emotional Insight", rated from 0 to 100.

Note. Item lists and descriptions of psychometric properties are included in the [Supplementary Information](#).

^a Derived from the 5-Dimension Altered States of Consciousness Rating Scale.

^b The 5D-ASC and its predecessors, the APZ and OAV, do not have an insight-related factor. However, some studies administer these measures but report the 11D-ASC factors. Studies were included only if the *Insightfulness* factor was reported.

^c Includes studies that administered the States of Consciousness Questionnaire (SOCQ), a 100-item scale that includes the MEQ43.

^d The experience of certain specific insights are also included in the *External Unity* factor.

^e Some studies extract a *Noetic Quality* factor, though this is not the most common factor structure. Studies were included only if the *Noetic Quality* factor was reported.

thoughts, emotions, and behaviours, but not "mystical insights" concerning metaphysical, supernatural or spiritual topics) or aspects of insight (e.g., only evaluations of insightfulness without capturing the accompanying affective aspects), rather than studying the phenomenon of insight as a whole (see [Tulver et al., 2023](#), for an exception). Consequently, research on psychedelic-catalysed insight risks being undermined by construct under-representation and the jingle-jangle fallacies. As such, we include in this review not only scales that explicitly measure insight, but also scales that measure defining aspects of insight experiences (such as the felt certainty that is central to *Noetic Quality* scales). We believe that studying insight as a type of cognitive process catalysed by psychedelics will bring greater coherence and clarity around the role of psychedelic-catalysed insight, facilitate cross-pollination between psychedelic research and the cognitive science of insight, and highlight important avenues for future research.

Given this rationale, this systematic review analyses empirical findings relating to insight catalysed by psychoactive doses of psychedelics (i.e., not microdoses), including its prevalence, relationship to dose, time-course and relationship to therapeutic outcomes. While not identified as a core research question in the protocol, this review also presents an exploratory comparison of insight and mystical-type experiences as predictors of therapeutic outcomes. Additionally, the limitations of the available evidence and directions for future research are discussed.

2. Methods

2.1. Transparency and openness

The study protocol was developed in accordance with the Systematic Reviews and Meta-Analyses guidelines (PRISMA; [Page et al., 2021](#)) and registered on the International Prospective Register of Systematic Reviews (<https://www.crd.york.ac.uk/prospero>; ID: CRD42023405854). All research materials and files associated with the data (search queries,

search validation set, imported databases searches, excluded studies at each screening stage, extracted data, data analysis scripts) are available at the Open Science Framework (https://osf.io/qzegk/?view_only=3446dfc43b1248368d30413dd4622879).

2.2. Search procedure

We aimed to identify all peer-reviewed studies that published data on insight catalysed by a classic psychedelic at psychoactive levels. Inclusion criteria were: 1) use of 'classic' or serotonergic psychedelics (LSD, psilocybin, DMT, ayahuasca, 5-MEO-DMT or mescaline); 2) doses above the microdose range (as defined by [Polito and Liknaitzky, 2022](#)) OR if the dose was not ascertained, doses where the effects were hallucinogenic and/or involved functional impairment; 3) reporting of primary quantitative data relating to insight-related constructs (including "insight", "insightfulness", "psychological insight", and "noetic quality"); 4) use of human subjects; and 5) peer reviewed publications, written in English. All study designs were eligible for inclusion, including randomised controlled trials, other interventional designs, observational studies and prospective or retrospective survey studies. No restrictions were placed on the date of publication.

Our search strategy was to identify papers that included a term in the title, abstract or keywords related to any classic psychedelic substance, plus a term anywhere in the article related to insight or instruments that capture psychedelic-catalysed insight. As additional psychometric instruments that measure psychedelic-catalysed insight were identified, the search was re-run with the name of the new instrument added to the search terms. The search terms at the start and the end of this iterative process, and the set of clearly eligible studies used to validate the search strategy, are included in the [Supplementary Information](#).

We identified seven instruments providing data on psychedelic-catalysed insight (Table 1). The psychometric properties and item content of the instruments are included in the [Supplementary Information](#). Some commonly used measures that contain insight-related items, such

as the Phenomenology of Consciousness Inventory (PCI) and Hallucination Rating Scale (HRS), were excluded as they do not have an insight-related factor, and hence, their total and factor scores do not provide information specifically about insight. Similarly, studies using the 5-Dimensional Altered States of Consciousness Rating Scale (5D-ASC), Hood Mysticism Scale, or Revised Mystical Experience Questionnaires (MEQ30), which do not typically have an insight-related factor, were only included if they published data for an alternative factor structure that included an insight-related factor (Insightfulness or Noetic Quality).

The final search was completed on 13th July 2024. The databases searched included MEDLINE, PsycINFO, Scopus, Embase and CINAHL. Additionally, we scanned key bibliographies for any additional eligible studies and searched the Altered States Database (ASDB; Schmidt and Berkemeyer, 2018), which contained data until 31st December 2023 (Devitt et al., 2024).

All screening rounds were conducted independently by two reviewers (JK, RL). Search results from the five databases, eligible studies from the ASDB, and manual bibliography searches were imported into Covidence (Covidence, 2021), where duplicates were removed, and titles and abstracts were screened for eligibility. Full text screening was conducted on the remaining studies. At each stage, the primary reviewer (JK) screened all articles and the secondary reviewer (RL) screened a random sample of 20 % of the same articles, in accordance with previously published recommendations (Nevis et al., 2015; Schlosser, 2007). Any disagreements during screening were resolved through discussion, and if consensus was not reached, a third reviewer (PL) arbitrated. If agreement was below a pre-specified threshold of 90 %, an additional random sample of 20 % of the set of articles was screened. The level of agreement between the two reviewers was 96 % at the title stage, and 88 % at full-text review stage. Consequently, a second 20 % sample of papers was reviewed, in which the inter-rater agreement was 100 %.

2.3. Data extraction

Data were extracted by the primary reviewer. Another team member reviewed 20 % of the included studies to confirm that data had been extracted accurately. Errors were detected in 0.3 % of extracted data points, falling below the threshold of 5 % that would have triggered the review of an additional random sample of 20 %. Authors were contacted if the relevant data was presented but interpretation was unclear, whereas authors were not contacted when insight data was not reported.

The extracted data included: study design, sample size and characteristics, drug and dose, insight-related scale scores, timing of administration of insight scale, data permitting the computation of a summary effect size between active vs. placebo conditions (where relevant), and measures of the relationship between insight scores and mental health outcomes. Where necessary, insight-related scores were converted to the conventional units for that scale (e.g., converting from a raw score to a proportion of scale maximum). Additionally, from studies that published correlations between mental health outcomes and both mystical-type experiences and psychedelic-catalysed insight, we extracted bivariate correlations between mental health outcomes and mystical-type experiences (or defining aspects of mystical-type experiences, such as ego-dissolution).

2.4. Synthesis

Given degree of expected heterogeneity in outcome measurements, treatment type, and trial design, a meta-analytic summary was not specified in the protocol. Instead, to inform the research question about the prevalence of psychedelic-catalysed insight, we used vote-counting based on whether insight scores were statistically significantly higher in the placebo or psychedelic condition (McKenzie and Brennan, 2019). For the research question about the relationship between insight and psychedelic dose, we calculated a correlation coefficient for each drug-measure combination, using data from all relevant conditions. By

including data at the condition level rather than the study level, studies reporting insight scores for multiple high dose conditions (e.g., dose-dependence studies) contribute multiple datapoints. We graphically present only the drug-measure combinations with the most data (Fig. 2 and Fig. 2B). For the research question about the time-course of insight ratings, we graphically present the data for all studies which measured insight at more than one timepoint (Fig. 3). For the research question about the association between acute psychedelic-catalysed insight and mental health outcomes, we present a structured tabulation of results grouped by the type of outcome variable (Table 2) and study design (Table S3). For the exploratory research question comparing insight and mystical-type experiences as predictors of therapeutic outcomes, we used vote-counting to assess the relative strength of these relationships. Specifically, we compared the strength of association of insight and mystical-type experiences with therapeutic outcomes using two criteria: a) absolute values, irrespective of statistical significance, and b) statistically significant differences, based on Steiger z-tests for the equality of two dependent correlations (Steiger, 1980). Vote counting was conducted at both the outcome comparison and study levels. Studies containing comparisons of multiple therapeutic outcomes were classified as having “mixed” results if some outcomes demonstrated a stronger relationship with insight and others favoured mystical-type experiences.

2.5. Risk of bias

Given that the studies reviewed were highly heterogeneous, we used an adaptation of the risk assessment methodology developed by Polito and Liknaitzky (2022), based on Murad et al. (2018), rather than common Risk of Bias assessments such as the Cochrane Collaboration tool (Higgins et al., 2011). Studies were scored (low, medium, high risk) on ten domains, with precisely operationalised scoring guidelines for each domain (Table S5). After piloting, the Risk of Bias criteria in the pre-registered protocol were slightly amended to enhance the clarity and completeness of the rating criteria.

The Risk of Bias assessment was completed by the primary reviewer. The secondary reviewer assessed 20 % of the included studies to confirm that risk of bias criteria had been evaluated accurately. Any discrepancies were recorded and resolved via discussion. If agreement was below a pre-specified threshold of 90 %, an additional random sample of 20 % of the same articles were assessed for risk of bias. However, this was not triggered, as the level of agreement between the two reviewers was 93 %.

3. Results

3.1. Study selection and characteristics

The systematic database search strategy identified 2089 papers, with another 27 papers identified from other sources. After removing duplicates, 741 unique papers had their titles and abstracts screened for eligibility. Full text screening was conducted on the remaining articles ($n = 311$), leading to a final sample of 98 included papers (see Fig. 1).

An overview of the characteristics and findings of all studies, ordered by study methodology and year, are presented in the supplementary information (Table S2). Studies were organised in four categories based on their methodology: a) Retrospective survey studies, which involved on-line questionnaires that asked participants to report on prior psychedelic experience (26 studies); b) Prospective survey studies, which involved data collection before and after a psychedelic experience in a naturalistic setting (14 studies); c) Non-randomised studies of interventions, which investigated the effects of a psychedelic drug administered in a study design either without randomisation or a control condition (14 studies); and d) Randomised-controlled trials, which investigated the effects of a psychedelic drug administered with a study design involving both randomisation and a control condition (44 studies).

Sample sizes ranged widely, from 8 to 7785 participants. Survey studies had more participants (11–7785, $Mdn = 452$) than randomised

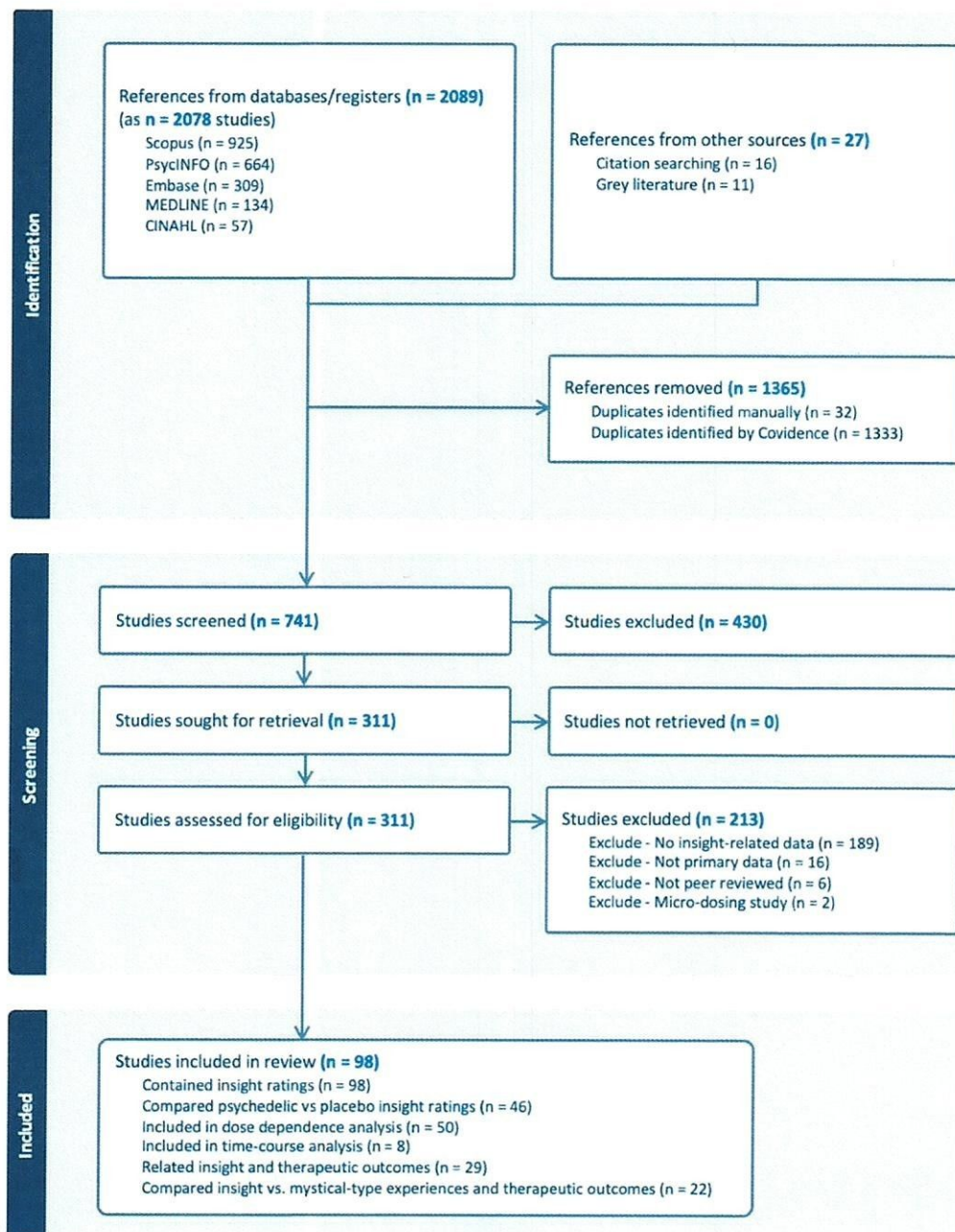


Fig. 1. PRISMA Flow Diagram.

controlled trials (15–60, Mdn = 24) or non-randomised studies of interventions (8–327, Mdn = 15). The majority of both interventional (84 %) and survey (90 %) studies used healthy, as opposed to clinical, populations. The most studied clinical population was depression (6 studies), followed by alcohol use disorder (2 studies), anxiety (1 study), body dysmorphic disorder (1 study), problematic substance use (1 study), and various treatment-resistant psychiatric conditions (1 study). Most survey studies explored multiple different psychedelics (24 studies, 60 %), while most interventional studies investigated only a single psychedelic drug, primarily psilocybin (32 studies, 56 %) or LSD (16 studies, 28 %).

3.2. Measures of insight

Within the 98 selected studies, 85 studies used standard measures of insight, while the remaining 13 studies used unconventional measures. Most commonly, insight was assessed through items included in broad, multidimensional measures of psychedelic experience. The 5D/11D-ASC was the most used instrument that included data on insight, with its Insightfulness subscale reported in 60 studies. Other popular measures of insight included the single-item JHU – Psychological Insight (JHU-PI) measure (15 studies), the Psychological Insight Questionnaire (PIQ; 14 studies) and the Noetic Quality subscale of the MEQ43 (11 studies).

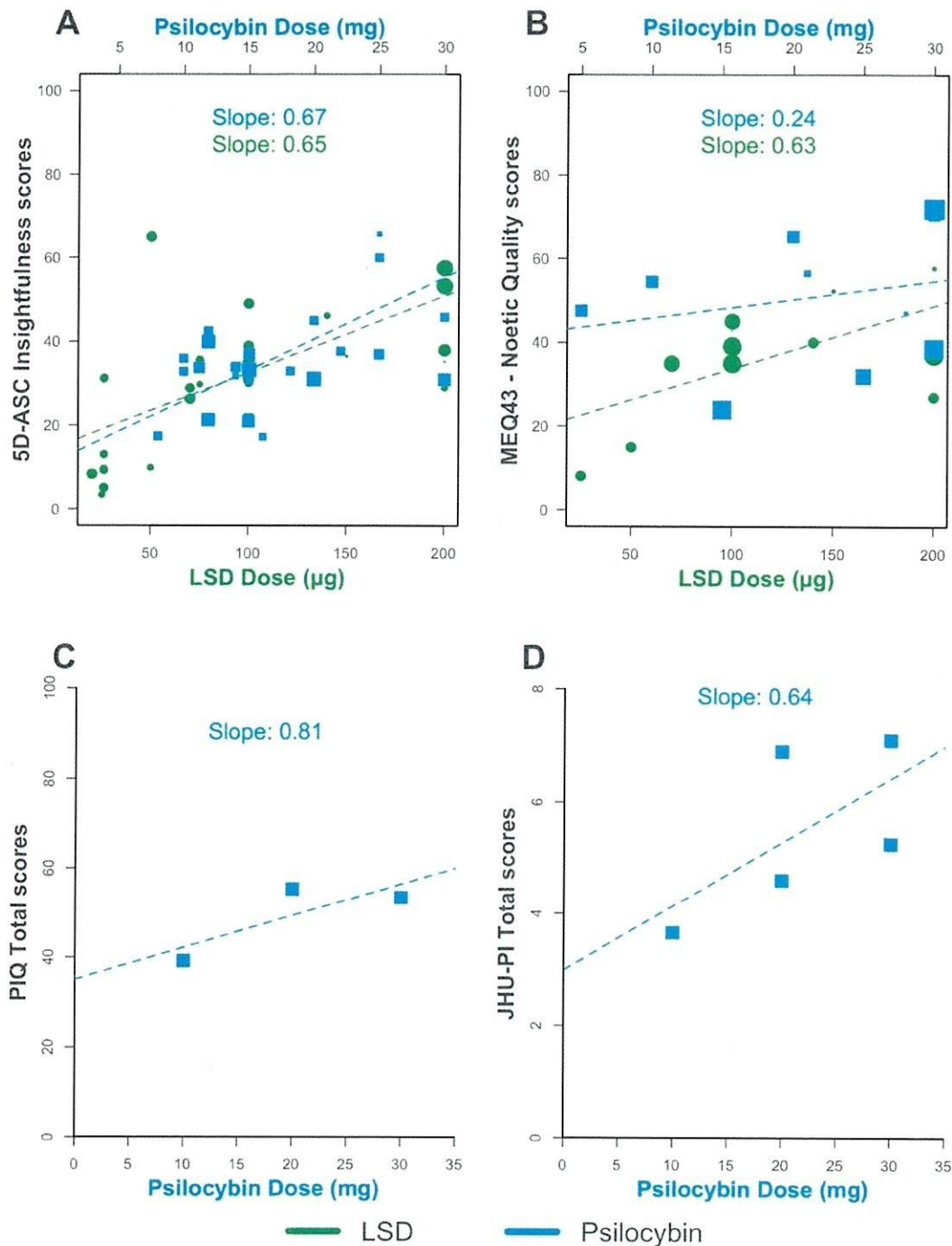


Fig. 2. Relationship Between Dose and the a) Insightfulness Factor of the 11-DASC, b) Noetic Quality Factor of the MEQ43, c) PIQ Total, and d) JHU-PI Score. *Note.* Lines of best fit are weighted by sample size.

3.3. The prevalence of insight

Across all study designs, psychedelic substances, and populations, psychedelic administration was consistently found to be associated with insight experiences. Of the 46 studies that presented a comparison between classic psychedelic (without pretreatment with Ketanserin or an SSRI) and placebo conditions, 43 studies (93.5 %) found insight was significantly higher in the psychedelic condition. The three studies that

did not find a significant difference between conditions used a 26 μg dose of LSD. While above the 25 μg threshold defining a “microdose” (Polito and Liknaitzky, 2022), and therefore included in this review, a 26 μg dose could arguably still be considered a “microdose”. The ubiquity of insight experiences is further supported by the largest study to assess insight immediately after a psychedelic experience (Peill et al., 2022), in which 99 % of the 886 participants indicated that they gained insight from their experience.

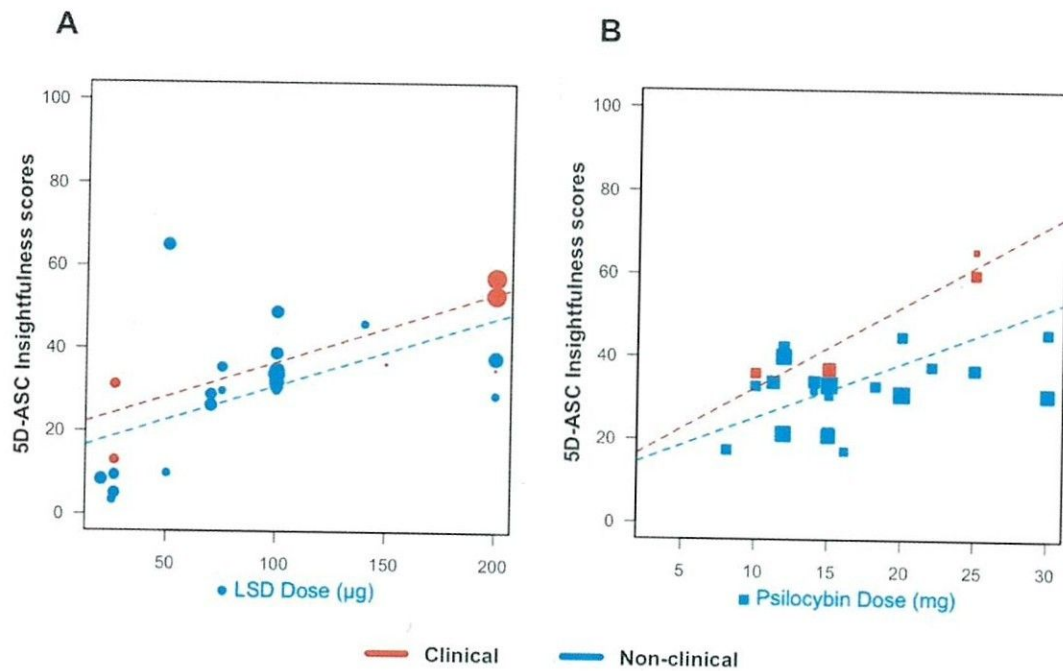


Fig. 2B. Dose-Insight Relationships in Clinical and Non-Clinical Populations. *Note.* Panel A contains 8 clinical datapoints from 3 studies and 21 non-clinical datapoints from 17 studies. Panel B contains 4 clinical datapoints from 3 studies and 28 non-clinical datapoints from 19 studies.

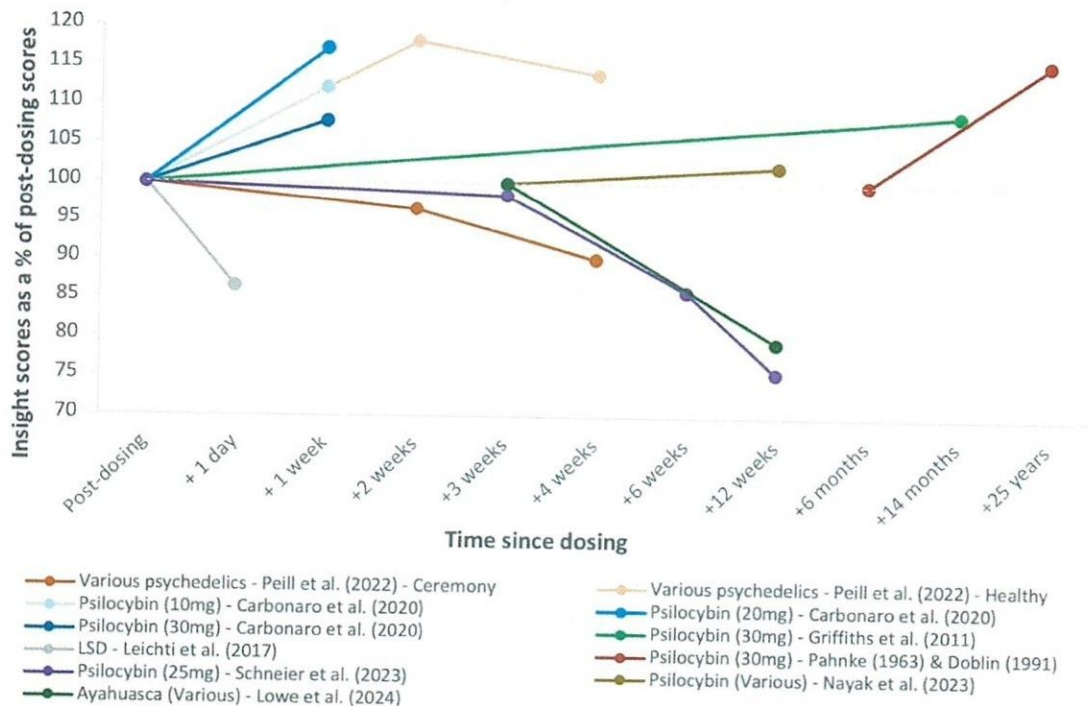


Fig. 3. Change in Insight Scores Over Time.

3.4. Insight and dose

To investigate the relationship between insight and psychedelic dose, we analysed the 50 studies that reported data on insight following a precise dose of a classic psychedelic without pre-treatment with another drug (such as an SSRI or Ketanserin). Insight scores were positively correlated with dose, across all drug-measure combinations tested

(Fig. 2). For psilocybin, the substance with the most data, there was a moderate to strong positive correlation ($r = .64$, 95 % CI [0.37, 0.81]) between dose and the Insightfulness factor of the 11D-ASC within RCTs. This is consistent with previous studies that found a similar within-study relationship. Insight scores for multiple psychoactive doses were reported by 13 included studies, of which 12 (92 %) observed that higher doses were associated with higher insight ratings. Additionally,

Hirschfeld and Schmidt (2021) analysed the studies listed in the Altered States Database (Schmidt and Berkemeyer, 2018) and found that higher doses were associated with higher scores on the Insightfulness factor of the 11D-ASC ($\beta = 0.112$, 95 % CI [0.002, 0.22], $t(2.2) = 4.0$, $p = .048$).

Although not pre-specified in the PROSPERO protocol, we conducted an exploratory analysis comparing insight scores between clinical and non-clinical populations. We fitted separate linear models for clinical and non-clinical populations on the drug-measure combinations with the most available data (Psilocybin-5/11D-ASC – Insightfulness: 4 groups from 3 studies and LSD5/11D-ASC – Insightfulness: 8 groups from 3 studies). These models were run at the condition level, meaning that studies reporting insight scores for multiple macrodose conditions (e.g., dose-dependence studies) contributed multiple datapoints. The regression lines for both LSD and psilocybin were higher for clinical

populations across the entire range of doses. For LSD studies, clinical populations had a higher intercept ($\beta_0 = 20.0$, $p = 0.10$) and slope ($\beta_1 = 0.167$, $p = 0.047$, $R^2 = 0.51$), than non-clinical populations ($\beta_0 = 14.6$, $p = 0.023$; $\beta_1 = 0.165$, $p = 0.014$, $R^2 = 0.28$). Similarly, for psilocybin studies, clinical populations had a higher intercept ($\beta_0 = 12.8$, $p = 0.26$) and slope ($\beta_1 = 1.97$, $p = 0.043$, $R^2 = 0.92$) than non-clinical populations ($\beta_0 = 12.0$, $p = 0.041$; $\beta_1 = 1.32$, $p < 0.001$, $R^2 = 0.40$). These findings suggest that clinical populations perceive psychedelic experiences as more insightful than non-clinical populations. While there are likely to be systematic factors contributing to this difference (such as greater psychotherapeutic support provided in clinical trials), this result is consistent with a number of studies that have directly compared these populations. Schmid et al. (2021) reported 11D-ASC Insightfulness scores for a group ($n = 11$) of patients suffering from anxiety associated

Table 2
Summary of insight associations by domain.

Authors (Year)	Outcome	Study type	Insight measures	Findings relating insight to outcome variables
Psychopathology Outcomes				
Carhart-Harris et al. (2018)	- Depression	Nonrandomised Study of an Intervention	5/11D-ASC ¹ - Insightfulness	Insightfulness predicted changes in Depression (QIDS-SR16 ²³) at 5 weeks ($r = -.57$, $p = .01$).
Garcia-Romeu et al. (2019)	- Alcohol Use Problems	Retrospective Survey Study	JHU-PI ³	Psychological Insight was associated with decreased Alcohol Use (AUDIT ⁴ ; $r = .13$, $p < .05$).
Uthaug et al. (2020)	- Depression	Prospective Survey Study	5/11D-ASC - Insightfulness	Insightfulness was correlated with reduced Depression scores after dosing (DASS21 ⁵ ; $r = -.605$, $p < .05$), but not at 7-day follow-up.
Garcia-Romeu et al. (2020)	- Drug Use Problems	Retrospective Survey Study	JHU-PI	Psychological Insight was associated with decreased Drug Use (DUDIT ⁶ ; $r = .18$, $p < .001$).
Davis et al., (2021)	- Psychological distress	Retrospective Survey Study	PIQ ⁷	Psychological Insight was associated with lower Psychological Distress (DASS21, $r = -.31$, $p < .001$).
Davis, Xin, et al. (2021)	- Trauma symptoms of discrimination	Retrospective Survey Study	PIQ	Psychological Insight was correlated with reductions in Trauma Symptoms (TSDS ⁸ ; $r = -.36$, $p < .001$).
Agin-Liebes et al. (2021)	***- Mental health symptom change	Retrospective Survey Study	PIQ, JHU-PI	Psychological insight (PIQ Total and JHU-PI) was higher in those whose Depression, Anxiety, PTSD, AUD ⁹ and SUD ¹⁰ scores improved ($p < .01$).
Williams et al. (2021)	- Psychological Distress	Retrospective Survey Study	PIQ	Greater Psychological Insight scores, together with greater Mystical-Type Experience (MEQ30 ¹¹) scores and lower Challenging Experience (CEQ ¹²) scores, predicted reduced Psychological Distress (DASS21, $R^2 = .52$, $p < .001$).
Sarris et al. (2021)	- Psychological Distress	Retrospective Survey Study	**Number of "15 commonly reported insights" endorsed.	The number of insights was associated ($r = -.071$, $p < .001$) with better mental health for the affective disorders sample (assessed K10 ¹⁴ Total score).
Uthaug et al. (2021)	Ø Psychological Distress	Randomised Controlled Trial	5/11D-ASC - Insightfulness	Neither Insightfulness nor Ego Dissolution Inventory scores were correlated with Psychological Distress (DASS21) change scores.
Davis et al. (2021) & Gukasyan et al. (2022)	- Depression	Randomised Controlled Trial	JHU-PI	Psychological insightful ($r = -.60$, $p < .01$), also personal meaning ($r = -.70$, $p < .01$) and spiritual significance ($r = -.57$, $p < .01$) predicted decreased Depression at 4-weeks.
Moreton et al. (2022)	- Obsessions and Compulsions	Retrospective Survey Study	PIQ	Psychological Insight predicted reductions in Obsessions And Compulsions (Y-BOCS ¹⁵ ; $r = .31$, $p < .01$; VOCI ¹⁶ , $r = .36$, $p < .01$).
Moreton et al. (2023)	- Negative affect	Retrospective Survey Study	PIQ	Psychological Insight predicted changes in negative affect (SPANE ¹⁷ ; $r = .37$, $p < .01$).
Fauvel et al. (2023)	- Psychological distress	Retrospective Survey Study	PIQ	Psychological Insight was associated with decreased Psychological Distress (DASS21, $r = .33$, $p < .10$).
Xin et al. (2023)	- Trauma symptoms - Anxiety Ø Depression	Prospective Survey Study	JHU-PI	Psychological Insight was associated with reduced Trauma Symptoms (PCL-5 ¹⁸ , $p < .01$). Psychological Insight was associated with reduced Anxiety (GAD-7 ¹⁹ , $p < .05$). Psychological Insight was not associated with changes in Depression (PHQ-2 ²⁰ , $p > .05$).
von Rotz et al. (2023)	- Depression	Randomised Controlled Trial	5/11D-ASC - Insightfulness	Insightfulness correlated with depression scores 14 days after the intervention, using the MADRS ²¹ ($r = -.46$, $p = .019$) and BDI ²² ($r = -.41$, $p = .040$). However, these correlations did not remain significant after Bonferroni-correction.
Jylkkä et al. (2024)	+ Anxiety	Retrospective Survey Study		The PIQ - Awareness of Maladaptive Patterns (AMP) subscale was associated with increased anxiety (GAD-7 ²³).
Jylkkä et al. (2024)	+ Depression	Retrospective Survey Study		The PIQ - Awareness of Maladaptive Patterns (AMP) subscale was associated with increased depression (PHQ-9 ²⁴).
Positive Mental Health Outcomes				
Uthaug et al. (2020)	+ Satisfaction with life	Prospective Survey Study	5/11D-ASC - Insightfulness	Insightfulness was correlated with higher Satisfaction With Life after dosing (SWL ²⁵ ; $r = -.614$, $p < .05$), but not at 7-day follow-up.
Davis, Barrett, So, et al. (2021)	+ Satisfaction with life	Retrospective Survey Study	PIQ	Psychological Insight was correlated with increased Satisfaction With Life (SWL, $r = .41$, $p < .001$).

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Table 2 (continued)

Authors (Year)	Outcome	Study type	Insight measures	Findings relating insight to outcome variables
Davis et al. (2021) & Gukasyan et al. (2022)	⊖ Wellbeing	Randomised Controlled Trial	JHU-PI	Psychological Insight was not correlated with changes in Wellbeing.
Peill et al. (2022)	+ Wellbeing	Prospective Survey Study	PIS	Psychological Insight was associated with increased Wellbeing (WEMWBS ²⁶) 2 weeks post-experience (Study 1: $r_s = .344$, $p < .001$, $n = 312$; Study 2: $r_s = .248$, $p < .001$, $n = 190$). This relationship was stronger within the low wellbeing subgroup (Study 1: $r_s = .506$, $p < .001$, $n = 120$; Study 2: $r_s = .515$, $p < .001$, $n = 69$).
Moreton et al. (2023)	+ Satisfaction with life	Retrospective Survey Study	PIQ	Psychological Insight predicted increased Satisfaction With Life (SWL, $r = .37$, $p < .01$).
Moreton et al. (2023)	+ Positive affect	Retrospective Survey Study	PIQ	Psychological Insight predicted increased Positive Affect (SPANE, $r = .37$, $p < .01$).
Xin et al. (2023)	+ Satisfaction with life	Prospective Survey Study	JHU-PI	Psychological Insight was associated with Life Satisfaction (SWL, $p < .001$).
Aicher et al. (2024)	+ Wellbeing	Randomised Controlled Trial	PIQ	Psychological Insight was associated ($p < .01$) with positive Persisting Effects scores (PEQ ²⁷).
Jylkkä et al. (2024)	+ Wellbeing	Retrospective Survey Study	PIQ	The PIQ - Awareness of Goals and Adaptive Patterns (GAP) subscale was associated with wellbeing (WEMWBS).
Kettner et al. (2024)	⊖ Wellbeing	Retrospective Survey Study	PIS	Psychological Insight was not correlated with changes in wellbeing (WEMWBS, $p > .05$).
Psychopathology-Related Processes				
Wießner et al. (2021)	+ Aberrant salience	Randomised Controlled Trial	5/11D-ASC - Insightfulness	Insightfulness was correlated with Aberrant Salience Inventory scores ($r = .65$, $p < .01$).
Barba et al. (2022)	- Thought suppression	Randomised Controlled Trial	PIS	In the psilocybin group, changes in Thought Suppression (WBSI ²⁸ , $r = -.56$, $p < .001$) correlated with Psychological Insight.
Barba et al. (2022)	- Experiential avoidance	Randomised Controlled Trial	PIS	In the psilocybin group, changes in Experiential Avoidance (BEAQ ²⁹ , $r = -.38$, $p = .037$) correlated with Psychological Insight.
Barba et al. (2022)	- Rumination	Randomised Controlled Trial	PIS	In the psilocybin group, changes in Rumination (RRS ³⁰ , $r = -.69$, $p < .001$) correlated with Psychological Insight.
Moreton et al. (2022)	- Obsessive beliefs	Retrospective Survey Study	PIQ	Psychological Insight predicted reductions in Obsessive Beliefs (OBQ ³¹ , $r = .35$, $p < .01$).
Moreton et al. (2022)	- Death anxiety	Retrospective Survey Study	PIQ	Psychological Insight predicted reductions in Death Anxiety (CLFD-R ³² , $r = .21$, $p < .01$).
Fauvel et al. (2023)	- Rumination	Retrospective Survey Study	PIQ	Psychological Insight was associated with decreased Rumination (RRS, $r = -.34$, $p < .10$).
Moreton et al. (2023)	⊖ Death anxiety	Retrospective Survey Study	PIQ	Insight did not predict reduced Death Anxiety (DAP-R ³³ , $r = -.06$, $p > .05$).
Moreton et al. (2024)	⊖ Death anxiety	Retrospective Survey Study	PIQ	Psychological Insight was not correlated with reduced fear of death (DAP-R, $r = .077$, $p > .05$).
Positive Mental Health-Related Outcomes				
Smigielski et al. (2019)	⊖ Positive life changes	Randomised Controlled Trial	Hood Mysticism Scale - Noetic Quality	Noetic Quality did not predict change in Life Changes Inventory - Revised scores, four months after the retreat.
Uthaug et al. (2020)	+ Mindfulness	Prospective Survey Study	5/11D-ASC - Insightfulness	Insightfulness was correlated with Non-Judgement after dosing (FFMQ ³⁴ , $r = .820$, $p < .05$) and at 7-day follow-up ($r = .839$, $p < .01$).
Davis et al. (2020)	+ Psychological flexibility	Retrospective Survey Study	PIQ	Psychological Insight was associated with Psychological Flexibility (AAQ-II ³⁵ , $r = .50$, $p < .001$).
Davis, Barrett, So, et al. (2021)	+ Psychological flexibility	Retrospective Survey Study	PIQ	Psychological Insight was correlated with increased Psychological Flexibility (AAQ-II; $r = .56$, $p < .001$).
Davis, Xin, et al. (2021)	+ Psychological flexibility	Retrospective Survey Study	PIQ	Psychological Insight was correlated with increased Psychological Flexibility (AAQ-II; $r = .36$, $p < .001$).
Uthaug et al. (2021)	⊖ Empathy	Randomised Controlled Trial	5/11D-ASC - Insightfulness	Neither Insightfulness nor Ego Dissolution Inventory scores were correlated with Emotional Empathy (to negative stimuli) change scores.
Mason et al. (2021)	+ Creativity	Randomised Controlled Trial	5/11D-ASC - Insightfulness	Insightfulness was correlated ($r = .296$, $p = .026$) with long-term changes in new ideas generated.
Simonsson et al. (2022)	+ **Changes in health behaviour	Retrospective Survey Study	PIQ	Psychological Insight was associated with improved health behaviour outcomes (overall, diet, exercise, alcohol but not tobacco).
C. Simonsson et al. (2023)	+ **Meditation frequency	Retrospective Survey Study	PIQ	Psychological Insight was correlated with frequency of meditation practice (mindfulness and metta).
Fauvel et al. (2023)	+ Self-compassion	Retrospective Survey Study	PIQ	Psychological Insight was associated with increased Self-Compassion (SCS-SF ³⁶ , $r = .35$, $p < .20$).
Xin et al. (2023)	+ Cognitive functioning + Psychological Flexibility	Prospective Survey Study	JHU-PI	Psychological Insight was associated with improved Cognitive Functioning (MOS-Cog ³⁷ , $p < .01$). Psychological Insight was associated with Psychological Flexibility (AAQ-II, $p < .01$).

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Table 2 (continued)

Authors (Year)	Outcome	Study type	Insight measures	Findings relating insight to outcome variables
Other Outcomes				
Leary et al. (1963)	+ Change in self/life	Nonrandomised Study of an Intervention	** "Did you learn a lot about yourself and the world?"	Responses to "Did you learn a lot about yourself and the world?" were correlated ($r = .58$) with responses to "Has the mushroom experience changed you and your life?".
O. Simonsson et al. (2023)	+ **Leadership impact	Retrospective Survey Study	PIQ	Psychological Insight during respondents' most intense psychedelic experience was associated with endorsements of a positive impact on leadership ($OR = 3.37; p < .001$).

Note. 0 indicates that no significant relationship was found. + indicates that a significant positive relationship was found. - indicates that a significant negative relationship was found. ** indicates that an author-constructed measure was used.

¹ 5/11Dimension Altered State of Consciousness Questionnaire.

² Quick Inventory of Depressive Symptomatology Self-Report.

³ Johns Hopkins University - Psychological Insight.

⁴ Alcohol Use Disorder Identification Test.

⁵ Depression Anxiety and Stress Scale-21.

⁶ Drug Use Disorders Identification Test.

⁷ Psychological Insight Questionnaire.

⁸ Trauma symptoms of discrimination scale.

⁹ Alcohol Use Disorder.

¹⁰ Substance Use Disorder.

¹¹ Mystical Experience Questionnaire 30.

¹² Challenging Experience Questionnaire.

¹³ Canonical Correlation Coefficient.

¹⁴ Kessler Psychological Distress Scale.

¹⁵ Yale Brown Obsessive-Compulsive Scale.

¹⁶ Vancouver Obsessive Compulsive Inventory.

¹⁷ Scale of Positive and Negative Experience.

¹⁸ PTSD Checklist for DSM-5.

¹⁹ General Anxiety Disorder-2.

²⁰ Patient Health Questionnaire-2.

²¹ Montgomery-Asberg Depression Rating Scale.

²² Beck Depression Inventory.

²³ General Anxiety Disorder-7.

²⁴ Patient Health Questionnaire-9.

²⁵ Satisfaction With Life Scale.

²⁶ Warwick-Edinburgh Mental Well-Being Scale.

²⁷ Persisting Effects Questionnaire.

²⁸ White Bear Suppression Inventory.

²⁹ Brief Experiential Avoidance Questionnaire.

³⁰ Rumination Response Scale.

³¹ Obsessive Beliefs Questionnaire - 20.

³² Collett-Lester Fear of Death Scale.

³³ Death Attitude Profile-Revised— Fear of Death Subscale.

³⁴ Five Facets Mindfulness Questionnaire - 39.

³⁵ Acceptance and Action Questionnaire-II.

³⁶ Self-Compassion Scale—Short Form.

³⁷ Medical Outcomes Study - Cognitive Functioning Subscale.

with life-threatening diseases, and a healthy comparator group ($n = 16$). The clinical group had more insightful experiences ($M = 47$, $SEM = 7.7$ vs. $M = 40$, $SEM = 6.8$) though the difference was not statistically significant. Similarly, in a randomised, double-blind study of low dose LSD, Molla et al. (2024) found higher 11D-ASC Insightfulness scores in the high BDI group (≥ 17 ; $n = 20$) relative to the low BDI group (< 17 ; $n = 19$; $F(1,37) = 5.9$, $p = 0.02$, $\eta_p^2 = 0.14$).

3.5. Time-course of insight ratings

There is little data on how people's evaluation of psychedelic-catalysed insight changes over time, as insight has generally been considered as an aspect of the acute psychedelic experience. Of the interventional and prospective survey studies we reviewed, 92 % measured insight only once, and 88 % of those assessed insight within 24 hours of the experience. Only eight studies reported changes in the way people rate their psychedelic-catalysed insight over time (Fig. 3). The available evidence suggests that typically, rather than being devalued over time, people continue to rate their acute experiences of

insight as genuinely insightful. For example, Carbonaro et al. (2020) found that ratings of insight (using items from the HRS, MEQ43, JHU - PI and 5D-ASC) increased in the week after the administration of psilocybin. Similarly, in a 25-year follow-up of the participants in Pahnke's "Good Friday Experiment" (Pahnke, 1963), Doblin (1991) found that Noetic Quality ratings were higher than at 6 months after the psychedelic experience. This finding, that ratings of insightfulness tend to endure long after the psychedelic experience, is consistent with research on non-psychedelic induced religious and spiritual experiences (James, 1902/2008; Yaden et al., 2017).

While preliminary evidence suggests that ratings of insightfulness remain elevated long after the acute psychedelic experience, how psychedelic-catalysed insight ratings change over time remains poorly characterised. Only two studies measured insight experiences at more than two time-points (Peill et al., 2022; Schneider et al., 2023), providing inconsistent findings. Using the Psychological Insight Scale in a large scale prospective survey study of psychedelic retreat attendees ($n = 886$), Peill and colleagues (2022) found that insight ratings were highest one day following the experience ($M = 63.8$, $SD = 27.9$), falling

after 2 weeks ($M = 61.6$, $SD = 28.0$) and 4 weeks ($M = 57.5$, $SD = 29.6$). However, using the same measure in another prospective survey study of healthy individuals taking a psychedelic drug in a range of contexts ($n = 279$), insight ratings increased from 1 day ($M = 47.7$, $SD = 32.7$) to 2 weeks ($M = 56.3$, $SD = 30.6$) after the experience, before falling at 4 weeks ($M = 54.3$, $SD = 30.0$) post-experience (Peill et al., 2022). Schneier and colleagues (2023) also used the Psychological Insight Scale in a pilot study ($n = 12$) of psilocybin for body dysmorphic disorder, and found that insight ratings fell steadily, though not significantly, across the end of day, Week 3, Week 6 and Week 12 timepoints.

3.6. The relationship between insight and mental health outcomes

Of the 29 studies that examined associations between psychedelic-catalysed insight and therapeutic outcomes, 25 (86 %) established a significant association of correlation, mediation, and/or prediction. These studies included 59 associations, of which 81 % were significant. Prior studies reporting associations between psychedelic-catalysed insight measures and a range of psychopathology symptoms, broad wellbeing-related measures, and various related constructs, are presented in Table 2. A Fisher's Exact Test revealed no difference ($p = 0.32$) in the proportion of significant associations between the various insight measures used (34 PIQ, 10 JHU-PI, 7 5/11D-ASC – Insightfulness, 5 PIS, 2 author-constructed measures, and 1 Hood Mysticism Scale – Noetic Quality). In summary, the evidence from clinical trials to date, while preliminary, suggests that the intensity of acute psychedelic-catalysed insight is associated with improved therapeutic outcomes, including reduced symptomatology and increased quality of life.

A total of 11 studies presented data correlating insight with psychopathology outcome measures. The correlation coefficients varied from $r = -0.13$ to -0.61 , and a pooled correlation was calculated via a random-effects model as $r = -0.33$ ($Z = -7.20$, 95 % CI $[-0.42, -0.23]$) with moderate-high heterogeneity ($I^2 = 73$ %). A total of 6 studies (7 independent samples) presented data correlating insight with positive mental health outcome measures. The correlation coefficients varied from $r = 0.25$ – 0.79 , and a pooled correlation was calculated via a random-effects model as $r = 0.43$ ($Z = 5.35$, 95 % CI $[0.24, 0.58]$) with moderate-high heterogeneity ($I^2 = 76$ %).

Below, we highlight several notable findings relating insight to changes in psychopathology scores. In an RCT of psilocybin versus escitalopram for depression (Barba et al., 2022), psychological insight measured with the PIS scores at 6 weeks post-treatment were significantly correlated with decreases in rumination ($r(28) = -.69$, $p < .001$), thought suppression ($r(28) = -.56$, $p < .001$) and experiential avoidance ($r(28) = -.38$, $p = .037$) from 1 week before to 6 weeks after treatment. Another recent RCT of psilocybin-assisted therapy for depression found that reduction in depression scores from 5 days before to 14 days after the intervention were more strongly related to 11D-ASC Insightfulness scores on the day of dosing (MADRS: $r = -.46$, $p = .019$; BDI: $r = -.41$, $p = .040$) than any other aspect of acute psychedelic experience (von Rotz et al., 2023). For example, 11D-ASC – Experience of Unity scores comparatively less associated with reductions in depression scores (MADRS: $r = -.36$, $p = .07$; BDI: $r = -.36$, $p = .07$). In an open-label study of psilocybin for depression, 11D-ASC Insightfulness scores on the day of dosing were correlated with reductions in depression scores from baseline to five weeks post-treatment ($r = -.57$, $p = .01$; Carhart-Harris et al., 2018), and were higher in those that responded to treatment than in non-responders (Roseman et al., 2018). In contrast, in a follow-up long-term study, Agin-Liebes et al. (2020) did not find a significant association between mystical experience scores on participant's psilocybin dosing day and reductions in anxiety, depression, hopelessness, demoralization, and death anxiety, measured on average 4.5 years (range: 3.5–5.5 years) after dosing.

3.7. Therapeutic relevance of insights vs. mystical-type experiences

In studies examining the relationship between clinical outcomes and both insight and mystical-type experiences (including measures of defining aspects of mystical-type experiences, such as ego-dissolution), insight demonstrated a stronger association in 12 of the 22 studies (55 %). Five studies (23 %) found that therapeutic outcomes were more strongly correlated with mystical-type experiences, while another five (23 %), reported mixed results that varied across associated constructs. Of the 45 comparisons within these studies, 31 (69 %) indicated that acute insight was more strongly correlated with therapeutic outcomes than are mystical-type experiences (Table S4). A subset of 28 comparisons (19 [68 %] favouring insight), which used standard measures of insight and mystical-type experience and presented data correlating these measures with a therapeutic outcome, is depicted in Fig. 4. Nine studies (containing 15 comparisons) published the necessary data to statistically compare the correlations between therapeutic outcomes and both insight and mystical-type experiences using Steiger z-tests (Steiger, 1980). Of these comparisons, 7 favoured insight, 8 were not statistically different, and none favoured mystical-type experiences.

3.8. Risk of bias

The reviewed studies displayed a wide range of Risk of Bias (RoB) scores (see Table S5). There were several patterns related to study type and year of publication. Interventional studies had lower average RoB scores than survey studies ($M = 0.51$ vs. $M = .69$), with Randomised Controlled Trials tending to have lower RoB than any other study design ($M = 0.49$). RoB scores were negatively correlated with year of publication ($r = -.14$), indicating that the RoB has tended to be lower in more recent studies.

In terms of categories of risk, selection bias was a risk in most studies, with unrepresentative and convenience sampling being common. Causality and reliability bias scores varied significantly, and were mostly associated with study designs, and not design flaws (e.g., retrospective survey studies have inherently higher risk of reliability and causality bias than randomised controlled trials). Encouragingly, studies are increasingly following open science practices and reporting their methods rigorously, as reflected in a moderate negative correlation between RoB transparency scores and year of publication ($r = -.35$).

Ranked categories of bias risk were as follows:

1. Unrepresentative/convenience sampling (most common risk)
2. Lack of dose-response effect
3. Lack of preregistration
4. Lack of open data
5. Lack of control conditions
6. Lack of controlled outcome assessment
7. Poor reporting fidelity
8. Lack of controlled exposure to drug
9. Use of unvalidated measures
10. Inadequate time to follow up (least common risk)

4. Discussion

Experiencing a new understanding that feels true ("insight") features prominently in many reports of classic psychedelic use at psychoactive doses. Many people consider this feature to be central to the value of psychedelic substances, whether therapeutic or otherwise. Indeed, insight has been highlighted as a mechanism driving the therapeutic effects of psychedelics (Noorani et al., 2018; Watts et al., 2017). To better understand the relationship between psychedelics, insight, and therapeutic efficacy, we conducted the first systematic review on psychedelic-catalysed insight. We comprehensively reviewed all available empirical research involving psychoactive doses of psychedelics to better understand psychedelic-catalysed insight's (a) prevalence, (b)

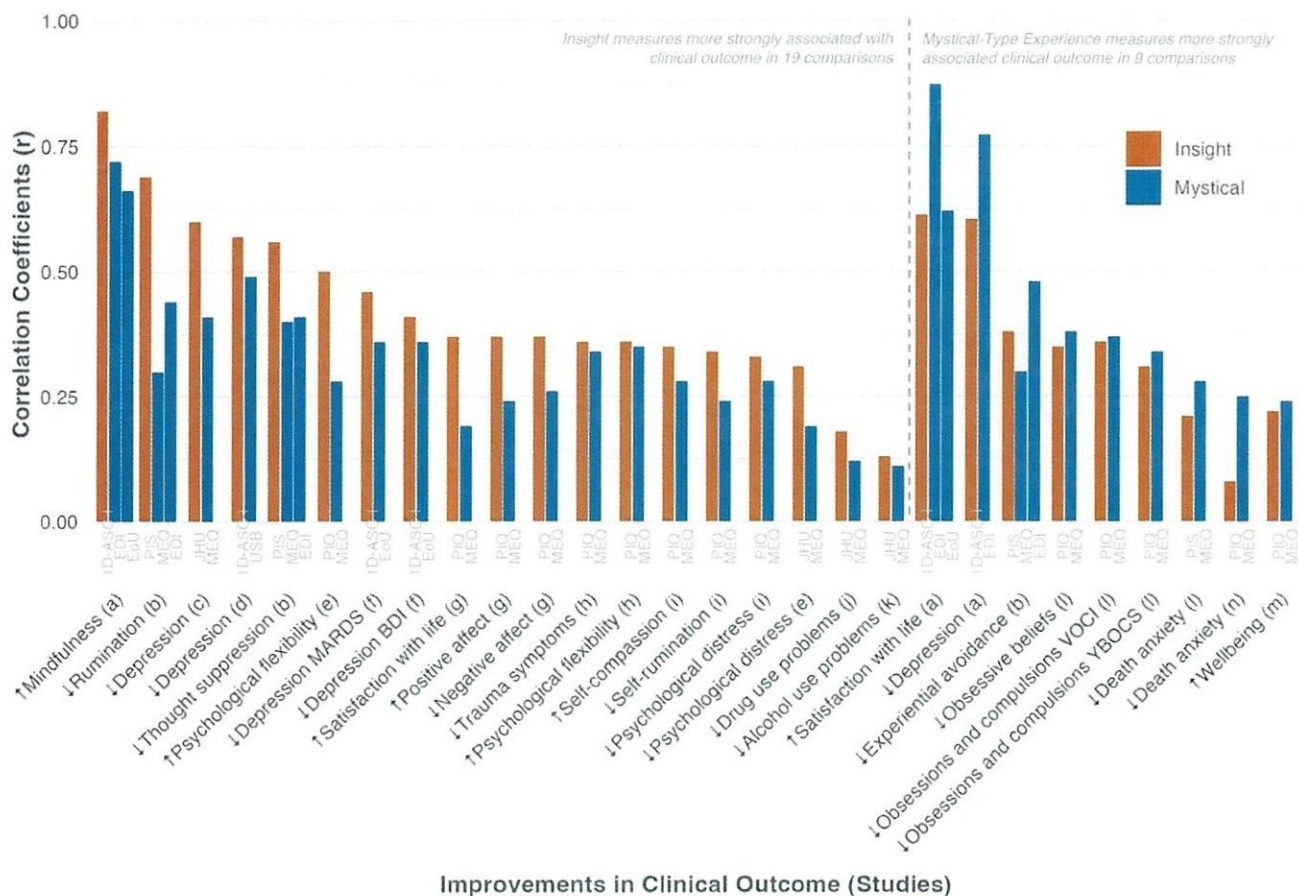


Fig. 4. Comparison of Strength of Relationship between Therapeutic Outcomes and Insight vs. Mystical-type Experiences. *Note.* Comparisons included in Fig. 4 used a standard measure of insight and mystical-type experience or altered self-experience, and presented data correlating these measures with an outcome. ^a Uthaug et al. (2020). ^b Barba et al. (2022). ^c Davis, Barrett, May, et al., (2021). ^d Carhart-Harris et al. (2018). ^e Davis et al. (2020). ^f von Rotz et al. (2023). ^g Moreton et al. (2023). ^h Davis, Xin et al. (2021). ⁱ Fauvel et al. (2023). ^j Garcia-Romeu et al. (2020). ^k Garcia-Romeu et al. (2019). ^l Moreton et al. (2022). ^m Peill et al. (2022). ⁿ Moreton et al. (2024).

relationship to psychedelic dose, (c) time-course, and (d) relationship to therapeutic outcomes. We found 98 studies that published data on psychedelic-catalysed insight, including 26 retrospective survey studies, 14 prospective survey studies, 44 randomised controlled trials, and 14 non-randomised studies of interventions. In this section, we describe how the findings answer our research questions, comment on the methodological rigour of the included studies, offer suggestions regarding the clinical implications, and highlight fruitful directions for future research.

4.1. Measures of psychedelic-catalysed insight

We identified seven instruments providing data on psychedelic-catalysed insight. These measures were used in 85 studies of the included studies, while the remaining 13 studies used unconventional measures. An overview of the seven measures is presented in Table 1 and item content and psychometric details are provided in the supplementary information. The 5D/11D-ASC was the most used instrument that included data on insight, with its Insightfulness subscale reported in 60 studies, followed by the single-item JHU – Psychological Insight (JHU-PI) measure (15 studies), the Psychological Insight Questionnaire (PIQ; 14 studies) and the Noetic Quality subscale of the MEQ43 (11 studies).

The included measures providing data on psychedelic-catalysed insight reflect a diversity of conceptualisations of insight. Some items and measures capture the specific content of insights (e.g., “Realized how current feelings or perceptions are related to events from my past”

from the PIQ), while others focus on the feelings and phenomenology associated with insight experiences (e.g., “I felt very profound” from the 11D-ASC Insightfulness). This distinction mirrors the differing approaches within problem-solving research, where insight has been defined and identified either by self-reported phenomenology or by the type of problem or cognitive restructuring undertaken (Wiley and Danek, 2024). Moreover, insight ratings may also be systematically influenced by study design. Insight ratings from retrospective survey studies may reflect recollections coloured by memory biases, while those from studies of psychedelic-therapies may conflate acute insight experiences with the broader therapeutic context. Additionally, the timing of survey administration may similarly influence ratings, with surveys administered closer to dosing capturing immediate subjective states, while those administered later reflecting broader evaluative processes. Improved definition and measurement of psychedelic-catalysed insight, and how its measurement is influenced by methodological variables, are important topics for future research.

4.2. The prevalence of psychedelic-catalysed insight

This review showed that classic psychedelic substances almost always catalyse experiences of insight at all psychoactive doses (above a “microdose”). Across differing study designs, psychedelic substances, and populations, 43 of 46 (93 %) studies that presented a comparison of psychedelic and placebo conditions found insight was higher in the psychedelic condition. Our findings on the prevalence of psychedelic-

catalysed insight accord well with the way various cultures have characterised psychedelics in terms of their epistemic value. For example, some Amazonian cultures refer to the plants used in the psychedelic Ayahuasca brew as “teachers” (Luna, 1984). Indeed, the etymology of the word psychedelic, coined by Humphrey Osmond in 1957 (Dyck, 2006) from the Greek words *psykhē* (“mind”) and *deíoun* (“reveal”), connotes new knowledge or understanding.

4.3. Psychedelic-catalysed insight and dose

Another finding was that insight scores were positively correlated with dose, across all psychedelic substances. Of the 13 studies that presented data on psychedelic-catalysed insight at multiple doses, 12 (92 %) found that higher-doses of classic psychedelics were associated with higher insight ratings. Measured across studies, we found a positive correlation between insight scores and dose, for all drugs and measures of insight. For example, for psilocybin, the substance with the most high-quality data, there is a moderate-strong positive correlation ($r = .67$) between dose and the 11D-ASC - Insightfulness factor scores in RCTs. Interestingly, a number of studies found no difference in, or even lower, insightfulness ratings between moderate and high doses (e.g., Carbonaro et al., 2018; Holze et al., 2022; E. James et al., 2024; Ley et al., 2023). This suggests that insight ratings may peak, or have a ceiling, at some dose, or be related to extra-pharmacological factors associated with the treatment or treatment population. Additionally, the historical divide between high-dose “psychedelic” and moderate-dose “psycholytic” approaches to psychedelic-assisted therapy suggests that different doses may be conducive to different types of insights (Grof, 1980). The suggestion, which is speculative and requires empirical testing, is that insight content could tend to move from the psychological and interpersonal to the mystical and metaphysical as dose increases. Further research is required to support the optimisation of dose for different therapeutic approaches.

4.4. Time-course of psychedelic-catalysed insight

Scant data on changes to psychedelic-catalysed insight ratings over time means that the following patterns should be treated as preliminary and in need of further verification. Only eight studies measured insight experiences at two or more time-points, with insufficient data to determine whether the performance of different insight measures varies over time. The evidence to date suggests that people continue to rate their experiences of psychedelic-catalysed insight as genuinely insightful, even years after the psychedelic experience, which is consistent with research on non-psychedelic induced religious and spiritual experiences (Yaden et al., 2017). However, how ratings of insightfulness change over time remains unclear. Only two studies measured insight experiences at more than two time-points. Schneider et al. (2023) found that ratings of psychological insightfulness (JHU-PI) fell steadily but statistically non-significantly between 1 day, 3 weeks and 6 weeks after dosing, while Peill et al. (2022) found that psychological insightfulness (PIS) fell between 1 day, 2 weeks and 4 weeks after dosing in one sample, but increased in another sample. Further, no data has been published about how ratings of specific insights change over time. Characterising whether insight ratings change over time, examining whether such trajectories differ for various types of insights, and whether such changes relate to the durability of therapeutic benefit will be valuable areas for future research.

4.5. Psychedelic-catalysed insight and mental health outcomes

The majority of studies (86 %, $n = 25$) found a significant association between psychedelic-catalysed insight and therapeutic outcomes. Of the 8 RCTs that examined the relationship between psychedelic-catalysed insight and therapeutic outcomes, 6 (75 %) found a significant relationship. Across other study types, 19 of 21 studies (90 %) found at least

some therapeutic outcomes were associated with insight ratings. These associations were found across therapeutic outcomes, including psychopathology symptoms (such as depression, drug and alcohol use problems, obsessions and compulsions, and trauma symptoms), psychopathology processes (such as thought suppression, experiential avoidance, and rumination), global measures of mental health (such as wellbeing and satisfaction in life) and health-associated outcomes (such as psychological flexibility, self-compassion, and various health behaviours). More studies presented data correlating insight with psychopathology outcome measures ($n = 11$) than with positive mental health outcome measures ($n = 6$). Pooled correlations, calculated via a random-effects model, were similar for both psychopathology ($r = -0.33$, 95 % CI [-0.42, -0.23], $I^2 = 73$ %) and positive mental health outcomes ($r = 0.43$, 95 % CI [0.24, 0.58], $I^2 = 76$ %). These findings may overstate the relationship between insight and mental health outcomes due to publication bias and the selective reporting of significant associations, as insight was typically not a primary outcome in the included studies. Nonetheless, the evidence from clinical trials to date, while preliminary, suggests that the intensity of acute psychedelic-catalysed insight is associated with improved therapeutic outcomes, including reduced symptomatology and increased quality of life.

Of the 22 studies that measured associations between therapeutic outcomes and both insight and mystical-type experiences (including measures of key aspects of mystical-type experiences, such as ego-dissolution), 12 (55 %) found that therapeutic outcomes were more strongly associated with acute insight than mystical-type experiences. Five studies (23 %) found that mystical-type experiences were more strongly associated with therapeutic outcomes than insight measures were, while another five studies (23 %) reported mixed results. Steiger z -tests (Steiger, 1980) were applied to 15 comparisons of correlations with therapeutic outcomes from nine studies, revealing that 7 comparisons favoured insight, 8 showed no difference, and none favoured mystical-type experiences. Interestingly, when looking at associations with increases in certain positive mental health outcomes (such as wellbeing and satisfaction with life), 4 of 8 studies (50 %) found that these outcomes were more strongly associated with mystical-type experience than insight, while only 3 of 8 studies (38 %) favoured insight. Whether insight and mystical-type experiences better predict different types of outcomes, will be an interesting question for future research.

The interpretation of comparisons between insight and mystical-type experiences is complicated by the inclusion insight-related items in measures of mystical-type experience, such as the Mystical Experience Questionnaire and Hood Mysticism Scale. In particular, items within the Noetic Quality factor of mystical experience measures overlap conceptually with insight. The relationship between, and disentangling of, insight and mystical experiences – both complex, multidimensional constructs – warrants further research. However, the present finding that psychedelic-catalysed insight more reliably predicts therapeutic improvements than mystical-type experiences, suggests that a narrow focus on mystical-type experiences as a therapeutic goal or as a proxy measure treatment success, may be misguided. Instead, the practice and assessment of psychedelic-therapy should consider a broader variety of psychedelic experiences, such as those primarily characterised by insight.

4.6. Limitations

While these findings provide support for insight as a central and therapeutic component of the psychedelic experience (Tolle et al., 2024), they should be interpreted with caution and further explored in future research. The findings, and especially interpretations of their synthesis, are limited by the diversity of included study designs and timing of survey administration, and by the heterogeneous ways in which insight is operationalised in existing measures. In broad measures of altered states of consciousness, such as the 11-Dimension Altered States

of Consciousness Rating Scale (11D-ASC) and the Mystical Experience Questionnaire (MEQ43), the insight-related factors capture select aspects of the phenomenology of insight. For example, the 11D-ASC Insightfulness factor captures profundity ("I felt very profound") and originality ("I had very original thoughts"), while the MEQ43 Noetic Quality factor captures certainty ("Certainty of encounter with ultimate reality [in the sense of being able to 'know' and 'see' what is really real] at some time during your session") and an intuitive rather than analytical basis for insight ("Gain of insightful knowledge experienced at an intuitive level"). In contrast, the recently developed measures assessing the subset of insights considered psychologically-relevant, the Psychological Insight Scale (Peill et al., 2022) and Psychological Insight Questionnaire (Davis, Barrett, So, et al., 2021), capture only insight content but not phenomenology. Given the heterogeneity of the data available, we did not attempt to quantitatively synthesise findings through meta-analysis.

The operationalisation of insight in existing measures is not just heterogeneous, but incomplete, potentially leading this review to overlook aspects of psychedelic-catalysed insight that may be important for therapeutic outcomes. No existing measures currently capture the full range of commonly reported psychedelic-catalysed insight content, including mystical, psychological, and other themes. Further no measures capture all the phenomenological qualities commonly used in cognitive science to identify insight, such as suddenness, certainty, surprise and emotionality. Additionally, there may be other factors important to the study of psychedelic-catalysed insight that are not currently prominent in the insight or psychedelic literatures, such as the attributed source of insights (e.g., insights received from other entities), the novelty of the insight, or the degree to which an insight fits with or demands a change in the person's worldview. Future research should seek to identify and assess the therapeutically relevant aspects of psychedelic-catalysed insight, through both qualitative investigations and the development of more comprehensive psychometric instruments.

Other limitations of the review process include that we dually screened only a subsample of studies, and did not formal assess publication bias. Findings on the relationship between insight and mental health outcomes, in particular, may overstate the strength of the relationship due to publication bias and selective reporting, given that insight was typically not a primary outcome of the included studies. Additionally, most included studies were subject to methodological limitations (e.g., lack of placebo control, inadequate blinding, small sample sizes). Even in well-designed clinical trials, strong correlations between clinical outcomes and aspects of the acute psychedelic experience do not provide evidence for causal claims, leaving open epiphenomenal and other accounts (Olson, 2021). Various research approaches are being sought to clarify the role of subjective experience in the therapeutic effects of psychedelics, including the administration of psychedelics to people under anaesthesia (Heifets et al., 2024), and the development of psychedelic-like drugs designed to have minimal subjective effects (Olson, 2021). Similarly, more robust support for the causal role of psychedelic-catalysed insight in therapeutic benefit, will require studies that go beyond associating therapeutic outcomes with the degree of acute insightfulness experienced. Studies demonstrating a clear link between the specific contents of psychedelic-catalysed insight and related positive behavioural changes, would provide stronger evidence for insight as a therapeutic mechanism. Such a relationship was found in an open-label trial of psilocybin therapy for tobacco addiction, where seven of the 12 participants reported that the contents of psilocybin-catalysed insights that were directly relevant to their efforts to quit smoking (Noorani et al., 2018). Future research should seek to replicate and extend these findings.

Despite our finding that psychedelic-catalysed insight predicts positive outcomes, insight experiences can be misleading or maladaptive, despite feeling true (Laukkonen et al., 2023). While insight experiences are associated with more accurate problem-solving (Laukkonen et al., 2021; Salvi et al., 2016; Webb et al., 2018), they can also be misleading

(Grimmer et al., 2022) and bias epistemic processes (McGovern et al., 2024). For example, Laukkonen et al. (2020), (2022) found that participants rated worldview beliefs as truer when they had just experienced an insight while solving an anagram corresponding to the belief. Also, insight experiences have long been linked to psychosis (Feyaerts et al., 2021; Jaspers, 1913), where they have been proposed to play a central role in its onset via a series of insight experiences and contradictory or undermining "anti-aha experiences" that can cause profound and enduring destabilisation (Sips, 2019; Sips et al., 2020). Even in the absence of psychopathology, insight experiences can have negative effects (Carhart-Harris and Friston, 2019; Grof and Grof, 2017; Timmermann et al., 2020). For example, Timmerman and colleagues (2020) describe a trial participant who experienced significant distress after being unable to determine the veracity of a revelation that his parent had tried to smother him as an infant. The risks associated with misleading insights are exacerbated by the tendency of understandings arrived at via insight to be more resistant to disconfirmatory evidence (Hedne et al., 2016). Further research is necessary to characterise the range, prevalence, and early indicators of epistemic harms, which could inform clinical practice in working with insights to increase the probability that they are useful and adaptive. Additionally, drawing on other fields which work with unfalsifiable experiences, such as recovered memories in therapy and particular adverse effects in meditation (Britton et al., 2021; Lomas et al., 2014; Palitsky et al., 2024), could be valuable for clinicians supporting people who are at risk of a maladaptive interpretations following insight experiences.

4.7. Future directions

As a follow-up to this review, several directions are recommended for future research. Firstly, the variety in the item-content of existing insight measures suggests that further research is needed to explore and characterise the phenomenon of psychedelic-catalysed insight. The diversity of insight-related constructs could be clarified through psychometric and factor analytic studies, and organised through theoretical work situating these constructs within theories of mental states, attention and arousal. Additionally, studies capturing the specific content and phenomenological qualities of psychedelic-catalysed insight would enable the development of better measurement tools, and would inform questions of how psychedelic-catalysed insight experiences fit with the definitions and descriptions of insight that come largely from problem-solving research. Secondly, researchers should capture evaluations of insight experiences over time. Ideally, these evaluations should be conducted on a granular insight-by-insight basis. More granular ratings of discrete insight experiences would facilitate improved understanding of how insights evolve over time, which may help guide clinical practice. Thirdly, the role of insight experiences in adverse psychedelic events should be studied. Finally, the strong relationship between psychedelic-catalysed insight and therapeutic benefit suggests that understanding the neurobiology of psychedelic-catalysed insight may be a fruitful avenue for better understanding the neural mechanisms of psychedelic action.

5. Conclusion

In this first systematic review on psychedelic-catalysed insight, we used a systematic search approach to collate a comprehensive list of all relevant studies and data ever published. Here, we examined psychedelic-catalysed insight and its prevalence, relationship to psychedelic dose, time-course and relationship to therapeutic efficacy. Insight was common at psychoactive doses, and the intensity of insight experiences was positively correlated with dose. Preliminary evidence suggested that psychedelic-catalysed insight tend to be rated as genuinely insightful even years after the experience. Of greatest clinical relevance, insight was positively associated with therapeutic benefits following psychedelics. This relationship was seen across different

substances, study designs, populations, and constructs. Notably, the relationship between therapeutic benefit and insight was typically stronger than with mystical-type experience. These findings suggest that future studies of psychedelic-catalysed insight could valuably inform both clinical practice of psychedelic therapies, and understanding of the mechanisms of psychedelic therapeutic efficacy.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.neubiorev.2025.106117.

Data availability

All research materials and files associated with the data are available at the Open Science Framework (https://osf.io/qzegk/?view_only=3446dfc43b1248368d30413dd4622879)

References

- Agin-Liebes, G., Haas, T.F., Lancelotta, R., Uthaug, M.V., Ramaekers, J.G., Davis, A.K., 2021. Naturalistic use of mescaline is associated with self-reported psychiatric improvements and enduring positive life changes. *ACS Pharmacol. Transl. Sci.* 4 (2), 543–552. <https://doi.org/10.1021/acspstci.1c00018>.
- Agin-Liebes, G.I., Malone, T., Yalch, M.M., Mennenga, S.E., Ponté, K.L., Guss, J., Bossis, A.P., Grigsby, J., Fischer, S., Ross, S., 2020. Long-term follow-up of psilocybin-assisted psychotherapy for psychiatric and existential distress in patients with life-threatening cancer. *J. Psychopharmacol.* 34 (2), 155–166. <https://doi.org/10.1177/0269881119897615>.
- Aicher, H.D., Mueller, M.J., Dornbierer, D.A., Suay, D., Elsner, C., Wicki, I., Meling, D., Caflisch, L., Hempe, A., Steinhart, C., Mueller, J., Von Rotz, R., Kleim, B., Scheidegger, M., 2024. Potential therapeutic effects of an ayahuasca-inspired N,N-DMT and harmine formulation: a controlled trial in healthy subjects. *Front. Psychiatry* 14, 1302559. <https://doi.org/10.3389/fpsy.2023.1302559>.
- Barba, T., Buehler, S., Kettner, H., Radu, C., Cunha, B.G., Nutt, D.J., Erritzoe, D., Roseman, L., Carhart-Harris, R., 2022. Effects of psilocybin versus escitalopram on rumination and thought suppression in depression. *BJPsych Open* 8 (5), e163. <https://doi.org/10.1192/bjo.2022.565>.
- Bowden, E., Jungbeeman, M., Fleck, J., Kounios, J., 2005. New approaches to demystifying insight. *Trends Cogn. Sci.* 9 (7), 322–328. <https://doi.org/10.1016/j.tics.2005.05.012>.
- Britton, W.B., Lindahl, J.R., Cooper, D.J., Canby, N.K., Palitsky, R., 2021. Defining and measuring meditation-related adverse effects in mindfulness-based programs. *Clin. Psychol. Sci.* 9 (6), 1185–1204. <https://doi.org/10.1177/2167702621996340>.
- Carbonaro, T.M., Johnson, M.W., Griffiths, R.R., 2020. Subjective features of the psilocybin experience that may account for its self-administration by humans: a double-blind comparison of psilocybin and dextromethorphan. *Psychopharmacology* 237 (8), 2293–2304. <https://doi.org/10.1007/s00213-020-05533-9>.
- Carbonaro, T.M., Johnson, M.W., Hurwitz, E., Griffiths, R.R., 2018. Double-blind comparison of the two hallucinogens psilocybin and dextromethorphan: similarities and differences in subjective experiences. *Psychopharmacology* 235 (2), 521–534. <https://doi.org/10.1007/s00213-017-4769-4>.
- Carey, T.A., Carey, M., Stalker, K., Mullan, R.J., Murray, L.K., Spratt, M.B., 2007. Psychological change from the inside looking out: a qualitative investigation. *Couns. Psychother. Res.* 7 (3), 178–187. <https://doi.org/10.1080/14733140701514613>.
- Carhart-Harris, R.L., Bolstridge, M., Day, C., Rucker, J., Watts, R., Erritzoe, D., Kaelen, M., Giribaldi, B., Bloomfield, M., Pilling, S., 2018. %J P. (2018). Psilocybin with psychological support for treatment-resistant depression: Six-month follow-up. 235 (2), 399–408..
- Carhart-Harris, R.L., Bolstridge, M., Day, C.M.J., Rucker, J., Watts, R., Erritzoe, D.E., Kaelen, M., Giribaldi, B., Bloomfield, M., Pilling, S., Rickard, J.A., Forbes, B., Feilding, A., Taylor, D., Curran, H.V., Nutt, D.J., 2018. Psilocybin with psychological support for treatment-resistant depression: Six-month follow-up. *Psychopharmacology* 235 (2), 399–408. <https://doi.org/10.1007/s00213-017-4771-x>.
- Carhart-Harris, R.L., Friston, K.J., 2019. REBUS and the anarchic brain: toward a unified model of the brain action of psychedelics. *Pharmacol. Rev.* 71 (3), 316–344. <https://doi.org/10.1124/pr.118.017160>.
- Carhart-Harris, R.L., Nutt, D.J., 2010. User perceptions of the benefits and harms of hallucinogenic drug use: a web-based questionnaire study. *J. Subst. Use* 15 (4), 283–300. <https://doi.org/10.3109/14659890903271624>.
- Cole-Turner, R., 2021. Psychedelic Epistemology: William James and the “Noetic Quality” of Mystical Experience. *Article 12. Religions* 12 (12). <https://doi.org/10.3390/rel12121058>.
- Covidence. (2021). *Systematic review software* [Computer software]. Veritas Health Innovation.
- Danek, A.H., Fraps, T., von Müller, A., Grothe, B., Öllinger, M., 2014. It's a kind of magic—What self-reports can reveal about the phenomenology of insight problem solving. *Front. Psychol.* 5. (<https://www.frontiersin.org/articles/10.3389/fpsyg.2014.01408>).
- Danek, A.H., Wiley, J., 2017. What about false insights? Deconstructing the aha! experience along its multiple dimensions for correct and incorrect solutions separately. *Front. Psychol.* 7. (<https://www.frontiersin.org/articles/10.3389/fpsyg.2016.02077>).
- Davis, A.K., Barrett, F.S., Griffiths, R.R., 2020. Psychological flexibility mediates the relations between acute psychedelic effects and subjective decreases in depression and anxiety. *J. Context. Behav. Sci.* 15, 39–45. <https://doi.org/10.1016/j.jcbs.2019.11.004>.
- Davis, A.K., Barrett, F.S., May, D.G., Cosimano, M.P., Sepeda, N.D., Johnson, M.W., Finan, P.H., Griffiths, R.R., 2021. Effects of psilocybin-assisted therapy on major depressive disorder: a randomized clinical trial. *JAMA Psychiatry* 78 (5), 481. <https://doi.org/10.1001/jamapsychiatry.2020.3285>.
- Davis, A.K., Barrett, F.S., So, S., Gukasyan, N., Swift, T.C., Griffiths, R.R., 2021. Development of the psychological insight questionnaire among a sample of people who have consumed psilocybin or LSD. *J. Psychopharmacol.* 35 (4), 437–446. <https://doi.org/10.1177/0269881120967878>.
- Davis, A.K., Xin, Y., Sepeda, N.D., Garcia-Romeu, A., Williams, M.T., 2021. Increases in psychological flexibility mediate relationship between acute psychedelic effects and decreases in racial trauma symptoms among people of color, 247054702110356 Chronic Stress 5. <https://doi.org/10.1177/24705470211035607>.
- Devitt, K., Prugger, J., Hirschfeld, T., Schmidt, T.T., 2024. Update of the altered states. *Database (ASDB)* 2023–12-3. <https://doi.org/10.31234/osf.io/ge93w>.
- Doblin, R., 1991. Pahnke's “Good Friday experiment”: a long-term follow-up and methodological critique. *J. Transpers. Psychol.* 23 (1), 1–28.
- Dyck, E., 2006. Hitting highs at rock bottom: LSD treatment for alcoholism, 1950–1970. *Soc. Hist. Med.* 19 (2), 313–329. <https://doi.org/10.1093/shm/hkl039>.
- Fauvel, B., Strika-Bruneau, L., Piolino, P., 2023. Changes in self-rumination and self-compassion mediate the effect of psychedelic experiences on decreases in depression, anxiety, and stress. *Psychol. Conscious.: Theory, Res., Pract.* 10 (1), 88–102. <https://doi.org/10.1037/cns0000283>.
- Feyaerts, J., Kusters, W., Van Duppen, Z., Vanheule, S., Myin-Germeyns, I., Sass, L., 2021. Uncovering the realities of delusional experience in schizophrenia: a qualitative phenomenological study in Belgium. *Lancet Psychiatry* 8 (9), 784–796. [https://doi.org/10.1016/S2215-0366\(21\)00196-6](https://doi.org/10.1016/S2215-0366(21)00196-6).
- Garcia-Romeu, A., Davis, A.K., Erowid, F., Erowid, E., Griffiths, R.R., Johnson, M.W., 2019. Cessation and reduction in alcohol consumption and misuse after psychedelic use. *J. Psychopharmacol.* 33 (9), 1088–1101. <https://doi.org/10.1177/0269881119845793>.
- Garcia-Romeu, A., Davis, A.K., Erowid, E., Erowid, F., Griffiths, R.R., Johnson, M.W., 2020. Persisting reductions in cannabis, opioid, and stimulant misuse after naturalistic psychedelic use: an online survey. *Front. Psychiatry* 10. (<https://www.frontiersin.org/article/10.3389/fpsy.2019.00955>).
- Griffiths, R.R., Richards, W.A., McCann, U., Jesse, R., 2006. Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology* 187 (3), 268–283. <https://doi.org/10.1007/s00213-006-0457-5>.
- Grimmer, H., Laukkonen, R., Tangen, J., Von Hippel, W., 2022. Eliciting false insights with semantic priming. *Psychon. Bull. Rev.* 29 (3), 954–970. <https://doi.org/10.3758/s13423-021-02049-x>.
- Grof, S., 1980. *LSD psychotherapy*. Hunter House.
- Grof, C., Grof, S., 2017. Spiritual emergency: the understanding and treatment of transpersonal crises. *Int. J. Transpers. Stud.* 36 (2), 30–43. <https://doi.org/10.24972/ijts.2017.36.2.30>.
- Gukasyan, N., Davis, A.K., Barrett, F.S., Cosimano, M.P., Sepeda, N.D., Johnson, M.W., Griffiths, R.R., 2022. Efficacy and safety of psilocybin-assisted treatment for major

- depressive disorder: prospective 12-month follow-up. *J. Psychopharmacol.* 36 (2), 151–158. <https://doi.org/10.1177/02698811211073759>.
- Hedne, M.R., Norman, E., Metcalfe, J., 2016. Intuitive feelings of warmth and confidence in insight and noninsight problem solving of magic tricks. *Front. Psychol.* 7. (<http://www.frontiersin.org/articles/10.3389/fpsyg.2016.01314>).
- Heifets, B., Lii, T., Smith, A., Flohr, J., Nyongesa, C., Cianfichi, L., Hack, L., Schatzberg, A., 2024. Clinical outcomes and biomarkers from a randomized trial of ketamine masked by surgical anesthesia in depressed patients. *Biol. Psychiatry* 95 (10), S47. <https://doi.org/10.1016/j.biopsych.2024.02.117>.
- Hendricks, P.S., 2018. Awe: a putative mechanism underlying the effects of classic psychedelic-assisted psychotherapy. *Int. Rev. Psychiatry* 30 (4), 331–342. <https://doi.org/10.1080/09540261.2018.1474185>.
- Higgins, J.P.T., Altman, D.G., Gøtzsche, P.C., Jüni, P., Moher, D., Oxman, A.D., Savovic, J., Schulz, K.F., Weeks, L., Sterne, J.A.C., 2011. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 343, d5928. <https://doi.org/10.1136/bmj.d5928>.
- Hirschfeld, T., Schmidt, T.T., 2021. Dose-response relationships of psilocybin-induced subjective experiences in humans. *J. Psychopharmacol.* 35 (4), 384–397. <https://doi.org/10.1177/0269881121992676>.
- Holze, F., Ley, L., Müller, F., Becker, A.M., Straumann, I., Vizeli, P., Kuehne, S.S., Roder, M.A., Duthaler, U., Kolarzyska, K.E., Varghese, N., Eckert, A., Liechti, M.E., 2022. Direct comparison of the acute effects of lysergic acid diethylamide and psilocybin in a double-blind placebo-controlled study in healthy subjects. *Neuropsychopharmacology* 47 (6), 1180–1187. <https://doi.org/10.1038/s41386-022-01297-2>.
- Ireland, M., 2012. Meditative insight: conceptual and measurement development. *Ment. Health, Relig. Cult.* 16, 1–21. <https://doi.org/10.1080/13674676.2011.645225>.
- James, W. (2008). *The varieties of religious experience: A study in human nature* (1. publ. in Routledge Classics). Routledge.
- James, E., Erritzoe, D., Benway, T., Joel, Z., Timmermann, C., Good, M., Agnorelli, C., Weiss, B.M., Barba, T., Campbell, G., Baker Jones, M., Hughes, C., Topping, H., Boyce, M., Routledge, C., 2024. Safety, tolerability, pharmacodynamic and wellbeing effects of SPL026 (dimethyltryptamine fumarate) in healthy participants: a randomized, placebo-controlled phase 1 trial. *Front. Psychiatry* 14. <https://doi.org/10.3389/fpsyg.2023.1305796>.
- Jaspers, K., 1913. *Allg. Psychopathol.*
- Jennissen, S., Huber, J., Ehrenthal, J.C., Schauenburg, H., Dinger, U., 2018. Association between insight and outcome of psychotherapy: systematic review and meta-analysis. *Am. J. Psychiatry* 175 (10), 961–969. <https://doi.org/10.1176/appi.ajp.2018.17080847>.
- Johnstad, P., 2023. Entheogenic spirituality: characteristics of spiritually motivated psychedelics use. *Int. J. Psychol. Relig.* 33 (4), 380–396. <https://doi.org/10.1080/10508619.2022.2148060>.
- Jylkkä, J., Krabbe, A., Jern, P., 2024. Endorsement of metaphysical idealism mediates a link between past use of psychedelics and wellbeing. *Sci. Rep.* 14 (1), 13276. <https://doi.org/10.1038/s41598-024-63687-4>.
- Kettner, H., Roseman, L., Gazzaley, A., Carhart-Harris, R.L., Pasquini, L., 2024. Effects of psychedelics in older adults: a prospective cohort study. *Am. J. Geriatr. Psychiatry*. <https://doi.org/10.1016/j.jagp.2024.05.007>.
- Kounios, J., Beeman, M., 2014. The cognitive neuroscience of insight. *Annu. Rev. Psychol.* 65 (1), 71–93. <https://doi.org/10.1146/annurev-psych-010213-115154>.
- Laukkonen, R.E., Ingledew, D.J., Grimmer, H.J., Schooler, J.W., Tange, J.M., 2021. Getting a grip on insight: real-time and embodied Aha experiences predict correct solutions. *Cogn. Emot.* 35 (5), 918–935. <https://doi.org/10.1080/02699931.2021.1908230>.
- Laukkonen, R.E., Kaveladze, B.T., Protzko, J., Tange, J.M., Von Hippel, W., Schooler, J.W., 2022. Irrelevant insights make worldviews ring true. *Sci. Rep.* 12 (1), 2075. <https://doi.org/10.1038/s41598-022-05923-3>.
- Laukkonen, R.E., Kaveladze, B.T., Tange, J.M., Schooler, J.W., 2020. The dark side of Eureka: Artificially induced Aha moments make facts feel true. *Cognition* 196, 104122. <https://doi.org/10.1016/j.cognition.2019.104122>.
- Laukkonen, R.E., Webb, M., Salvi, C., Tange, J.M., Slagter, H.A., Schooler, J.W., 2023. Insight and the selection of ideas. *Neurosci. Biobehav. Rev.* 153, 105363. <https://doi.org/10.1016/j.neubiorev.2023.105363>.
- Leary, T., Litwin, G.H., Metzner, R., 1963. Reactions to psilocybin administered in a supportive environment. *The Journal of Nervous and Mental Disease* 137 (6), 561–573.
- Ley, L., Holze, F., Arikci, D., Becker, A.M., Straumann, I., Klaiber, A., Coviello, F., Dierbach, S., Thomann, J., Duthaler, U., Luethi, D., Varghese, N., Eckert, A., Liechti, M.E., 2023. Comparative acute effects of mescaline, lysergic acid diethylamide, and psilocybin in a randomized, double-blind, placebo-controlled cross-over study in healthy participants. *Neuropsychopharmacology* 48 (11), 1659–1667. <https://doi.org/10.1038/s41386-023-01607-2>.
- Lomas, T., Cartwright, T., Edginton, T., Ridge, D., 2014. A qualitative summary of experiential challenges associated with meditation practice. *Mindfulness* 29.
- Luna, L.E., 1984. The concept of plants as teachers among four mestizo shamans of iquitos, Northeastern Peru. *J. Ethnopharmacol.* 11 (2), 135–156. [https://doi.org/10.1016/0378-8741\(84\)90036-9](https://doi.org/10.1016/0378-8741(84)90036-9).
- Mason, N.L., Kuypers, K.P.C., Reckweg, J.T., Müller, F., Tse, D.H.Y., Da Rios, B., Toennes, S.W., Stiers, P., Feilding, A., Ramaekers, J.G., 2021. Spontaneous and deliberate creative cognition during and after psilocybin exposure. *Transl. Psychiatry* 11 (1), 209. <https://doi.org/10.1038/s41398-021-01335-5>.
- McGovern, H.T., Grimmer, H.J., Doss, M.K., Hutchinson, B.T., Timmermann, C., Lyon, A., Corlett, P.R., Laukkonen, R.E., 2024. An integrated theory of false insights and beliefs under psychedelics. *Commun. Psychol.* 2 (1), 69. <https://doi.org/10.1038/s44271-024-00120-6>.
- McKenzie, J.E., Brennan, S.E., 2019. Synthesizing and presenting findings using other methods. In: *Cochrane Handbook for Systematic Reviews of Interventions*. John Wiley & Sons, Ltd., pp. 321–347.
- Metcalfe, J., Wiebe, D., 1987. Intuition in insight and noninsight problem solving. *Mem. Cogn.* 15 (3), 238–246. <https://doi.org/10.3758/BF03197722>.
- Mintzes, J., Quinn, H.J., 2007. Knowledge restructuring in biology: testing a punctuated model of conceptual change. *Int. J. Sci. Math. Educ.* 5 (2), 281–306. <https://doi.org/10.1007/s10763-006-9035-x>.
- Molla, H., Tare, I., de Wit, H., 2024. Greater subjective effects of low dose LSD in participants with depressed mood. *Neuropsychopharmacology* 49 (5), 774–781.
- Moreton, S.G., Arena, A.F.A., Foy, Y., Menzies, R.E., 2023. Reduced death anxiety as a mediator of the relationship between acute subjective effects of psychedelics and improved subjective well-being. *Death Stud.* 47 (10), 1115–1126. <https://doi.org/10.1080/07481187.2023.2169848>.
- Moreton, S.G., Barr, N.N., Giese, K.J., 2024. Investigating the relationship between changes in metaphysical beliefs and death anxiety following a significant psychedelic experience. *Q(0)*. *Death Stud.* 1–10. <https://doi.org/10.1080/07481187.2024.2352726>.
- Moreton, S.G., Burden-Hill, A., Menzies, R.E., 2022. Reduced death anxiety and obsessive beliefs as mediators of the therapeutic effects of psychedelics on obsessive compulsive disorder symptomatology. *Clin. Psychol.* 1–16. <https://doi.org/10.1080/13284207.2022.2086793>.
- Murad, M.H., Sultan, S., Haffar, S., Bazerbachi, F., 2018. Methodological quality and synthesis of case series and case reports. *BMJ Evidence-Based Medicine* 23 (2), 60–63.
- Nevis, I., Sikich, N., Ye, C., Kabali, C., 2015. Quality control tool for screening titles and abstracts by second reviewer: QCTSTAR. *J. Biom. Biostat.* 06 (01). <https://doi.org/10.4172/2155-6180.1000230>.
- Noorani, T., Garcia-Romeu, A., Swift, T.C., Griffiths, R.R., Johnson, M.W., 2018. Psychedelic therapy for smoking cessation: qualitative analysis of participant accounts. *J. Psychopharmacol.* 32 (7), 756–769. <https://doi.org/10.1177/0269881118780612>.
- Nour, M.M., Evans, L., Nutt, D., Carhart-Harris, R.L., 2016. Ego-dissolution and psychedelics: validation of the ego-dissolution inventory (EDI). *Front. Hum. Neurosci.* 10. <https://doi.org/10.3389/fnhum.2016.00269>.
- Ohlsson, S., 1984. Restructuring revisited. *Scand. J. Psychol.* 25 (2), 117–129. <https://doi.org/10.1111/j.1467-9450.1984.tb01005.x>.
- Ohlsson, S., 1992. Information-processing explanations of insight and related phenomena. *Adv. Psychol. Think.* 1–44.
- Ohlsson, S., 2018. The dialectic between routine and creative cognition. *Insight. Routledge*.
- Olson, D.E., 2021. The subjective effects of psychedelics may not be necessary for their enduring therapeutic effects. *ACS Pharmacol. Transl. Sci.* 4 (2), 563–567. <https://doi.org/10.1021/acspsci.0c00192>.
- Page, M.J., Moher, D., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., McKenzie, J.E., 2021. PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ* 372, n160. <https://doi.org/10.1136/bmj.n160>.
- Pahnke, W. (1963). *Drugs & Mysticism: An Analysis of the Relationship between Psychedelic Drugs and Mystical Consciousness, A thesis presented by Walter Norman Pahnke to The Committee on Higher Degrees in History and Philosophy of Religion in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the subject of Religion and Society, Harvard University, Cambridge, Massachusetts, June 1963.* (<https://maps.org/images/pdf/books/pahnke/>).
- Palitsky, R., Canby, N.K., Van Dam, N.T., Levin-Aspensson, H.F., Kaplan, D.M., Maples-Keller, J., Raison, C.L., Grant, G.H., Dunlop, B.W., Britton, W.B., 2024. Leveraging meditation research for the study of psychedelic-related adverse effects. *Int. Rev. Psychiatry* 1–15. <https://doi.org/10.1080/09540261.2024.2420745>.
- Peill, J.M., Trinci, K.E., Kettner, H., Mertens, L.J., Roseman, L., Timmermann, C., Rosas, F.E., Lyons, T., Carhart-Harris, R.L., 2022. Validation of the Psychological Insight Scale: A new scale to assess psychological insight following a psychedelic experience. *J. Psychopharmacol.* 36 (1), 31–45. <https://doi.org/10.1177/02698811211066709>.
- Piaget, J., 1951. *The Biological Problem of Intelligence. Organization and Pathology of Thought.* Columbia University Press, pp. 176–194. <https://doi.org/10.7312/rapa92214-010>.
- Polito, V., Liknaitzky, P., 2022. The emerging science of microdosing: A systematic review of research on low dose psychedelics (1955–2021) and recommendations for the field. *Neurosci. Biobehav. Rev.* 139, 104706. <https://doi.org/10.1016/j.neubiorev.2022.104706>.
- Roseman, L., Haijen, E., Idialu-Ikoto, K., Kaelen, M., Watts, R., Carhart-Harris, R., 2019. Emotional breakthrough and psychedelics: Validation of the Emotional Breakthrough Inventory. *J. Psychopharmacol.* 33 (9), 1076–1087. <https://doi.org/10.1177/0269881119855974>.
- Roseman, L., Nutt, D.J., Carhart-Harris, R.L., 2018. Quality of Acute Psychedelic Experience Predicts Therapeutic Efficacy of Psilocybin for Treatment-Resistant Depression. *Front. Pharmacol.* 8. (<https://www.frontiersin.org/article/10.3389/fphar.2017.00974>).
- Salvi, C., Bricolo, E., Kounios, J., Bowden, E., Beeman, M., 2016. Insight solutions are correct more often than analytic solutions. *Think. Reason.* 22 (4), 443–460. <https://doi.org/10.1080/13546783.2016.1141798>.
- Sanders, J.W., Zijlmans, J., 2021. Moving Past Mysticism in Psychedelic Science. *ACS Pharmacol. Transl. Sci.* 4 (3), 1253–1255. <https://doi.org/10.1021/acspsci.1c00097>.

- Sandison, R.A., 1954. Psychological Aspects of the Lsd Treatment of the Neuroses. *J. Ment. Sci.* 100 (419), 508–515. <https://doi.org/10.1192/bjp.100.419.508>.
- Sarris, J., Perkins, D., Cribb, L., Schubert, V., Opaleye, E., Bouso, J.C., Scheidegger, M., Aicher, H., Simonova, H., Horák, M., Galvão-Coelho, N.L., Castle, D., Tófoli, L.F., 2021. Ayahuasca use and reported effects on depression and anxiety symptoms: An international cross-sectional study of 11,912 consumers. *J. Affect. Disord. Rep.* 4, 100098. <https://doi.org/10.1016/j.jadr.2021.100098>.
- Schlosser, R.W., 2007. Appraising the Quality of Systematic Reviews. *F. o C. U. S.*
- Schmid, Y., Gasser, P., Oehen, P., Liechti, M.E., 2021. Acute subjective effects in LSD- and MDMA-assisted psychotherapy. *Journal of Psychopharmacology* 35 (4), 362–374.
- Schmidt, T.T., Berkemeyer, H., 2018. The Altered States Database: Psychometric Data of Altered States of Consciousness. *Front. Psychol.* 9, 1028. <https://doi.org/10.3389/fpsyg.2018.01028>.
- Schneier, F.R., Feusner, J., Wheaton, M.G., Gomez, G.J., Cornejo, G., Naraindas, A.M., Hellerstein, D.J., 2023. Pilot Study of Single-Dose Psilocybin for Serotonin Reuptake Inhibitor-Resistant Body Dysmorphic Disorder. *J. Psychiatr. Res.* 161, 364–370. <https://doi.org/10.1016/j.jpsychires.2023.03.031>.
- Shen, W., Yuan, Y., Liu, C., Luo, J., 2016. In search of the 'Aha!' experience: Elucidating the emotionality of insight problem-solving. *Br. J. Psychol.* 107 (2), 281–298. <https://doi.org/10.1111/bjop.12142>.
- Simonsson, C., Chambers, R., Hendricks, P.S., Goldberg, S.B., Osika, W., Schlosser, M., Ryde, A., Christersson, E., Simonsson, O., 2023. Classic Psychedelic Use and Current Meditation Practice. *Mindfulness* 14 (4), 763–768. <https://doi.org/10.1007/s12671-023-02103-w>.
- Simonsson, O., Hendricks, P.S., Chambers, R., Osika, W., Goldberg, S.B., 2022. Classic psychedelics, health behavior, and physical health. *Ther. Adv. Psychopharmacol.* 12, 20451253221135363. <https://doi.org/10.1177/20451253221135363>.
- Simonsson, O., Stenfor, C.U.D., Goldberg, S.B., Hendricks, P.S., Osika, W., 2023. Altered states of leadership: Mindfulness meditation, psychedelic use, and leadership development. *Front. Psychol.* 14. <https://doi.org/10.3389/fpsyg.2023.1151626>.
- Sips, R., 2019. Psychosis as a Dialectic of Aha- and Anti-Aha-Experiences. *Schizophr. Bull.* 45 (5), 952–955. <https://doi.org/10.1093/schbul/sby072>.
- Sips, R., Duppen, Z., Kasanova, Z., de Thurah, L., Teixeira, J., Feyaerts, J., Myin-Germes, I., 2020. Psychosis as a dialectic of aha-and anti-aha- experiences: A qualitative study. *Psychos. (Psychol., Soc. Integr. Approaches)*. <https://doi.org/10.1080/17522439.2020.1798492>.
- Smigielski, L., Kometer, M., Scheidegger, M., Krähenmann, R., Huber, T., Vollenweider, F.X., 2019. Characterization and prediction of acute and sustained response to psychedelic psilocybin in a mindfulness group retreat. *Sci. Rep.* 9 (1), 14914. <https://doi.org/10.1038/s41598-019-50612-3>.
- Steiger, J.H., 1980. Tests for comparing elements of a correlation matrix. *Psychol. Bull.* 87 (2), 245–251. <https://doi.org/10.1037/0033-2909.87.2.245>.
- Timmermann, C., Watts, R., Dupuis, D., 2020. Towards psychedelic apprenticeship: Developing a gentle touch for the mediation and validation of psychedelic-induced insights and revelations [Preprint]. *PsyArXiv*. <https://doi.org/10.31234/osf.io/j5768>.
- Tolle, H.M., Farah, J.C., Mallaroni, P., Mason, N.L., Ramaekers, J.G., Amico, E., 2024. The unique neural signature of your trip: Functional connectome fingerprints of subjective psilocybin experience. *Netw. Neurosci.* 8 (1), 203–225. https://doi.org/10.1162/netn_a_00349.
- Tulver, K., Kaup, K.K., Laukkonen, R., Aru, J., 2023. Restructuring insight: An integrative review of insight in problem-solving, meditation, psychotherapy, delusions and psychedelics. *Conscious. Cogn.* 110, 103494. <https://doi.org/10.1016/j.concog.2023.103494>.
- Uthaug, M.V., Lancelotta, R., Szabo, A., Davis, A.K., Riba, J., Ramaekers, J.G., 2020. Prospective examination of synthetic 5-methoxy-N,N-dimethyltryptamine inhalation: Effects on salivary IL-6, cortisol levels, affect, and non-judgment. *Psychopharmacology* 237 (3), 773–785. <https://doi.org/10.1007/s00213-019-05414-w>.
- Uthaug, M.V., Mason, N.L., Toennes, S.W., Reckweg, J.T., De Sousa Fernandes Perna, E. B., Kuypers, K.P.C., Van Oorsouw, K., Riba, J., Ramaekers, J.G., 2021. A placebo-controlled study of the effects of ayahuasca, set and setting on mental health of participants in ayahuasca group retreats. *Psychopharmacology* 238 (7), 1899–1910. <https://doi.org/10.1007/s00213-021-05817-8>.
- van Oorsouw, K., Toennes, S.W., Ramaekers, J.G., 2022. Therapeutic effect of an ayahuasca analogue in clinically depressed patients: A longitudinal observational study. *Psychopharmacology* 239 (6), 1839–1852. <https://doi.org/10.1007/s00213-021-06046-9>.
- Vervaeke, J., Ferraro, L., Herrera-Bennett, A., 2018. In: Christoff, K., Fox, K.C.R. (Eds.), *Flow as Spontaneous Thought*, 1. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190464745.013.8>.
- von Rotz, R., Schindowski, E.M., Jungwirth, J., Schuld, A., Rieser, N.M., Zahoransky, K., Seifritz, E., Nowak, A., Nowak, P., Jäncke, L., Preller, K.H., Vollenweider, F.X., 2023. Single-dose psilocybin-assisted therapy in major depressive disorder: A placebo-controlled, double-blind, randomised clinical trial. *eClinicalMedicine* 56, 101809. <https://doi.org/10.1016/j.eclinm.2022.101809>.
- Watts, R., Day, C., Krzanowski, J., Nutt, D., Carhart-Harris, R., 2017. Patients' Accounts of Increased "Connectedness" and "Acceptance" After Psilocybin for Treatment-Resistant Depression. *J. Humanist. Psychol.* 57 (5), 520–564. <https://doi.org/10.1177/0022167817709585>.
- Webb, M.E., Little, D.R., Cropper, Simon J., 2018. Once more with feeling: Normative data for the aha experience in insight and noninsight problems. *Behav. Res. Methods* 50 (5), 2035–2056. <https://doi.org/10.3758/s13428-017-0972-9>.
- Wertheimer, M., 1959. *Productive thinking*. pp. xvi, 302. Harper.
- Wießner, I., Falchi, M., Palhano-Fontes, F., Oliveira Maia, L., Feilding, A., Ribeiro, S., Bezerra Mota, N., Araujo, D.B., Tófoli, L.F., 2021. Low-dose LSD and the stream of thought: Increased Discontinuity of Mind, Deep Thoughts and abstract flow. *Psychopharmacology*. <https://doi.org/10.1007/s00213-021-06006-3>.
- Wiley, J., Danek, A.H., 2024. Restructuring processes and Aha! Experiences in insight problem solving. *Nat. Rev. Psychol.* 3 (1), 42–55. <https://doi.org/10.1038/s44159-023-00257-x>.
- Williams, M.T., Davis, A.K., Xin, Y., Sepeda, N.D., Grigas, P.C., Sinnott, S., Haeny, A.M., 2021. People of color in North America report improvements in racial trauma and mental health symptoms following psychedelic experiences. *Drugs (Abingdon, Engl.)* 28 (3), 215–226. <https://doi.org/10.1080/09687637.2020.1854688>.
- Wolff, M., Mertens, L.J., Walter, M., Enge, S., Evens, R., 2022. The Acceptance/Avoidance-Promoting Experiences Questionnaire (APEQ): a theory-based approach to psychedelic drugs' effects on psychological flexibility. *J. Psychopharmacol.* 36 (3), 387–408. <https://doi.org/10.1177/02698811211073758>.
- Xin, Y., Armstrong, S.B., Averill, L.A., Sepeda, N., Davis, A.K., 2023. Predictors of psychedelic treatment outcomes among special operations forces veterans. *Psychol. Conscious.: Theory, Res., Pract.* <https://doi.org/10.1037/cns0000374>.
- Yaden, D.B., Goldy, S.P., Weiss, B., Griffiths, R.R., 2024. Clinically relevant acute subjective effects of psychedelics beyond mystical experience. *Nat. Rev. Psychol.* 3 (9), 606–621. <https://doi.org/10.1038/s44159-024-00345-6>.
- Yaden, D.B., Le Nguyen, K.D., Kern, M.L., Wintering, N.A., Eichstaedt, J.C., Schwartz, H. A., Buffone, A.E.K., Smith, L.K., Waldman, M.R., Hood, R.W., Newberg, A.B., 2017. The noetic quality: a multimethod exploratory study. *Psychol. Conscious.: Theory, Res., Pract.* 4 (1), 54–62. <https://doi.org/10.1037/cns0000098>.