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Psychedelics as an alternative to traditional pharmacotherapy in treating mental disorders – a review of latest studies

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ABSTRACT

Objective: The purpose of the following review was to summarize the recent studies on proposed mechanisms of action of psychedelic drugs (psilocybin, MDMA, LSD), their therapeutic potential in mental disorders (depression, PTSD, addictions), and the evaluation of their safety. This review also discusses the barriers to the clinical implementation of these agents. *Methodology:* The paper combines a review of scientific literature on the mechanisms of action of psychedelics and their effects on neural networks like the Default Mode Network (DMN), as well as their propensity to trigger the activation of neuroplasticity and induce introspection. The review includes clinical and experimental studies, meta-analyses, and systematic literature reviews. *Results:* Psychedelics hold the most promise as a potentially therapeutic modality in the treatment of treatment-resistant depression, the mitigation of existential dread in the terminally ill, and as an adjunct in the treatment of addiction. Psychedelics operate through modulation of activity across neural networks, amplified neuroplasticity, and the opportunity for affective insight and catharsis. Further research must evaluate the lasting effects and bodily safety of these substances. *Conclusion:* Psychedelic compounds show potential for clinical applications, but they also raise multiple ethical, legal, and social problems. We require additional research to establish these compounds' extended consequences, safety parameters, and optimal conditions.

Keywords: Psychedelics, psilocybin, LSD, MDMA, depression, anxiety, PTSD, OCD.

1. INTRODUCTION

People have been using psychedelics for ages or millennia, mainly for ceremonial and religious reasons. In the West, the quest for their medical utility started in earnest with the isolation of mescaline in the late 19th century. And then there was LSD in the 1940s; the new psychedelic agent led to a burst of psychopharmacologic inquiry in psychiatry, particularly in the 1950s. These substances received a lot of research attention until LSD was banned in the late 1960s over fears of misuse or negative impacts on society. MDMA was first synthesized in the late 1970s and early 1980s, and the mid-1980s banned it. Even so, the last 20 years have seen a growth of focus on using psychedelics to treat mental health illnesses.

Most leading scientific institutions publish hundreds of studies globally today, investigating their therapeutic potential (Sessa, 2016). Nowadays, depression, anxiety disorder, post-traumatic stress disorder, and addiction to alcohol or drugs are some of the most widespread mental health disorders, affecting more than one billion people worldwide. Current therapeutic practices, including pharmacotherapy and psychotherapy, often do not meet treatment objectives, particularly in treatment-resistant disorders, which manifest in 20–60% of patients seeking mental health treatment (Howes et al., 2022).

Substances like psilocybin, MDMA, LSD, and DMT — most often associated with recreational or ceremonial use — have recently been re-examined in clinical settings. Classical psychedelics such as psilocybin and LSD work not only via serotonin receptors but also significantly change the perception of reality, enable deep introspection, and enhance brain plasticity. These properties might assist the therapeutic process to produce enduring positive changes in the mental state of patients (Kelmendi et al., 2022). However, psychedelics remain controversial, although they show promising outcomes.

In the United States and many other countries, they fall into the category of Schedule I substances, which means they have no medical use and pose a substantial risk for abuse. As psychedelics are about to become part of therapeutic or medical practice, research, appropriate legal guidelines, and guidelines for safe use are extremely necessary. This review seeks to summarize the recent approach to psychedelics, considering their use in treatment, action mechanisms, therapeutic efficacy, and issues regarding clinical use.

2. METHODOLOGY

Literature search process

The literature review included only articles indexed in high-quality databases such as PubMed, Scopus, Web of Science, and PsycINFO. The search strategy included relevant terms about the active substances of interest, such as psychedelics, psilocybin, LSD, and MDMA, as well as terms that indicate a clinical angle to the research, such as depression, mental health, anxiety, PTSD, OCD, addiction, and psychedelic-assisted therapy. We collected pending or completed clinical trial data from the Clinical Trials database. We limited the search to papers published in January, 2014 to June, 2024 to include only the latest discoveries. We also supplemented the review with additional literature illustrating the historical context of psychedelics in psychiatry and detailing clinical techniques employed in studies (e.g., psychedelic-assisted psychotherapy).

Inclusion and exclusion criteria

Inclusion criteria for the review were clinical studies (both randomized and nonrandomized) of meta-analysis and systematic reviews evaluating the influence of psychedelic therapy on the treatment of mental disorders, reports on potential mechanisms of action of psychedelics based on the latest scientific findings, their therapeutic use in the treatment of depression, PTSD, addictions and other disorders, as well as papers that contained the most detailed information about the safety and therapeutic effect of medications used. Exclusion criteria included papers not published in peer-reviewed scientific journals, articles that did not include empirical data, such as philosophical essays and opinion pieces, or studies that considered the recreational use of psychedelics.

Publication selection process

We initially screened the articles using their title and abstracts, then followed by screening their full texts for compliance with our inclusion criteria.

Data analysis

We extracted data from the selected articles, including characteristics of patients, type of psychedelic taken and route of administration, clinical outcomes (changes in symptoms and long-term therapeutic effects), as well as adverse effects of psychedelics, and safety data.

3. RESULTS AND DISCUSSION

Overview of retrieved publications

We identified a total of 246 publications through the systematic literature search. Based on the review of abstracts and titles, we selected 198 articles, 48 of which were removed from the review due to duplication (n = 48). We excluded one hundred sixty-seven articles from this review based on the exclusion criteria. Finally, the review included 29 publications. They consisted of 11 clinical studies and 18 meta-analyses, systematic reviews, and descriptive or experimental studies.

Summary of selection results

The literature selection process provided a diverse dataset on the therapeutic potential of psychedelics in psychiatry. The chosen publications form a robust foundation for analyzing the mechanisms of action of these substances and their effectiveness in treating mental disorders.

Mechanisms of psychedelic action

Classic psychedelics such as psilocybin, LSD, and mescaline act predominantly via serotonin receptors, particularly the 5-HT2A subtype. Stimulating these receptors triggers a wide array of neurobiological responses critical to their therapeutic action. The most crucial reaction is the promotion of synaptic plasticity. 5-HT2A stimulation is associated with general increases in neuroplasticity capability, enabling the brain to reorganize nerve connectives. Research suggests psilocybin can stimulate the growth of new dendrites and synapses Carhart-Harris et al., (2018), Timmermann et al., (2018), resulting in the improvement of mood as well as adaptive processes in the brain, as well as neurochemical changes - psychedelics affect the release of serotonin, dopamine, and glutamate, thereby altering activity in networks involved in processing emotions and memory (Nichols, 2016).

Impact on neural networks

The primary mechanism of action of psychedelics is their effect on a brain network involved in self-referential thoughts, planning, and rumination, called the Default Mode Network (DMN). In contextual disorders like depression or other trauma-derived disorders, DMN is typically overactive, leading to rumination and rigid negative thought patterns. Psychedelics inhibit DMN activity, which allows for more flexible thinking and openness to new perspectives (Lebedev et al., 2021). This effect will result in a greater connection between areas of the brain, which might explain the intense perceptual and emotional experiences associated with psychedelic use (Carhart-Harris et al., 2014).

Psychological effects arising from biological mechanisms

Increased connectivity between different brain regions may help to elucidate the profound perceptual and emotional experiences during psychedelic use, including introspective effect - reduced activity of the DMN may facilitate greater introspection among patients, allowing them to process traumas and counter negative cognitive schemata Dos-Santos et al., (2016), ego dissolution - psychedelics can promote the dissolution of the boundaries between 'self' and environment, which can lead to mystical experiences and a feeling of unity with the environment Tagliazucchi et al., (2016), emotional catharsis - the intense emotional experiences that psychedelics can facilitate the processing of emotions, allowing patients to release and understand their repressed emotions (Roseman et al., 2019).

MDMA: A Distinct Mechanism of Action

MDMA, though distinct from a classical psychedelic, takes effect via a separate neurochemical pathway. At its core, MDMA induces the release of serotonin, dopamine, and norepinephrine, suppressing fear and stress reactions. This effect enables patients to face traumatic memories in a safe therapeutic environment (Mithoefer et al., 2018). Additionally, the elevated oxytocin levels mediate the

psychological effects of this drug to strengthen the bond between therapist and patient, subsequently amplifying the impact of psychotherapy (Hysek et al., 2014).

Therapeutic applications

Psilocybin

Numerous studies associate a statistically significant reduction in depressive symptoms following one or two doses of psilocybin (Lyons and Carhart-Harris, 2018; Carhart-Harris et al., 2016; Davis et al., 2021; Ross et al., 2016). These benefits were also maintained, including reductions in symptoms persisting at 6 months Griffiths et al., (2016), Carhart-Harris et al., (2016), 8 months Ross et al., (2016), and even 12 months (Gukasyan et al., 2022). A study comparing the differences between psilocybin and escitalopram Carhart-Harris et al., (2021) showed no significant differences considering these two treatments at six weeks. Still, psilocybin was favored in secondary outcome measures.

Both treatments were adequate, but the small sample groups may have limited detection of subtle variations. Studies comparing moderate or high doses of psilocybin vs placebo or low doses found significantly more efficacy at higher doses. Moreover, participants who received lower doses initially exhibited similar symptom improvements as the high-dose participant group despite subsequently receiving higher doses (Griffiths et al., 2016). Using niacin as a placebo in a different study brought comparable results (Ross et al., 2016). These studies confirm that a single moderate or high dose of psilocybin results in a substantial improvement in depressive symptoms.

Except for one study Carhart-Harris et al., (2021), most studies provided data on the magnitude of the therapeutic effects, which were substantial at all measurement points and decidedly favored using psilocybin. If we consider therapy safety, six out of eight studies reviewed Davis et al., (2021), Ross et al., (2016), Griffiths et al., (2016), Carhart-Harris et al., (2016), Carhart-Harris et al., (2021). Gukasyan et al., (2022) reported that the adverse effects were mild and transient (headache, dizziness, nausea, and tachycardia). Those did not limit the continuation of treatment. Notably, there were no cases of dependence on psilocybin.

Notably, the side effect profile of psilocybin was comparable to that of escitalopram in terms of duration and intensity (Carhart-Harris et al., 2021). Psilocybin has demonstrated itself to work wonders on existential anxiety and depression for the terminally ill. Over 80% of cancer patients studied had clinically notable alleviation in depression and anxiety after one or two sessions of psilocybin, and that effect lasted for over six months (Griffiths et al., 2016). In another study, 60–80% of participants reported antidepressant or anxiolytic effects up to 4.5 years post administration of psilocybin (Agin-Liebes et al., 2020). Psilocybin has other clinical applications as well, most notably for the treatment of addiction, particularly alcohol dependence.

In one study by Bogenschutz, a double-masked trial of over 32 weeks showed that the percentage of participant's heavy drinking days was reduced by 13.9% while taking psilocybin than placebo. Average daily alcohol consumption also declined (Bogenschutz et al., 2022). In another study related to nicotine dependency, 80% of participants were still smoke-free six months after psilocybin therapy. The termination rate was highly above the reported cessation rates for behavioral or pharmacotherapeutic therapies (<35%) (Johnson et al., 2014). The reduction of depression symptoms alongside those of anxiety and addiction demonstrates psilocybin's powerful transformative nature. The results are promising, yet more thorough research must confirm psilocybin's safety and efficacy over extended periods.

LSD

Research shows that LSD treatment might help terminal patients reduce their anxiety and depression levels. Research shows sizeable reductions in state anxiety as daily experience Holze et al., (2023) and trait anxiety (predisposition) in terminally ill patients (Gasser et al., 2014). These improvements typically lasted months after therapy (Holze et al., 2024). LSD's effect on the treatment of resistant mental health disorders stems from its ability to modulate emotional and cognitive processes profoundly. Despite limited studies and legal constraints, clinical research indicates LSD may have an advantage as an alternative to standard depression treatments for patients who do not respond to traditional methods. Further studies are needed to determine the best therapeutic protocols.

MDMA

MDMA (3,4-methylenedioxymethamphetamine) is showing much promise as a treatment for post-traumatic stress disorder (PTSD). Recent research under strict protocols yields encouraging outcomes that could revolutionize the treatment standards for the disorder.

MDMA-assisted therapy was significantly more effective than placebo on all treatment outcome measures. Philip E. Wolfson had shown that those who took MDMA had markedly fewer anxiety symptoms. MDMA participants had significant reductions in anxiety compared to the placebo group, with standard measures like the Hamilton Anxiety Scale (HAM-A). Those who had received MDMA reported improvements in quality of life and a greater sense of control over their situation.

These preliminary results suggest that MDMA-assisted psychotherapy may have long-term outcomes that could benefit those struggling with severe illness (Wolfson et al., 2020). In a study by Mitchell et al., (2023), 67% of patients who tried MDMA paired with therapy no longer met diagnostic criteria for PTSD even two months after their tests ended. In the control group who received a placebo with treatment, this percentage was only 32% (Mitchell et al., 2023). Mithoefer et al., (2018) conducted a study showing that effective therapy is directly related to MDMA dosage. Patients who took higher doses of MDMA showed the most significant reduction in PTSD symptoms. Within that cohort, 67% did not meet the diagnostic criteria for PTSD post-intervention as opposed to lower doses (Mithoefer et al., 2018).

MDMA was well tolerated by participants, with side effects including short-term and mild headaches, blood pressure fluctuations, and nausea (Wolfson et al., 2020; Mitchell et al., 2023). One study reported four serious adverse effects, three of which were deemed unrelated, and the remaining were likely related to the treatment with the study drug (Mithoefer et al., 2018). Combined with psychotherapy, MDMA is a breakthrough treatment for PTSD — especially for cases resistant to standard therapy. Research establishes its high effectiveness and safety in controlled environments. With more research and the development of regulations, it is likely to become an essential part of trauma treatment.

Finding therapeutic efficacy, studies of psychedelics have yielded promising results that will change the gold standards of treatment of mental health issues. Psilocybin, LSD, and MDMA are effective in treating some disorders that do not respond to standard treatments, including depression and PTSD (Table 1). Low processing doses of these substances may account for the ability to induce 'relearning' of patients, resulting in positive changes that include long-term reinforcement that persists long after the drug's effects wear off. The studies suggest that one or two psilocybin-fuelled treatment visits may lead to a reduction in depressive symptoms that can last up to a year.

MDMA studies emphasize its unique role in treating PTSD because it can foster a stronger bond between patient and therapist and lessen anxiety responses. Clinical studies reveal that more than 50 percent of patients who underwent MDMA-assisted therapy did not suffer from PTSD after completing the treatment. These results are particularly significant given the ineffectiveness of currently used treatments in these patient groups.

Table 1 Possible use of psychedelics in mental disorders

Substance	Possible use	Reference
Psilocybin	Depression	Carhart-Harris et al., 2016 Carhart-Harris et al., 2021 Davis et al, 2021 Griffiths et al., 2016 Gukasyan et al., 2022 Lyons and Carhart-Harris, 2018 Ross et al., 2016
	Existential anxiety and depression for the terminally ill patients	Agin-Liebes et al., 2020 Griffiths et al., 2016
	Treatment of addiction	Bogenschutz et al., 2022 Johnson et al., 2014
LSD	Anxiety	Gasser et al., 2014 Holze et al., 2023 Holze et al., 2024
MDMA	PTSD	Mitchell et al., 2023 Mithoefer et al., 2018

		Wolfson et al., 2020

However, there are many barriers to the incorporation of psychedelics into everyday clinical practice. The utmost obstacle is that they are hard to access for research or therapy due to psychedelics being considered Schedule I drugs. On the grounds of this classification, psychedelic research requires controlled treatment protocols and caution regarding possible misuse. Safety is another vital criterion. Most studies reported that adverse effects were transient and mild, but further studies are required to assess the long-term effects of psychedelics. Exploring their impact on individuals with co-occurring conditions and potential drug-to-drug interactions, in particular.

4. CONCLUSION

For psychedelics to become a part of a standard treatment protocol, a realignment will also have to take place in the social and cultural conception of these substances. Educational campaigns may prove essential for diminishing the stigma around their use. With the development of new research and governmental policies, these substances might become one of the most effective resources for treating numerous different patients from around the globe.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES

1. Agin-Liebes GI, Malone T, Yalch MM, Mennenga SE, Ponté KL, Guss J, Bossis AP, Grigsby J, Fischer S, Ross S. Long-term follow-up of psilocybin-assisted psychotherapy for psychiatric and existential distress in patients with life-threatening cancer. J Psychopharmacol 2020; 34(2):155-166. doi: 10.1177/0269881119897615
2. Bogenschutz MP, Ross S, Bhatt S, Baron T, Forcehimes AA, Laska E, Mennenga SE, O'Donnell K, Owens LT, Podrebarac S, Rotrosen J, Tonigan JS, Worth L. Percentage of Heavy Drinking Days Following Psilocybin-Assisted Psychotherapy vs Placebo in the Treatment of Adult Patients with Alcohol Use Disorder: A Randomized Clinical Trial. JAMA Psychiatry 2022; 79(10):953-962. doi: 10.1001/jamapsychiatry.2022.2096. Erratum in: JAMA Psychiatry 2022. doi: 10.1001/jamapsychiatry.2022.2982
3. Carhart-Harris R, Giribaldi B, Watts R, Baker-Jones M, Murphy-Beiner A, Murphy R, Martell J, Blemings A, Erritzoe D, Nutt DJ. Trial of Psilocybin versus Escitalopram for Depression. New Engl J Med 2021; 384(15):1402–1411. doi: 10.1056/NEJMoa2032994
4. Carhart-Harris RL, Bolstridge M, Rucker J, Day CM, Erritzoe D, Kaelen M, Bloomfield M, Rickard JA, Forbes B, Feilding A, Taylor D, Pilling S, Curran VH, Nutt DJ. Psilocybin with psychological support for treatment-resistant depression: an open-label feasibility study. Lancet Psychiatry 2016; 3(7):619-27. doi: 10.1016/S2215-0366(16)30065-7
5. Carhart-Harris RL, Leech R, Hellyer PJ, Shanahan M, Feilding A, Tagliazucchi E, Chialvo DR, Nutt D. The entropic brain: a theory of conscious states informed by neuroimaging research with psychedelic drugs. Front Hum Neurosci 2014; 8:20. doi: 10.3389/fnhum.2014.00020
6. Carhart-Harris RL, Roseman L, Haijen E, Erritzoe D, Watts R, Branchi I, Kaelen M. Psychedelics and the essential importance of context. J Psychopharmacol 2018; 32(7):725-731. doi: 10.1177/0269881118754710
7. Davis AK, Barrett FS, May DG, Cosimano MP, Sepeda ND, Johnson MW, Finan PH, Griffiths RR. Effects of Psilocybin-Assisted Therapy on Major Depressive Disorder: A Randomized Clinical Trial. JAMA Psychiatry 2021; 78(5):481-489. doi: 10.1001/jamapsychiatry.2020.3285. Erratum in: JAMA Psychiatry 2021; 569. doi: 10.1001/jamapsychiatry.2020.4714
8. Dos-Santos RG, Osório FL, Crippa JA, Riba J, Zuardi AW, Hallak JE. Antidepressive, anxiolytic, and antiaddictive effects of ayahuasca, psilocybin and lysergic acid diethylamide (LSD): a systematic review of clinical trials published in the last 25 years. Ther Adv Psychopharmacol 2016; 6(3):193-213. doi: 10.1177/2045125316638008
9. Gasser P, Holstein D, Michel Y, Doblin R, Yazar-Klosinski B, Passie T, Brenneisen R. Safety and efficacy of lysergic acid diethylamide-assisted psychotherapy for anxiety associated with life-threatening diseases. J Nerv Ment Dis 2014; 202(7):513-20. doi: 10.1097/NMD.0000000000000113
10. Griffiths RR, Johnson MW, Carducci MA, Umbricht A, Richards WA, Richards BD, Cosimano MP, Klinedinst MA. Psilocybin produces substantial and sustained decreases in depression and anxiety in patients with life-threatening cancer: A randomized double-blind trial. J Psychopharmacol 2016; 30(12):1181-1197. doi: 10.1177/0269881116675513
11. Gukasyan N, Davis AK, Barrett FS, Cosimano MP, Sepeda ND, Johnson MW, Griffiths RR. Efficacy and safety of psilocybin-assisted treatment for major depressive disorder: Prospective 12-month follow-up. J Psychopharmacol 2022; 36(2):151-158. doi: 10.1177/02698811211073759
12. Holze F, Gasser P, Müller F, Dolder PC, Liechti ME. Lysergic Acid Diethylamide-Assisted Therapy in Patients with Anxiety with and Without a Life-Threatening Illness: A Randomized, Double-Blind, Placebo-Controlled Phase II Study. Biol Psychiatry 2023; 93(3):215-223. doi: 10.1016/j.biopsych.2022.08.025
13. Holze F, Gasser P, Müller F, Strebel M, Liechti ME. LSD-assisted therapy in patients with anxiety: open-label prospective 12-month follow-up. Br J Psychiatry 2024; 225(3):362-370. doi: 10.1192/bjp.2024.99
14. Howes OD, Thase ME, Pillinger T. Treatment resistance in psychiatry: state of the art and new directions. Mol Psychiatry 2022; 27(1):58-72. doi: 10.1038/s41380-021-01200-3
15. Hysek CM, Schmid Y, Simmler LD, Domes G, Heinrichs M, Eisenegger C, Preller KH, Quednow BB, Liechti ME. MDMA enhances emotional empathy and prosocial behavior. Soc Cogn Affect Neurosci 2014; 9(11):1645-52. doi: 10.1093/scan/nst161.
16. Johnson MW, Garcia-Romeu A, Cosimano MP, Griffiths RR. Pilot study of the 5-HT2AR agonist psilocybin in the treatment of tobacco addiction. J Psychopharmacol 2014; 28(11):983-92. doi: 10.1177/0269881114548296
17. Kelmendi B, Kaye AP, Pittenger C, Kwan AC. Psychedelics. Curr Biol 2022; 32(2):R63-R67. doi: 10.1016/j.cub.2021.12.009
18. Lebedev AV, Acar K, Garzón B, Almeida R, Råback J, Åberg A, Martinsson S, Olsson A, Louzolo A, Pärnamets P, Lövden M, Atlas L, Ingvar M, Petrovic P. Psychedelic drug use and

schizotypy in young adults. Sci Rep 2021; 11(1):15058. doi: 10.1038/s41598-021-94421-z

19. Lyons T, Carhart-Harris RL. More Realistic Forecasting of Future Life Events After Psilocybin for Treatment-Resistant Depression. Front Psychol 2018; 9:1721. doi: 10.3389/fpsyg.2018.01721
20. Mitchell JM, Bogenschutz M, Lilienstein A, Harrison C, Kleiman S, Parker-Guilbert K, Ot'alora G M, Garas W, Paleos C, Gorman I, Nicholas C, Mithoefer M, Carlin S, Poulter B, Mithoefer A, Quevedo S, Wells G, Klaire SS, van der Kolk B, Tzarfaty K, Amiaz R, Worthy R, Shannon S, Woolley JD, Marta C, Gelfand Y, Hapke E, Amar S, Wallach Y, Brown R, Hamilton S, Wang JB, Coker A, Matthews R, de Boer A, Yazar-Klosinski B, Emerson A, Doblin R. MDMA-Assisted Therapy for Severe PTSD: A Randomized, Double-Blind, Placebo-Controlled Phase 3 Study. Focus (Am Psychiatr Publ) 2023; 21(3):315-328. doi: 10.1176/appi.focus.23021011
21. Mithoefer MC, Mithoefer AT, Feduccia AA, Jerome L, Wagner M, Wymer J, Holland J, Hamilton S, Yazar-Klosinski B, Emerson A, Doblin R. 3,4-methylenedioxymethamphetamine (MDMA)-assisted psychotherapy for post-traumatic stress disorder in military veterans, firefighters, and police officers: a randomised, double-blind, dose-response, phase 2 clinical trial. Lancet Psychiatry 2018; 5(6):486-497. doi: 10.1016/S2215-0366(18)30135-4
22. Nichols DE. Psychedelics. Pharmacol Rev 2016; 68(2):264-355. doi: 10.1124/pr.115.011478. Erratum in: Pharmacol Rev 2016; 68(2):356. doi: 10.1124/pr.114.011478err
23. Roseman L, Haijen E, Idialu-Ikato K, Kaelen M, Watts R, Carhart-Harris R. Emotional breakthrough and psychedelics: Validation of the Emotional Breakthrough Inventory. J Psychopharmacol 2019; 33(9):1076-1087. doi: 10.1177/0269881119855974
24. Ross S, Bossis A, Guss J, Agin-Liebes G, Malone T, Cohen B, Mennenga SE, Belser A, Kalliontzi K, Babb J, Su Z, Corby P, Schmidt BL. Rapid and sustained symptom reduction following psilocybin treatment for anxiety and depression in patients with life-threatening cancer: a randomized controlled trial. J Psychopharmacol 2016; 30(12):1165-1180. doi: 10.1177/0269881116675512
25. Sessa B. The History of Psychedelics in Medicine. Handbuch Psychoaktive Substanzen 2016; 1–26. doi: 10.1007/978-3-642-55214-4_96-1
26. Tagliazucchi E, Roseman L, Kaelen M, Orban C, Muthukumaraswamy SD, Murphy K, Laufs H, Leech R, McGonigle J, Crossley N, Bullmore E, Williams T, Bolstridge M, Feilding A, Nutt DJ, Carhart-Harris R. Increased Global Functional Connectivity Correlates with LSD-Induced Ego Dissolution. Curr Biol 2016; 26(8):1043–50. doi: 10.1016/j.cub.2016.02.010
27. Timmermann C, Spriggs MJ, Kaelen M, Leech R, Nutt DJ, Moran RJ, Carhart-Harris RL, Muthukumaraswamy SD. LSD modulates effective connectivity and neural adaptation mechanisms in an auditory oddball paradigm. Neuropharmacol 2018; 142:251-262. doi: 10.1016/j.neuropharm.2017.10.039
28. Wolfson PE, Andries J, Feduccia AA, Jerome L, Wang JB, Williams E, Carlin SC, Sola E, Hamilton S, Yazar-Klosinski B, Emerson A, Mithoefer MC, Doblin R. MDMA-assisted psychotherapy for treatment of anxiety and other psychological distress related to life-threatening illnesses: a randomized pilot study. Sci Rep 2020; 10(1):20442. doi: 10.1038/s41598-020-75706-1