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Bridging the gap: (a)typical psychedelic and near-death experience insights☆

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Mystical-like states of consciousness may arise in different contexts, two of the most well-known being drug-induced psychedelic experiences and near-death experiences, which arise in potentially life-threatening contexts. We suggest and review emerging evidence that the former may model the latter in laboratory settings. This suggestion is based on their phenomenologically striking similarities. In addition, this paper highlights crucial directions and relevant questions that require future research in the field, including the challenges associated with their study in laboratory settings and their neurophysiological underpinnings.

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Introduction

The study of psychedelics and near-death experiences (NDEs) is continuously expanding, and the emergence of their research field coincides surprisingly well (Figure 1). For both, the first scientific publications date back to between 1960 and 1980, but only in the last decade has there been a growth of publications, particularly fast for psychedelics. Although Moody [1] mentioned the resemblance of NDEs to psychedelic experiences in 1975, the first empirical studies directly comparing them have been published only in recent years (e.g. [2–4]).

Classical NDEs are defined as disconnected consciousness episodes that occur in critical, potentially life-threatening situations (e.g. cardiac arrest, stroke) [7] with a prevalence varying from 10 to 23% [8–11]. Although these experiences are generally positive, some NDEs can be distressing [12–14]. NDEs display prototypical features, such as out-of-body experiences (OBEs), inner peace, or encountering presences [15]. Interestingly, these characteristics are also found in situations that are not life-threatening (referred to as *near-death-like experience [NDE-like]*), such as in deep meditation or anxiety states but also in drug-induced psychedelic experiences [2,15]. The NDE-like phenomenon seems to be often reported by people who use typical psychedelics (i.e. serotonin-2A receptor agonists), such as N,N-dimethyltryptamine (DMT), and atypical psychedelics, such as the N-methyl-D-aspartate antagonist ketamine and *Salvia divinorum*.

Both classical NDEs and psychedelics usually feature immersive and vivid imagery. However, their key difference lies in their connection to the external environment. Classical NDE typically involves a disconnection from physical reality, while psychedelic experiences can be characterized by greater diversity in terms of content, with some maintaining a connection to physical reality and others leading to complete disconnection. Considerable empirical evidence has recently emerged that points to the intriguing similarity between classical NDEs and psychedelics. The area where this has been most demonstrated is phenomenology [2,4], yet more and more research has shown similarities in subsequent changes in attitudes and beliefs [6,16–18].

Phenomenology

A few recent studies have shown that NDEs closely resemble subjective experiences induced by some (a-)

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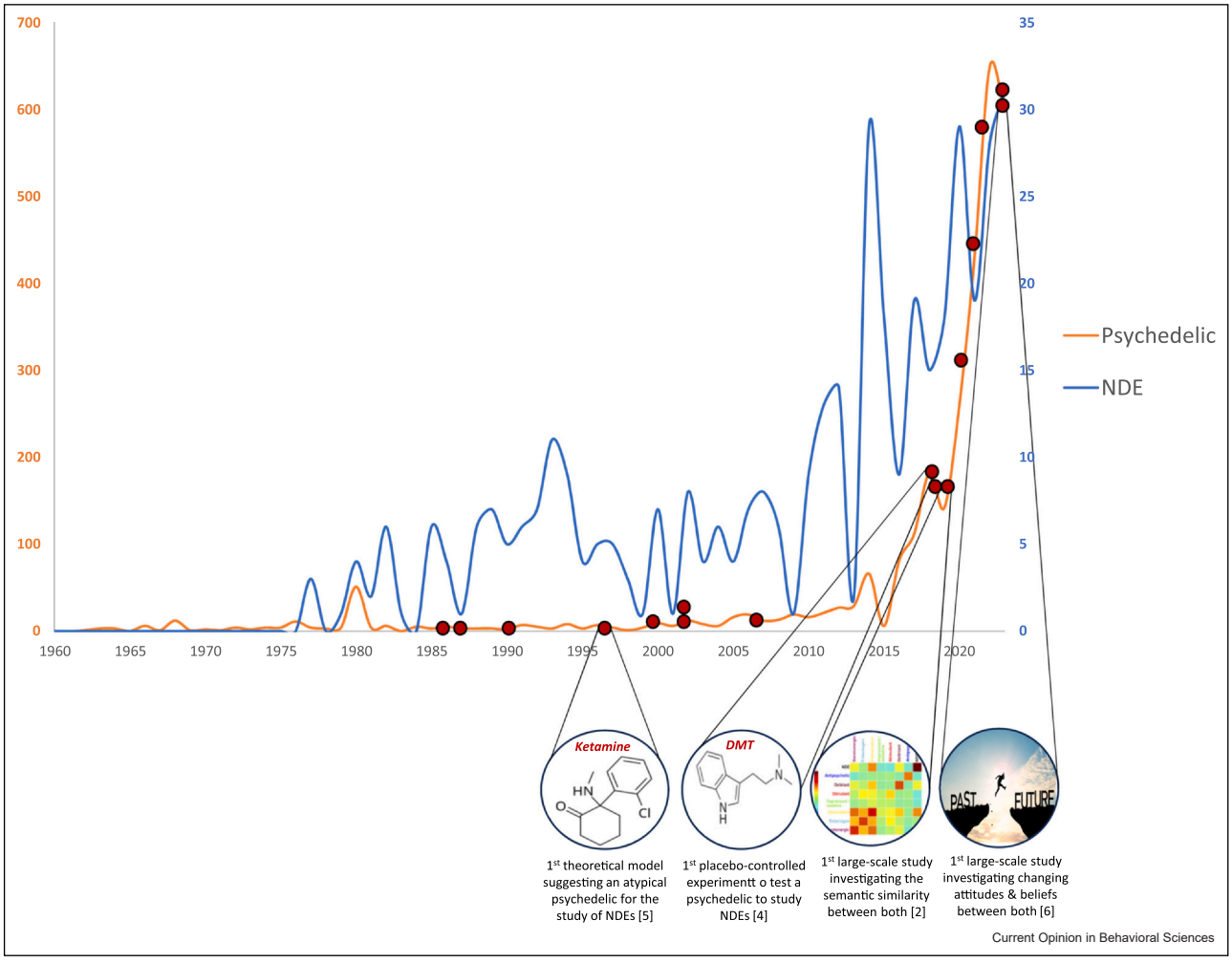
Figure 1



Publication trends on NDEs and psychedelic experiences. Number of publications per year on NDEs (for a total of 408 publications) and psychedelic research (for a total of 2,703 publications), as well as the identification of publications interested in both (red plots) and four key moments of their joint research history. A PubMed search was performed in September 2023 with the keywords "*near-death experience*" OR "*near-death experiences*" and "*psychedelic*" OR "*psychedelics*", respectively. [5] Jansen, 1997; [4] Timmerman et al., 2018; [2] Martial et al., 2019; [6] Sweeney et al., 2022.

typical psychedelics. The largest-scale study assessing the semantic similarity between psychedelics and NDE narratives showed that the substance that gave the most comparable experience was ketamine, followed by *Salvia divinorum* and a range of typical serotonergic psychedelics, such as DMT and psilocybin [2]. In the validation study of the *Near-Death Experience Content (NDE-C) scale*, which aims to characterize NDE phenomenology, Martial and colleagues [19] administered this standardized scale to people who experienced drug-induced experiences elicited by typical psychedelics (e.g. lysergic acid diethylamide [LSD], DMT, and psilocybin), *Salvia divinorum*, or 3,4-methylenedioxymethamphetamine. According to discriminant analyses, 10 out of the 20 items on the NDE-C scale were less often reported in the 'drug' group than in the NDE group. These 10 items included a border/point of no return, OBEs, the decision to come back from the experience, the feeling of dying and/or being dead, the feeling of peace and/or well-being, the sense of harmony or unity, seeing or feeling surrounded by a bright light, the sensation of leaving the earthly world, encountering a presence and/or an entity, and seeing or entering a gateway [19]. In a recent study using the Greyson NDE scale (which is the original scale upon which the NDE-C scale was built [19]), Sweeney et al. [6] showed that people who had psychedelic-induced experiences using DMT, psilocybin, LSD, or ayahuasca reported even richer phenomenology, as indexed by a higher total score on the Greyson NDE scale than the nondrug group. This discrepancy in findings with the study by Martial and colleagues [19] may stem from methodological

variations between the studies. Notably, the divergence in the results might be attributed to the inclusion, in the "nondrug experience" group of Sweeney et al. [6], of individuals who underwent a spectrum of diverse experiences, including NDEs or NDE-like ("other nonordinary experiences"). Additionally, limitations in the scale employed in this particular article could contribute to the observed differences (see [6,19]). Future large-scale empirical studies are needed to compare the different kinds of experiences. In particular, there is a need for additional prospective analyses, notably given that the abovementioned semantic analyses may have been biased by confounders (e.g. retrospective studies with only self-reports).

While these observations highlight a notable parallel between NDEs and certain psychedelic experiences, the degree of this phenomenological similarity can vary among different psychoactive substances and is still understudied. Using the example of ketamine, several retrospective studies (e.g. [2]), including the one by Corazza et al. [20], have consistently found enough commonalities to suggest that ketamine can reproduce at least some aspects of NDE phenomenology, such as OBEs, where individuals feel detached from their physical bodies.

In addition to ketamine, another substance that has been suggested for modeling NDEs is DMT [4]. The typical features of DMT experiences include a sense of transcending the physical body, entering an alternate reality, and encountering and communicating with otherworldly presences or entities [21–23]. Both NDE experiencers and DMT users often describe their experiences as feeling "more real than real", certainly due to their immersive nature, including vivid imagery or encounters with seemingly autonomous 'entities'. These visual and immersive features may create an overwhelming sense of reality beyond ordinary experiences. Vivid imagery adds to the authenticity of the experience and forms a common link between NDEs and DMT encounters [1,4,9,21,24,25]. Two recent naturalistic field studies have delved into the comparison between DMT and NDE. The first study qualitatively analyzed the common features of these two experiences, emphasizing the presence of encounters with entities and discovering alternative realities [26]. In contrast, the second study compared in the same individual the experience under 5-methoxy-DMT (a chemical kin of DMT) with a classical NDE, highlighting some distinct features, such as encountering other beings, that seem to be specific to the NDE only — at least within the context of the individual under investigation [3]. Moreover, a recent study has shed light on NDEs regarding a particular feature typically associated with DMT (as well as a few other drugs such as psilocybin): the experience of ego dissolution [27], referring to a profound and temporary loss of the sensation of being a distinct entity [27]. Studying ego dissolution in NDE research is of paramount importance because it could be a key dimension for subsequent enduring positive changes and benefits, as already demonstrated for psychedelics [28–30].

The correlation between NDEs and specific substances such as DMT provides a compelling starting point for further research. Nonetheless, despite this rising enthusiasm, only one placebo-controlled study has prospectively tested the potential of a psychedelic to model an NDE-like [4]. The authors compared the prospective subjective reports of participants who received DMT with classical NDE testimonies and found a significant overlap between the two, with only the "feeling of coming to a border or point of no return" being more commonly reported in NDEs [4].

Note that so far, the existing research comparing NDEs and psychedelic experiences has used only between-subject designs, thereby limiting our understanding of these topics. The need for within-subject studies (i.e. involving participants who have experienced both classical NDEs and psychedelic experiences) has now become apparent, permitting to reduce the influence of confounding factors arising from individual differences in background, beliefs, or linguistic expression. It is important to note, however, that even with this design, the challenge of disentangling the influence of context, such as the physical environment, social context, or emotional atmosphere, from the inherent nature of the experience, will remain.

Relevance of psychedelics to model near-death experiences

Studying NDEs is inherently limited by several factors. Indeed, the unpredictable nature of classical NDEs makes it difficult to be present when they occur, which leads mostly to retrospective and subjective reports and largely limits prospective studies. At this stage, we also cannot determine exactly when an NDE occurs. For example, in the case of cardiac arrest, it is impossible to determine whether NDE occurred before, during, or upon awakening. Hopefully, if one day one can objectively confirm the accuracy of perceptions of events associated with specific time periods, this may help researchers gain insights into the timing of the NDE. This makes prospective studies extremely challenging and mostly prevents the use of brain imaging to identify the neurophysiological correlates of these unique experiences. In addition, even when researchers attempt to be physically present in situations that might lead to NDEs (e.g. [31,32]), prospective studies on emergency or intensive care patients are difficult to implement and may be limited by several factors that can affect the rigor of the methodology and data collection (e.g. priority of

patient care over electroencephalography acquisition) [33]. While this allows for speculation, it limits our ability to make conclusive neurophysiological correlations. This highlights the complexity of the scientific study of NDEs, while there is an important need to develop a holistic evidence-based model for NDEs. Indeed, a variety of explanatory theories have been formulated independently, ranging from psychological [34], neurophysiological [5], and evolutionary [35] perspectives to more controversial ones, such as dualistic theories [8], but so far, none of these theories have been fully validated.

In 1997, Jansen [5] suggested the use of ketamine as a model for studying NDEs. He proposed that during a critical situation (e.g. decreased brain oxygen, blood flow, and blood sugar), there might be a release of an endogenous ketamine-like compound that could underlie NDE phenomenology [5,36]. However, while this theory has not been empirically tested and should be considered with caution, the very prominent similarity between the two types of experience leads some researchers to suggest that psychedelics could replicate, to some extent, NDEs in controlled environments. Indeed, simulating the core features of NDEs pharmacologically may offer a generally safe and reversible approach, particularly in curated clinical settings with thorough screenings to evaluate neurophysiological mechanisms. Nonetheless, potential adverse effects should be carefully considered [37].

While there are obvious advantages to use psychedelics to model NDE, including the potential for increased reproducibility and the ability to control variables such as the environment, they also offer the opportunity to gather neuroimaging or (electro)physiological data and obtain prospective testimonies [38–40]. These advantages address two important limitations that were previously discussed.

Another limitation of modeling NDEs using psychedelics relates to the representativeness of healthy participants who had NDE-like psychedelic experiences in a controlled laboratory environment. Indeed, this sample of participants may not faithfully represent the population of people who have experienced a classical NDE. In fact, we now know that several personality traits [34,41] and cognitive characteristics [11,42], assessed following NDE, are associated with the recall of the NDE. However, psychedelic experiences could be induced in laboratory settings in people who previously had a classical NDE, allowing them to directly compare both types of experiences — as previously done with hypnosis [43]. Obviously, particular attention should be given to the ethical implications given the potentially traumatic context in which participants may have experienced their classical NDE or their potential naivety regarding the use of psychedelics. The use of this type of design would permit the experiencers to share the commonalities and differences of both experiences. Finally, although there are limitations to take into account, the phenomenon of NDE, just as psychedelics, is important for better understanding human consciousness and has already been integrated into major frameworks of consciousness, such as the RElaxed Beliefs Under pSychedelics [44].

Influence of context and consecutive impact on life

To date, only one empirical study has compared the enduring consequences of both types of experience (psychedelic experiences [*drug group*] versus nondrug mystical experiences such as classical NDEs/non-psychedelic-induced NDE-like [*nondrug group*]) in a large sample. Specifically, Sweeney and co-authors [6] noted that approximately 90% of respondents reported that the experience resulted in a decrease in their fear of death, along with positive changes in their attitudes toward death [6], strengthening the existing knowledge in the literature on the enduring positive changes of both experiences [6,30,45–47]. Therefore, both types of experiences seem to be life-changing and can profoundly affect people's sense of self, feelings of relatedness with nature, and worldviews [45,48–50].

Interestingly, in Sweeney et al.'s [6] study, individuals from the nondrug group were more inclined to view their experiences as the most meaningful, spiritually significant, insightful, and challenging events in their lives compared with the drug group. This might be attributed to the fact that this group was also more likely to report instances of unconsciousness, clinical death, and imminent life-threatening situations, suggesting that a heightened personal significance was linked to their experiences [6]. One notable distinction between the two types of experiences is that NDEs typically occur spontaneously, whereas psychedelic experiences involve a deliberate decision to ingest a psychoactive substance. Consequently, the deliberate nature of taking psychedelics might lead people to perceive the effects of the substance as hallucinatory and to anticipate them, as they are aware of the effect of the ingested substance on their perceptions. On the other hand, people who have had an NDE have no anticipatory reason to describe their experience as hallucinatory, which may contribute to the authenticity of their perception. Thus, the sense of control over the experience may be different, as people who take psychedelics deliberately choose to make journeys, but people who have had NDEs often describe a profound lack of control, which may reinforce their sense of authenticity, meaning, and spiritual significance. Moreover, this disparity in the perception of meaning could also be influenced by the number of

experiences. Most people are likely to have had a single NDE, whereas those who have taken psychedelics may have had such experiences on several occasions. Therefore, these differences may influence the interpretation and meaning of the experiences.

In the same vein, psychological context seems to potentially play a significant role, whether in the context of NDEs or psychedelic experiences. A study conducted by Cassol and colleagues [12], which focused specifically on NDEs, revealed a greater prevalence of suicide attempts as a context of occurrence among people who experienced distressing NDEs than among those who reported positive NDEs. This finding suggested the influence of context on the emotions experienced during NDEs. Similarly, it is hypothesized that an unfavorable environment may increase the likelihood of a 'bad trip', an overwhelming distress during drug action [51–53]. Moreover, another study suggested that individuals with preexisting psychological symptoms, especially if they have not received treatment, may be more vulnerable to enduring adverse effects from psilocybin use [54]. This highlights the importance of creating a reassuring and supportive environment when using psychedelics, especially in laboratory or therapeutic settings [51–53]. Notably, individuals may manage to turn these negative psychedelic experiences into pivotal moments in their lives [12–14]. To date, there is no literature on positive transformations resulting from distressing NDEs. The scarcity of published research on distressing NDEs and long-term consequences may stem from their infrequency, the potential reluctance of individuals to share such experiences, or other reasons.

Conclusions

In conclusion, NDEs and psychedelic experiences provide unique prospects for fundamental scientific discovery. Empirical studies concur that there is a remarkable overlap between them in terms of phenomenology, underlying mechanisms, and long-lasting effects. Both are intense experiences that pervade many dimensions of the human experience, including consciousness, perception, and spirituality. There is now a need for laboratory research and within-subject comparative studies that, with cautious interpretation, may serve to elucidate the possible neurophysiological mechanisms underlying NDEs. While our focus here has been on the potential similarities between classical NDEs and psychedelic experiences, future research should also address the differences between these experiences. Exploring these differences promises to refine characterizations and advance our understanding of both phenomena. Therefore, we suggest that we should take advantage of the fact that the emergence of the NDE field coincides surprisingly well with the (re)naissance of responsible scientific experimentation of psychedelics to better understand NDEs.

CRediT authorship contribution statement

Fritz Pauline: Conceptualization, Writing – original draft, Writing – review & editing. **Lejeune Nicolas**: Writing – review & editing. **Cardone Paolo**: Writing – review & editing. **Gosseries Olivia**: Writing – review & editing. **Martial Charlotte**: Conceptualization, Writing – original draft, Writing – review & editing, Supervision.

Data Availability

No data were used for the research described in the article.

Declaration of Competing Interest

The authors have no conflict of interest to disclose.

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