**Final scientific report for Pascal Michael, application number 359/18**

# 1.

*Introduction and Aims*

N,N-dimethyltryptamine (DMT) is a natural compound known for inducing profound subjective experiences often likened to the near-death experience (NDE). While hypotheses suggest DMT as a key mediator in NDE neurology, this thesis aims to cross-examine the qualitative nature of both states. It explores if neural data implicates DMT or other psychedelics in the NDE, focusing on DMT and its analogs like 5-MeO-DMT and changa. By comparing the phenomenology of these experiences, the study seeks to answer if DMT experiences resemble NDEs.

The thesis seeks to deepen past studies by providing a detailed phenomenological investigation into the parallels between DMT experiences and NDEs. Past studies, like those by Timmermann et al (2018) and Charland-Verville et al (2014), have compared these experiences using generic measures, potentially oversimplifying their complexity. By conducting thematic analyses of DMT experiences and comparing them with in-depth NDE data, the study aims to provide a nuanced understanding of their similarities and differences. Additionally, case studies of individuals with experiences of both DMT and NDEs are explored, offering unique insights into their comparability. This work is crucial for informing ethical considerations surrounding the potential medical use of psychedelics for conditions like depression and anxiety, as well as understanding the nature of human consciousness and its relation to mortality.

The thesis comprises studies derived from field research on DMT use, aiming to understand its breakthrough experiences and their potential parallels with NDEs. Specific objectives include comprehending the dimensions of the DMT experience, exploring themes such as otherworldly encounters and NDE-like phenomena, and comparing these with detailed NDE data. Through thematic and content analyses, the study seeks to improve upon previous psychometric comparisons and explore the possible role of DMT in inducing NDE-like states. Additionally, case studies of individuals with experiences of both DMT and NDEs aim to further elucidate the relationship between these phenomena. Overall, the thesis aims to contribute to our understanding of consciousness, psychedelics, and the human experience of mortality.

*Methods*

The methods for each study in this thesis are outlined below. Chapters 3-5 share a common methodology derived from the DMT Field Study, with slight variations noted separately.

<u>Chapter III: Thematic Analysis of the DMT Experience: An Encounter with the Other</u>

Participants and Recruitment

Volunteers were primarily recruited through online advertisements and snowball sampling. Inclusion criteria required participants to be experienced DMT users, having had at least three DMT sessions or similar experiences. Participants were screened using stringent criteria via clinical interview and safety guidelines, resulting in 39 included participants and 47 DMT sessions for analysis.

Measures and Materials

Dosage of DMT provided by participants was monitored using microscales, with participants typically using doses ranging from 40mg to 75mg. Semi-structured interviews were conducted to explore participants' DMT experiences comprehensively.

Procedure and Anonymity

To maintain anonymity, participants were assigned pseudonyms and all personal information was kept confidential. One minute-interval intensity ratings were collected during the DMT experience, and structured interviews were conducted post-session, covering various domains such as entity encounters and sensory experiences. Interviews were audio-recorded, transcribed verbatim, and analyzed thematically using NVivo software.

Chapter IV: Thematic Analysis of the DMT Experience: An Encounter with the Self

The methodology for this chapter mirrored that of Chapter III, with the analysis focusing on participants' experiences of the self during DMT sessions.

Chapter V: Thematic Analysis of the DMT Experience: An Encounter with Death

The methodology for analyzing DMT experiences related to death followed the same procedures as Chapters III and IV. Additionally, comparisons were made with thematic analyses of near-death experiences (NDEs) reported by Cassol et al. (2018).

Chapter VI: A Comparative Analysis of a Near-death Experience and Subsequent 5-Methoxy-DMT Experience

One participants who had experienced both near-death and 5-MeO-DMT experiences were recruited, and semi-structured interviews were conducted to explore the nature of their experiences. Thematic analysis was performed on the interview data, and comparisons were made between the two experiences. Additionally, the Greyson NDE Scale was administered to provide a quantitative measure of similarity between the experiences.

Chapter VII: Two Case Studies of Experiencers of Both Changa and Near-death Experiences

Two participants who had experienced both DMT (changa) and NDEs were recruited, and semi-structured interviews were conducted to explore their experiences. Thematic analysis was performed on the interview data, and comparisons were made between the two experiences. The Greyson NDE Scale was also administered to provide a quantitative measure of similarity between the experiences.

Ethics

Approval for these studies was obtained from the University of Greenwich Research Ethics Committee.

*Results*

The first empirical chapter ('An Encounter with the Other') identified that, in a naturalistic setting with experienced DMT users at minimum 40 mg dosage, 96% of our participants reported encounters with, normally, multiple entities who were typically of a benevolent and guiding nature, yet who took on a myriad of forms, mostly of a generally alien-like quality. Suggested neural correlates of the encounter were given, but their elaborately complex nature was concluded to elude present understanding. The second empirical chapter ('An Encounter with the Self') dedicated as it was to how the DMT experience affected the participants themselves, showed pervasive effects in the domains of body, sensorium, psychology, and emotions. The emotional impact was especially profound, where potential for psychotherapeutic use was endorsed (though caveated).

For both these studies, the internal consistencies within the naturalistic study were highlighted, and consistencies with other DMT studies were also emphasised. This was even at the level of specific content, as opposed to gross features, which is of particular note (and may have ontological implications) given that cultural transmission may be unlikely due to the other supporting studies not involving experienced users (as in our study) but many of whom were naïve to such DMT content. Again for both, yet especially the former, while shamanic or folkloric phenomenology was reminiscent, the abduction or extra-terrestrial encounter phenomenon bore the greatest resemblance.

The third empirical chapter ('An Encounter with Death') included multiple levels of analyses, but may be summarised by the following: All features of the NDE were reproduced by DMT, however some more (e.g. entities) or less (e.g. the threshold) by DMT, as according to the psychometric and content analyses. The qualitative nature of the content of the DMT experience, however, which was the primary thrust of the study, was evidenced to be (to paraphrase the conclusion) intense, prodigious, bizarre, kaleidoscopic, non-biographic, extra-terrestrial, cross-cultural, artificial, infantile, archetypal, atavistic or mythological. While the NDE may certainly consist of archetypal imagery, as well as have perinatal parallels, it overwhelmingly lacks these other dimensions, tending to be more self-referential and culturally consistent. This, however, is not ubiquitous, where some 'idiosyncratic' NDEs are compared with which were in this sense, DMT-like in content – and some DMT experiences were isolated also which were NDE-like (though the content in the latter was generally still stereotypically psychedelic). As such, DMT was considered to be an 'occasional, partial NDE-ogen', and best approached as an 'NDE-mimetic'. The 'mimetic' qualifier, however, may ontologically connote an inability to produce 'authentic' or 'real' near-death experiences, as may be the intention by some with the use of the term 'mystico-mimetic' to imply failure to create as genuine experiences as those 'naturally-occurring'. While by definition DMT experiencers are not near death and so the experience may only ever correctly be categorised as NDE-like, this new term 'NDE-mimetic' is meant only to be ontologically

neutral. The fact of DMT in this extensive though limited way mimicking NDEs undermines endogenous DMT's major biological contribution near-death. Though it retains its candidacy as a therapeutic treatment, yet perhaps not as effective as one of a less overwhelming and extra-terrestrial nature and one closer to the prototypically transformative NDE.

The fourth empirical chapter ('This is your Brain on Death') found that the 5MeO-DMT experience was found to overlap with the NDE of the case study in the mystical experience quality, as classically described by the mystical experience questionnaire, especially time-space transcendence. It is arguable that it is deep NDEs (such as that of the case study e.g. reporting 30/32 on the NDES) which tend to incorporate this mystical experience, and thus may be engendered by 5MeO-DMT – as suggested by Ring's (1980) finding of progressively fewer experiencers reaching the 'deeper' layers of his NDE measure i.e., past the 'light', as well as Owens et al. (1990) finding those closer to death to more often report the light phenomenon, which is itself associated with the 5MeO state. As such, this experience may be more appropriately considered to be like the 'death' state, mirroring as it is of the 'Clear light' of the Tibetan book of the dead, which may have ontological connotations of its mediation independent of the brain. In contrast, the comparatively dualistic features of the case's NDE may be better modelled by N,N-DMT, as well as by, in a non-mutually exclusive manner, perinatal recollection or lucid dream mechanisms. Given the relatively 'content-less' nature of this mystical experience, endogenous 5MeO-DMT may well provide a physiological contribution to this dimension of the NDE – however this may be hindered by an arguable inaccessibility of the 5HT-2A receptors due to the encephalitis. Despite this, the interruption of layer V pyramidals or high-level inhibitory networks by this aitiology may in some way still mimic the downstream action of psychedelics – which could be an alternative, or supplementary, mechanism in any near-death aitiology, especially traumatic brain injury.

Finally, in the last empirical chapter ('Smokable Vine of the Dead'), a 3rd person (i.e. researcher analysed) content analysis illustrated a moderate similarity of the case studies' changa experiences with their near-death experiences, though a high similarity with NDEs at large. Further 1st person analyses (i.e. via self-reports) yielded mixed similarities, according to the NDE scale and participants' qualified and quantified perceptions, wherein one subject rated their experiences as almost identical, versus the second subject rating theirs as less comparable with only some features replicated. A small cluster of features of the changa experiences, especially a threshold appearing as a gate concomitant with a message that the experiencer was not ready (i.e. to cross), as well as both experiences' generic sequence, were highly reminiscent of NDEs. Though, in both, the qualitative content of said features was still categorically DMT-resembling. The less NDE-resembling nature of the second case may be owing to the NDE being non-classical (without significant threat to life), where DMT (though formally categorised as 'NDE-like' itself) may more closely model classical NDEs due to possible endogenous release in hypoxic conditions. Similarly, this second may undermine, though the first may support the implication of DMT or the monoamines (pharmacological targets of changa) in NDEs, under the framework of state-dependent memory, where content at encoding (the original NDE) may be more accessible if similar conditions are present at retrieval/recollection (the subsequent changa experience).

*Discussion*

Applications

In elucidating the N,N-DMT, 5MeO-DMT and changa experience and their resonance with the NDE, this may have many implications for application, essentially clinically, all of which described in their respective chapters, yet may be summarised in the following.

The otherworldly breakthrough by DMT echoes the abduction phenomenon and NDEs, which in turn confer beneficial changes like eco consciousness, spirituality, less death anxiety, connection to self/world/others. Less psychopathology itself has been noted as a possible outcome, for example, amongst a psychiatric outpatient population, including a range of disorders such as depression, bipolar and other psychoses, those who reported NDEs were generally less psychopathological (Greyson, 2003). Many such outcomes are likely intimately linked to the subjective experience itself, such as the entity encounter (and other anomalous features) possibly engendering both insight and psychological flexibility which are psychotherapeutically valuable.

Many elements of the self-bound DMT experience, such as sense of dying, acceptance of death, ego disruption or ego preservation when convinced of being dead, symbolisation of death-related themes or disembodiment, all mirror the therapeutic approaches of exposure therapy, existential therapy, ACT, psychodynamic therapy or self-transcendence – in a way which alleviates fear of death, which may itself be perpetuating of general psychopathology. For instance, the DSM classifies pathological preoccupation with death as one criterium for depression, and Moreton et al (2023) identified that reduced death anxiety mediated the mystical experience's effects on the reductions in negative affect and improvements in positive affect. That is, regardless of the disorder in question, qualities inherent in the psychedelic experience which address existential angst could have trans-diagnostic salutary potential. Though, a crucial caveat is the ontological shock, which may mediate flexibility, may also presage traumatisation, mainly for any psychedelic naïve, vulnerable psychiatric populations, or the 'uninitiated' in such effectively religious experience. The non-personal and extra-terrestrial content may also constrain DMT's applicability in psychotherapy, especially in end-of-life treatment – even though the dying-pertaining themes will be valuable – given that such content fundamentally demarcates it from the NDE. This said, the science-fiction-esque quality of DMT such as the "alien" encounter may be partially owing to expectation (see Limitations, Chapter 3), and if they did occur, alien abductions, though harder to integrate versus NDEs, are linked to positive changes in the self, not limited to reduced fear of death (e.g. Strassman, 2001). The profound emotional impact, understanding and release also importantly constitutes 'emotional breakthrough', which has, understandably, been linked to better outcomes after psychedelic experiences.

Especially in respect to Chapter 5, the NDE can be considered the prototype for engendering personal transformation, or so-called 'conversion' to a religiospiritual orientation – where idealist/dualist metaphysical beliefs after psychedelics are correlated with enhanced wellbeing (Timmermann et al., 2021) – so a highly effective psychedelic therapy should be one which most emulates the NDE. DMT showed some, albeit limited, fidelity to the NDE –

whereas, high dose psilocybin could be a superior model (Michael, 2022b), or other substances or indeed combinations (like that explored in Chapter 7 with changa) with complex psychopharmacology which echoes that near-death. An example of this is ibogaine from the iboga root (with serotonergic, glutamatergic, cholinergic and dopaminergic activity), which phenomenologically, also commonly produces a 'life-review' effect, and is often considered an 'oneirogen' given its deeply dreamy state – where NDEs, in their being linked to psychedelics (e.g. Martial et al, 2019), can also be legitimately considered as dream-like (e.g. Sanz et al, 2018).

Not explicitly discussed in the respective chapters were the applications of 5MeO-DMT or changa. The participant of the 5MeO study stressed a felt difference that the NDE provided dimensions of deep learning about life lessons, for instance about substance abuse, which the 5MeO experience lacked. However, 5MeO has been shown to be clinically useful in substance use disorders (Barsuglia et al., 2018), and the mystical experience, which the 5MeO was fundamentally characterised by, from psychedelics in general have been associated most strongly with improved outcomes in addiction (Kangaslampi, 2022). Notwithstanding, the intimate link between the mystical state and therapeutic outcome and its powerful and universal occasioning by 5MeO makes it an important candidate as a clinical agent, where its producing of the deepest NDEs which contain this dimension and which are the most transformative is also testament to its potential. This transformation is linked to conversion, and the participant shifted from atheist to non-physicalist post-NDE which was itself concurrent with his elevated wellbeing (Timmermann et al., 2021).

Regarding changa, while there was expressly stated motivations by the prior 5MeO participant to take the substance to return to the NDE space, this was possible with one case of the changa study, though unstated in the other. However, this latter volunteered their use of other psychedelics since their NDE partly with the intention of attempting to comprehend their experience, as such indicating an application of these substances, if not to re-enter the NDE 'world', to assist in the integration experience. While Michael (2022a) proposed the need for psychotherapy (before and) after a near-death experience mirroring the (preparation and) integration of psychedelic therapy, a case could also be made for employing psychedelics themselves in a controlled manner for the purpose of integration after an NDE, given that over a tenth may be of a deeply distressing nature. Given the more abduction-esque content of DMT (as argued in Chapter 5) vs NDEs, DMT could similarly be a candidate in helping integrate abductees' experiences – which are typically more ontologically challenging and difficult to integrate (albeit, re-triggering potential must be mediated in any such therapeutic process). Lastly, the preliminary observations that changa may in some ways be more like NDEs (such as having some features normally absent in N,N-DMT or their chronology) deserves further scrutiny to determine if they are better inducers and thus more apt therapies for reasons above outlined.

<u>Limitations</u>

The varying methodologies used in the multivariate evaluation of psychoactive agents in relation to NDEs employed in this thesis were not without their limitations. Again, these were elaborated in the discussion of all the relevant chapters at length, and so the reader is

referred to these sections. However, one unexpanded point regarding Chapters 3, 4 and 5, analysing data from the DMT field study, would include the use of experienced DMT 'psychonauts' and thus priming the data for certain content associated with this subculture. However, this was necessary for not only ethical reasons, but for a rationale which may compensate for the expectation effects by allowing for a highly skilled and careful focus during and navigation of the DMT space itself and articulation thereafter, which directly echoes the enlisting of experienced DMT users in recent continuous infusion experiments as part of an explicit project to retrieve the nuances of the deeply reconfigured conscious experience by those experienced in doing so, where repeat, and continuous exposure would feedback to further enhance this (Timmermann, 2022). Two more unexpanded points regarding Chapter 5 would include that only classic, anoxic NDEs were compared with, versus other NDE-like episodes for instance, where the experiences may have otherwise been concluded to be more like one another than this thesis suggested, given that DMT is an example of an NDE-like experience, or less like one another, if indeed DMT is produced in anoxic conditions like those compared with in this study. However, even though Charland-Verville et al. (2014) and Facco & Agrillo (2012) conclude that NDEs are the 'same' irrespective of threat to life – and there being many reports of meditation (Gordon et al., 2018) being able to produce more features than typical NDEs, or hypnosis (Schenk, 1999; Ohkado & Greyson, 2018; Pederzoli et al., 2019) producing all or most, or epilepsy and other temporal neuropathologies producing some features like OBEs (Blanke et al., 2004; Hoepner et al., 2013) – this 'similarity' is fundamentally only at the level of phenomenological structure, that is, experiential features, compared to the level of qualitative content which was the focus especially of Chapter 5 of this thesis. In other words, if NDE-like NDEs vs classical ones were compared with, the same conclusion would likely be made i.e., that the DMT experience is distinguishable by unique content – but further research is indicated to corroborate this. Additionally, in Chapter 5 the adapted and extended themes of the NDE from Cassol et al. (2018) were used to begin with as the reference point with which to compare the DMT themes, and as such those content items present in DMT but not the NDE were not included in the prevalence analysis – however, these were explored in tables attached to the appendices.

Finally, one fundamental limitation of the present thesis as a whole may be the following: Qualitative analyses used here have provided experiential illumination of the psychedelics and the NDE itself, and the epicentral thrust of not only Chapter 5's conclusions, but also of the subsequent chapters comparing with 5MeO and changa, surrounded the qualitative content divergences undermining DMT's role in the NDE. However, such analyses are certainly not the ideal-most tool for ascertaining if DMT or analogous substances are implicated in the NDE. Of course, the direct-most technique to deduce this would be microdialyses such as that performed by Dean et al. (2019) of endogenous DMT during animal model death. Future work to substantially contribute to this overarching project may thus include the simple measurement of blood concentrations during spontaneous hospital deaths or near-death (akin to Klemenc-Ketis et al., 2010 re: $CO_2$; or Parnia et al., 2001 re $O_2$) – or comparatively more complex, logistically and ethically, neuroimaging using PET via radioisotopes linked to the investigated compound, or fMRI for non-pharmacological but

functional imaging, which may be quasi-experimental in a prospective manner, for instance, recruiting convicts receiving capital punishment or those seeking euthanasia. While ethical approval of this may be challenging, the consent given by informed participants and the immense and direct evidence this would provide for the neurobiology of the dying process, not to mention the ontological ramifications this may have, should be duly considered by approving bodies. An alternative, however, though improbable, may be to survey the literature which may include or contact researchers who may possess the accidental data gathering of such neuroimaging during medical events such as cardiac arrest or stroke.

*Recommendations*

Many indications for possibilities of future research have been suggested above, either from limitations of the studies within the present thesis or from other studies. However, the overarching research endeavour regarding the phenomenology, neural or other physiological correlates, and the ontology of psychedelic and transpersonal experiences, namely the DMT and near-death experience, could benefit greatly from a host of other investigations. Three of these studies include those for which data had been collected and at least partially analysed for the present thesis, but where limitations of time and length precluded their incorporation. However, the analyses are ongoing, where final write-ups are planned, which will duly acknowledge the Bial Foundation. Brief summaries of the rationale, methods and very preliminary results of these are delineated here:

The first of these includes a case series of four other individuals who have experienced both near-death and *NN*-DMT experiences, which expands on the very same rationale and methods as described above for Chapters 4 and 5 of this thesis (studying those with experiences of NDEs and 5-MeO-DMT, and NDEs and changa, respectively), and takes advantage of the unique vantage point these participants have to personally comment on their phenomenological relationships. “Anna” (Female, 57, White British) reported an experience with freebase DMT (dose unknown) on September 2018, at age 56; and also reported a near-death experience via a profound depressive episode (& cannabis) in 1989, at age 27. “Carlos” (Male, 38, White British) reported an experience with freebase DMT (1g in group context) on November 2019, at age 37; and also reported a near-death experience from a motorcycle accident on January 30th 2005, at age 23. “Noggin” (Male, White British, Age 53) reported an experience with freebase DMT (dose unknown) on May 1993, at age 27; and also reported a near-death Experience from Bilateral Pulmonary Emboli during 19-20 May 2016, at age 50. Lastly, “Stone” (Male, 38, Yoruba, Nigerian), reported an experience with freebase DMT (54mg) on 6th December 2019, at age 38; and also reported a near-death experience, via an allergic reaction to medication on September 1992, at age 10. All these narratives have been fully qualitatively coded, but are in the first phases of thematic-content analysis, so conclusions cannot yet be readily made.

Additionally, the raw interview data gathered by Rick Strassman, on which “DMT: The Spirit Molecule” (Strassman, 2001) was based, was shared to the present author. An exhaustive, systematic content analysis of this was performed, assiduously identifying themes pertaining

to entities, other worlds, mystical experiences and near-death experiences, as well as their frequency of occurrence. This helps in more comprehensively characterising the reported DMT experiences – but where a comparison of this almost 30 year-old DMT study with the more recent DMT field study (upon which many chapters herein were based), helps elucidate any changes over time in DMT phenomenology (which may be due to propagation of DMT-pertaining memes) and represent a further means – in the same vein as Chapters 2-4 of this thesis – to explore the internal theme consistency of the experience. A comparison as well – in the same vein as Chapter 4 – with the near-death experience would be especially instructive, not only to replicate, or otherwise, the conclusions of the present thesis as to the phenomenological similarity – but if the findings are replicated with this older DMT study, then given less opportunity for the propagation in popular consciousness of associations between DMT and near-death experiences in the intervening years, this may suggest such comparability being less due to cultural influence. Preliminary results of this analysis and such a comparison with the DMT field study suggest that for a select few participants of the original study (of Strassman's), these mirrored experiences reported in the DMT field study on the specific level of qualitative content; these are included in the following conference presentation (duly acknowledging the Bial Foundation): *Michael, P. (2019, August). Preliminary results from the DMT Field Study. Paper presented at Breaking Convention: The 5th International Conference on Psychedelic Consciousness, University of Greenwich, London, 16th-18th August*

Finally, studying altered states of consciousness – mainly psychedelic but also, for instance, sleep paralysis, hypnosis, etc – in the blind, and most interestingly the congenitally so, would complement the findings of Ring & Cooper (2008) showing putatively visual NDEs in the blind. In this way, if blind subjects also reported apparently visual experience during, for example, psychedelic episodes, this could again represent a further domain in which NDEs and psychedelic states may be paralleled and suggest the possibility of endogenous psychedelics inciting NDEs. Such a research project extends from very scant studies exploring the effects of psychedelics in blind humans (Krill et al., 1963) and monkeys (Siegel et al., 1976); the visual nature of dreams in the blind (Bértolo et al., 2003) – however see (Kerr & Domhoff, 2004) – and some evidence that ayahuasca can cause remission of, at least acquired, aphantasia i.e. 'mind blindness' (dos Santos et al., 2018), whereas DMT may not be capable of doing so in congenital aphantasia (Luke, 2018) – while acknowledging clear mechanistic differences between aphantasia and blindness related to physical visual system damage. Such a study was performed by this author, interviewing 10 male Caucasian (age range 18-78) legally blind individuals, a proportion of whom congenitally, as regards their visual experiences during altered states of consciousness (including psychedelics & NDEs). Analyses are again ongoing, however one particular case is especially illuminating. "Terry" describes generally being able to physically navigate and perform fine-movements in a more enhanced manner – but also reports being convinced he could 'see' a rush of energy and imagery upon a car riding past him while under the influence of psilocybin, as well as 'see' a guitar in his path on the stairs and dextrously stepping over it under the influence of cannabis and LSD. These results are included in the following conference presentation (duly acknowledging the Bial Foundation): *Luke, D. (2021, October). Are non-visual visionary*

*experiences possible? Psychedelics & aphantasia. Presentation for the Extreme Imagination Conference (online), 21-23 October.*

Akin to this study, further phenomenological reports from the DMT field study involving two participants with *aphantasia* (mind-blindness, i.e. inability to produce mental imagery) are also in preparation, which may bear on the capability for visual imagery to account for certain DMT features (such as entity encounters). Preliminary results from this entail one subject reporting grid-like patterns – where of note, this individual also reported some visuality in dreams (involuntary mental imagery) – and the other reporting effectively a classic DMT experience with all features except for any visual concomitants – who, instead, reported no dream visuality. The inclusion of entity encounters in this report significantly undermines hypotheses that entities are a product of Bayesian hallucination based on interior visual stimuli (Michael et al, 2021).

In terms of further recommendations for investigation going forward, other opportunities to further study reports predicated on the DMT field study include one investigating the capacity of DMT to be conducive to precognition (Luke, 2019), where any suggestion of this, given the parapsychological components of NDEs, may represent more support for endogenous DMT's implication near-death. Ontologically, any evidence for psychedelic's conduciveness to psi, in turn suggesting nonlocality of consciousness, enhances the feasibility of the survival hypothesis as gestured to by near-death experiences. Additionally, investigations into the post-acute effects from DMT on wellbeing, cognitive, existential and personality domains – as already suggested by ayahuasca's clinical outcomes (Dos Santos et al., 2018; Loizaga-Velder & Verres, 2014; Murphy-Beiner & Soar, 2020; Palhano-Fontes et al., 2019; Zeifman et al., 2019) or the several clinical trials of DMT underway (D'Souza, 2021; Liechti & Ley, 2020; Scheidegger, 2021; Steiner et al., 2020; Devlin & Bhatt, 2022; Erritzoe et al., 2020) – would comprise an entirely parallel project to compare DMT and NDEs (in terms of long-term influence versus experiential effects). Namely, NDEs have been evidenced to engender a litany of after-effects which significantly mirror those positive outcomes after psychedelics, for instance in respect to decreased existential anxiety and materialistic worldview, enhanced sense of transcendence, self-worth, concern for others and for the natural world, spiritual wellbeing and meaning in life (Groth-Marnat & Summers, 1998; Sutherland, 1990; Khanna & Greyson, 2013; Van Lommel, 2002). Lastly, a classical priming study, wherein the video content showed to participants on the field study in the control condition, that is prior to DMT intake, could involve a content comparison between the video material and the subsequent DMT experience. Not only would this explore the sensitivity of DMT to priming, versus other psychedelics, which has not been studied – but if priming were evident, this may bear on the ontology of the DMT experience.

Originally planned projects included in the proposal of the present thesis but not finally incorporated related largely to the physiological correlates of the near-death experience. For example, an investigation into the resting-state EEG activity of those who have undergone NDEs and comparison with those who have not would, given its retrospective nature, wither help indicate neuroelectric changes or baseline predispositions to reporting NDEs. While general spiking activity has been explored retrospectively (Britton & Bootzin, 2004), more

nuanced cortical excitability measures of said EEG activity, specifically, have not been. Such excitability analyses may also be applied to participants in DMT studies and correlated with its NDE-like quality, which in a prospective manner could help disentangle the predictive power or consequential nature of the excitability. Also, a similar study could also be carried out looking into blood concentrations of endogenous DMT (versus EEG correlates) of NDErs – where, for instance, the possibility of higher such concentrations predicting NDE reports may be supported by higher endogenous DMT at baseline linking to higher increases in DMT after cardiac arrest in rodents (Dean, personal communication). Finally, on a phenomenological level, qualitative analyses of experiments currently underway researching a continuous infusion protocol of DMT administration would represent an important opportunity to not only chart the subjective effects of a maintained peak DMT experience, but the greater chance for subjects to recall content may assist in the exercise of comparing and contrasting with the NDE.

Other recommended research projects would include the testing of the above suggested hypothesis that any release of endogenous psychedelics near-death could influence the perception of intrinsic sensations evoked by neural hyperexcitability, such as in the optic tract, leading to the tunnel and light effect (Blanke et al., 2015). For example, presenting DMT participants, during their experience, with a simulation of such a growing disk of light on video, and identifying if reports include a transformation of the basic stimulus into the more complex tunnel imagery common in NDEs. Studies into the reverse of this, that is, similar intrinsic neural activity, namely epiletiform activity – versus psychedelic release – itself influencing the psychological impact of released psychedelics, could also be instructive. For instance, reports of the enhancement in the psychoactive effects of psychedelics during seizures (in epileptics or spontaneously), thus mimicking any concurrence of seizure-like activity and endogenous psychedelics near-death, could rebut claims of the insufficiency of DMT alone to account for the NDE (Nichols, 2018). This paralells suggestions by Borjigin (Borjigin & Chavez, n.d.) that the unique state of the dying brain, for instance in its compromised state, could reduce the threshold by which any released endogenous DMT may exert significant psychoactive effects. Finally, one considerably important research project would entail the phenomenological and content analyses of near-death experiences resultant from specific aitiologies involving focal lesioning to the brain. One study has already qualitatively explored NDEs from traumatic brain injury (TBI; Hou et al., 2013), though without analysing any possible link between the location/type of cortical injury and the experience – while only one other has specifically tried to associate focal lesions, namely in the brain stem, with any differences in NDE content (Charland-Verville et al., 2015), finding less positive affect. This overarching project could systematically explore structural phenomenological differences, using the NDE scale, between neuropsychological patients of different lesions, from TBI or stroke, thus identifying the possible neural origins of different NDE features. Finally, the evident resonance between DMT and the near-death experience, indirectly, links NDEs and abduction/alien encounter tropes which should be analysed further, and this thesis' exhibiting of DMT to replicate NDEs by some dimensions and including a poly-pharmacological model (changa), and other studies showing ketamine to be

perhaps an even more reliable generator (Martial et al., 2019a) indicate a need to explore participant reports of experiencing both in tandem.

# 2.

**Table highlighting the differences between expected and achieved output indicators**

**Expected and achieved output indicators (number of actions)**

| **Output indicators** | Expected (according to application) | Achieved |
|---|---|---|
| Advanced training: PhD theses | 1 | 1<br>November 2022: Submission of PhD thesis<br>25th May 2023: University of Greenwich confirmed the outcome of *viva* examination for the award of PhD as "Approval with minor amendments"<br>September 2023: Certification of award sent<br>October 2023: Graduation. |
| Advanced training: Master theses | | |
| Advanced training: Other | | |
| Organization of seminars and conferences | | |
| Book | | |
| Book chapter | 0 | 2 |
| Conference presentation | 3 | 10 conferences/academic lectures directly generated from funded doctorate, marked with * in publication list below (+ many others not representing presentations regarding specific doctoral chapters) |

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| Conference paper | As above | As above |
| Journal article | 3 | 5 directly generated from funded doctorate, marked with * in publication list below (+ many others not representing publications of specific doctoral chapters) |
| Other (specify) | | |

**List of publications**

## Publications

Michael, P. (2020). Neurothanatology: The Quest for the NDE-ogen. The Paranormal Review

*Michael, P., Luke, D., & Robinson, O. (2021). An encounter with the other: a thematic and content analysis of DMT experiences from a naturalistic field study. *Frontiers in psychology*, 5731. - https://www.frontiersin.org/articles/10.3389/fpsyg.2021.720717/full?fbclid=IwAR2RZ9fJ6s7KmwZI2n05FhjloOYRhxm6ptekyHJDOwtPbAiTjrIurZXZmis

→ The metrics of this article currently indicate 136,000 views, and a score on *altmetric* of 97 – which designates it as having more views than 99% of all Frontiers articles

Michael, P. (2022). Thanatotherapy: Death-assisted psychotherapy?. BPS Psychotherapy Section Review

Michael, P. (2022). Commentary on "After: A Doctor Explores What Near-Death Experiences Reveal About Life and Beyond" by Bruce Greyson. Journal of Near-death Studies. 39(3)

Michael, P. (2022). Rejoinder to 'Response to Pascal Michael's commentary on After: A Doctor Explores What Near-Death Experiences Reveal About Life and Beyond'. Journal of Near-Death Studies. 39(3)

*Michael P, Luke D and Robinson O (2023) An encounter with the self: A thematic and content analysis of the DMT experience from a naturalistic field study. Front. Psychol. 14:1083356. doi: 10.3389/fpsyg.2023.1083356 - Frontiers | An encounter with the self: A thematic and content analysis of the DMT experience from a naturalistic field study (frontiersin.org)

*Michael P, Luke D and Robinson O (2023). This is Your Brain on Death: A Comparative Analysis of a Near-death Experience and Subsequent 5-Methoxy-DMT Experience. Front. Psychol. Volume 14. doi: 10.3389/fpsyg.2023.1083361 - https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1083361/abstract

→ The metrics of this article currently indicate 18,000 views, and a score on *altmetric* of 114 – which designates it as being in the top 5% of all research outputs scored by Altmetric

*Michael, P., Luke, D., and Robinson, O. (2024). Smokable "vine of the dead": Two case studies of experiencers of both a changa and near-death experience.

"Smokable "Vine of the Dead": Two Case Studies of Experiencers of Both " by Pascal Michael, David Luke et al. (ciis.edu)

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*Michael, P., Luke, D., and Robinson, O. (*in review*). An encounter with death: Comparative thematic analyses of the DMT experience and the near-death experience.

*Book contributions*

Michael, P. (2022). The Death-Trip: A Case Study of Psilocybin's Simulation of the Phenomenology and Long-term changes of the Near-death Experience. In Tollen, A., King, D., Luke, D. (Ed.). Breaking Convention: A seismic shift in psychedelia, Strange Attractor Press

Michael, P., Luke, D. (*in press*). Imitations of Immortality: Psychedelics as NDE-mimetics and the Neuroscience of Death and Near-death. In Ruickbie, L. (Ed.) Is There Life After Death?

## Presentations

Conferences:

*Michael, P. (2019, August). Preliminary results from the DMT Field Study. Paper presented at Breaking Convention: The 5th International Conference on Psychedelic Consciousness, University of Greenwich, London, 16th-18th August

*Michael, P. (2019, September). A comparative phenomenological analyses of the DMT and Near-death experience. Paper presented at the 43rd International Society for Psychical Research Annual Conference, Leicester, 20th-22nd September

*Michael, P. (2022, June). Neurothanatodelia: The 'Phenomeneurology' of DMT as an NDE-mimetic. Paper presented for SSE-PA conference, Online, June 23rd-26th

*Michael, P. (2022, September). A Marriage of Heaven and Hell: Oneness in psychedelic and Near-death Experiences. 2nd September

*Timmermann, C., Martial, C., Michael, P., et al. (2022, September). A Panel on Psychedelic, Near-death and Mystical Experiences. Broughton Hall

[Other e.g.s inc. Occulture; Breaking Convention]

Public talks:
*Luke, D., Michael, P., Davis, L. (2020, October). DMT, NDE & Aphantasia: A panel with David Luke, Pascal Michael & Luke Davis. Invited talk (online) for the Psychedelic Society of the University of Sussex, 22nd October.

*Michael, P. (2020, December). Drugs at Dusk: DMT and the Near-death experience. Invited talk (online) for the Psychedelic Society of the University of Oxford, 3rd December.

Michael, P. (2021, December). Psi-chedelia and Interspecies Communication. Accepted talk (online) for Public Parapsychology, 17 December.

*Michael, P. (2022, August). Beyond DMT: Near-death Neuroscience. Invited talk (online) for The Psychedelic Society (official, UK)

[Other e.g.s inc. Last Tuesday Society; York psychedelic society, Greenwich Psychedelic Society; Copenhagen Psychedelic Soc.; Multiple podcast interviews…]

Teaching:

*Michael, P. (Autumn term, 2018, 2019, 2020, 2021, 2022). The Science of the Near-death experience, for The Psychology of Exceptional Human Experiences, University of Greenwich [Lecture]

Michael, P. (Summer 2021, 2022). Drugs at Dusk: DMT and the Near-death experience, for Professional Certificate in Psychedelics, Altered States and Transpersonal Psychology, ALEF Trust [Lecture, Online]

Michael, P. (Spring, 2022, 2023) Neurodelia: The Neuroscience of Psychedelics, for Professional Certificate in Psychedelics, Altered States and Transpersonal Psychology, ALEF Trust [Lecture, Online]

Festival talks:
Smith, C. H., Janes, S., Michael, P., Timmermann, C., Gandy, S. The 7th Ray: A Modern Mystery School. Noisily Festival, 9th July 2022

Michael, P. et al. Differing perspectives on death, dying and grief. Medicine festival, 20th August 2022

[Other e.g.s inc. Anthropos Festival; LoveJam festival; Noisily 2023]

Scheduled:

Michael, P. (2022, TBC). The Entropic Brain: A productive theory of psi and neural model for first sight theory [Title TBC]. Invited talk (online) for The Parapsychological Association

[Other e.g.s inc. Psychedelic Society PsySocial; SeedTalks]

Planned, undelivered:

*Michael, P (2021, September). Unique Experiencers of Both DMT and NDEs: A Case Series Including Personal Appraisal of Comparability. Paper presented at the 43rd International Society for Psychical Research Annual Conference

## Awards

Receiving of Schmeidler Outstanding Student Award 2020 from the Parapsychology Association

Receiving of Best Presentation Award for Post-graduate Research Conference 2020, University of Greenwich

Receiving of People's Choice Award for 3 Minute Thesis, Faculty of Education and Health, University of Greenwich