Non-Pharmacological Induction of Altered States: Applying neural DMTx data to calibrate a multisensory stimulation protocol

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1. INTRODUCTION

DMTx refers to the "extended" experimental protocol developed by Dr. Andrew R Gallimore and Dr. Rich Strassman, implemented by Imperial College London's Centre for Psychedelic Research, to study the neural and subjective effects of N,N-dimethyltryptamine (DMT), a powerful naturally occurring psychedelic compound.

Unlike traditional bolus administration, which induces a brief but intense psychedelic experience, the DMTx protocol employs continuous intravenous infusion, allowing researchers to sustain the DMT state for an extended period. This innovation enables the systematic exploration of prolonged altered states of consciousness in a controlled setting.

Such controlled DMT administration protocols facilitate real-time capture of neural activity using electroencephalography (EEG) or functional magnetic resonance imaging (fMRI) during DMT-induced altered states, providing new insights into the neural effects of non-ordinary states of consciousness.

Our research utilises this neuroimaging data to develop a non-pharmacological multisensory stimulation protocol designed to induce key subjective and neural features of peak-state DMT experiences. While the experiences may differ significantly between our multisensory stimulation approach and DMT, our goal is to compare and quantify the neural and experiential effects of both induction methods. This work has the potential to establish a new methodology for consciousness exploration.

The relevance of 'altered states' extends beyond simplistic claims about creativity enhancement, which have persisted since the 1950s. Rather than framing altered states as a 'royal road' to creativity, Holden (1980) posed a thought-provoking question: "If, as Freud said, dreams are the royal road to the unconscious, is it possible that psychedelic drugs are a superhighway to the unconscious?" (Carhart Harris et al., 2014).

2. METHODOLOGICAL FRAMEWORK

Our methodology will translate key spectral features of neural data from peak DMTx experiences into multi-sensory stimulation protocols. We focus on operational details regarding specific brain, frequency characteristics observed during DMT-induced states, and precise technical parameters for mapping these neural signatures to sensory stimulation protocols.

2.1 Stroboscopic light stimulation

Stroboscopic light stimulation (SLS) typically induces simple visual hallucinations, characterised by vivid, geometric and colourful patterns (Schwartzman et al. 2019). Recent research has also shown that SLS can also induce psychedelic-like experiences, including diverse altered states of consciousness and complex visual hallucinations (Beauté et al. 2025). Our SLS protocol will utilise the Roxiva RX1 4x LED arrays with precise frequency control.

The key neural mechanism leveraged in this research is neural entrainment, or the oscillatory synchronisation of brain activity with external rhythmic stimulation. The effects of entrainment are well documented and include the modulation and enhancement of endogenous brainwave activity

towards the external rhythmic input. Stroboscopic stimulation has been shown to induce sustained deviations from normative endogenous oscillatory ranges for the duration of stimulation, effectively altering neural dynamics in a controlled manner.

Based on the key neural signatures of DMTx experiences, we will develop a SLS protocol designed to entrain brain activity toward this brain state.

2.2 Spatial audio and data sonification

Binaural spatial audio technologies (SPAT, Ambisonics, Atmos) create deeply immersive experiences. We will leverage these technologies to calibrate auditory stimulation to the neural oscillation patterns observed during DMTx experiences. Previous research has shown that such techniques produce "an increase in reported positive feelings and a decrease in negative feelings, alongside reduced blood pressure and heart rate" (Oomen et al. 2021).

Specifically, our spatial audio components are mapped to brainwave activity relevant to peak states. This mapping creates a direct correspondence between neural states during peak DMTx experiences and the perceptual audio environment, potentially reinforcing and amplifying these states through auditory feedback mechanisms.

Additionally, data sonification will be used to directly translate fMRI activation patterns from peak DMTx states into auditory experiences, following Mermikides' assertion that "the sonic domain is no less arbitrary or abstracted a medium [than visual media] and in some contexts more sophisticated" (Mermikides 2021). Our sonification processes focus specifically on translating the neural correlates of key phenomenological aspect of peak psychedelic experiences – into corresponding sonic parameters. This allows participants to "hear" the neural patterns associated with these profound subjective states, potentially facilitating their induction into an altered state of consciousness.

2.3 Haptic feedback

Continuing with the holotechnica approach, we will also use low frequency vibrotactile stimulation delivered through a transducer system with 4 actuators to provide physical feedback synchronised with the audio and SLS stimulation. This approach builds on research demonstrating that precise acoustic patterns can organise cellular structures: "Utkan Demirci and Sean Wu use acoustics to manipulate heart cells into intricate patterns. A simple change in frequency and amplitude puts the cells in motion, guides them to a new position and holds them in place" (Armitage 2018).

3. COMPARING NEURAL AND EXPERIENTIAL DATA

A critical component of our research involves comparing neural (EEG) and experiential data from our tuned multisensory stimulation protocol with data from the DMTx trials. The goal is to determine whether this protocol can elicit similar alterations in brain activity, neural signal diversity, and cross-network communication between sensory processing areas. Additionally, phenomenological reports provided in both contexts will serve as a key method for identifying overlaps in experience between these two induction methods. This analysis aims to uncover common neural signatures of altered states induced via different methodologies, with particular attention to transitional states and peak experiences.

The comparative analysis between the DMTx data and neural responses generated by our multi-sensory stimulation protocol represents a significant step toward identifying shared neural mechanisms underlying altered states of consciousness. This project will focus on refining multi-sensory stimulation protocols to induce specific neural signatures found in the DMTx data, developing protocols informed by EEG measurements, and conducting controlled comparative studies between pharmacological and non-pharmacological induction methods.

4. BRIDGING CLINICAL AND ARTISTIC DOMAINS

Rather than forcing a binary classification between clinical treatment and artistic intervention, this research exists within a translational framework spanning both domains. For therapeutic applications, our protocols target conditions where altered states have shown benefit. The effects observed in pharmacological psychedelic research may be "partially" replicated through our targeted multi-sensory approach. For clinical applications, we will research and discuss potential therapeutic mechanisms that reference existing therapeutic frameworks utilising non-ordinary states (psychedelic-assisted psychotherapy protocols) and identify specific clinical populations that might benefit from such an approach.

For digital arts applications, these techniques provide both new creative tools and expanded audience experiences. Artists can utilise the multi-sensory stack to create immersive installations that induce specific perceptual states, while audience members experience novel altered states of

consciousness via non-pharmacological means, as demonstrated in the recent *Dreamachine* installation (dreamachine.world). *Dreamachine* features a multisensory experience combining stroboscopic lighting and 360-degree spatial sound, which in 2022 induced visual hallucinations and altered states of consciousness in thousands of visitors (Beauté et al. 2025).

5. CONCLUSION

This research introduces a novel non-pharmacological approach to inducing altered states of consciousness, bridging therapeutic, artistic, and scientific domains. By translating neural data from DMTx studies into precise multisensory stimulation protocols, we aim to establish a controlled method for evoking key phenomenological and neural features of peak-state experiences.

Through comparative analysis of DMTx fMRI/EEG data and multisensory-induced neural responses, this project seeks to identify common neural mechanisms underlying different routes to altered states. This work has the potential to advance consciousness research, contribute to clinical applications, and expand creative possibilities in digital arts.

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