EXPLORING ALTERED STATES OF CONSCIOUSNESS: A PILOT STUDY OF PHENOMENOMICS USING CITIZEN SCIENCE

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Introduction

An important task of empirical consciousness research is the identification of invariant structures of conscious experience, also called basic dimensions of consciousness. The study of altered states of consciousness (ASC) induced by mind-modifying techniques (CMT) may be particularly fruitful in this context. The variability of these ASCs should allow us to uncover invariant, etiology-independent phenomenological patterns and identify the fundamental dimensions of consciousness to map the so-called phenomenal state space (PSS). Mapping PSS using validated psychometric questionnaires in conjunction with open-ended reports to extract invariant patterns in ASCs induced by any CMT is a promising method for determining or validating PSS dimensions. We refer to this approach as "phenomenomics": the systematic study of the PSS.

Theoretical Background

Altered States of Consciousness (ASC)

It has been argued that an ASC does not refer to a mere quantitative change in a single cognitive function (e.g., increased arousal), but is a multidimensional phenomenon that involves relative changes along basic dimensions of consciousness (Bayne et al., 2016).

At a phenomenological level of description and analysis, relative intensity on multiple dimensions of consciousness represents a phenomenological pattern indicative of a particular state or class of states (e.g., psychedelic states).

In this context, it is crucial to examine more closely how states are mapped, classified, and taxonomized. For example, a well-known map based on a two-dimensional classification of consciousness can be found in the literature (Leaury, 2005; see also Metzinger, 2019), but it falls short in terms of dimensionality. In addition, there are numerous examples in the literature for mapping states in a higher-dimensional space (see, e.g., Fell, 2004; Millière et. al, 2018).

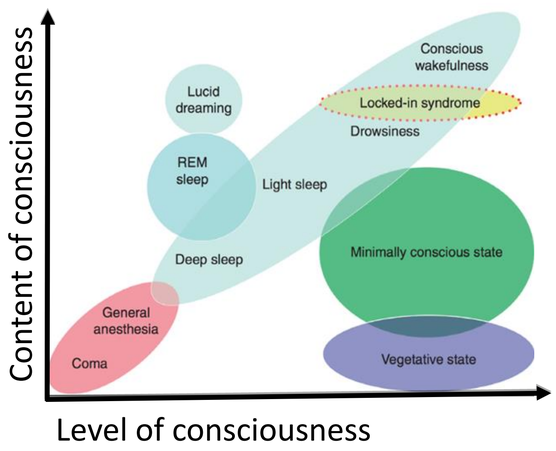

Fig. 1: From Metzinger (2019) adapted from Leaurys (2005): two main components of consciousness: level of consciousness (i.e., arousal) and content of consciousness (i.e., awareness).

By identifying invariants in the phenomenological patterns of ASCs, referred to as etiology-independent alterations (Dittrich, 1996), the basic dimensions of consciousness could be inferred. A systematic analysis of ASCs may help to identify dissociations between distinct dimensions of consciousness.

Phenomenal State-Space (PSS)

To formalize the systematic study of ASCs, it is helpful to subsume all states of consciousness under a multidimensional phenomenal state-space (PSS) in which states are defined by their location in the PSS, which is determined by relative intensity on multiple PSS dimensions. All dimensions together form the CSS model, which includes all possible states of consciousness.

Examples of PSS models with different dimensionality can be found in the literature (see Fell, 2004; Werner, 2009; Berkovich-Ohana & Glicksohn, 2014).

While a state is defined as a location in the PSS, a consciousness state changes over time along a trajectory through the multidimensional PSS. The subspace of trajectories of ASCs are thought to be distinct from the subspace where trajectories of normal everyday wakefulness states are to be found. Mapping a progression across multiple dimensions over time allows for a fruitful form of ASC description and analysis: Instead of talking about different states or progressions, it is possible to refer in probabilistic terms to subspaces of consciousness, e.g., the subspace of psychedelic experience, which would be in a separate subspace of the PSS. A subspace is defined based on the probability distribution of how likely it is that a consciousness system instantiates a particular class of states that have a particular configuration of intensities on the basic dimensions of consciousness.

Methods: Citizen Science Platform

In an online pilot study, the use of citizen science crowdsourcing methods was investigated. In collaboration with the Citizen Science specialists *El Gato y La Cvaya* (Argentina) data were collected online in October 2022, where participants reported on a 22-item version of the 11-ASC questionnaire (Studerus et al., 2010) their altered experiences induced by four CMTs: alcohol, cannabis, MDMA, and psilocybin.

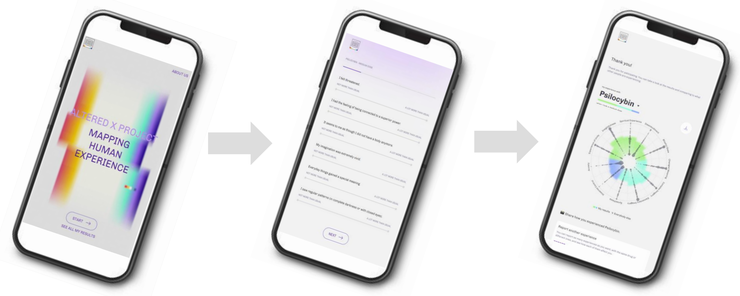

Fig. 2: Screenshots of the smartphone-compatible front-end website through which the data was collected.

https://alteredxproject.com/

Results of Pilot Study

Approximately 10,000 responses were collected over a 5-day period, demonstrating distinct phenomenological patterns for alcohol, cannabis, MDMA, and psilocybin, including their dose-dependent modulation.

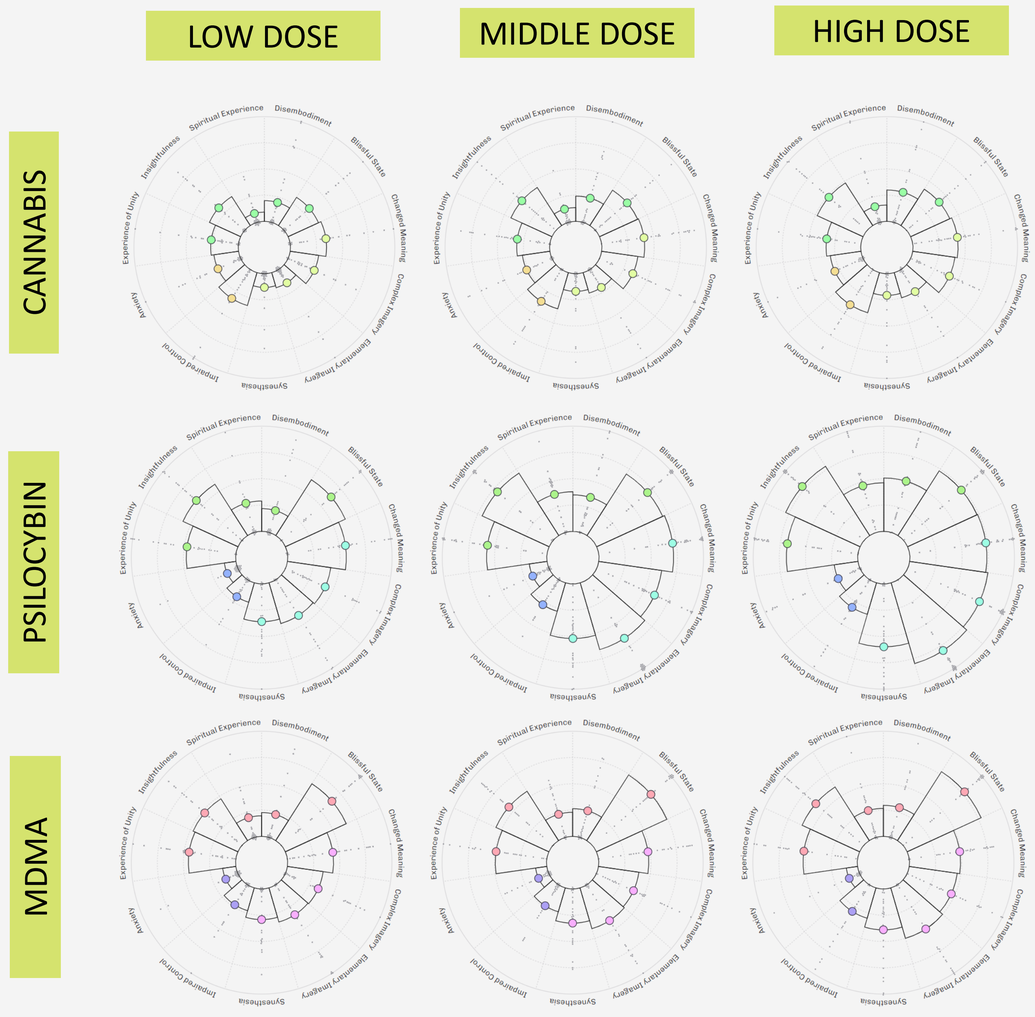

Fig. 3: Phenomenologically fine-grained quantification of the dose-dependent subjective effects of cannabis, psilocybin, and MDMA measured with a modified version of the 11-item ASC questionnaire. Spiderplots show the estimated dose-response relationships to the 11 subscales (see subscale names in plots). For example, Psilocybin and MDMA induced a dose-dependent phenomenology of bliss, insight, and unity, with psilocybin additionally accompanied by a sense of altered meaning of percepts, complex images, and elemental imagery.

For psilocybin, the results were consistent with meta-analytic findings on drug-induced phenomenology and dose-response relationships reported in conventional laboratory studies (Hirschfeld & Schmidt, 2021).

Conclusion & Outlook

Our pilot study has demonstrated the feasibility, cost-effectiveness and informational value of a Citizen Science approach to neuroscientific and philosophical consciousness research, not least for clinical research and application. To date, no meta-analyses of psychometric data on the phenomenology of alcohol, cannabis, and MDMA are available. However, our preliminary results strongly indicate that all phenomenological profiles are generally consistent with quantitative and qualitative findings reported in the literature (Prugger et al., 2022; Schmidt & Berkemeyer, 2018). For this reason, the Phenomenomics project will systematically expand the collection of Big Data (e.g., by including more CMTs) to successively map the full spectrum of states of consciousness within the PSS. Ultimately, this will advance the development of a data-based, formalized, phenomenologically grounded and CMT-independent taxonomy of the PSS.

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