

Applicant

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Stage of Project

We are in the data collection stage of the project and have collected full data from 85 participants.

Purpose

The purpose of our study is to (a) examine changes in Five-factor model personality (i.e., Neuroticism, Extraversion, Openness, Agreeableness, Conscientiousness) associated with the use of ayahuasca in ceremonial context; and (b) examine process-level psychological mechanisms that may underlie these changes. A secondary purpose will involve examining changes in other

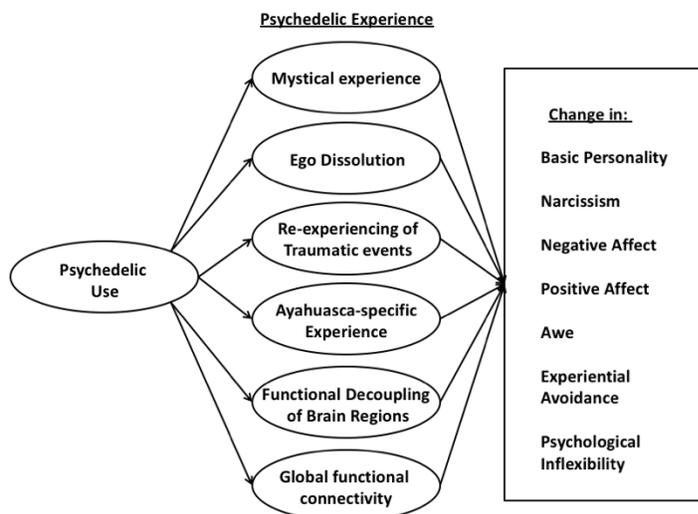


Figure 1. Conceptual Model for Psychedelic-mediated Psychological Change

relevant traits beyond basic personality. *Figure 1* delineates our conceptual model for how these constructs may interrelate. Specifically, we conceptualize psychedelic use as leading to a cascade of psychological and neurobiological processes in which short-term changes such as mystical experience, ayahuasca-specific qualia, and re-experiencing of trauma - common in appropriate settings - as well as known perturbations in neural functioning lead to long-standing effects on basic personality traits (e.g., increased FFM Openness), emotional/affective traits (e.g., less negative, more positive, such as awe), and psychological resilience (e.g., less experiential avoidance, greater psychological flexibility).

Introduction

Background Informing Study

Since the 1990's, renewed interest in the neurobiological, psychiatric, and psychological underpinnings and effects of serotonergic psychedelics (i.e., HT_{2A} receptor agonists) as well as relaxed restrictions on research licensing has revived the scientific examination of psychedelic experience. Our study aims to examine the ceremonial use of *ayahuasca*, a concoction of psychoactive plants indigenous to the Amazon basin of South America. Used for millennia by indigenous peoples, ayahuasca combines the woody vine of *Banisteriopsis caapi* (Ott, 1994;

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Spruce, 1908; Quechua for “vine of the soul” or “vine of the dead”) and potent tryptamine-containing plants (e.g., the shrub *Psychotria viridis* was used in our study; McKenna, Towers, & Abbott, 1984). Participants have been recruited primarily from among incoming clients of Pulse Tours healing center, half a day’s journey from Iquitos, Peru, where Shipibo tribe practitioners, serving in the lineage of ancient Shipibo medicine, conduct multiple ceremonies each week. Ayahuasca ceremony (offered four times each week) represents the most immersive experience that is offered to participants, and these are conjectured to contribute most strongly to any observed effects in outcomes of interest. Nevertheless, in addition to the ceremonial use of ayahuasca, ceremonial use of nunu (jungle Tobacco snuff), flower baths, and Kambo (a purgative frog venom), among others, are conducted. Thus, our study examines the effect of the full breadth of Shipibo ceremonies offered at Pulse Tours on personality change.

Importance

Examining personality change occasioned by ayahuasca in ceremonial context is important for at least four reasons. First, and most importantly, examining ayahuasca in ceremonial context permits investigation into the circumstances and mechanisms under which certain personality traits are subject to change. Personality describes “how individuals differ from each other in their persistent patterns of emotion, motivation, cognition, and behavior” (DeYoung, 2015). Personality is associated with the goals we select (e.g., Mount, Barrick, Scullen, & Rounds, 2005), the values we hold (Parks & Guay, 2009), our ability to achieve goals (Barrick & Mount, 1991), and, ultimately, the quality of the lives we lead (Ozer & Benet-Martinez, 2006; e.g., spirituality, well-being, physical health, longevity). Recent empirical findings indicate that the structure of basic personality such as the well-validated and widely used FFM model of personality (FFM; Costa & Widiger, 2002) underlies the structure of mental illness, such that clinical and personality disorders are conceptualized as maladaptive variants of basic personality dimensions (e.g., Kotov et al., 2017). Indeed, inasmuch as individuals are able to change their personalities, they can meaningfully improve the quality of their lives.

Second, although our study was designed to principally examine basic personality, given strong relations between personality and mental illness, our results have strong implications for the effect of psychedelic experience on clinical and mental disorders. Anecdotal reports suggest that ceremonial use of ayahuasca may hold unique efficacy for remediating certain clinical disorders (e.g., post-traumatic stress, addiction) relative to other serotonergic psychedelics.¹ The ceremonial use of ayahuasca is distinguished from the administration of serotonergic psychedelics in notable ways including, but not restricted to, the environmental setting, communal experience, and physically painful and purgative aspects of ayahuasca-ingestion, which each may interact with the psychedelic experience to produce unique psychological outcomes.

Third, it is well-known that healing centers in South America and ayahuasca ceremonies in particular have become popular as alternative means for mental health treatment, particularly among westerners whose mental illness has proven resistant to clinical and pharmacological treatments in their western countries of origin. Accordingly, our sample is likely to include a substantial number of individuals with a history of mental illness such as addiction, post-

¹ For example, MAPS supports research on the effectiveness of ayahuasca-assisted treatment for drug addiction and Post-traumatic Stress Disorder (PTSD), and in recent years, organizations like Heroic Hearts (HHP) have begun connecting military veterans struggling with PTSD to ayahuasca therapy retreats.

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traumatic stress disorder (PTSD), and depression, among others. This presents an opportunity for examining relations between psychedelic experience and personality in clinical populations.

Fourth, as organizations like the Multidisciplinary Association of Psychedelic Studies (MAPS), the Heffter Research Institute, the Beckley Foundation, and others progress in revealing the psychiatric and psychological benefits of psychedelics under controlled laboratory conditions, many in the West are beginning to formulate protocols for psychedelic-assisted psychotherapeutic treatment and are duly considering the place that psychedelic treatments will have within the biomedical model of mental healthcare. We believe there is great utility in examining elements of ancient ceremonial practice that may have evolved intelligently to potentiate healing outcomes. The ayahuasca ceremony is one that combines multiple elements which may inform future protocols: a communal/group setting, guiding elements (e.g., chanting of song over the course of the ceremony), and personal engagement with the ceremony leader (e.g., personal icaro song delivered by the shaman).

Pathways to personality change

To date, psychologists have examined a number of mechanisms and pathways by which personality may change, including developmental, sociological, and psychotherapeutic (psychopharmacological or “talk therapy”). First, longitudinal evidence suggests that although FFM personality shows high mean-level stability over time (Roberts, 2009), nevertheless, normative personality changes reliably occur across the full life course (Roberts, Walton, & Viechtbauer, 2006). Scholars suggest that these changes may be driven by biological maturation processes (e.g., Bleidorn et al., 2009) and/or intrinsic temperamental or genetic factors (e.g., McCrae et al., 2000). Sociological changes often accompany these developmental trends, such as new social roles and experiences (e.g., Roberts & Bogg, 2004). For example, the social investment principle posits that investing in specific roles within social institutions such as work, marriage, and family leads to personality change through contingent reward structures that offer stable reinforcement of certain personality states over others. Alternatively, it has been postulated that lasting change in personality may accompany commitment to new identities (e.g., being a good husband; Lodi-Smith & Roberts, 2007; Wood & Roberts, 2006). Second, given overlap between personality and mental illness, it is perhaps not surprising that clinical and pharmacological psychotherapy shows evidence of mediating change in almost all FFM traits with the exception of Openness (Bagby, Levitan, Kennedy, Levitt, & Joffe, 1999; Noordhof, Kamphuis, Sellbom, Eigenhuis, & Bagby, 2018; Quilty, Meusel, & Bagby, 2008; Roberts et al., 2017). Finally, three studies to date have examined volitional intention as a means of changing personality, observing small to large changes in relation to structured personality change goals, specific intentions each week (Hudson & Fraley, 2015) and motivational coaching (Allan, Leeson, De Fruyt, & Martin, 2018).

Another pathway: Psychedelics and personality change

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Over the last decade, researchers have witnessed yet another pathway by which personality may undergo change, namely in relation to discrete episodes of psychedelic experience. At least eight cross-sectional findings indicate the presence of personality differences between users of psychedelics and controls (Anglin, 1986; Barbosa et al., 2016; Bouso et al., 2012, 2015; Grob et al., 1996; Kavenska & Simonova, 2015; Nour & Carhart-Harris, 2017; Schneider et al., 2015). Psychedelic users appear to exhibit lower Temperament and Character Inventory (TCI; Cloninger, Svrakic, & Przybeck, 1993) Harm Avoidance (Bouso et al., 2012, 2015; Schneider et al., 2015; Grob et al., 1996), and higher TCI Reward Dependence (Bouso et al., 2012), TCI Self-Transcendence (Bouso et al., 2015; Schneider et al., 2015), and FFM Openness (Barbosa et al., 2016; Nour & Carhart-Harris, 2017). Building upon the considerable methodological constraints of cross-sectional designs, seven studies have prospectively examined personality change occasioned by psychedelic experience under observational

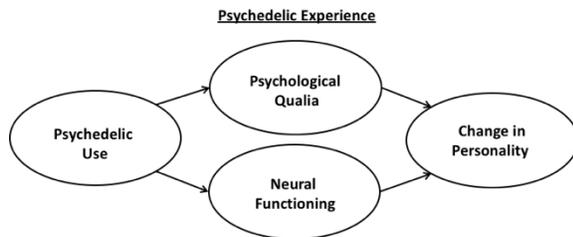


Figure 2. General Model of Psychedelic-mediated Personality Change

(Barbosa, Carzola, Giglio, & Strassman, 2009; Fernandez et al., 2013) and controlled (Carhart-Harris et al., 2016; Erritzoe et al., in press; Griffiths, Richards, & Jesse, 2006; MacLean, Johnson, & Griffiths, 2011; Schmid & Liechti, 2018) conditions. These findings have shown evidence for psychedelic-mediated decreases in TCI Harm Avoidance (Barbosa et al., 2009; Fernandez et al., 2013), FFM Neuroticism (Erritzoe et al., in press), and increases in TCI Self-Directedness (Fernandez et al., 2013), FFM Openness (Carhart-Harris et al., 2016; Erritzoe et al., in press; MacLean, Johnson, & Griffiths, 2011), FFM Extraversion (Erritzoe et al., in press), and FFM Conscientiousness (Schmid & Liechti, 2018). On balance, these findings converge in indicating personality change across TCI Harm Avoidance and FFM Openness, and some of these effects showed stability for up to a year after psychedelic experience (e.g., MacLean, Johnson, & Griffiths, 2011).

An adequate theory of psychedelic experience must explain not only *how* personality changes, but also *why*. Observed personality change occasioned by psychedelic experience seems largely incompatible with extant theories of personality change. Most of these theories involve normative changes over long periods of time and/or long-standing engagement with

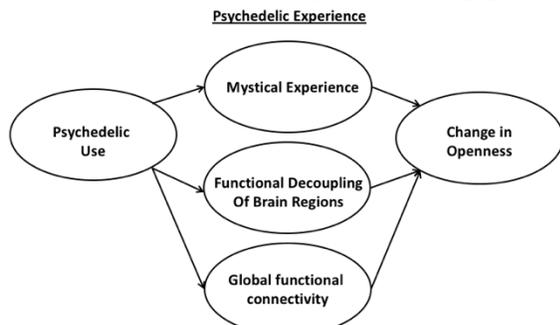


Figure 3. Specific Model of Psychedelic-mediated Change in Openness

by which psychedelic-mediated personality change occurs. Neurobiological findings involving decoupling within the default mode network (DMN), as well as decoupling between DMN regions and the medial temporal lobe, increased global functional

environmental reward structures. Nevertheless, it is plausible that psychedelic-mediated personality change may support theories that postulate a role for commitment to new identity and volitional change. In addition, recent psychedelic research provides some direction regarding the mechanisms

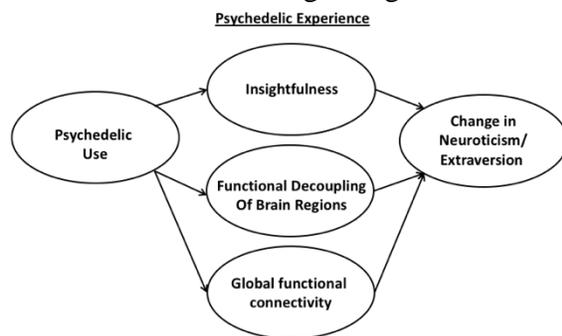


Figure 4. Specific Model of Psychedelic-mediated Change in Neuroticism / Extraversion

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connectivity, and concomitantly unconstrained cognition during psychedelic experience offer a promising source of explanation for personality change that should be further explored in the future (e.g., Carhart-Harris et al., 2012, 2014). Furthermore, explanations at the psychological level of analysis are also important to investigate. Previous research implicates *self-reported mystical experience* and *insightfulness* within the psychedelic experience as moderators of change in Openness, Neuroticism, and Extraversion (Erritzoe et al., in press; MacLean, Johnson, & Griffiths, 2011), but more research is needed to explore process-level psychological mechanisms that may be linked to change, such as connectedness to self, others, and nature (Carhart-Harris, Erritzoe, Haijen, Kaelen, & Watts, 2017). *Figure 2, 3, and 4* delineate general and specific models that have some empirical support.

Limitations of Previous Research

Despite the considerable progress researchers have made in delineating the psychological changes occasioned by psychedelic experience and the psychological mechanisms underlying change, there is yet vast ground to cover in elucidating gaps in our knowledge. First, although previous findings reflect some convergence in change (e.g., TCI Harm Avoidance, FFM Openness), other findings are quite mixed, suggesting the need for further replication efforts. Second, extant studies tend to contain small samples that impair the external validity and generalizability of their findings. Indeed, the average sample size in previous prospective studies is $n = 24$. Third, under-powered studies are at high risk of failing to detect true effects of smaller size. Fourth, only two studies have examined the effects of ceremonial ayahuasca use and none have administered personality instruments that would permit comparison of results across studies involving other serotonergic psychedelics. Fifth, only three extant studies have prospectively examined the *mechanisms* that may underlie change in personality (e.g., mystical experience; MacLean, Johnson, & Griffiths, 2011).

Present Study

The present study builds upon these methodological limitations by *prospectively* examining ceremonial use of ayahuasca in a well-powered sample of 200 participants using self- and informant-reported facet-level measures of FFM personality across three timepoints (i.e., pre-experience, immediately post-experience, 3-month follow-up). Our study involves at least four notable methodological strengths. First, our large study size permits an examination of moderation-based effects of individual characteristics including ethnicity, gender, socio-economic status, prior use of psychedelics or ayahuasca, and previous trauma. For example, we will be able to examine how the subjective experience of ayahuasca ceremony may differ across individuals of different genders or ethnicities. We will also be able to examine how personality change outcomes may differ between individuals with and without a history of trauma. Among individuals with a history of past trauma, we will be able to examine whether the presence and intensity of traumatic re-experiences differentially affect personality- and affect-based outcomes. Second, including a 3 month follow-up enables us to detect change over and above placebo. Third, we collect informant reports of our participants' personalities to ensure the validity of our personality data. Fourth, we have implemented measures to ensure the validity of our results. Expectancy and placebo effects on clinical outcomes are well-known (e.g., Lambert & Barley, 2001; Price, Finniss, & Benedetti, 2008). These effects may be even more pronounced at shamanic healing centers wherein clients have traveled long distances at substantial expense to experience what others (e.g., friends, community members, journalists, researchers) have

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exuberantly described as transformational, and wherein shamans and facilitators exude confidence in the power of their practices to produce desirable change. To address these confounding influences, we measured our participants' levels of trait suggestibility as well as their expectations of psychological benefits (e.g., "I will experience a significant reduction in anxiety"). Moreover, we measured valid responding on self-reported mystical experience to identify individuals who were at higher risk for endorsing experiential phenomena that were not present. To do so, we composed a validity scale comprised of items describing unlikely events while in ceremony (e.g., "experience of a distant childhood friend you have not seen or thought of in a long time"). We aim to use these measures to control for suggestibility, examine the effect of expectancies on outcomes, and exclude invalid responders.

Research Aims

Aim 1. Change in FFM Personality. We aim to examine change in FFM personality domains and facets occasioned by the ceremonial use of ayahuasca.

Hypotheses.

H1A: We hypothesize a significant fixed effect of Time on change in FFM Openness using Latent Growth Curve analysis, based on previous findings (Carhart-Harris et al., 2016; Erritzoe et al., in press; MacLean, Johnson, & Griffiths, 2011).

H1B: We hypothesize a significant difference in FFM Openness between Timepoint 1 (Pre) and Timepoint 3 (Follow-up).

Aim 2 (Process-Level Mechanisms). Our study also includes aims to examine a series of potential process-level psychological mechanisms underlying change in personality and other traits.

Role of Mystical Experience: We aim to examine elements of mystical experience as moderators of change in Openness (e.g., MacLean, Johnson, & Griffiths, 2011; Erritzoe et al., in press).

Hypotheses.

H2A: We hypothesize that the effect of Time on change in FFM Openness will be moderated by Mystical experience (operationalized by R-MEQ Total score).

H2B: Consistent with MacLean, Johnson, and Griffiths (2011), we hypothesize that the subgroup of participants who experienced a 'complete mystical experience,' defined as having a score of 60% or higher on each subscale of the Revised Mystical Experience Questionnaire (R-MEQ), would show significantly greater positive change in Openness than the subgroup who did not.

Research Questions. While the role of mystical experience has been studied sufficiently to form strong hypotheses, the following three hypothesis are less certain, so we consider them research questions:

RQ1a: Ego Dissolution: We aim to examine ego dissolution as a possible mechanism of change in personality, and are particularly interested in investigating ego dissolution in relation to FFM Openness, FFM Neuroticism, awe, and narcissistic personality, in line with other scholars' theories (Carhart-Harris et al., 2017).

RQ1b: Re-experiencing of Traumatic events: We aim to examine the effect of re-experiencing previous trauma during psychedelic experience on change in traits related to personality and affect (among individuals who previously endorsed traumatic events). Intensity of re-experiencing will also be included as a moderator. This aim enables us to examine the

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moderating effect that engagement with trauma in ceremony may hold for change in personality, experiential avoidance, psychological inflexibility, and negative emotions (e.g., shame).

RQ1c: Ayahuasca specific experience: In collaboration with Pulse Tours shamans and facilitators, we created a new experiential measure that captures elements of psychedelic experience that may be unique to ayahuasca ceremony (e.g., “I felt the sentiment, ‘I am on the right path,’” “I felt great compassion for others’ distress or pain”). We plan to factor-analyze these items to identify the measure’s underlying factor structure and examine these factors as potential moderators of change in outcomes.

Secondary Aims (Other Traits). In addition to examining change in FFM domains and facets, our study was designed to examine change in other traits in an exploratory manner.

Narcissistic Personality: We aim to examine change in narcissistic personality and trait entitlement, which we postulate may change in relation to experiences of ego dissolution.

Affective change: We aim to examine change in positive and negative affect, which will serve as a nonspecific proxy for internalizing and externalizing mental illness.

Awe: We aim to examine the tendency to feel awe, which we postulate may be a unique capacity that emerges from psychedelic experience. Awe may be associated with connectedness to nature and others, which may be linked to self-transcendence/ego-dissolution (e.g., Carhart-Harris et al., 2017).

Experiential Avoidance / Psychological Inflexibility: We aim to examine experiential avoidance and psychological inflexibility, which index how individuals relate to their thoughts and feelings (rather than the form negative thoughts and feelings take) and have been shown to partially underlie the severity of PTSD symptoms (e.g., Thompson & Waltz, 2010). We postulate that psychedelic experience (and experience with ayahuasca in particular) may reduce experiential avoidance through a process of exposing individuals to stimuli they typically avoid (e.g., fears, traumatic experiences), in line with the rationale of exposure-based treatments for PTSD (Kline, Cooper, Rytwinski, & Feeny, 2018). We also postulate that psychedelic experience may reduce psychological inflexibility via enhanced insight into personal patterns and engagement with a broader repertoire of perspectives.

Method

Procedure

Our participants are emailed two weeks before the date of their ayahuasca retreat with an invitation to enroll as participants in our study and a web address linking to the Timepoint 1 (Pre) survey. Participants are informed that they will be compensated with a customized personality change report and entry into a raffle for a free week-long retreat at Pulse Tours (valued at approximately \$1,300.00). In the Timepoint 1 (Pre) survey, participants are asked to include contact information for close significant others (informants) who may be able to accurately assess participants’ personalities. Before participants reach the Pulse Tours Healing center, their informants are contacted with an invitation to report on participants’ personality.

On the first day of participants’ retreat experience, an email is sent to them that provides the link to the Timepoint 2 (Post) survey and instructions on ways to access the internet in order to complete their surveys in Peru. On the last day of their Pulse Tours retreat, participants are sent an additional email reminding them to please complete the Timepoint 2 (Post) survey. If necessary, up to two subsequent reminder emails are sent approximately every 2 days following

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the last day of participants' retreat. The second reminder email offers participants \$20.00 compensation for their effort in completing the survey.

Three months following the last day of their Pulse Tours retreat, an additional email is sent to participants with a link to their final Timepoint 3 (Follow-up) survey. If necessary, up to three reminder emails are subsequently sent. The second reminder email offers an added incentive of \$20.00 to complete the survey. The third reminder email offers an added incentive of \$30.00 to complete the survey. At this stage, emails are also sent to their informants, asking for additional assessment on participants' personality.

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Measures (across Timepoints)

Time point 1 (Pre) Survey.

Demographics	Gender, Ethnicity, Socio-economic status	Created for study
Facet-level FFM Personality	International Personality Item Pool 120-item	Maples, Guan, Carter, & Miller, 2014
Valid responding	Elemental Psychopathy Assessment Validity scales	Lynam et al., 2011
Suggestibility	Multidisciplinary Iowa Suggestibility Scale-Short	Kotov, Bellman, & Watson, 2004
Prior use of psychedelics		Created for study
Expectancies	Questions concerning which effects participants are expecting from their ayahuasca ceremony experiences	Created for study
Positive and Negative Affect	Positive and Negative Affect Scale	Watson, Clark, & Tellegen, 1998
Awe	3 items from the revised Dispositional Positive Emotions Scale	Shiota, Keltner, & John, 2006
Trauma	Life Events Checklist	Blake, Weathers, Nagy, Kaloupek, Charney, & Keane, 1995
Experiential Avoidance, Psychological Inflexibility	Acceptance and Action Questionnaire	Hayes et al., 2004
Grandiose Narcissism	Narcissistic Personality Inventory-13 likert items	Gentile et al., 2013
Narcissistic Entitlement	Psychological Entitlement Scale	Campbell, Bonacci, Shelton, Exline, & Bushman, 2004

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Time point 2 (Post) Survey.

Mystical Experience	Revised Mystical Experience Questionnaire; composed of four subscales: mystical (i.e., including internal unity, external unity, noetic quality, sacredness), positive mood, transcendence of time and space, and ineffability	MacLean, Leoutsakos, Johnson, & Griffiths, 2012
Mystical Experience Validity	Validity items (e.g., “Experience of a distant childhood friend you have not seen or thought of in a long time,” “Experience of bodily fragmentation”)	Created for study
Ego Dissolution	Ego Dissolution Inventory	Nour, Evans, Nutt, & Carhart-Harris, 2016
Traumatic re-experiencing	Items include: “Did you re-experience a previous traumatic experience over the course of your ceremonies?,” “Which traumatic experience?,” Intensity of re-experience	Created for study
Altered states of consciousness	Relevant items from 5-D Altered States of Consciousness	Dittrich, Lamparter, & Maurer, 2010
Ayahuasca Ceremony Experience	63-item questionnaire developed in collaboration with Pulse Tours shamans and facilitators to measure in ceremony experience (e.g., “I felt the sentiment, ‘I am on the right path,’” “I felt great compassion for others’ distress or pain”)	Created for study
Self-world union	Graphical display of relationship between Self and World	Created for study

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Time point 3 (Follow-up) survey:

Facet-level FFM Personality	International Personality Item Pool 120-item	Maples, Guan, Carter, & Miller, 2014
Valid responding	Elemental Psychopathy Assessment Validity scale	Lynam et al., 2011
Awe	3 items from the revised Dispositional Positive Emotions Scale	Shiota et al., 2006
Experiential Avoidance, Psychological Inflexibility	Acceptance and Action Questionnaire	Hayes et al., 2004
Grandiose Narcissism	Narcissistic Personality Inventory-13 likert items	Gentile et al., 2013
Narcissistic Entitlement	Psychological Entitlement Scale	Campbell, Bonacci, Shelton, Exline, & Bushman, 2004

Main Proposed Data Analyses

The following describes data analyses that are planned to address the main aim of our study, namely to examine the effect of ceremonial use of ayahuasca on FFM personality domains and facets:

Descriptive Analyses:

We first plan to describe (a) the means and standard deviations of manifest FFM domains and facets for each timepoint; (b) the demographic characteristics of our sample; and (c) zero-order inter-correlations among personality and mechanism variables.

Primary Analyses:

For primary analyses, we will examine change in FFM Openness and Neuroticism. First, we will use Mplus software to model our personality domains as latent variables at three timepoints. Second, Latent growth curve modeling will be used to evaluate trajectory of change across pre, post, and follow-up timepoints (Alpha will be set at $p < .05$) (*Corresponding to Hypothesis 1A*).

$$\text{Level 1: } Y_{tp} (\text{FFM Domain}) = b_{0p} + b_{1p} (\text{TIME}_{tp}) + e_{tp}$$

$$\text{Level 2: } b_{0p} = \gamma_{00} + r_{0p}$$

$$b_{1p} = \gamma_{10} + r_{1p}$$

Third, we will examine the relation between rate of change (Time) and personality while including covariates (e.g., gender, age, prior experience, suggestibility). That is, intercept and slope will be regressed on our covariates. This model will also assist us in examining how trajectories of change may differ by participant characteristics.

$$\text{Level 1: } Y_{tp} (\text{FFM Domain}) = b_{0p} + b_{1p} (\text{TIME}_{tp}) + e_{tp}$$

$$\text{Level 2: } b_{0p} = \gamma_{00} + \gamma_{01} (\text{Gender [grand centered]}) + r_{0p}$$

$$b_{1p} = \gamma_{10} + \gamma_{11} (\text{Gender [grand centered]}) + r_{1p}$$

Fourth, we will examine the variance in participants' slopes of change in order to investigate the degree to which individuals differ from one another in their trajectories.

Fifth, we will examine the relation between participant intercept and slope in order to investigate whether individuals with higher initial levels of FFM Openness or FFM Neuroticism tend to exhibit positive or negative trajectories in personality over time.

Sixth, repeated-measures *t*-tests will be conducted to examine differences in manifest personality scores between Timepoint 1 (Pre) and Timepoint 3 (Follow-up) in order to precisely evaluate the presence of long-term change in personality (*Corresponding to Hypothesis 1B*).

Pathway Analyses:

To examine the effect of process-level variables on change in FFM Openness and Neuroticism, Latent growth curve analysis will be conducted in which intercept and slope will be regressed on Level 2 process-level variables (e.g., Ego Dissolution) (*Corresponding to Hypothesis 2a*).

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$$\text{Level 1: } Y_{tp} (\text{FFM Domain}) = b_{0p} + b_{1p} (\text{TIME}_{tp}) + e_{tp}$$

$$\text{Level 2: } b_{0p} = \gamma_{00} + \gamma_{01} (\text{Ego Dissolution [grand centered]}) + r_{0p}$$

$$b_{1p} = \gamma_{10} + \gamma_{11} (\text{Ego Dissolution [grand centered]}) + r_{1p}$$

Second, a two-way analysis of variance (ANOVA) will be conducted to examine the interaction between Time (Pre, Post, Follow-up) and Group (complete mystical experience vs. no mystical experience) in the prediction of personality scores (*Corresponding to Hypothesis 2b*). Planned contrasts will be applied in order to compare scores at Pre to the average of scores at Post and Follow-up (i.e., the Time value for Pre will be assigned -1, and the Time values for Post and Follow-up will be assigned .5).

Ancillary Analyses:

Ancillary analyses are considered exploratory. We will largely replicate the foregoing models while including the remaining FFM traits (i.e., Extraversion, Agreeableness, Conscientiousness) using an alpha of $p < .05$; and including the FFM facets using an alpha of $p < .01$.

Impact/Implications

An adequate theory of psychedelic experience should explain both *how* personality changes in relation to psychedelic experience and *why*. The present study marks a valuable contribution to the advancement of scientific knowledge concerning the potential of serotonergic psychedelics to effect beneficial change in personality for at least four reasons.

First, we replicate and extend previous research examining *how* personality changes in relation to psychedelic experience. Although multiple findings have converged in indicating change in FFM Openness, extant studies are few in number, generally contain small sample sizes that limit confidence in generalizability, and are underpowered such that they may fail to detect true personality change effects on other FFM domains. The present study offers a well-powered examination of personality change.

Second, the present study extends and builds upon previous work in investigating *why* personality changes in relation to psychedelic experience by measuring mystical experience, altered states of consciousness, as well as ego dissolution, intensity of traumatic re-experiencing, and experiential elements unique to ayahuasca ceremony (e.g., purging, shaman's presence).

Third, our study sheds light on an understudied domain of psychedelic experience, namely ceremonial use of ayahuasca, and connects the study of ayahuasca-induced personality change to the majority of extant research on psychedelic-induced personality change by utilizing FFM measures.

Fourth, our study builds upon previous studies that have examined personality change in particularly at-risk and vulnerable samples (Erritzoe et al., in press) by investigating personality change among participants who are more likely to possess a history of mental illness (e.g., PTSD, depression). As such, our results will carry important implications for the efficacy of ayahuasca-assisted psychotherapy for the treatment of multiple clinical indications including those related to post-traumatic stress, addiction, and depression. In the event of positive findings, we hope to utilize our results as valuable pilot data in the effort to attract grant funding for more methodologically rigorous treatment-outcome studies in the future.

Sources of Recruitment

We are fortunate to have two sources of recruitment. First, Pulse Tours intake director and study collaborator, Rafael Lopez, provides us with a list of Pulse Tours clients on an ongoing basis, which we subsequently contact with invitations to participate in our study. Second, Jesse Gould, co-founder of Heroic Hearts Project, a non-profit that connects military veterans struggling with PTSD to ayahuasca therapy retreats, refers his veterans.

Status of Recruitment

We began recruitment in November, 2016. To date, we have enrolled 171 participants into our study (i.e., 171 participants have completed the Timepoint 1 (Pre) survey). 141 participants have completed the Timepoint 2 (Post) survey (i.e., 84% of enrolled participant). 85 participants have completed the Timepoint 3 (Follow-up) survey (i.e., 81% of enrolled participants who have reached 3 month Follow-up). Based on our rate of follow-through (~80%), we plan to enroll 250 participants. We will thus need to recruit 79 additional participants before study completion. Based on our extant rate of study recruitment (9 participants per month), data collection will be complete in 11-12 months.

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