

# Chapter 11

## Assessment of the Psychotherapeutic Effects of Ritual Ayahuasca Use on Drug Dependency: A Pilot Study

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**Abstract** Using personality, psychopathology, and neuropsychological assessment instruments, our team assessed the therapeutic effects of an ayahuasca ritual treatment. Data was collected at the Institute of Applied Amazonian Ethnopsychology (IDEAA), in the Brazilian Amazon Basin. Psychological assessments were obtained both before and at the end of the treatment. The ayahuasca treatment lasted between 3 and 9 months and included biweekly ayahuasca consumption. The sample consisted of 13 patients (8 men, 5 women) with a mean age

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of 35 years. Nine had a diagnosis of drug abuse and/or dependence; one of borderline personality disorder, and 3 were at IDEAA for personal growth. Results showed that the “Impulsiveness,” “Disorderliness,” “Anticipatory Worry,” and “Shyness with Strangers” subscales of the *Temperament and Character Inventory* presented statistically significant reductions after treatment, while the “Self-Directedness,” “Responsibility,” “Purposefulness,” and “Congruent Second Nature” subscales presented significant increases. The psychopathology subscales “Positive Symptoms,” “Obsessive–Compulsive,” and “Anxiety” of the *Symptom Check-List-90-Revised*, were significantly diminished after treatment, as well as all subscales of the *Frontal Systems Behavior Scale*: “Total,” “Apathy,” “Disinhibition,” and “Executive Dysfunction.” In addition, the “Resistance to Interference” measure of the *Stroop Color and Word Test*, the *Purpose in Life Test*, and the “Transcendent Dimension,” “Meaning and Purpose in Life,” “Mission in Life,” and “Material Values” subscales of the *Spiritual Orientation Inventory* presented statistically significant increases after treatment. Despite important limitations, such as the small sample size and the lack of a control group, the present pilot study provides preliminary evidence suggesting psychotherapeutic effects of ritual ayahuasca treatment in drug-related disorders.

**Keywords** Ayahuasca · Hallucinogens · Ritual · Spirituality · Drug dependence · Personality · Psychopathology · Cognition · Psychosocial well being · Psychotherapy · Therapeutic assessment

## Introduction

Anecdotal evidence suggests that the ritual use of ayahuasca, either in the traditional indigenous and *mestizo* contexts, in the syncretic Brazilian religions, or in diverse neo-shamanic practices, and in clinics like the Takiwasi Center in Peru, may help the treatment of drug-related disorders (see Bouso and Riba, in this

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volume). Nevertheless, to the best of our knowledge, there is neither any efficacy study, nor a longitudinal research devoted to assess, within the same study, personality, psychopathology, executive functions and neuropsychological status, life attitudes, and spirituality, in drug-dependent individuals after a ritual treatment program with ayahuasca.

This chapter presents preliminary data obtained at the Institute of Applied Amazonian Ethnopsychology Instituto de Etnopsicología Amazónica Aplicada (IDEAA). The Institute was created by one of the authors, Fábregas. It is placed at the Brazilian Amazon basin, near the Mapiá River, a tributary of the Purús River in the municipality of Pauini, in the Amazon State (Fernández and Fábregas, in this volume). The aim of this text is to describe an observational study on the variations on personality, psychopathology, and neuropsychological measures in individuals treated with ayahuasca in the IDEAA setting.

## Methods

**Volunteers.** Thirteen Spanish volunteers over 18 years of age (eight men and five women) with a mean age of 35 years participated in the study. The sample included nine patients with drug abuse and/or dependence disorder (D) mainly related with the consumption of heroin and cocaine derivatives (hydrochloride salt, cocaine paste, and crack cocaine); one with borderline personality disorder (BPD), and three individuals who were at IDEAA for personal growth (PG). The sample included people with a medium–high socioeconomic status, i.e., all volunteers had higher-than-average income and all were high school graduates. Most participants had no previous experience with ayahuasca. All subjects with dependence disorders were very problematic drug users with long and prolific delictive careers, who were considered hopeless by their families and their social environment, and that had previously failed in other treatments for their drug-related problems.

All volunteers signed a written informed consent allowing their clinical data to be used for scientific purposes, as long as their anonymity was preserved. Data was collected in Spain before and after the volunteer's travel to IDEAA. Data collection was performed from October 2004 to November 2008.

**Study Design and Variables.** Patients stayed in IDEAA for at least 3 months (mean: 4½ months; range: 3–9 months). During this time, patients consumed ayahuasca at IDEAA between 1 and 2 times per week, and also in a Santo Daime community near the institute (mean: 2–3 times per month; range: 1–15 times per month). Study evaluations were performed before and after the ayahuasca treatment. As this is not a clinical study, but an observational one, questionnaires were not equally administered to all volunteers. The criteria for choosing which questionnaires should be applied were based on the clinical expertise of the IDEAA team (see below).

In this study, personality was assessed using the *Temperament and Character Inventory-Revised (TCI-R)* ( $N = 10$ ; 9D + 1BPD). The psychopathological status

of the volunteers was evaluated with the *Symptom Check-List-90-Revised (SCL-90-R)* ( $N = 9$ ; 9D), and their neuropsychological performance and behavior was assessed with the *Stroop Color and Word Test* ( $N = 13$ ; all sample), the *Letter-Number Sequencing (LNS)* from the *WAIS-III* ( $N = 12$ ; 9D + 1 BPD + 2PG), and the *Frontal Systems Behavior Scale (FrSBe)* ( $N = 11$ ; 9D + 1BPD + 1PG). Life attitudes and spirituality were assessed with the *Purpose in Life Test (PLT)* ( $N = 9$ ; 9D) and the *Spiritual Orientation Inventory (SOI)* ( $N = 9$ ; 9D). Our group used these scales and questionnaires in previous research (Bouso et al. 2011, 2012). The questionnaires used are briefly described below:

**Personality traits.** *Temperament and Character Inventory (TCI-Revised)*. The *TCI-R* is based on the psychobiological model of personality developed by Cloninger, Svrakic, and Przybeck (1993). The temperament dimensions are assumed to be independently inheritable and to manifest in early development, while the character dimensions are assumed to be influenced more by sociocultural learning and maturation. The *TCI-R* has 240 Likert-type items with five response options, assessing seven dimensions of personality and 29 sub-dimensions. The four primary dimensions of temperament and their facets are: (1) Harm Avoidance (HA): HA1-Anticipatory Worry versus Uninhibited Optimism; HA2-Fear of Uncertainty versus Confidence; HA3-Shyness with Strangers versus Gregariousness; HA4-Fatigability and Asthenia versus Vigor; (2) Novelty Seeking (NS): NS1-Exploratory Excitability versus Stoic Rigidity; NS2-Impulsiveness versus Reflection; NS3-Extravagance versus Reserve; NS4-Disorderliness versus Regimentation; (3) Reward Dependence (RD): RD1-Sentimentality versus Insensitivity; RD3-Attachment versus Detachment; RD4-Dependence versus Independence; and (4) Persistence (P).

The three dimensions of character are: (1) Self-Directedness (SD): SD1-Responsibility versus Blaming; SD2-Purposefulness versus Lack of Goal-Direction; SD3-Resourcefulness; SD4-Self-Acceptance versus Self-Striving; SD5-Congruent Second Nature; (2) Cooperativeness (C): C1-Social Acceptance versus Social Intolerance; C2-Empathy versus Social Disinterest; C3-Helpfulness versus Unhelpfulness; C4-Compassion versus Revengefulness; C5-Integrated Conscience; and (3) Self-Transcendence (ST): ST1-Self-Forgetfulness versus Self-Conscious Experience; ST2-Transpersonal Identification versus Self-Isolation; ST3-Spiritual Acceptance versus Rational Materialism.

**Psychopathological status.** *The Symptom Check-List-90-Revised (SCL-90-R)*. The *SCL-90-R* (Derogatis 1994) is a self-report questionnaire that assesses nine psychopathological symptomatic dimensions, including 90 Likert-type items that are scored from 0 to 4: Somatization (SOM), Obsessive-Compulsive (O-C), Interpersonal Sensitivity (I-S), Depression (DEP), Anxiety (ANX), Hostility (HOS), Phobic Anxiety (PHOB), Paranoid Ideation (PAR), and Psychoticism (PSY). The scale also provides three additional psychopathological indices: General Severity Index (GSI), Positive Symptoms Distress Index (PSDI), and Positive Symptoms Total (PST). For all the scales, higher scores imply worse symptomatology.

**Neuropsychological performance and behavior.** *The Stroop Color and Word Test.* The *Stroop* test (Golden 1994) assesses conflict monitoring and resolution (resistance to interference), cognitive abilities involving the anterior cingulate-dorsolateral prefrontal system and the rostroventral prefrontal cortex (Melcher et al. 2008). In this test, subjects must first read a list of color names (“red,” “green,” “blue”) written in black ink. When this is completed, a list of X’s, each printed in red, green, or blue, is presented and the subject must indicate the color of the X. Finally, a third list is presented to the participant containing a list of the same color names, but printed this time in an incongruent ink color. As with the second list, the participant is asked to indicate the color in which each element is printed. The subject is given 45 s, and the numbers of correctly read items from the first list and correctly reported items from lists two and three are recorded. Dependent variables are the total number of words read (W), the total number of correctly identified colors in the second list (C) and the total number of color incongruent words read (IW). Finally, a “Resistance to Interference” measure (RI) is calculated according to the following formula:  $RI = IW - (C \times W/C + W)$ . Better performance is reflected as higher scores on IW and RI.

*The Letter-Number Sequencing (LNS) from the WAIS-III.* The *LNS* (Wechsler 1997) is a measure of working memory, a task involving dorsolateral, ventrolateral, and orbitofrontal prefrontal cortices (Barbey et al. 2011). Subjects are verbally presented with a random series of numbers and letters that they have to report back in a specified order, i.e., numbers in ascending order and letters in alphabetical order. Series of increasing length are presented to the subject until an error is committed. The score is the maximum number of elements in the series correctly reported by the participant. Higher scores indicate better performance.

*The Frontal Systems Behavior Scale (FrSBe).* The *FrSBe* (Grace and Malloy 2001) is a rating scale designed to measure behaviors associated with damage to the frontal lobes and systems of the brain. This questionnaire was used to assess hypothetical frontal lobe alterations that could potentially go undetected with classical neuropsychological tests, but that could have an impact on everyday life. Both self- and relative-administered versions exist. In the present study, the self-administered version was used. The questionnaire comprises 46 Likert-type items with five response options. The items are distributed into three subscales: Apathy/Akinesia (14 items), Disinhibition/Emotional Dysregulation (15 items), and Executive Dysfunction (17 items). Higher scores reflect worse frontal function. A global score is computed by adding up the scores of the individual scales.

**Life Attitudes and Psychosocial Well Being.** *Purpose in Life Test (PLT).* The *PLT* (Crumbaugh and Maholick 1976) is a measure of a subject’s perceived “meaning of life” versus “existential vacuum” and is based on Victor Frankl’s Logotherapy. It consists of 20 items; each rated on a 7-point scale ranging from 1 (low purpose) to 7 (high purpose). The total score can range from 20 (low purpose) to 140 (high purpose).

*Spiritual Orientation Inventory (SOI).* The *SOI* (Elkins et al. 1988) is a measure of spirituality based on the humanistic model and is designed to assess the spirituality of those affiliated with traditional religion. It is an 85 Likert-type item

self-report questionnaire. Items are distributed into nine major components: Transcendent Dimension, Meaning and Purpose in Life, Mission in Life, Sacredness of Life, Material Values, Altruism, Idealism, Awareness of the Tragic, and Fruits of Spirituality. Each item has seven response options.

All volunteers gave their written informed consent to participate.

**Statistical analysis.** Because different questionnaires were administered to varying numbers of volunteers, statistical results are presented accordingly. Scores of the assorted questionnaires and scales were analyzed using paired Student's *t* tests of repeated measures comparing the scores obtained by each subject before and after the treatment. In all tests performed, differences were considered statistically significant for *p* values lower than 0.05.

## Results

**Personality traits.** The “Impulsiveness” ( $p = 0.042$ ), “Disorderliness” ( $p = 0.022$ ), “Anticipatory Worry” ( $p = 0.029$ ), and “Shyness with Strangers” ( $p = 0.011$ ) subscales of the *TCI-R* presented statistically significant reductions after the ayahuasca treatment ( $N = 10$ ; 9D + 1BPD) (Table 11.1).

On the other hand, the subscales “Self-Directedness” ( $p = 0.007$ ), “Responsibility” ( $p = 0.021$ ), “Purposefulness” ( $p = 0.030$ ), and “Congruent Second Nature” ( $p = 0.015$ ) presented increases after the ayahuasca treatment ( $N = 10$ ; 9D + 1BPD) (Table 11.1). There were no statistically significant differences on the other subscales.

**Psychopathological Status.** On the *SCL-90-R* ( $N = 9$ ; 9D), the subscales “Positive Symptoms Total” ( $p = 0.029$ ), “Obsessive–Compulsive” ( $p = 0.006$ ), and “Anxiety” ( $p = 0.045$ ) presented statistically significant reductions after the ayahuasca treatment (Table 11.2). There were no statistically significant differences on the other subscales.

**Neuropsychological Performance and Behavior.** The “Resistance to Interference” ( $p = 0.026$ ) subscale of the *Stroop* test ( $N = 13$ ; all sample) presented a

**Table 11.1** TCI-R scales means with significant statistical results ( $N = 10$ )

TCI-R scales	Before treatment	After treatment	Student t test
Impulsiveness	27.20	23.00	*
Disorderliness	21.00	19.50	*
Anticipatory worry	29.80	26.80	*
Shyness with strangers	21.00	17.10	*
Self-directedness	131.10	147.50	**
Responsibility	30.50	33.10	*
Purposefulness	21.40	24.70	*
Congruent second nature	31.80	38.50	*

\*  $p < 0.05$ ; \*\*  $p < 0.01$

**Table 11.2** SCL-90-R subscales means and statistical results ( $N = 9$ )

SCL-90-R subscales	Before treatment	After treatment	Student t test
GSI	0.61	0.35	ns
PSDI	1.46	1.37	ns
PST	32.22	18.37	*
SOM	0.65	0.55	ns
O-C	0.75	0.33	**
I-S	0.53	0.36	ns
DEP	0.67	0.37	ns
ANX	0.63	0.26	*
HOS	0.44	0.14	ns
PHOB	0.47	0.19	ns
PAR	0.59	0.29	ns
PSY	0.43	0.22	ns

GSI: General Severity Index; PSDI: Positive Symptoms Distress Index; PST: Positive Symptoms Total; SOM: Somatization; O-C: Obsessive-Compulsive; I-S: Interpersonal-Sensitivity; DEP: Depression, ANX: Anxiety; HOS: Hostility; PHOB: Phobic Anxiety; PAR: Paranoid Ideation; PSY: Psychoticism; ns: non-significant; \*  $p < 0.05$ ; \*\*  $p < 0.01$

statistically significant increase after the ayahuasca treatment. There were no statistically significant differences on the other *Stroop* subscales.

*LNS* measures ( $N = 12$ ; 9D + 1BPD + 2PG) did not show statistically significant differences before and after the ayahuasca treatment.

All subscales of the *FrSBe*—“Total” ( $p = 0.001$ ), “Executive Dysfunction” ( $p = 0.000$ ), “Apathy” ( $p = 0.001$ ) and “Disinhibition” ( $p = 0.019$ )—indicated statistically significant reductions after the ayahuasca treatment ( $N = 11$ ; 9D + 1BPD + 1PG) (Table 11.3).

**Life Attitudes and Spirituality.** There was a statistically significant increase in the *PLT* scores after the ayahuasca treatment ( $N = 9$ ; 9D;  $p = 0.001$ ) (Table 11.4).

The subscales “Transcendent Dimension” ( $p = 0.004$ ), “Meaning and Purpose in Life” ( $p = 0.006$ ), “Mission in Life” ( $p = 0.008$ ), “Sacredness of Life” ( $p = 0.031$ ) and “Fruits of Spirituality” ( $p = 0.004$ ) of the *SOI* ( $N = 9$ ; 9D) showed statistically significant increases after the ayahuasca treatment (Table 11.4). There were no statistically significant differences on the other *SOI* subscales.

**Table 11.3** FrSBe subscales means and statistical results ( $N = 11$ )

FrSBe subscales	Before treatment	After treatment	Student t test
Total	111.09	88.54	**
Executive Dysfunction	45.91	35.54	**
Apathy	35.55	27.90	**
Disinhibition	32.91	27.27	*

\*  $p < 0.05$ ; \*\*  $p < 0.01$

**Table 11.4** PLT and SOI subscales means and statistical results ( $N = 9$ )

	Before treatment	After treatment	Student t test
PLT	96.44	114.44	**
SOI subscales			
Transcendent dimension	3.57	5.29	**
Meaning/purpose in life	4.84	5.58	**
Mission in life	4.04	5.19	**
Sacredness of life	5.03	5.56	*
Material values	4.57	4.72	ns
Altruism	4.94	4.96	ns
Idealism	4.40	4.61	ns
Awareness of the tragic	5.04	5.37	ns
Fruits of spirituality	3.78	5.26	**

ns: non-significant; \*  $p < 0.05$ ; \*\* $p < 0.01$

## Discussion

The overall results of this study suggest that the ritual treatment with ayahuasca as was performed at IDEAA led to some therapeutic benefits that included amelioration of several psychological dimensions related to drug dependence as measured by validated questionnaires and scales.

## Personality Traits

In the personality assessment using the *TCI-R*, differences were found in some of the temperament sub-dimensions, which are believed to be genetically determined. Scores in the “Impulsiveness” subscale were significantly reduced after the ayahuasca treatment. Since high scores in “Impulsiveness” have been associated extensively with drug use (Pedrero-Pérez and Mota 2008; Verdejo-García et al. 2008), the reductions showed in the “Impulsiveness” subscale, together with significant reductions in the sub-dimensions “Disorderliness,” “Anticipatory Worry,” and “Shyness with Strangers,” may reflect less risk-taking behavior, more ordered pattern of behaviors, and less anxiety and shyness after ritual treatment with ayahuasca.

Regarding the character dimensions, participants scored significantly higher in the dimension “Self-Directedness,” and in the subscales of “Responsibility,” “Purposefulness,” and “Congruent Second Nature” after the ayahuasca treatment. These findings may also reflect positive and therapeutic behavior modifications directed to more self-regulation, responsibility, orientation, congruency, and motivation to change. In fact, perhaps the most interesting personality result, from a clinical point of view, may be the higher scores achieved by subjects in the dimension “Self-Directedness” after the ayahuasca treatment, since this change



may predict long-term beneficial outcomes. “Self-Directedness” is consistently found to be low in drug abusers (Pedrero-Pérez and Mota 2008), so its increase after the ayahuasca treatment may be reflecting the efficacy of the treatment. Higher scores in “Self-Directedness” may also reflect that the treatment enhanced the inner potentialities of the patients. It would be interesting to develop long-term efficacy studies in order to see if this change in personality is permanent.

One eventual radical consequence of permanent change in the “Self-Directedness” trait may be related to a major change not only in terms of treatment outcome, but also in terms of a more difficult kind of change; that is, in the kind of psychiatric diseases that have no or little cure, known as the “personality disorders.” Patients suffering from personality disorders commonly have low scores in “Self-Directedness,” and it is common to find a combination of low scores in “Self-Directedness” and high scores in “Self-Transcendence” in many types of personality disorders (Gutiérrez et al. 2008). Notably, more than half of the patients with drug-related disorders have some kind of personality disorder (Herrero et al. 2008), and it is also very common that this patient group has low scores in “Self-Directedness” and high scores in “Self-Transcendence” independent of the drug abused (Pedrero-Pérez and Mota 2008).

Our subjects did not significantly change their scores in the “Self-Transcendence” dimension after the ayahuasca treatment, besides being involved in several ayahuasca ceremonies. Since patients with drug-related disorders often present high “Self-Transcendence” scores and ayahuasca consumption frequently induces extreme spiritual experiences, the reason we did not see changes in the “Self-Transcendence” dimension after the ayahuasca treatment may be that our subjects already had high scores in that dimension. In fact, the scores obtained for our subjects both at the beginning and at the end of the treatment are considered as high “Self-Transcendence” scores for the normative data of the general Spanish population (Gutiérrez-Zotes et al. 2004), and also higher than the ones found in other studies where this personality trait has been assessed in Spanish addicts.

It is interesting to note that higher scores obtained in “Self-Directedness” by our subjects after the treatment were indicators of good treatment outcomes. In our previous long-term ayahuasca study, this variable was lower in the ayahuasca-using groups compared with control groups (Bouso et al. 2012), even while they used less drugs than controls (Fábregas et al. 2010). Perhaps we are attending to two different approaches here to treat drug abuse: one, the religious use of ayahuasca (Grob et al. 1996; Halpern et al. 2008), and the other, the psychotherapeutic approach (for an overview, see Loizaga-Velder and Loizaga Pazzi, in this volume).

Although the religious and the psychotherapeutic approaches are not mutually exclusive, especially in the context of the ritual use of ayahuasca (Labate et al. 2009; Goulart 2011), we separate the two contexts here for practical reasons: the religious context, more associated with a doctrine and a group of individuals that give encouragement and support for personal changes; and the psychotherapeutic context, more associated with the individual’s own strength to overcome difficulties. In this perspective, in the religious approach, the “Self-Directedness” dimension would be lower because it is the doctrine of the group that drives the

subject's behaviors, and, while following a doctrine, subjects would be protected from temptations to abuse drugs. On the other hand, in a psychotherapeutic approach, it is the subject that would take control of his or her personal situation and, accordingly, psychotherapeutic techniques are focused on subjects gaining self-control over their situations.

In summary, the increments in the "Self-Directedness" scores and the absence of significant changes in the "Self-Transcendence" scores may indicate a benefit in terms not only of treatment outcome, but also in terms of benefits of patients with personality disorders. Future prospective studies are needed in order to eventually confirm or to refute this interesting finding.

## Psychopathological Status

Regarding the psychopathological status of the volunteers as measured by the *SCL-90-R*, it can be observed in Table 11.2 that the subscales "Positive Symptoms Total," "Obsessive–Compulsive," and "Anxiety" were significantly reduced after the ayahuasca treatment, suggesting a reduction of some psychopathological symptoms as measured by the *SCL-90-R* after the ayahuasca treatment.

Previous studies with healthy long-term users of ayahuasca, including adolescents and adults, suggest that these individuals present low levels of psychopathology, and may even present better mental health status compared to the control groups used in the studies (*Studies with adults*: Grob et al. 1996; Barbosa et al. 2005; Halpern et al. 2008; Barbosa et al. 2009; Bouso et al. 2012; *Study with adolescents*: da Silveira et al. 2005; for a review of adult and adolescent studies see Labate et al. 2009; Barbosa et al. 2012). The psychopathological data are supported by increasing preclinical and clinical evidence demonstrating anxiolytic and antidepressive potentials for ayahuasca or some of its isolated alkaloids (dos Santos et al. 2007; Osório et al. 2011; Palhano-Fontes et al. in this volume).

## Neuropsychological Performance and Behavior

Scores in the "Resistance to Interference" subscale of the *Stroop* test were significantly higher after the ayahuasca treatment. This subscale is associated with visuoperceptive functions involved in discriminating interference. Specifically, this part of the *Stroop* test consists of rapidly naming the color of a word that is written in another color, exemplifying the capacity to inhibit reading, a highly automated process. In a broader sense, the significant increase in the "Resistance to Interference" subscale after the ayahuasca treatment could indicate an improvement in some aspects of the executive functions.

In line with the *Stroop* data, all subscales of the *FrSBe* showed statistically significant reductions after treatment. Since the *FrSBe* is a behavioral

questionnaire, these data suggest that patients increased their planning and execution abilities; while, at the same time, they reduced their apathy in the behavioral level.

Deficits in executive functions related to attention, cognitive flexibility, memory, and processing speed, are commonly reported among drug-dependent individuals. The data presented in our pilot study suggests that the ayahuasca treatment improved, or at least normalized, the cognitive and executive functions among our patient group.

On the other hand, there was neither difference on the other *Stroop* subscales nor in the *LNS* measures before and after the ayahuasca treatment. The absence of significant differences in the neuropsychological tests may indicate the overall safety profile of ayahuasca for cognition. These data are in line with the subject's interviews, and with studies with healthy long-term consumers of ayahuasca (Grof et al. 1996; Barbosa et al. 2005; da Silveira et al. 2005; Halpern et al. 2008; Barbosa et al. 2009; Bouso et al. 2012; for a review of adult and adolescent studies see Labate et al. 2009; Barbosa et al. 2012).

## Life Attitudes and Spirituality

There was a statistically significant increase in the *PLT* scores after the ayahuasca treatment. Moreover, the subscales "Transcendent Dimension," "Meaning and Purpose in Life," "Mission in Life," and "Material Values" of the *SOI* also showed statistically significant increases after the ayahuasca treatment.

These data might indicate that patients increased their motivation for pursuing new and less harmful goals in life, associated with an increase in the transcendent aspects of life. Increases in mystical-type and religious experiences, similar to those described by our group of volunteers, are comparable to the ones that had been described in human research with hallucinogenic compounds like LSD and psilocybin. These experiences have been related to improvements in several mental health measures (Grof 2001; Griffiths et al. 2006, 2008, 2011; MacLean et al. 2011).

## Limitations

Despite the promising results suggesting that a ritual treatment involving ayahuasca might present psychotherapeutic value for people with drug-related disorders, the present study has several limitations.

First, the small sample size may have decreased statistical power and increased the probability of false positive results. Second, there was no comparison group, and third, data from some volunteers was lost because of the difficulties of the fieldwork conditions in the middle of the Amazon. Nevertheless, independent of

the statistical differences, what seems most interesting is the observation of the clinical changes that the patients experienced after the ayahuasca treatment: objective clinical changes measured with personality, psychopathological, and neuropsychological rating scales.

The observed changes might not be entirely related to the ayahuasca treatment, but could also be explained by the fact that the subjects had stayed several months in a relatively isolated environment where there were few possibilities of obtaining drugs, and the observed changes could just be the consequence of the passage of time. Nevertheless, the observed changes in personality measures, above all in impulsivity and in self-directedness, suggest that those changes were more a consequence of the therapeutic program than the mere passage of time. In any case, the positive changes observed at the end of the treatment in personality, psychopathological, and neuropsychological assessments indicate that the global experience was positive and beneficial for the subjects, as also shown by their subjective narratives (Fernández and Fábregas, in this volume).

Today, according to our fieldwork observation some years after the experience, all 13 subjects are completely integrated in society. Moreover, two of them are ayahuasca leaders in their local communities. Future studies should try to replicate the present findings using a control group and also including follow-up assessments.

## Conclusions

Despite its limitations, and recognizing the exploratory nature of this observational pilot study, our results suggest that the ritual use of ayahuasca in a therapeutic context may have beneficial psychotherapeutic effects in several mental health dimensions. This statement is further illustrated by the fact that clinical changes suggesting therapeutic effects were observed in several psychological areas, including personality, psychopathology, cognition, life attitudes, and spirituality. These preliminary results give support for continuous investigations on the possible therapeutic use of ayahuasca.

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