

A Six-Month Prospective Evaluation of Personality Traits, Psychiatric Symptoms and Quality of Life in Ayahuasca-Naïve Subjects

Paulo Cesar Ribeiro Barbosa, M.Sc.*; Irene Maurício Cazorla, Ph.D.**;
Joel Sales Giglio M.D., Ph.D.*** & Rick Strassman, M.D****

Abstract—The authors assessed 23 subjects immediately before and six months (27.5 weeks) after their first ayahuasca experience in an urban Brazilian religious setting, either Santo Daime (N = 15) or União do Vegetal (N = 8). Measures included scores on instruments assessing psychiatric symptoms, personality variables and quality of life. Independent variables were the frequency of ayahuasca use throughout the period and the length of ayahuasca wash-out after six months. Santo Daime subjects had a significant reduction of minor psychiatric symptoms, improvement of mental health, and a change in attitude towards more confidence and optimism. The União do Vegetal group had a significant decrease in physical pain, and attitude change towards more independence. Independence was positively correlated with the frequency of ayahuasca use and negatively correlated with the wash-out period. We discuss possible mechanisms by which these changes may occur and suggest areas for future research.

Keywords—ayahuasca, mental health, psychometric, religion

Ayahuasca is a hallucinogenic beverage produced from decocting parts of two Amazonian plants. One is the root bark and sometimes the stem cortex of the liana *Banisteriopsis caapi*, which contains the beta-carboline harmala alkaloids

*Professor of Science Methods and Mental Health, Departamento de Filosofia e Ciências Humanas, Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, Brazil.

**Professor of Statistics, Departamento de Ciências Exatas e Tecnológicas, Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, Brazil.

***Professor of Psychiatry, Departamento de Psicologia Médica e Psiquiatria, Universidade Estadual de Campinas (UNICAMP), Campinas, São Paulo, Brazil.

****Clinical Associate Professor of Psychiatry, University of New Mexico School of Medicine; Cottonwood Research Foundation, Taos, New Mexico USA

Please address correspondence and reprint requests to Paulo Cesar Ribeiro Barbosa, Rua 02, N.101 ap. 305, Ilhéus, Bahia State, Brazil, CEP 45654-010; email: pcesarr@yahoo.com.br

harmine, harmaline, and tetrahydroharmine. The second group comprises plants containing N,N-dimethyltryptamine (DMT), such as the leaves of the bush *Psychotria viridis* (McKenna & Towers 1984). Archeological data suggest its use among Amazonian pre-Columbian cultures dates from at least 2000 B.C. (Naranjo 1986). Contemporary culturally sanctioned ritual use of the beverage for magico-religious purposes throughout the western Amazon Basin by Amerindian and mestizo populations has been described (Luz 2002; Dobkin de Rios 1989; Reichel-Dolmatoff 1975). Ethnological data suggest that the rituals accompanying the use of ayahuasca in these societies can minimize social and psychological problems associated with the use of psychoactive substances in western societies (Dobkin de Rios & Smith 1977).

Throughout the twentieth century, migrant people from northeastern Brazil have combined the local Amerindian/

mestizo-Amazonian ayahuasca use with their previous religious beliefs. The result of this process has been the establishment of modern urban Brazilian ayahuasca religions, such as *União do Vegetal* (also known as UDV), *Santo Daime* and *Barquinha*, who use ayahuasca as a key element in their doctrines and ceremonial meetings (Senna Araújo 1999; Brissac 1999; Labigalini Jr. & Dunn 1995; MacRae 1992). During the last three decades Santo Daime and UDV churches have spread from the Amazon to major cities in Brazil as well as to Europe and North America (Tupper 2008; Labate 2002).

Based on the right of religious freedom and respect for cultural diversity, lawsuits against the religious use of ayahuasca were decided in favor of Santo Daime in Holland and Spain (Tupper 2008) and UDV in the United States (Groisman & Dobkin de Rios 2007). In Brazil, where thousands of urban, ritual ayahuasca users practice, a recent federal regulatory commission upheld a favorable decision for the ritual use of ayahuasca (CONAD 2006; CONFEN 1986). As these judicial decisions are expected to significantly increase the religious use of ayahuasca throughout the world, studies on mental health of ayahuasca users within these religious contexts are needed.

Grob and colleagues (1996) began the systematic assessment of the mental health of urban ayahuasca users within a modern syncretic religious setting. They reported, in this case-control study, that long-term regular users of ayahuasca within the UDV suffered from less psychopathology, and had better scores with respect to some measures of memory function and personality traits compared to non-ayahuasca users.

Subsequently, a more comprehensive case-control study was conducted to evaluate the effects of ayahuasca among adolescent users in UDV regarding neurocognitive function, psychiatric symptomatology, and drug use (Da Silveira et al. 2005; Doering-Silveira et al. 2005a, b). This study found a lower incidence of some psychiatric symptoms and alcohol use among ayahuasca-using adolescents compared to in the control group (Da Silveira et al. 2005; Doering-Silveira et al. 2005a). Furthermore, neurocognitive assessments showed no significant differences between groups (Doering-Silveira et al. 2005b).

All of these studies focused on subjects who already had formal institutional ties to UDV after a long and regular period of ayahuasca use at the time of the assessments. Leading researchers in the field have pointed to the need for longitudinal studies that elicit the health status of subjects before their first ritual experience with ayahuasca and throughout the process of becoming involved with the framework of the ayahuasca religion (McKenna, Callaway & Grob 1998; Grob et al. 1996). Furthermore, systematic psychological evaluations of ayahuasca users in other Brazilian ayahuasca religions, such as Santo Daime, are still lacking.

This report is the second phase of our study designed to address these issues. The first phase described psychological

evaluations of ayahuasca-naïve subjects one to four days before and one to two weeks after their first ayahuasca experience in UDV or Santo Daime (Barbosa, Giglio & Dalgalarrondo 2005). The present phase presents the evaluations of these subjects six months after that initial experience.

BACKGROUND INFORMATION: SANTO DAIME AND UDV

The study was conducted in two large cities in southeastern Brazil: São Paulo (one UDV and two Santo Daime temples) and Campinas (two UDV temples). Santo Daime and UDV define themselves as religions aiming to contribute to human moral and spiritual development. Both groups ascribe to Christian principles of goodness, fraternity, harmony and justice. They also believe in spiritual evolution through successive reincarnations of the soul. Behavioral patterns consistent with those principles (e.g., helpfulness, respect, serenity and diligence towards life and other church members) are encouraged; while behavior inconsistent with these principles (e.g., substance abuse and violence) are discouraged.

Within these religions ayahuasca is not regarded merely as a psychoactive substance. Rather, this psychedelic beverage is viewed as a divine gift related to the mythic origins of these religions. It is regarded as the tool of spiritual evolution *par excellence* because of its property of opening people's receptivity to the "spiritual world" (Santo Daime 2008; CEBUDV 1989).

The use of ayahuasca is thoroughly integrated into these religions' rituals. These rituals are characterized by the constant preaching of Santo Daime's and UDV's religious ethos (e.g., goodness, harmony, and justice) and worldview (e.g., the divine nature of ayahuasca and the reality of the spiritual world).

In Santo Daime, the preaching takes place through the collective performance of hymns and a synchronized dance called a *bailado*, both of which are accompanied by vigorous percussive and musical instruments. All participants are required to sing and dance during the ceremonies, which last four to 12 hours.

In UDV, the preaching occurs through questions directed to the session leader by the participants, through popular songs played on stereo equipment, and also through hymns performed by single participants. During some periods silence predominates. The rituals invariably last four hours and the participants remain seated in a relaxed position throughout the ceremony.

Santo Daime and UDV beliefs and practices concerning ayahuasca direct the psychedelic experience towards positive social and individual outcomes by means of the collective ceremonial performance and preaching. These external structures reinforce the religions' values and social cohesion, providing conceptual and behavioral guidelines that minimize confusion or disorientation during the visionary

experiences and maximize a particular manner of interpreting and integrating the hallucinogenic state (Baker 2005; MacRae 1992).

This well-established religious conceptual and ceremonial framework is the key feature that has lead researchers to characterize the religious use of ayahuasca as a sacrament similar to those of the Christian churches (e.g., Eucharist), in contrast to more idiosyncratic use of psychedelic drugs that lack well-established concepts and practices (Baker 2005).

Besides attending ayahuasca ceremonies regularly, membership in these religions involves participation in other communal activities such as maintenance of the church organization: e.g., collective cleaning of the shrines and fund raising activities. In addition, participants usually are actively involved in the social support network of the group. This network is used to further integrate religious values into psychosocial spheres, including offering services or goods at a lower price than the market value, and amusement activities.

Despite the Amazonian origins of Santo Daime and UDV among the working classes, the religious use of ayahuasca in larger southern Brazilian cities seems to be predominantly a middle- and educated-class phenomenon (Barbosa, Giglio & Dalgarrondo 2005). In this urban context, the novices of Santo Daime tend to be recruited through New Age religious social circles, and those of UDV through relatives and close friends who belong to the organization (Barbosa 2001).

People who are about to experience ayahuasca are instructed by a senior member of Santo Daime or UDV in the protocol to be adopted during the ritual. Once the novice undergoes his/her first ritual ayahuasca experience, he/she is free to attend regularly scheduled ceremonies without establishing formal affiliation with the religion. Santo Daime and UDV regard this period as an opportunity for the individual to learn about the doctrine, the religious community, and the effects of ayahuasca before deciding to formally join the religion. Santo Daime advises novices to try ayahuasca at least two times after the first experience. No such recommendation exists in UDV. Usually this period lasts from a few weeks to one year in an individual who attends the ceremonies regularly. The formal affiliation (called *fardamento* in Santo Daime and *associação* in UDV) is symbolized by the wearing of a uniform, which means that from this point on the individual is referred to as *fardado* (Santo Daime) or *associado* (UDV) and must accept the guidelines of the religion

METHODS

Design

Twenty three subjects were assessed prospectively one to four days before their first ritual experience with ayahuasca (T0); and between seven and 14 days (T1) and six

months (mean 27.5 weeks; SD 3.2; range 26-34) after their first experience with ayahuasca (T2). Fifteen participants experienced ayahuasca in the Santo Daime and eight in the União do Vegetal.

Subjects

Recruiting naïve subjects to make a group analysis was difficult because first ritual ayahuasca experiences are relatively rare, and require rather demanding logistics to be evaluated. Therefore, it was decided to use whatever individuals were available. Novices were invited to participate in the research by elder members of Santo Daime or UDV who were responsible for instruction in the behavior to be adopted during the ritual. Those who accepted the invitation to participate in the research were directed to the researcher. Twenty-eight subjects were evaluated in the first phase of the study, between T0 and T1 (Barbosa, Giglio & Dalgarrondo 2005). Five subjects dropped out between T1 and T2: four in Santo Daime dropped out—one suffered an intercurrent myocardial infarction, one failed to appear for the scheduled interview, one moved abroad, and one was lost to follow-up. Follow-up revealed that none of the three former subjects contacted described adverse effects from their ayahuasca experience. One from UDV dropped out because of an unrelated stressor (a recent mugging).

Of the 23 subjects who completed the study, 15 (65%) were female (Santo Daime 11; UDV 4). The mean age was 37 years (SD 13.3; range 18-57), [Santo Daime: 34.3 years (SD 13.7; range 18-57), UDV: 42.3 (SD: 11.8; range 27-57)]. Eleven subjects (48%) were married (Santo Daime 4; UDV 7), nine (39%) were single (Santo Daime 8; UDV 1), and three (13%) were separated (all from Santo Daime). Eleven subjects (48%) possessed a bachelor's degree (Santo Daime 5; UDV 6), 10 (43%) finished high school (Santo Daime 8; UDV 2), and two (9%) were college students (both from Santo Daime). One subject from the Santo Daime reported marijuana use along with ayahuasca during Santo Daime ceremonies. All subjects lived in the São Paulo and Campinas areas, two large and modern cities located in southwestern Brazil.

At T2 one of the 15 Santo Daime and four of the eight UDV subjects (21.7% of the 23 subjects) subjects had formally become members of the religious organization.

Number of ayahuasca experiences and length of wash-out period. Subjects were asked how many times they had attended Santo Daime or UDV rituals after their first session with ayahuasca, and the wash-out period (length of time abstinent) between their last use and T2.

Clinical Interview Schedule-Revised Edition (CIS-R). The CIS-R is a semistructured interview that measures the intensity of minor psychopathological symptoms. The scale comprises 14 sections: somatic symptoms, fatigue, difficulties in concentration, sleep problems, irritability, preoccupation with body functions, depression, depressive ideas, worry, anxiety, compulsions, obsessions, panic and

phobias. The score for each section ranges from 0 to 4 with the exception of “depressive ideas” which ranges from 0 to 5. The total CIS-R score ranges from 0 to 57; the higher the score, the more distressed is the subject. A psychiatric disorder is considered present if a subject’s cumulative score is 12 or greater. We used a Brazilian version of the CIS-R (Freitas & Botega 2002; Botega et al. 1995). Subjects were asked to answer items for the week-long period preceding the evaluation day. The scale was administered at all three time points.

Short Form-36 Health Survey (SF-36). The SF-36 is a self-rated questionnaire with 36 questions designed to measure eight dimensions of general health and wellbeing: physical functioning (10 questions), role-physical (four questions), bodily pain (two questions), general health (five questions), vitality (four questions), social functioning (two questions), role-emotional (three questions) and mental health (five questions). Scores for each of the eight dimensions ranges from 0 to 100. The higher the score the less distressed is the subject. The SF-36 also includes an additional question regarding personal health status during the previous year (McHorney, Ware & Raczek 1993; Ware & Sherbourne 1992). We used a Brazilian Portuguese version of the SF-36 (Ciconelli et al. 1999).

Since this instrument is intended to assess the subject’s status during the month before the evaluation day we administered it only twice. This was in order to compare baseline scores at T0 with those at the six-month evaluation (T2), and we therefore excluded the shorter follow-up time point (T1).

Temperament and Character Inventory—125 items (TCI-125). The TCI-125 is a self-rated questionnaire of 125 true-or-false items generating scores for four domains of “temperament” and three domains of “character.” Temperament domains are postulated to be determined by neural systems and genetic inheritance, while domains of character may reflect individual differences in self-concepts more susceptible to change than those belonging to the temperament dimensions (Cloninger, Svrakic & Przybeck 1993). The temperament dimensions are: novelty seeking (20 items), reward dependence (15 items), harm avoidance (20 items), and persistence (five items). The character dimensions are: self-directedness (25 items), cooperativeness (25 items), and self-transcendence (15 items). A Brazilian Portuguese version of the TCI-125 was developed for this study through a process of translation and back-translation (available by request). As this scale is designed to assess personality traits that are believed not amenable to change within short term periods, we administered it only at T0 and T2, and excluded the shorter follow-up time point T1.

The study was conducted in accordance with the Declarations of Helsinki and Tokyo, and Brazilian laws concerning studies on humans. It was approved by the ethics

committee at the Universidade Estadual de Campinas, Brazil (#114/2002).

Analysis

As in the previous phase of the study, we analyzed the variables for the total sample, and also compared the Santo Daime with the UDV subsamples (Barbosa, Giglio & Dalgalarondo 2005). Five analyses were done with these groups.

- 1) Scores between groups (Santo Daime versus UDV) for each time point (T0, T1 [CIS-R only] and T2) were analyzed using Fisher’s Exact test and Mann-Whitney U-tests.
- 2) Scores for changes in the CIS-R, SF-36 and TCI-125 for each group (total sample, Santo Daime and UDV) at T0, T1 [CIS-R only] and T2 were analyzed using McNemar’s and Wilcoxon’s Signed Rank tests.
- 3) If significant effects were found for Santo Daime, UDV, or the total sample between T0 and the final follow-up time point T2 we used Spearman’s correlation analyses to determine the relationship between these significant effects and the number of ayahuasca experiences the subjects underwent throughout the six-month period.
- 4) These significant effects were also correlated with the length of wash-out from their last ayahuasca experience to the time of the evaluation (T2).
- 5) We also used Spearman’s analyses to determine correlations between significant changes among CIS-R, TCI-125 and SF-36 between T0 and T2. The correlations were done in parts, two by two (e.g. significant change for CIS-R was correlated with significant change of a specific dimension of SF-36; significant change of a specific dimension of TCI-125 was correlated with a significant change of CIS-R, and so on).

In the current phase of the study, we also compared data for subjects by the criterion of intensity of ayahuasca use throughout the six-month evaluation period. Subjects who underwent more than nine ayahuasca experiences (including the first one) and a wash-out period of four weeks or less were placed into the “regular-use” group. Subjects who underwent nine or less ayahuasca experiences and a washout period of more than four weeks were placed into the “irregular-use” group. We used Fisher’s Exact test and Mann-Whitney tests to analyze differences between regular-use and irregular-use groups at each follow-up time point. McNemar’s and Wilcoxon’s Signed Rank tests were used to analyze differences between groups throughout the follow-up time points.

SPSS 10.0 software was used for analysis of CIS-R, TCI-125 and SF-36 data. We considered $p < 0.05$ as statistically significant. Dropouts were excluded from the analyses.

RESULTS

Intensity of Ayahuasca Use throughout the Follow-up Period

Seventeen of 23 subjects (73.9%) were irregular ayahuasca users (i.e., less than 10 experiences and more than four weeks washout at T2). Thirteen (87.7%) of the 15 Santo Daime subjects and four (50%) of the eight UDV subjects were irregular ayahuasca users. All regular users were formally initiated members of the religions, except for one uninitiated Santo Daime subject.

Clinical Interview Schedule – Revised Edition (CIS-R)

The Fisher's Exact test revealed a significantly higher incidence of CIS-R-defined psychiatric cases in Santo Daime (9/15, 60%) than in UDV (0/8) at T0 ($p = 0.007$). Due to the decreased incidence of Santo Daime cases over time this difference was no longer significant at T2 (2/15, 13%). There was also no significant difference between the incidence of cases in the total sample at T0 and T2. No significant differences were found between regular and irregular ayahuasca users at T0 and T2.

A significant reduction in the intensity of minor psychiatric symptoms as measured by the CIS-R was found in the Santo Daime group between T0 and T1 (11.6 ± 8.3 vs 5.1 ± 4.6 ; $p = 0.005$), a difference that remained significant at T2 (5.1 ± 5.7 ; $p = 0.024$ compared to T0). No significant difference was observed between T1 and T2.

No significant differences were found in CIS-R scores at any time points for the UDV group. No significant differences in scores were found between the Santo Daime and UDV groups at T2, whereas scores were significantly higher in the Santo Daime vs. the UDV at T0 (11.6 ± 8.3 vs 2.3 ± 2.4 ; $p = 0.01$). Interestingly, scores in the regular user group dropped significantly after their first ayahuasca session (T0 = 6.5 ± 6.1 vs T1 = 1.5 ± 2.3 ; $p = 0.042$). Scores were lower among the regular compared to irregular ayahuasca users at T1 only (1.5 ± 2.3 vs 5.7 ± 5.0 ; $p = 0.043$). Total sample scores showed a significant improvement only between T0 and T1 (8.4 ± 8.1 vs 4.6 ± 4.8 ; $p = 0.018$).

In the Santo Daime group, no significant correlation was found between improvement in CIS-R scores between T0 and T2 and intensity of use of ayahuasca or length of the wash-out period.

Short Form-36 Health Survey Questionnaire (SF-36)

Significant improvements in the mental health dimension in the Santo Daime group (T0 = 58.4 ± 23.8 vs T2 = 74.7 ± 13.8 ; $p = 0.027$) and in bodily pain in the UDV group (T0 = 78.3 ± 14.1 vs T2 = 90.7 ± 18.5 ; $p = 0.044$) were found between T0 and T2. At T0 the UDV group scores were higher than those of the Santo Daime group for the social functioning (92.9 ± 14.2 vs 76.7 ± 16.3 ; $p = 0.022$),

emotional role (85.7 ± 26.2 vs 42.2 ± 38.8 ; $p = 0.017$), and mental health dimensions (77.7 ± 14.6 vs 58.4 ± 23.8 ; $p = 0.037$).

In the UDV group, we found no significant correlation between bodily pain improvement (T0 – T2) and intensity of ayahuasca use or length of wash-out. In the Santo Daime group, no significant correlation was found between improvement in mental health (T0 – T2) and the intensity of use of ayahuasca or length of wash-out period.

At T2 regular users scored higher than irregular users in the dimensions of emotional role (94.4 ± 13.6 vs 52.1 ± 40.3 ; $p = 0.023$) and social functioning (95.8 ± 6.5 vs 70.3 ± 23.7 ; $p = 0.019$).

Temperament and Character Inventory-125 items (TCI-125)

Between T0 and T2, significantly lower scores for harm avoidance were found in the Santo Daime group (9.6 ± 4.2 vs 6.9 ± 2.9 ; $p = 0.035$), and for reward dependence in the UDV group (9.9 ± 2.9 vs 7.6 ± 2.0 ; $p = 0.017$) as well as in the total sample (9.5 ± 2.9 vs 8.4 ± 2.4 ; $p = 0.028$) between T0 and T2. The Santo Daime group scored significantly higher (10.9 ± 3.8) than did the UDV (7.9 ± 1.1) in novelty seeking at T2 ($p = 0.025$).

In the Santo Daime group we found no correlation between the decrease in the harm avoidance score (T0 – T2) and either the intensity of use of ayahuasca or the length of wash-out period.

In the UDV group a significant positive correlation was found between the decrease in reward dependence scores between T0 and T2 and intensity of ayahuasca use [r_s ($N = 8$) = $.759$, $p = 0.029$]. The lower reward dependence score was also negatively correlated with length of wash-out period [r_s ($N = 8$) = $-.843$, $p = 0.009$].

In the total sample, we found a significant positive correlation between the decrease in reward dependence scores between T0 and T2 and intensity of ayahuasca use [r_s ($N = 23$) = $.505$, $p = 0.014$]. The decrease in reward dependence score was not correlated with length of wash-out period [r_s ($N = 23$) = $-.391$, $p = 0.065$].

Regular users showed a significant decrease in reward dependence scores between T0 (12.2 ± 1.7) and T2 (8.8 ± 2.6 ; $p = 0.026$). Regular users scored significantly higher than the irregular users on reward dependence scores (12.2 ± 1.7 vs 8.6 ± 2.7) at T0 ($p = 0.005$) and in self-directedness scores at T2 (regular 23.0 ± 2.1 vs irregular 18.2 ± 4.2 ; $p = 0.009$).

Correlation between CIS-R, SF-36 and TCI-125 Significant Results

In the Santo Daime group, we found a significant negative correlation between the decrease of CIS-R psychiatric symptoms and improvement of SF-36 mental health domain

$[r_s (N = 15) = -0.780, p = 0.001]$. There was a significant positive correlation between CIS-R improvement and the decrease of TCI-125 harm avoidance scores $[r_s (N = 15) = 0.601, p = .018]$.

DISCUSSION

Careful six-month follow-up of newly initiated ayahuasca users of the two most popular Brazilian ayahuasca religions, the Santo Daime and the UDV, demonstrated no adverse effects of participation in either group on scores regarding quality of life as measured by the SF-36, nor minor psychiatric symptoms as measured by the CIS-R. In addition, regular ayahuasca users (more than nine sessions during the evaluation period) scored significantly higher in both emotional role and social functioning domains of SF-36 than did the irregular users (nine or fewer sessions).

The Santo Daime group demonstrated significant improvement on CIS-R-measured minor psychiatric symptoms as well as significant improvement in SF-36-assessed mental health from baseline to either one or both follow-up time points.

These six-month data confirm and extend our findings from the first phase of this study in which we described that the motivations of the Santo Daime sample to participate in ayahuasca rituals included a search for "healing" and "equilibrium." This group demonstrated positive mood and behavioral changes two weeks following their first ayahuasca experience (Barbosa, Giglio & Dalgalarondo 2005).

Our current findings demonstrate maintenance of improvements in the Santo Daime sample at six-month follow-up. Anthropological literature has emphasized the role of spontaneous remission to explain health improvement related to "religious healing" (Kleinman 1980). As some subjects sought participation in the Santo Daime during episodes of psychological distress (Barbosa, Giglio & Dalgalarondo 2005) it is possible that a spontaneous drop-off of distress that may have occurred during the six-month period contributed to our observed benefits. However, growing evidence of benefits from the administration of psychedelics within a structured setting (Winkelman 2007) reinforces the suggestion that the religious use of ayahuasca itself influenced the positive mental changes. Our data suggest that either administration of hallucinogens in a clinical research setting (Griffiths et al. 2006; Grinspoon & Bakalar 1986) or in a naturalistic religious setting may result in some psychological benefit.

The reduction of SF-36-assessed somatic pain complaints in the UDV group over the six-month observation period is consistent with reports that hallucinogens may alleviate pain syndromes (Grinspoon & Bakalar 1979).

Our proposing that hallucinogen use in naturalistic religious settings may lead to similar benefits as those purported to occur in clinical research settings is supported by theoretical models which propose transcultural and universal

brain mechanisms for hallucinogen-assisted healing (Winkelman 2007). However, absence of a significant correlation between intensity of ayahuasca use and time between last use and positive changes at six months does not lend itself to simply suggesting acuity or intensity of ayahuasca use determines long-term effects.

Despite the suggestion that the effects of regular use of ayahuasca on the serotonergic system may have positive psychological effects (McKenna 2007), other variables concerning the use of a powerful DMT-containing psychedelic within a social religious setting should be taken into account. Social support and encouragement of healthy behavior have been described as contributing to mental health improvement because they provide a sense of belonging to a fellowship that helps deal with painful affect and discourages unhealthy behavior such as drug abuse and attitudes related to stress, such as competitiveness and anger (Moreira-Almeida, Lotufo Neto & Koenig (2006). Perhaps these mechanisms are enhanced in these Brazilian ayahuasca religions by the enhancement of suggestibility resulting from ayahuasca use. Hyper-suggestibility, a marked characteristic of the psychedelic experience, would facilitate the acceptance of the Santo Daime and UDV ethos and worldview which are integrated during the ritual (see Dobkin de Rios, Grob & Baker 2002). In addition, the ability of psychedelics to enhance the psychotherapeutic process may play a role in participants' working through difficult personal issues (Grinspoon & Bakalar 1986). Finally, the spiritual experiences brought on by psychedelics (Griffiths et al. 2006; Pahnke 1966) can also elicit a spectrum of personally and socially beneficial consequences. Therefore, we suggest that the religious use of ayahuasca acts at a number of focal points, exerting a constellation of psychological, social, spiritual, and pharmacological factors.

Unlike the Santo Daime group, the total sample's significant improvement in CIS-R-assessed psychiatric symptoms between T0 and T1 was no longer significant at T2. At T1 all subjects were evaluated within one to two weeks after their first ayahuasca experience. At T2 73.9% of subjects were evaluated more than four weeks after their last ayahuasca experience (range one to 28 weeks). This may reflect that this longer hiatus between the last ritual and T2 contributed to the fading of affective improvement in the total sample.

The finding that the regular-use group had already undergone a significantly better improvement in CIS-R-assessed psychiatric symptoms between T0 and T1 compared to the irregular-use group may reflect a selective process that seems to occur after the first ayahuasca experience. Such a process would influence the intensity of subsequent ayahuasca use, i.e., better responses to the first ayahuasca experience would prompt people to attend ayahuasca sessions more often than unpleasant responses.

An intriguing finding concerns the data on personality change. TCI-125 dimensions that are proposed to be more

amenable to change (Cloninger, Svrakic & Przybeck's "character" dimensions) did not change. However, two theoretically less malleable "temperament" dimensions, reward dependence and harm avoidance, did.

Change scores for reward dependence were positively correlated with the intensity of ayahuasca use in the total sample, whereas irregular ayahuasca users showed no significant effects. Within the UDV group change scores for this factor were positively correlated with intensity of ayahuasca use and negatively correlated with the length of time elapsing between one's last ayahuasca session and T2. These data, as well as those demonstrating a drop-off of beneficial effects in the total group on CIS-R-assessed psychiatric symptoms between T1 and T2 suggest that some short-lived therapeutic processes require a particular number of, and intervals between, sessions for optimal benefit.

With respect to reward dependence, Cloninger's model defines this trait as contributing to the maintenance of previously rewarded behavior. According to this model, the lowering of reward dependence scores suggests a decrease in such behavior: e.g., from sentimentality, eagerness to please others, and sensitivity to signs of social approval towards detachment, coolness, emotional independence, and less sensitivity to signals of social approval (Cloninger 1987). Pharmacological studies have hypothesized that ayahuasca has short-term effects on the norepinephrine system (Riba et al. 2003), which is a major determinant of the reward dependence domain (Cloninger 1987). These pharmacological effects may relate to our current findings.

The significant reduction in harm avoidance scores within the Santo Daime group is identical to that seen in Grob and colleagues' 1996 research which found that regular long-term UDV ayahuasca users scored lower than matched controls on this dimension. As that study assessed regular and long-term users of ayahuasca (bimonthly use for at least 15 years), it is not known at what point subjects and controls began to diverge from each other along this dimension. Our data suggest this may take place rather early, at least among Santo Daime ayahuasca users.

According to Cloninger's model of personality, low harm avoidance is related to low anxiety levels (Cloninger 1987). The decrease in the harm avoidance domain correlates with CIS-R measured improvement of psychiatric

symptoms. Perhaps this improvement in the Santo Daime sample mediated the lowering of the observed scores on harm avoidance. This hypothesis is consistent with the findings of the first phase of our study, which reported positive affective changes such as increased serenity, joy, relaxation, and assertiveness (Barbosa, Giglio & Dalgalarrodo 2005); this corresponds, to some extent, to our observed lowering of the harm avoidance domain.

This current report is limited by a relatively small sample size. In addition, its naturalistic nature limited our control of variables such as the concentration of the relevant psychoactive alkaloids in the brew and their cumulative doses.

In summary, we extend our findings from this first naturalistic study comparing the psychological states and traits of subjects before and after their use of ayahuasca in a religious setting. Our use of ayahuasca-naïve subjects as their own controls also is more reliable than previous case-control studies. Our follow-up showed that most subjects did not use ayahuasca regularly and did not formally adhere to religious observance throughout the follow-up period. As Grob and colleagues' previous case-control studies evaluated only regular ayahuasca users, they missed an important population that uses ayahuasca irregularly and often discontinues use.

Due to recent favorable judicial decisions in the United States and Western Europe on religious use of ayahuasca, we expect its use to increase significantly. Naturalistic studies are necessary to more fully explicate the complex relationships between the larger social world and mental health responses to ayahuasca use. Also, mental health studies should be done comparing the ayahuasca religions with other religions, in order to clarify the specific role of the psychedelic beverage on psychological status of the adepts.

In conclusion, this study demonstrates no adverse, and some beneficial, effects resulting from the use of ayahuasca within a religious setting in the urban Brazilian context. Future studies should consider following up this project by recruiting larger sample sizes of ayahuasca-naïve subjects who are about to try the beverage for the first time, and to discriminate among the multiple set and setting factors that may influence outcome.

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