Published in final edited form as:
J Sci Study Relig. 2012 December ; 51(4): 721–737. doi:10.1111/j.1468-5906.2012.01685.x.

Factor Analysis of the Mystical Experience Questionnaire: A Study of Experiences Occasioned by the Hallucinogen Psilocybin

Katherine A. Maclean,
Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine

Jeannie-Marie S. Leoutsakos,
Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine

Matthew W. Johnson, and
Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine

Roland R. Griffiths
Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine

Abstract

A large body of historical evidence describes the use of hallucinogenic compounds, such as psilocybin mushrooms, for religious purposes. But few scientific studies have attempted to measure or characterize hallucinogen-occasioned spiritual experiences. The present study examined the factor structure of the Mystical Experience Questionnaire (MEQ), a self-report measure that has been used to assess the effects of hallucinogens in laboratory studies. Participants (N=1602) completed the 43-item MEQ in reference to a mystical or profound experience they had had after ingesting psilocybin. Exploratory factor analysis of the MEQ retained 30 items and revealed a 4-factor structure covering the dimensions of classic mystical experience: unity, noetic quality, sacredness (F1); positive mood (F2); transcendence of time/space (F3); and ineffability (F4). MEQ factor scores showed good internal reliability and correlated with the Hood Mysticism Scale, indicating convergent validity. Participants who endorsed having had a mystical experience on psilocybin, compared to those who did not, had significantly higher factor scores, indicating construct validity. The 4-factor structure was confirmed in a second sample (N=440) and demonstrated superior fit compared to alternative models. The results provide initial evidence of the validity, reliability, and factor structure of a 30-item scale for measuring single, hallucinogen-occasioned mystical experiences, which may be a useful tool in the scientific study of mysticism.

Keywords

mystical experience; spiritual experience; entheogen; psychedelic; hallucinogen; psilocybin

Correspondence should be addressed to Katherine A. MacLean, Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine, 5510 Nathan Shock Drive, Balitmore, Maryland, 21224 USA. katherine.a.maclean@gmail.com.

SUPPORTING INFORMATION

The following supporting information is available for this article:

Appendix. Revised Mystical Experience Questionnaire

Supporting Information may be found in the online version of this article at wileyonlinelibrary.com.

Introduction

Mystical experiences are a common component of religious traditions across human history. Historical descriptions of mystical experience from diverse sources reveal common themes, suggesting a core experience that cuts across religions and cultures (Stace 1960). Questionnaire-based research has shown that the defining features of classic mystical experiences include feelings of unity, sacredness, ineffability, peace and joy, as well as a sense of transcending time and space and an intuitive belief that the experience is a source of objective truth about reality (see reviews in Hood 2003; Hood, Hill, and Spilka 2009:331–65). In addition, national-sample surveys show that approximately 30–50% of Americans endorse having had a mystical experience or religious awakening (Hood, Hill, and Spilka 2009:343–47; Yamane and Polzer 1994). However, few empirical studies have investigated single mystical experiences, and little is known of the specific causes and conditions that might elicit or promote mystical experiences.

A large body of historical evidence describes the use of psilocybin, a classic hallucinogen found in more than 100 species of mushrooms, as a spiritual sacrament (Guzmán 2008; Metzner 2004; Stamets 1996; Wasson 1980). Regarding contemporary use, at least 9% of U.S. adults have tried psilocybin mushrooms at least once in their lifetime (SAMHSA 2010) and a subset of users report being motivated to ingest psilocybin for spiritual exploration and personal growth (e.g., Móró et al. 2011). Early research on the mystical-type effects occasioned by psilocybin suggested that psilocybin could be a useful tool for the scientific investigation of the nature of mystical experience (Pahnke 1963). More recently, rigorous double-blind laboratory studies have shown that psilocybin can reliably occasion mystical-type experiences that are associated with persisting increases in personal well-being, life satisfaction and positive behavior change (Griffiths et al. 2006; Griffiths et al. 2008; Griffiths et al. 2011). These findings demonstrate an experimental model for occasioning mystical experiences in the laboratory that permits a study their causes and consequences, an approach that is supported by some philosophers of religion, such as Huston Smith, who have suggested that the sacramental use of hallucinogens should be a legitimate object of scientific investigation (see commentary by Hood 2001).

An accurate characterization of a single mystical experience depends on having psychometrically sound measurement tools. To our knowledge, however, no study has attempted to validate a self-report measure for quantifying the mystical features of single life experiences. The Mystical Experience Questionnaire (MEQ) is an unvalidated self-report measure that has been used to measure mystical-type experiences in laboratory studies of hallucinogens. Although the MEQ has had a long history of use in hallucinogen studies, it is important to better understand its psychometric properties and factor structure before it can be considered a valid and reliable measure of single, hallucinogen-occasioned mystical experience. Thus, the aim of the present study was to test the validity, reliability, and factor structure of the MEQ in a large, heterogeneous sample. To accomplish this aim, we administered a web-based survey to a large number of anonymous individuals who endorsed having had a profound and personally meaningful experience after ingesting psilocybin mushrooms. Below we review the empirical study of mysticism and the use of questionnaires to assess the features of mystical experience, including mystical-type effects of psilocybin and other classic hallucinogens.

Features of Mystical Experience

Stace (1960) provided one of the first comprehensive characterizations of the features of mystical experience by analyzing religious texts and historical accounts, including personal narratives and biographical descriptions. Although Stace focused primarily on the

experiences of religious mystics, he also included cases of historically famous non-religious intellectuals (1960:39). He observed that mystical experiences were generally characterized by a profound feeling of unity or interconnectedness, and concluded that the core experience of unity was "the essence of all mystical experience" (Stace 1960:132). Although Stace differentiated between internally focused and externally focused experiences, he acknowledged the inherent similarities between them: "The mystics themselves take for granted that the One which is disclosed in the introvertive experience is identical with the One which is disclosed in the extrovertive experience. There are not two Ones, but only one, which, in the mystic's interpretation, is God or the Universal Self of the whole universe" (Stace 1960:133). Stace proposed an organizational framework that included characteristics specific to either introvertive or extrovertive mystical experience, as well as characteristics that were common to both types of experiences. The nine characteristics Stace (1960) identified were (1) internal unity (i.e. undifferentiated awareness, unitary consciousness); (2) external unity (i.e. a sense of unity with the surrounding environment); (3) nontemporal and nonspatial quality (i.e. feelings of infinite time and limitless space, transcending usual time and space boundaries); (4) inner subjectivity (i.e. a sense of life or living presence in all things); (5) objectivity and reality (i.e. noetic quality, a sense that the experience was a source of objective truth); (6) sacredness (i.e. worthy of reverence, divine or holy); (7) deeply felt peace and joy; (8) paradoxicality (i.e. needing to use illogical or contradictory statements to describe the experience); and (9) ineffability (i.e. difficulty of communicating or describing the experience to others).

Beginning with Hood (1975), the modern empirical study of mysticism has focused on characterizing mystical experiences that individuals have had across their lifetime. Hood's Mysticism Scale (Hood 1975; Hood, Morris, and Watson 1993; Hood and Williamson 2000), which was developed according to Stace's (1960) framework, is the most widely used quantitative measure of mystical experience. The Mysticism Scale has generally been shown to be a reliable and cross-culturally valid measure of lifetime experiences (Chen et al. 2012; Hood et al. 2001; Lazar and Kravetz 2005), although recent reports suggest some cultural variation in the specific structure of mystical experience (Anthony, Hermans, and Sterkens 2010; Chen, Hood et al. 2011; Chen, Qi et al. 2011). Relevant to the present analysis, relatively few studies have focused on the features of single mystical experiences or the specific features of hallucinogen-occasioned mystical experiences.

Characterizing Single Mystical Experiences

Mystical experiences often occur spontaneously (Miller 2004) but can also be generated or elicited. For millennia, humans have used a variety of rituals, such as meditation, prayer, fasting, and dance, as well as naturally occurring substances (e.g. plants with psychoactive properties), to increase the likelihood of having a mystical or spiritual experience (Guzmán 2008; Metzner 2004; Stamets 1996; Wasson 1980). Some research studies have attempted to elicit mystical-type phenomena in the laboratory using various induction methods, such as meditation (Beauregard, Courtemanche, and Paquette 2009; van der Lans 1987) and sensory deprivation (Hood, Morris, and Watson 1990). In addition, a modified single-experience version of the Mysticism Scale has been used to quantify mystical experiences that occur under naturalistic conditions (solitary wilderness expeditions: Hood 1977).

The Mystical Experience Questionnaire (MEQ) was developed by Pahnke (1963, 1969) as a tool for the evaluation of single mystical experiences occasioned by hallucinogens. The MEQ is based on Stace's conceptual framework (1960) and covers the major dimensions of classic mystical experience: unity (internal and external), transcendence of time and space, noetic quality, sacredness, positive mood, and ineffability/paradoxicality. The MEQ has historically been administered in the context of distracter items that assess other phenomenological content including visual imagery, emotion, memories, fantasies and

thoughts (e.g., Pahnke 1963; Richards 1975). In its most recent iteration, the MEQ was administered along with 57 distracter items in a 100-item instrument called the States of Consciousness Questionnaire (SOCQ) (Griffiths et al. 2006; Griffiths et al. 2008; Griffiths et al. 2011). Relevant to the present study, although the wording and number of distracter items have changed over the years, the mystical items have remained largely consistent since the inception of the MEQ (see Pahnke 1969).

Psilocybin-Occasioned Mystical Experiences

Several studies have demonstrated the sensitivity of the MEQ to the effects of psilocybin (Doblin 1991; Pahnke 1963, 1969) and other classic hallucinogens (Richards et al. 1977; Turek, Soskin, and Kurland 1974). More recently, the MEQ was used in conjunction with the Mysticism Scale to characterize the mystical-type effects of psilocybin using double blind, placebo-controlled methods (Griffiths et al. 2006; Griffiths et al. 2008; Griffiths et al. 2011). In an initial study, Griffiths and colleagues (2006) administered psilocybin to healthy volunteers under supportive interpersonal conditions and found that mystical-experience scores on the MEQ and the Mysticism Scale were higher for psilocybin sessions than for active placebo (methylphenidate) sessions. In a subsequent study (Griffiths et al. 2011), the effects of a range of psilocybin doses from low to high were evaluated in healthy volunteers under similar conditions. The results demonstrated dose-dependent increases on the MEQ and the Mysticism Scale. Other recent psilocybin studies (conducted in independent laboratories using different questionnaire measures) have also reported mystical-type subjective effects such as feelings of unity, spiritual experiences, insight, positive mood (bliss, peace and love), and an altered sense of time and space following psilocybin administration (see Studerus, Gamma, and Vollenweider 2010 for a review).

In addition to acute effects, Griffiths et al. (2011) have demonstrated that scores on the MEQ (and the Mysticism Scale) at the time of the psilocybin session predict ratings of personal meaning, spiritual significance, personal well-being, life satisfaction and positive behavior change at short-term (1-month; Griffiths et al. 2011) and long-term (14-month; Griffiths et al. 2008) follow-up assessments. Moreover, retrospective ratings on the MEQ at follow-up do not differ from ratings made at the end of high-dose psilocybin sessions (Griffiths et al. 2008; Griffiths et al. 2011). Finally, a recent analysis of personality change following high-dose psilocybin sessions suggests that the MEQ predicts some long-term outcomes (e.g. increases in openness traits) better than the Mysticism Scale or other measures of positively experienced hallucinogen effects (MacLean, Johnson, and Griffiths 2011). Taken together, these findings suggest that the MEQ may have broader relevance as a tool in the empirical study of mysticism, particularly for characterizing single, hallucinogen-occasioned mystical experiences.

Factor Analysis of Mystical Questionnaires

Although the MEQ appears to be a sensitive measure of single mystical experiences as well as uniquely predictive of some long-term consequences of specific mystical life events, it is important to assess its factor structure before it can be considered a valid and reliable measure of mystical experience. Previous exploratory and confirmatory factor analyses of the Mysticism Scale (lifetime version) inform our present approach. Hood (1975) initially proposed two empirical factors to quantify (1) phenomena related to the experience of unity and (2) phenomena related to interpretation of the unity experience (including noetic quality, sacredness, positive mood, and ineffability). Exploratory factor analysis (EFA) studies supported this two-factor structure (Caird 1988; Hood 1975; Reinert and Stifler 1993), although subsequent EFA studies with larger sample sizes indicated distinct factors for Introvertive Unity and Extrovertive Unity, resulting in a three-factor structure (Hood, Morris, and Watson 1993; Hood and Williamson 2000). Later CFA studies demonstrated

that the Hood 3-factor model provided an acceptable fit to mystical-experience data from Iranian Muslims (Hood et al. 2001), Israeli Jews (Lazar and Kravitz 2005), and Chinese Christians and non-Christians (Chen et al. 2012). However, these studies were exclusively confirmatory (e.g., comparing three-factor models to two- and one-factor models) and often used groupings or clusters of items (i.e., testlets) to test factor loadings. Thus, they do not permit an evaluation of individual item loadings, which would be ideal when assessing the factor structure of an unvalidated scale (the MEQ).

Although several studies have provided strong support for a three-factor structure of mystical experience, results from recent studies suggest a lack of cross-cultural reliability of the composition and number of factors. For example, CFA studies of the Mysticism Scale have indicated alternative factor structures for Christians, Muslims, and Hindus in India (Anthony, Hermans, and Sterkens 2010), Tibetan Buddhists (Chen, Hood et al. 2011), and Chinese Buddhist monks and nuns (Chen, Qi et al. 2011). In these studies, the alternate models outperformed the Hood and Stace models and required modifications of factor number (e.g., a single factor that subsumed unity, noetic quality, and ineffability; Anthony, Hermans, and Sterkens 2010) and factor composition (e.g., noetic quality loading on the Extrovertive factor and positive mood loading on the Introvertive factor; Chen, Hood et al. 2011), or the addition of a new facet to achieve optimal model fit (Chen, Qi et al. 2011). Taken together, studies of the Mysticism Scale do not provide a clear prediction of the factor structure of the MEQ.

The MEQ is conceptually similar to the Mysticism Scale in that both questionnaires are based on Stace's framework (1960). However, the questionnaires differ substantially in item wording and structure. Regarding item wording, for example, the alleged internal unity items in the MEQ do not use the word "void" and are less suggestive of complete ego loss than the comparable Mysticism Scale items. Regarding item structure, the MEQ uses both positively worded items and rating scale labels while the Mysticism Scale uses both positively and negatively worded items and rating scale labels (e.g., requiring double- or triple-negative logic for several items). Two recent analyses of the Mysticism Scale by Chen and colleagues (Chen, Hood et al. 2011; Chen et al. 2012) found that the positive vs. negative structure introduced significant variance in the data, which could affect the ultimate decision about the best-fitting factor structure. Moreover, it is reasonable that a measure of a single, circumscribed mystical event (MEQ) might have a different underlying structure than a lifetime measure of mystical experience, which samples from different life events and diverse memories (Mysticism Scale). Furthermore, because the MEQ was developed to assess the mystical effects of hallucinogens, it may have a different factor structure than a scale designed to measure traditional religious experiences. Thus, considering the substantial differences between the Mysticism Scale and the MEQ in item wording, item structure, modality/reference, and participant population, as well as the recent evidence for cross-cultural variation in the factor structure of the Mysticism Scale, we concluded that an exploratory factor analysis was the most appropriate initial approach for elucidating the factor structure of the MEQ.

The goal of the present study was to assess the factor structure of the MEQ by administering a web-based survey to a large number of anonymous individuals who endorsed having had a profound and personally meaningful experience after ingesting psilocybin mushrooms. In an initial sample (Study 1), we conducted an exploratory factor analysis of the 43 items in the MEQ, which participants answered in reference to a single psilocybin experience. In a second convenience sample (Study 2), we conducted a confirmatory factor analysis to verify the factor structure found in the first sample.

Study 1

Method

Participants—Participants were recruited primarily via web-link advertisement and email invitation. A link to the survey (e.g., “Have you had a profound experience with psilocybin mushrooms? Take an online survey of psilocybin and spiritual experience”) was posted on websites that attract individuals interested in spiritual experience (e.g., the Council on Spiritual Practice, an interfaith group focused on spiritual experiences: http://www.csp.org) and hallucinogens (e.g., Erowid, an online library of psychoactive substances: http://www.erowid.com). Information about the survey was also shared by word of mouth and online networking, as well as with individuals who manage large email distribution lists related to states of consciousness (e.g., Reality Sandwich, http://www.realitysandwich.com) and hallucinogens (e.g., the Multidisciplinary Association for Psychedelic Studies, http://www.maps.org). Participants were informed that study participation was anonymous and that their specific responses would not be used if they did not complete the survey. The Institutional Review Board of the Johns Hopkins University School of Medicine approved all study procedures.

Participants were required to confirm that they (a) had not taken the survey before; (b) could speak and write English fluently; (c) were 18 years or older; (d) had taken an active dose of psilocybin mushrooms that produced moderate to strong psychoactive effects; and (e) had had a profound, personally meaningful experience during a psilocybin session. During two rounds of recruitment (May–June, 2010 and July, 2010), 1720 individuals completed the survey and 1602 (93%) met all inclusion criteria and complied with the survey instructions. Participants who did not meet the inclusion criteria were directed to an alternate, shorter version of the survey and their data were not used in the analyses. The Institutional Review Board of the Johns Hopkins University School of Medicine approved all study procedures.

Survey—The survey was designed to take approximately 30 – 45 minutes to complete (including an optional open-ended response portion), and participants were required to complete the survey in one sitting. The survey was administered using SurveyMonkey (http://www.surveymonkey.com), an online survey and data-collection software tool with detailed security and privacy policies in place that make it suitable for IRB-governed experimental research. The overall survey design is described below, with a focus on the measures of primary relevance to the analysis of the factor structure, reliability, and validity of the MEQ. Verbatim survey instructions and items are available from the authors upon request.

Demographics: In the first section of the survey, participants answered questions covering basic demographic information, life satisfaction (Pavot and Diener 1993), religiousness and spirituality (Marler and Hadaway 2002; Zinnbauer et al. 1997), and lifetime hallucinogen use.

Choosing a single psilocybin experience: In the second section of the survey, participants were instructed in a step-wise process of choosing a single “psilocybin session”, which was defined as “the time period of drug action”. Specifically, participants answered two probe questions that referred to “experiences you may have had after ingesting an active dose of psilocybin mushrooms that produced moderate or strong psychoactive effects”. The purpose of the probe questions was to permit an analysis of construct validity by comparing MEQ scores in participants who claimed to have had a mystical experience on psilocybin vs. participants who did not claim to have had a mystical experience on psilocybin.

The *meaningful-experience probe* verified one of the major inclusion criteria: "During a psilocybin session, would you say that you have ever had a profound, personally meaningful experience?" Participants who responded 'no' to this question were directed to an alternate, shorter version of the survey and their data were not used in the analyses. The *mystical-experience probe* was a modified version of the Bourque question, which has been used in national surveys and large-scale questionnaire studies to assess the frequency of mystical experiences in the population (Back and Bourque 1970; Hood, Hill, and Spilka 2009:344–45). The mystical-experience probe read as follows: "During a psilocybin session, would you say that you have ever had a 'spiritual or mystical experience' -- that is, a moment of sudden spiritual awakening or insight?"

After answering the mystical-experience probe, participants were instructed to complete the remaining survey items in reference to a single psilocybin session. Participants who responded 'yes' to the mystical-experience probe then chose a psilocybin session during which they had had a "mystical or spiritual experience." Participants who responded 'no' to the mystical-experience probe chose their "single most profound and personally meaningful psilocybin experience." All participants were reminded to choose a psilocybin session that occurred when they were between 18 and 70 years old, and that did not occur in the context of an official university or hospital research study.

Mystical Experience Questionnaire (MEQ): Participants completed the MEQ in reference to their chosen psilocybin session. The 43 mystical-experience items in the MEQ were intermixed with 57 distracter items, consistent with previous studies (e.g., the 100-item SOCQ, Griffiths et al. 2006; Griffiths et al. 2008; Griffiths et al. 2011; cf. Richards 1975; Turek, Soskin, and Kurland 1974). Each item was rated on a 6-point scale (0=none, not at all; 1=so slight cannot decide; 2=slight; 3=moderate; 4=strong [equivalent in degree to any previous strong experience]; and 5=extreme [more than ever before in my life and stronger than 4]).

Mysticism Scale: For purposes of comparing the MEQ to an established measure of mystical experience, participants also completed the 32-item Mysticism Scale (Hood et al. 2001) in reference to their chosen psilocybin session. Consistent with a previous study that used the Mysticism Scale in reference to a single event (Hood 1977), we modified the verb tense of each item. For instance, the original item, 'I have had an experience which I knew to be sacred' was changed to 'I had an experience which I knew to be sacred'. The Mysticism Scale includes 4 items for each of eight dimensions of mystical experience. Each item was rated on a 9-point scale (−4=this description is extremely not true of my own experience; 0=I cannot decide; +4=this description is extremely true of my own experience). Scores on the Mysticism Scale were calculated as the sum across items for each of three empirical factors (Introvertive, Extrovertive, and Interpretation) and total sum across all items (maximum possible score across items = 288).

Details of the chosen psilocybin session: Participants completed several additional questions about their chosen psilocybin session, including three questions from the Persisting Effects Questionnaire (see Griffiths et al. 2008; Griffiths et al. 2011) that assessed possible long-lasting effects of the psilocybin session. Participants were also offered an optional opportunity to provide a written description of their psilocybin experience (82% provided a written response).

Analysis

The present analyses focused on the factor structure, reliability and validity of the MEQ. Detailed statistical results regarding participant characteristics, previous hallucinogen use,

details of the chosen psilocybin session, the long-term effects of the psilocybin experience, and open-ended narratives are beyond the scope of the present report.

We conducted an exploratory factor analysis of the MEQ to determine whether the items could be psychometrically described by distinct factors. To determine the appropriate number of factors to extract, the polychoric correlation matrix of all 43 items was first subjected to a parallel analysis for principal components using 1000 random draws. Polychoric correlations (Jöreskog 1994), rather than Pearson correlations, were used because the scores on the items were sparsely and non-normally distributed. Parallel analysis is one of the most accurate methods of determining the appropriate number of factors to extract (Hayton, Allen, and Scarpello 2004). The process involves generating a number of simulated data sets (typically 1000) with the same dimensions, means, and standard deviations as the observed data, but without correlations among the variables. The simulated data sets are then subjected to principal components analysis, and the means of each eigenvalue are calculated. These mean eigenvalues represent what might be expected if there were, in fact, no underlying factors. Therefore, one chooses the number of factors that, in the observed data, have eigenvalues greater than their respective mean eigenvalues from the simulated data sets.

We then performed a factor analysis using the number of factors determined from the parallel analysis and inspection of the scree plot of component eigenvalues. If the parallel analysis was ambiguous (e.g., the observed eigenvalue was only very slightly higher than the simulated eigenvalue), and the scree plot favored a smaller number of factors, we chose the smaller number of factors. We then rotated the factor loadings using a promax rotation, which allowed for correlations among the factors. We inspected these rotated factor loadings for each item and removed items that a) did not load strongly on any factor (highest loading < .40); b) showed poor discrimination between factors (had loading ≥.40 on more than one factor); or had high unique variance (uniqueness > .60) (see Clark and Watson 1995).

We then ran a second parallel analysis using only the items that were retained in the first analysis. Because this was an initial exploratory study, we decided *a priori* to proceed conservatively and conduct only one round of item elimination. We fit a final model using the now-optimal number of factors and the smaller set of items; the factor loadings were rotated using promax rotation. Using the factor loadings from the final model, standardized scores for each factor ($M \approx 0$, $SD \approx 1$) were calculated for each participant to enable comparisons of groups of participants. *T* tests and analysis of variance (ANOVA) were used for these comparisons.

Participant Characteristics—Participants ($N = 1602$; 50% female) represented a wide range of ages and countries of origin, and were generally well educated and satisfied with life (see Table 1 for demographic information). The majority of participants (70%) identified as “spiritual but not religious” when asked to choose the best single statement to define their religiousness and spirituality; the remaining participants identified as “spiritual and religious” (13.5%), “neither spiritual nor religious” (16%), or “religious but not spiritual” (less than 1%).

Exploratory Factor Analysis—The parallel analysis of the 43 mystical items in the MEQ supported a model with either 4 or 5 factors (observed and simulated eigenvalues for the 5th component were 1.40 and 1.23, respectively); inspection of the scree plot supported a model with 3 or 4 factors. Consequently, we selected a 4-factor model. Based on the promax rotated 4-factor solution, we removed 13 items as follows: low primary factor loading (highest loading < .40: items 8, 10, 27); poor discrimination (more than 1 factor loading ≥. 40: items 42, 60); and high unique variance (uniqueness > .60: items 3, 19, 26, 31, 50, 51,

59, 62) (see Griffiths et al. 2006, Electronic Supplemental Materials Table 1 for item wording). The removed items were generally redundant with items that were retained, although neither of the two paradoxicality items was retained in the final model. This is consistent with an early study of the Mysticism Scale in which paradoxicality items were excluded early in scale development (Hood 1975).

We then ran a second parallel analysis on the 30 items that had been retained, which supported a model with 4 factors (observed and simulated eigenvalues for the 5th component were .95 and 1.16, respectively). Inspection of the scree plot also supported a model with 4 factors. Promax rotated factor loadings for 30 items from this final model are shown in Table 2 and between-factor correlations are shown in Table 3. On average, the 4-factor structure explained 57% of the variance in each item (range of communality values = 39% to 78%; communality is the inverse of uniqueness). Items with primary loadings on Factor 1 were related to internal unity, external unity, noetic quality, and sacredness. Each of the remaining factors had a smaller number of primary item loadings: Factor 2 included items relating to positive mood; Factor 3 included items relating to transcendence of time and space; and Factor 4 included items relating to ineffability.

Reliability and Validity of the MEQ Compared to the Mysticism Scale—Scores on the Mysticism Scale covered the full range for each item (range = 1 – 9). Total scores (M = 224.6, range = 57 – 288) and factor scores (Introvertive: M = 80.6, range = 15 – 108; Extrovertive: M = 55.7, range = 8 – 72; Interpretation: M = 88.3, range = 28 = 108) fully overlapped scores in previous laboratory studies of psilocybin (e.g. range of total scores = 124 –288 on high-dose sessions) (Griffiths et al. 2006; Griffiths et al. 2008; Griffiths et al. 2011). These results indicate that the mystical experiences measured in the present sample are quantitatively comparable to mystical experiences in previous studies.

Estimates of alpha reliability (Cronbach's alpha) indicated excellent internal consistency for the 30-item MEQ (alpha = .933) and good internal consistency for the four provisional subscales (Factor 1 = .926; Factor 2 = .831; Factor 3 = .810; Factor 4 = .800). These estimates were comparable to the alpha reliability values for the 32-item Mysticism Scale (alpha = .930) and its subscales (Introvertive = .843; Extrovertive = .887; Interpretation = .865). Regarding convergent validity, the Mysticism Scale (total) correlated strongly with total MEQ (r = .81, p < .001) and with Factor 1 (r = .79, p < .001), and correlated modestly with Factor 2 (r = .55, p < .001), Factor 3 (r = .47, p < .001), and Factor 4 (r = .41, p < .001).

To examine construct validity, we conducted between-group t tests to compare mystical-experience scores of participants who did and did not endorse having had a mystical experience after ingesting psilocybin (i.e., in response to the mystical-experience probe question). The majority of participants (N = 1410; 88%) endorsed having had a mystical experience after ingesting psilocybin, as indicated by a positive response to the mystical-experience probe. Participants who endorsed having had a mystical experience had significantly higher factor scores on the MEQ (p < .001), as well as significantly higher scores on the Mysticism Scale (p < .001), compared to participants who did not endorse having had a mystical experience (see Table 4). This finding supports the validity of the MEQ factor scores as reliable indicators of self-claimed mystical experience.

Study 2

To verify the factor structure found in Study 1, we conducted a confirmatory analysis using an available dataset from a survey that was administered in a similar manner (see Bunch 2009). Although there were some differences in survey administration procedures, relevant participant characteristics (e.g., psilocybin use, spiritual orientation) were similar across the

two samples. We used confirmatory factor analysis to test the fit of the Study 1 model compared to two alternative models that have been supported in several previous studies of the Mysticism Scale (e.g., Hood et al. 2001).

Method

Participants—Participants were recruited via web-link advertisement, on-line chat forums, flyers, email invitation, and word-of-mouth to participate in an anonymous survey study "exploring psychedelic mushrooms and spirituality". Data collection lasted approximately 4 weeks (February – March, 2009). Participants (N = 440 with complete MEQ data) were predominantly male (88%) and were slightly younger (M = 28 years; range = 18 – 84) and less educated (14% had obtained a graduate degree, 23% had obtained a college degree, 15% had completed some college, and 47% had not received formal education beyond high school) than Study 1 participants. As in Study 1 (see Table 1), the majority of Study 2 participants were Caucasian (87%), did not identify with any religion (73%), had used psilocybin less than 10 times during their lifetime (*median* = 7 times), and endorsed having had a "spiritual experience" after ingesting psilocybin (88%).

Survey Design—The survey was administered using SurveyMonkey and consisted of demographic items, the 43-item MEQ, and items from the Persisting Effects Questionnaire (Griffiths et al. 2008; Griffiths et al. 2011). Two differences in survey administration between Study 1 and Study 2 are noteworthy: (1) Study 1 administered the 43 MEQ items intermixed with 57 distracter items whereas Study 2 administered only the 43 MEQ items, and (2) Study 1 directed participants to complete the items in reference to a single psilocybin session whereas Study 2 directed participants to complete the items in reference to "any time [you] were under the influence of psilocybin mushrooms".

Results

Three CFA models were fit to the dataset: (1) the "Hood" 3-factor model (Introvertive factor [items 35, 41, 54, 77, 83, 2, 12, 15, 29, 34, 48, 65, 6, 23, 86]; Extrovertive factor [items 14, 47, 74]; and Interpretation factor [items 9, 22, 69, 36, 55, 73, 5, 18, 30, 43, 80, 87]); (2) the "Stace" 3-factor model (identical to the Hood model except ineffability items [6, 23,86] were moved to the Interpretation factor); and (3) the "Psilocybin" 4-factor model. Models were fit in MPLUS v. 6.1, using categorical responses and a robust, weighted least squares estimator (Muthén, du Toit, and Spisic 1997). Fit indices included the RMSEA (residual mean square error of approximation), CFI (conditional fit index), and TLI (Tucker-Lewis index). We considered RMSEA values < .10 (Browne and Cudeck 1992) and CFI/TLI values > .90 (Hu and Bentler 1999) to be suggestive of adequate fit. Given the large sample size, the chi-square goodness of fit test was not appropriate (Bentler and Bonett 1980).

Both the Hood (RMSEA = .110; CFI = .88; TLI = .88) and Stace models (RMSEA = .109; CFI = .89; TLI = .88) failed to meet the cut-off values indicating acceptable model fit. In contrast, the 4-factor Psilocybin model demonstrated better fit than the Hood and Stace models and exceeded the cut-offs for acceptable fit (RMSEA = .074; CFI = .95; TLI = .94). Factor loadings for the Psilocybin model were high (> .65; Table 5) and the factors were intercorrelated (Table 3). On average, the 4-factor structure explained 64% of the variance in each item (range of residual variance values = 16% to 54%). As in Study 1, alpha reliability estimates indicated excellent internal consistency for the 30-item scale (alpha = .957) and good internal consistency for all four subscales (Factor 1 = .946; Factor 2 = .831; Factor 3 = .887; Factor 4 = .864).

DISCUSSION

In two web-based survey studies, we examined the factor structure of a self-report measure, the Mystical Experience Questionnaire (MEQ), designed to measure single mystical experiences that resulted from ingesting the hallucinogen psilocybin. In Study 1, exploratory factor analysis of the 43-item MEQ revealed a 4-factor structure. The 30 items retained in the final model represent a revised scale for measuring mystical experience, which shows approximately 90% overlap (in item wording) with the original scale proposed by Pahnke (1963, 1969). Both the revised MEQ (total scale) and the four provisional subscales demonstrated substantial convergent validity with the widely used Mysticism Scale. In support of the construct validity of the revised MEQ, participants who endorsed having had a mystical experience after ingesting psilocybin (in response to a single mystical-experience probe question) had higher factor scores than participants who did not endorse having had a mystical experience. In a second convenience sample (Study 2), the 4-factor structure was confirmed using confirmatory factor analysis, demonstrating that the revised MEQ is robust to differences in sample demographics (e.g., gender, education level) and inclusion/exclusion of distracter items. Results from both studies indicate excellent reliability (internal consistency) for the revised scale and good reliability for the factor-analyzed subscales. Thus, the revised MEQ appears to be a psychometrically sound instrument for assessing hallucinogen-occasioned mystical-type experiences. Although additional confirmatory factor analysis studies are necessary to verify the reliability (e.g., internal consistency, test-retest), validity (e.g., convergent, divergent), and factor structure of the MEQ in other participant samples and contexts, the factor scores may prove useful for quantifying other types of mystical experiences in future studies.

It is important to consider whether the factor structure of the MEQ is consistent with previous literature on mystical experience. The primary loadings on the first factor of the MEQ represent what appear to be the most unique and salient features of mystical experience: unity, noetic quality, and sacredness; thus, we have labeled Factor 1 “mystical”. The second factor comprises items related to “positive mood,” including items that were previously considered by Pahnke (1963), but not by Stace (1960), to reflect sacred feelings (e.g., awe, amazement). The remaining factors comprise items related to “transcendence of time and space” (Factor 3), and “ineffability” (Factor 4). Thus, three of the four factors appear to each represent a specific feature of mystical experience as outlined by Stace (1960:131). However, the combination of internal unity, external unity, noetic quality, and sacredness on a single factor is novel. It is possible that this factor structure is unique to the particular characteristics of the MEQ, to the specific participant sample (individuals who have had a hallucinogen-occasioned mystical experience), and/or to the analysis of single (not lifetime) mystical experiences. Although we cannot draw a strong conclusion based on the present data, these possible interpretations can be explored in future research. Nonetheless, below we consider whether the MEQ factor structure is consistent with other factor analyses of lifetime mystical experience using the Mysticism Scale.

The primary loadings on Factor 1 indicate that features of both internal and external unity are present during individual, time-limited psilocybin sessions and are represented by the same underlying factor. This pattern is in contrast to factor analysis studies of the lifetime Mysticism Scale that indicated a distinction between introvertive and extrovertive mysticism (see Hood 2003 for a review), as well as historical accounts that illustrated differences between internally and externally focused unity experiences (Stace 1960). Importantly, although Stace distinguished between internal and external unity, he also emphasized that an individual could experience both types of unity, and “Mystics in general do not distinguish between the introvertive One and the extrovertive One … it is an essential and explicit part of the message of many mystics that the external and internal unity are identical” (Stace

1960:67, 73, 132–133). Furthermore, other researchers have noted that a single individual can experience both forms of unity during a lifetime (Chen, Qi et al. 2011) and even during single, time-limited hallucinogen sessions (Griffiths et al. 2006; Griffiths et al. 2008; Griffiths et al. 2011; Pahnke 1963:37).

The present results are in line with a recent factor analysis study showing that internal and external unity items load on a single factor (Chen, Qi et al. 2011; cf. Anthony, Hermans, and Sterkens 2010). Chen and colleagues (2011) assessed lifetime mystical experiences in Buddhist monks and nuns using a combination of qualitative interview techniques and factor analysis of reported phenomena. During the interviews, the monks and nuns described a particular type of "unifying experience of self with everything", which the authors interpreted as a combination of internal unity and external unity. In order to quantify this experience for the purpose of factor analysis, the authors introduced a new facet of "internal unity" (Chen, Qi et al. 2011:661) that was distinct from Hood's facet of "contentless unity (i.e., ego loss)" (Hood 2003). In the subsequent factor analysis, a single factor represented the new facet of "internal unity" combined with Hood's facets of "external unity" and "inner subjectivity." These three facets are semantically consistent with 9 of the 15 items in the first factor of the MEQ, suggesting that some of the features of psilocybin-occasioned unity experiences overlap with those described by Buddhist meditators. Along these lines, Chen and colleagues (2011) proposed that the particular structure of mystical experience in their Buddhist contemplative sample might also describe experiences of some non-Buddhists, such as spiritually inclined individuals who are not religiously affiliated.

The primary loadings on Factor 1 additionally indicate that noetic quality and sacredness are represented by the same factor as unity. This result contrasts with early factor analyses of the Mysticism Scale that supported a theoretical distinction between the phenomenological experience of unity and a person's interpretation of that experience (see Hood 2003 for a review). However, our results are at least partially consistent with more recent studies of lay Tibetan Buddhists (Chen, Hood et al. 2011) and Hindu, Muslim and Christian individuals in India (Anthony, Herman, and Sterkens 2010), which found noetic quality to load on the same factor as unity. Notably, early scholars such as William James (2002 [1902]) suggested that noetic quality could reflect a feeling or perception during a mystical experience rather than a post-hoc interpretation. Similarly, Stace suggested that sacred or divine feelings might be central to the unity experience (1960:341). Participants in the present study endorsed sacred/holy feelings, a sense of reverence, and a sense of being at a "spiritual height" as relevant features of the unity experience occasioned by psilocybin. These sacred items are semantically consistent with some current definitions of sacredness as feelings of deep meaning (van der Lans 1996), respect, and reverence (Pargament 1999).

Finally, it is important to acknowledge how participants' spiritual and religious beliefs may have influenced the factor analysis results. Whereas the majority of participants in previous studies of mystical experience were religiously committed (e.g., American Christians, Israeli Jews, Iranian Muslims, and Tibetan/Chinese Buddhists), participants in the present study overwhelmingly identified as "spiritual but not religious" (Study 1: 70%) or religiously unaffiliated (Study 2: 73%). Although it is not possible to disentangle the effects of psilocybin, spirituality, and religious affiliation in the present self-selected sample, the factor analysis results may still be germane to understanding the mystical experiences of "spiritual but not religious" individuals in the general population. National surveys indicate that 15–20% of Americans identify as "spiritual but not religious" (see Marler and Hadaway 2002 for a review) and empirical findings suggest that these individuals are more likely than the general population to have had mystical experiences (Roof 1993; Zinnbauer et al. 1997). Thus, this demographic group may be a logical focus for future empirical studies of the causes, features, and consequences of mystical experience. We suggest that the scientific

study of mysticism would be advanced by examining the structure of mystical experiences in groups of individuals who differ in self-identified spirituality, as a complement to the majority of published studies that have focused on religiously affiliated individuals.

In conclusion, the factor analysis results provide initial evidence of the validity and reliability of a 30-item scale for measuring mystical experiences, the revised MEQ. Because the present study was conducted in a large, heterogeneous sample of hallucinogen users, the results are likely generalizable to a range of naturalistic situations in which people choose to use hallucinogens. Although it is reasonable to assume that the results may be biased toward positive spiritual experiences (because participants self-selected into the study), the findings suggest that the MEQ is a psychometrically sound measure for laboratory studies of classic hallucinogens. However, the appropriateness of the scale for use in other populations or contexts is not directly supported by the present results. It will be necessary to explore the validity, reliability, and factor structure of the MEQ in additional confirmatory studies of different populations and modalities. Fortunately, web-based surveys are becoming popular tools in psychological research, including in research on hallucinogens (Baggott et al. 2011; Baggott et al. 2010), and several studies have demonstrated that questionnaires administered in this manner produce reliable, accurate, and psychometrically valid data (Birnbaum 2004; Cronk and West 2002; Ganassali 2008; Gosling et al. 2004; Reips 2002). Both survey- and laboratory-based studies will continue to be important for characterizing the phenomenological effects of classic hallucinogens and for the empirical study of mystical experience.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This research was supported by grants from the Council on Spiritual Practices, the Heffter Research Institute, and from NIH grants RO1DA03889 and 5T32 DA007209-30. The authors acknowledge Kevin Bunch for supplying the data for the replication analysis; and Robert Jesse, Margaret Klinedinst, Mary Cosimano, Eric Richter, and Eric Jackson for feedback on initial survey design and help with advertising and recruitment.

References

Anthony, Francis-Vincent; Hermans, Chris AM.; Sterkens, Carl. A comparative study of mystical experience among Christian, Muslim, and Hindu students in Tamil, Nadu, India. Journal for the Scientific Study of Religion. 2010; 49(2):264–77.

Back, Kurt W.; Bourque, Linda Brookover. Can feelings be enumerated? Behavioral Science. 1970; 15(6):487–96. [PubMed: 5478911]

Baggott, Matthew J.; Coyle, JR.; Erowid, Earth; Erowid, Fire; Robertson, Lynn C. Abnormal visual experiences in individuals with histories of hallucinogen use: A web-based questionnaire. Drug Alcohol Dependence. 2011; 114(1):61–7.

Baggott, Matthew J.; Erowid, Earth; Erowid, Fire; Galloway, Gantt P.; Mendelson, John. Use patterns and self-reported effects of Salvia divinorum: An internet-based survey. Drug Alcohol Dependence. 2010; 111(3):250–6.

Beauregard, Mario; Courtemanche, Jérôme; Paquette, Vincent. Brain activity in near-death experiencers during a meditative state. Resuscitation. 2009; 80(9):1006–10. [PubMed: 19573975]

Bentler, Peter M.; Bonett, Douglas G. Significance tests and goodness of fit in the analysis of covariance structures. Psychological Bulletin. 1980; 88(3):588–606.

Birnbaum, Michael H. Human research and data collection via the Internet. Annual Review of Psychology. 2004; 55(1):803–32.

Browne, Michael W.; Cudeck, Robert. Alternative ways of assessing model fit. Sociological Methods and Research. 1992; 21(2):230–258.

Bunch, Kevin Sean. PhD diss. Alliant International University; 2009. Psilocybin and spiritual experience.

Caird, Dale. The structure of Hood's mysticism scale: A factor-analytic study. Journal for the Scientific Study of Religion. 1988; 27(1):122–27.

Caird, Dale; Hood, Ralph W.; Yang, Lijun; Watson, PJ. Mystical experience among Tibetan Buddhists: The common core thesis revisited. Journal for the Scientific Study of Religion. 2011; 50(2):328–38.

Chen, Zhuo; Qi, Wen; Hood, Ralph W.; Watson, PJ. Common core thesis and qualitative and quantitative analysis of mysticism in Chinese Buddhist monks and nuns. Journal for the Scientific Study of Religion. 2011; 50(4):654–70.

Chen, Zhuo; Zhang, Yang; Hood, Ralph W.; Watson, PJ. Mysticism in Chinese Christians and non-Christians: Measurement invariance of the mysticism scale and implications for mean differences. International Journal for the Psychology of Religion. 2012; 22(2):155–68.

Clark, Lee Anna; Watson, David. Constructing validity: Basic issues in objective scale development. Psychological Assessment. 1995; 7(3):309–19.

Cronk, Brian C.; West, Jamie L. Personality research on the Internet: a comparison of Web-based and traditional instruments in take-home and in-class settings. Behavior Research Methods, Instruments, and Computers. 2002; 34(2):177–80.

Doblin, Rick. Pahnke's "good Friday experiment": A long-term follow-up and methodological critique. Journal of Transpersonal Psychology. 1991; 23(1):1–28.

Ganassali, Stéphane. The influence of the design of Web survey questionnaires on the quality of responses. Survey Research Methods. 2008; 2(1):21–32.

Gosling, Samuel D.; Vazire, Simine; Srivastava, Sanjay; John, Oliver P. Should we trust Web-based studies? A comparative analysis of six preconceptions about Internet questionnaires. American Psychologist. 2004; 59(2):93–104. [PubMed: 14992636]

Griffiths, Roland R.; Johnson, Matthew W.; Richards, William A.; Richards, Brian R.; McCann, Una D.; Jesse, Robert. Psilocybin occasioned mystical-type experiences: immediate and persisting dose-related effects. Psychopharmacology. 2011; 218(4):649–65. [PubMed: 21674151]

Griffiths, Roland R.; Richards, William A.; Johnson, Matthew W.; McCann, Una D.; Jesse, Robert. Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later. Journal of Psychopharmacology. 2008; 22(6):621–32. [PubMed: 18593735]

Griffiths, Roland R.; Richards, William A.; McCann, Una; Jesse, Robert. Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. Psychopharmacology. 2006; 187(3):268–83. [PubMed: 16826400]

Guzmán, Gastón. Hallucinogenic mushrooms in Mexico: An overview. Economic Botany. 2008; 62(3):404–12.

Hayton, James C.; Allen, David G.; Scarpello, Vida. Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. Organizational Research Methods. 2004; 7(2):191–205.

Hood, Ralph W. The construction and preliminary validation of a measure of reported mystical experience. Journal for the Scientific Study of Religion. 1975; 14(1):29–41.

Hood, Ralph W. Eliciting mystical states of consciousness with semistructured nature experiences. Journal for the Scientific Study of Religion. 1977; 16(2):155–63.

Hood, Ralph W. Review of *Cleansing the doors of perception: The religious significance of entheogenic plants and chemicals* by Huston Smith. International Journal for the Psychology of Religion. 2001; 11(4):285–286.

Hood, Ralph W. Conceptual and empirical consequences of the unity thesis. In: Belzen, Jacob A.; Geels, Antoon, editors. Mysticism: A variety of psychological perspectives. New York: Rodopi; 2003. p. 17-54.

Hood, Ralph W.; Ghorbani, Nima; Watson, PJ.; Ghramaleki, Ahad Framarz; Bing, Mark N.; Kristi Davison, H.; Morris, Ronald J.; Paul Williamson, W. Dimensions of the mysticism scale:

Confirming the three-factor structure in the United States and Iran. Journal for the Scientific Study of Religion. 2001; 40(4):691–705.

Hood, Ralph W.; Hill, Peter C.; Spilka, Bernard. The psychology of religion: An empirical approach. 4. New York: Guilford Press; 2009.

Hood, Ralph W.; Morris, Ronald J.; Watson, PJ. Quasi-experimental elicitation of differential report of religious experience among intrinsic and indiscriminately pro-religious types. Journal for the Scientific Study of Religion. 1990; 29(2):164–72.

Hood, Ralph W.; Morris, Ronald J.; Watson, PJ. Further factor analysis of Hood's mysticism scale. Psychological Reports. 1993; 73(2):1176–78.

Hood, Ralph W.; Paul Williamson, W. An empirical test of the unity thesis: the structure of mystical descriptors in various faith samples. Journal of Psychology and Christianity. 2000; 19(3):232–44.

Hu, Litze; Bentler, Peter M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling. 1999; 6(1):1–55.

James, William. The varieties of religious experience: A study in human nature. New York: Random House; 2002[1902].

Jöreskog, Karl G. On the estimation of polychoric correlations and their asymptotic covariance matrix. Psychometrika. 1994; 59(3):381–9.

Lazar, Aryeh; Kravetz, Shlomo. Responses to the mystical scale by religious Jewish persons: A comparison of structural models of mystical experience. International Journal for the Psychology of Religion. 2005; 15(1):51–61.

MacLean, Katherine A.; Johnson, Matthew W.; Griffiths, Roland R. Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. Journal of Psychopharmacology. 2011; 25(11):1453–61. [PubMed: 21956378]

Marler, Penny Long; Kirk Hadaway, C. "Being religious" or "being spiritual" in America: A zero-sum proposition. Journal for the Scientific Study of Religion. 2002; 41(2):289–300.

Metzner, Ralph. Teonanacatl: Sacred mushroom of visions. El Verano, CA: Four Trees Press; 2004. with Diane Conn Darling

Miller, William R. The phenomenon of quantum change. Journal of Clinical Psychology. 2004; 60(5): 453–60. [PubMed: 15048692]

Móró, Levente; Simon, Katalin; Bárd, Imre; Racz, József. Voice of the psychonauts: Coping, life purpose, and spirituality in psychedelic drug users. Journal of Psychoactive Drugs. 2011; 43(3): 188–98. [PubMed: 22111402]

Muthén, Bengt O.; du Toit, Stephen HC.; Spisic, Damir. Robust inference using weighted least squares and quadratic estimating equations in latent variable modeling with categorical and continuous outcomes. Unpublished technical report. 1997. available at http://pages.gseis.ucla.edu/faculty/muthen/articles/Article_075.pdf

Pahnke, Walter Norman. Drugs and mysticism: An analysis of the relationship between psychedelic drugs and the mystical consciousness. Cambridge, MA: Harvard University Press; 1963.

Pahnke, Walter Norman. Psychedelic drugs and mystical experience. International Psychiatry Clinics. 1969; 5(4):149–62. [PubMed: 4892137]

Pargament, Kenneth I. The psychology of religion and spirituality? Yes and no. International Journal for the Psychology of Religion. 1999; 9(1):3–16.

Pavot, William; Diener, Ed. Review of the satisfaction with life scale. Psychological Assessment. 1993; 5(2):164–72.

Reinert, Duane F.; Stifler, Kenneth R. Hood's mysticism scale revisited: A factor-analytic replication. Journal for the Scientific Study of Religion. 1993; 32(4):383–8.

Reips, Ulf-Dietrich. Standards for Internet-based experimenting. Experimental Psychology. 2002; 49(4):243–56. [PubMed: 12455331]

Richards, William Alan. PhD diss. UCLA; 1975. Counseling, peak experiences and the human encounter with death: An empirical study of the efficacy of DPT-assisted counseling in enhancing quality of life of persons with termincal cancer and their closest family members.

Richards, William Alan; Rhead, John C.; DiLeo, Francesco B.; Yensen, Richard; Kurland, Albert A. The peak experience variable in DPT-assisted psychotherapy with cancer patients. Journal of Psychoactive Drugs. 1977; 9(1):1–10.

Roof, Wade Clark. A generation of seekers: The spiritual journeys of the baby boom generation. San Francisco, CA: Harper; 1993.

SAMHSA (Substance Abuse and Mental Health Services Administration). The National Survey on Drug Use and Health Report 2009–2010: Table 1.88B, Specific Hallucinogen, Inhalant, Needle, and Heroin Use in Lifetime, by Age Group: Percentages, 2009 and 2010. Rockville, MD: Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality; 2010. Available athttp://www.samhsa.gov/data/nsduh/2k10NSDUH/tabs/Sect1peTabs47to92.htm

Stace, Walter Terence. Mysticism and philosophy. New York: The MacMillan Press; 1960.

Stamets, Paul. Psilocybin mushrooms of the world: An identification guide. Berkeley, CA: Ten Speed Press; 1996.

Studerus, Erich; Gamma, Alex; Vollenweider, Franz X. Psychometric evaluation of the altered states of consciousness rating scale (OAV). PLoS One. 2010; 5(8):1–19.

Turek IS, Soskin Robert A, Kurland Albert A. Methylenedioxyamphetamine (MDA) subjective effects. Journal of Psychoactive Drugs. 1974; 6(1):7–14.

van der Lans, Jan. The value of Sundén's role-theory demonstrated and tested with respect to religious experiences in meditation. Journal for the Scientific Study of Religion. 1987; 26(3):401–12.

van der Lans, Jan. Religion as a meaning system: A conceptual model for research and counseling. In: Grzymała-Moszczynska, H.; Beit-Hallahmi, Benjamin, editors. Religion, Psychopathology and Coping. Amsterdam: Rodopi; 1996. p. 95-105.

Wasson, Robert Gordon. The wondrous mushroom: Mycolatry in Mesoamerica. New York: McGraw-Hill; 1980.

Yamane, David; Polzer, Megan. Ways of seeing ecstasy in modern society: experimental-expressive and cultural-linguistic views. Sociology of Religion. 1994; 55(1):1–25.

Zinnbauer, Brian J.; Pargament, Kenneth I.; Cole, Brenda; Rye, Mark S.; Butter, Eric M.; Belvich, Timothy G.; Hipp, Kathleen M.; Scott, Allie B.; Kadar, Jill L. Religion and spirituality: Unfuzzying the fuzzy. Journal for the Scientific Study of Religion. 1997; 36(4):549–64.

Table 1

Demographic Variables

Numerical Variable	
Age at time of survey (years)	M = 32 (18 – 83)
Age at time of psilocybin session (years)	M = 25 (18 – 70)
Time elapsed since psilocybin session (years)	M = 8 (0 – 44)
Satisfaction with life	M = 25.2 (5 – 35)
Spirituality	M = 2.04 (0 – 3)
Religiosity	M = .44 (0 – 3)
Lifetime Hallucinogen Use	Med = “11 – 20” (1 – 300 or more)
Lifetime Psilocybin Use	Med = “6 – 10” (1 – 300 or more)
Categorical Variable	
Education	21% graduate degree, 35% college degree, 35% some college, 8% high school diploma, 1% some high school
Race	85% White, 7% more than one race, 1.5% American Indian, 1.5% Asian, 0.5% Black, 0.3% Native Hawaiian/Pacific Islander
Hispanic or Latino	91% No, 6% Yes
Marital status	34% single, 23% married, 23% single, 14% cohabiting, 4% divorced, 1% widowed
Household income (USD)	12% < 10K, 22% 10–30K, 22% 30–60K, 13% 60–90K, 15% 90–200K, 3% > 200K
Current country of residence	79% US, 6% Canada, 3% UK, 3% Australia, 2% Netherlands, 1% Germany

Note: The table presents descriptive statistics for demographic variables in Study 1 (N = 1602). Numerical variables are reported as mean or median values with range in parentheses. Life satisfaction was quantified as total score on the Satisfaction with Life Scale (Pavot and Diener 1993). Spirituality (“To what extent do you consider yourself a spiritual person?”) and religiosity (“To what extent do you consider yourself a religious person?”) were each rated on a four-point scale (0 = not at all spiritual/religious, 1 = slightly spiritual/religious, 2 = moderately spiritual/religious, 3 = very spiritual/religious). Lifetime hallucinogen use represents the participant’s estimate of the number of different occasions on which s/he had ingested psilocybin mushrooms, LSD, morning glory seeds, mescaline, peyote cactus, San Pedro cactus, DMT, or ayahuasca. Participants also submitted a separate estimate of the number of occasions of psilocybin mushroom use only. For each estimate, participants chose one among eight possible answers (1 time; 2 – 5 times; 6 – 10 times; 11 – 20 times; 21– 50 times; 51 – 100 times; 101 – 300 times; more than 300 times). Categorical variables are reported as percent of respondents who endorsed each category. Percentages may not sum to 100 because some questions included a “prefer not to answer” option. Approximately 40 additional countries of residence (not listed) were represented by ten or fewer participants each.

Table 2

Factor Loadings Obtained from a Principal Components Analysis of the Mystical Experience Questionnaire (30 items) in Study 1

Variable	F1	F2	F3	F4
Item 35	**.68**	.12	.05	.00
Item 41	**.68**	.14	.06	.01
Item 54	**.65**	.08	.10	−.05
Item 77	**.74**	−.04	.16	−.09
Item 83	**.86**	−.01	.01	.00
Item 12	**.59**	−.08	.34	−.03
Item 14	**.45**	.27	.05	−.02
Item 47	**.74**	.11	.00	−.03
Item 74	**.52**	.26	−.02	.04
Item 9	**.60**	.01	−.07	.17
Item 22	**.79**	−.15	−.01	.14
Item 69	**.82**	−.12	−.09	.10
Item 36	**.67**	.15	−.08	.03
Item 55	**.45**	.28	−.02	−.04
Item 73	**.68**	.14	−.07	.00
Item 5	−.03	**.48**	.02	.33
Item 18	.12	**.57**	.02	−.07
Item 30	.15	**.71**	−.05	−.09
Item 43	.03	**.76**	.10	−.03
Item 80	.15	**.56**	.04	.15
Item 87	−.06	**.92**	−.02	.02
Item 2	−.15	.07	**.64**	.15
Item 15	−.10	.03	**.74**	.01
Item 29	−.11	−.10	**.64**	.06
Item 34	.40	−.07	**.57**	.00
Item 48	.46	−.03	**.52**	−.10
Item 65	.13	.11	**.73**	.01
Item 6	−.02	.03	.05	**.85**
Item 23	.09	.00	−.01	**.83**
Item 86	.06	−.08	.05	**.66**

Note: N = 1602. F1: Mystical; F2: Positive mood; F3: Time/Space; and F4: Ineffability. Factor loadings are based on a promax rotated solution. Item numbers correspond to item number within the full 100-item questionnaire. Item order corresponds to item order in Table 6. Boldface type indicates the primary (i.e., highest) factor loading for each item.

Table 3

Factor Intercorrelations Obtained from a Principal Components Analysis of the Mystical Experience Questionnaire

	Factor		
	F1: Mystical	**F2: Positive Mood**	**F3: Time/Space**
F2: Positive Mood	.63[a], .80[b]		
F3: Time/Space	.42[a], .80[b]	.22[a], .65[b]	
F4: Ineffability	.42[a], .66[b]	.38[a], .65[b]	.44[a], .64[b]

Note: Factor intercorrelations are based on a promax rotated solution.

[a]Study 1 (N = 1602), Exploratory Factor Analysis

[b]Study 1 (N = 440), Confirmatory Factor Analysis

Table 4

Data and Factor Scores for Participants Who Did and Did Not Endorse Having Had a Mystical Experience after Ingesting Psilocybin Mushrooms

	Yes (*n* = 1410)	No (*n* = 192)
Hood Mysticism Scale		
Introvertive	81.9 (16.2)*	71.1 (15.8)
Extrovertive	57.4 (12.1)*	43.4 (14.3)
Interpretation	90.8 (14.1)*	70.3 (16.9)
Total	230.0 (36.3)*	184.7 (39.5)
MEQ – Factor Scores		
F1: Mystical	.15 (.81)*	−1.11 (.89)
F2: Positive Mood	.07 (.86)*	−.55 (1.05)
F3: Time/Space	.03 (.90)*	−.25 (.85)
F4: Ineffability	.04 (.88)*	−.27 (.94)

Note: N = 1602. The table presents mean values (with *SD* in parentheses). Data for the Hood Mysticism Scale are expressed as the sum across items. Factor scores for the MEQ (30 items in the final 4-factor model) are expressed as standardized units ($M \approx 0$, $SD \approx 1$). All measures were significantly different between the two groups (*$p < .001$; *t*-test statistics are available from the authors upon request).

Table 5

Factor Loadings Obtained from a Confirmatory Factor Analysis of the Mystical Experience Questionnaire (30 items) in Study 2

Factor	Variable	Estimate	Standard Error
Factor 1: Mystical	Item 35	.81	.02
	Item 41	.83	.02
	Item 54	.77	.02
	Item 77	.84	.02
	Item 83	.87	.01
	Item 12	.81	.02
	Item 14	.76	.02
	Item 47	.82	.03
	Item 74	.68	.03
	Item 9	.76	.02
	Item 22	.82	.02
	Item 69	.79	.02
	Item 36	.84	.02
	Item 55	.68	.03
	Item 73	.78	.02
Factor 2: Positive Mood	Item 5	.81	.03
	Item 18	.71	.03
	Item 30	.76	.03
	Item 43	.77	.03
	Item 80	.84	.02
	Item 87	.77	.03
Factor 3: Time/Space	Item 2	.77	.03
	Item 15	.75	.02
	Item 29	.70	.03
	Item 34	.90	.02
	Item 48	.88	.02
	Item 65	.88	.02
Factor 4: Ineffability	Item 6	.92	.02
	Item 23	.87	.02
	Item 86	.82	.03

Note: N = 440. Item numbers correspond to item number within the full 100-item questionnaire. Item order corresponds to item order in Table 6.