

Translation and cultural adaptation of the States of Consciousness Questionnaire (SOCQ) and statistical validation of the Mystical Experience Questionnaire (MEQ30) in Brazilian Portuguese

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Received: 9/5/2016 – Accepted: 1/26/2017

DOI: 10.1590/0101-60830000000105

Abstract:

Background: The States of Consciousness Questionnaire (SOCQ) was developed to assess the occurrence features of the change in consciousness induced by psilocybin, and includes the Mystical Experience Questionnaire (MEQ), developed to assess the occurrence of mystical experiences in altered states of consciousness. **Objective:** To translate the SOCQ to Brazilian Portuguese and validate the 30-item MEQ. **Methods:** The SOCQ was translated to Brazilian Portuguese and backtranslated into English. The two English versions were compared and differences corrected, resulting in a Brazilian translation. Using an internet-survey, 1504 Portuguese-speaking subjects answered the translated version of the SOCQ. The 4-factor version of MEQ30 was analyzed using confirmatory factor analysis and reliability analysis. **Results:** A Brazilian Portuguese version of the SOCQ was made available. Goodness-of-fit indexes indicated that data met the factorial structure proposed for the English MEQ30. Factors presented excellent to acceptable reliability according to Cronbach's alpha: mystical (0.95); positive mood (0.71); transcendence of time/space (0.83); and ineffability (0.81). **Discussion:** The Brazilian Portuguese version of the MEQ30 is validated and it fits in the factorial structure performed on the original English version. The SOCQ is also available to the Brazilian Portuguese speaking population, allowing studies in different languages to be conducted and compared systematically.

Schenberg EE et al. / Arch Clin Psychiatry. 2017;44(1):1-5

Keywords: Mystical, psychedelic, consciousness, altered, psychometric.

Introduction

Spirituality is increasingly gaining importance in psychiatry, mainly because of a number of recent studies showing the relevance of spiritual beliefs, practices and experiences to mental health and to the management, treatment and coping with psychiatric diseases¹⁻³. These include positive and beneficial effects of spirituality in preventing and/or recovering from conditions such as drug dependence⁴⁻⁶ or depression^{7,8}.

However, there is still room for debate on the precise meaning of the terms “spirituality” or “spiritual”, on how to measure them and in the interpretation of the results of such research^{4,9-11}. But far from being new, this debate has occupied researchers for decades, since at least the lectures of William James in the beginning of the last century¹². Especially important in James' proposal was the approach to consider that, although different practices and traditions vary widely, the core of most spiritual systems involves an actual experience, generally called spiritual or mystical experience. According to James, such an experience should be a topic for studies in psychology and philosophy. This line of inquiry was further developed by other important pioneers such as Walter Stace¹³, who expanded and deepened James' original studies into a coherent structure defining what the mystical experience is and what are its common features identifiable in many different cultures and historical periods.

While James and Stace developed on the psychological description and study of well-known historic cases of mystical experiences and their philosophical consequences, Walter Pahnke, working in Harvard during the 60's, developed a practical instrument to assess, quantify and determine as precisely as possible the occurrence or not of a mystical experience. This work resulted in the Mystical Experience Questionnaire (MEQ)^{14,15}, designed based on Stace's conceptual framework about mystical experiences in order

to evaluate single episodes elicited by psychedelic substances. The original MEQ covered the six major dimensions of the mystical experience: unity, transcendence of time and space, noetic quality, sacredness, positive mood and ineffability/paradoxicality¹⁵. In Pahnke's experiment the substance at hand was psilocybin, a naturally occurring compound found in *Psilocybe* mushrooms, long used for shamans with spiritual and religious purposes. Since then, the MEQ has been used in an expanded version containing distractor items unrelated to the mystical experience as defined by Stace's framework. This larger version, including 57 distractor items (in a total of 100 items), is called the States of Consciousness Questionnaire (SOCQ)¹⁵ and has been used in a series of recent studies with psilocybin¹⁶⁻²¹. More recently, the MEQ has been validated with exploratory¹⁵ and confirmatory¹⁶ statistical analysis, resulting in a new version which reduced the original 43-item MEQ which contained 6 major dimensions to a 30 items MEQ30 containing four factors.

Although Brazil has played an important role in the study of spirituality in psychiatry¹⁻³, there is a current lack of translated and validated instruments to assess the mystical experience among the Brazilian Portuguese speaking population. Specially regarding those occasioned by psychedelic substances such as psilocybin and ayahuasca, an amazonian tea used by many indigenous ethnicities, such as the Huni Kuin (Kaxinawá) in the State of Acre²² and by syncretic churches such as Santo Daime, União do Vegetal (UDV) and Barquinha²³. In a country where ayahuasca use is rapidly and steadily gaining adepts^{24,25}, this lack of questionnaires to develop structured research on the theme of substance-related spirituality is detrimental, especially for psychology, psychiatry and mental health in general.

Therefore, it was the aim of the present work to translate the SOCQ to Brazilian Portuguese and to validate the Brazilian version of the MEQ30, allowing it to be used and employed in future research on these topics with Portuguese speaking people.

Methods

An English version of the 100 items SOCQ was obtained with another researcher in the field by email. It was then compared with the MEQ version available online¹⁷ to verify if the SOCQ received actually included all the MEQ questions. The 100 items version of the SOCQ was then translated to Brazilian Portuguese following the general guidelines in Guillemin²⁶ (Translation 1, T1). This translation was done by a Brazilian psychologist (DR), with Portuguese as first-language and fluent in English, having previously lived and worked for two years in the USA. This translator was well aware of the SOCQ's history and purposes, and is involved with research on the theme of consciousness, meditation and spirituality. The T1 version was then back translated to English (Back translation, BT) by a Brazilian fluent in English, having lived 2 years in USA and with more than 30 years experience in multinational corporations. Each item on the BT version was then compared to the corresponding item in the original English version by two Brazilian researchers (DR and EES) fluent in English and involved with research on consciousness and psychedelic substances. All inconsistencies between the two English versions were noted and thoroughly discussed. This process then led to an update of the Brazilian version (T2) following available guidelines²⁶.

The final version of the SOCQ was included in a web-based survey platform (SurveyGizmo). Internet social media was used to broadcast the survey and to ask people who have used psychedelic to answer it anonymously. Participants were asked to answer the survey keeping in mind their last experience with a psychedelic drug, including classic psychedelics such as LSD and psilocybin, ayahuasca, MDMA ("ecstasy") and also other related substances such as ketamine and *Salvia divinorum*. Cannabis was not considered as a psychedelic for this study and answers reporting this substance were excluded. Anticholinergics were also not included. Participants had to confirm that they were fluent in Brazilian Portuguese to complete the survey. After about 30 days of data collection from 31st January and 28th February of 2015, 1504 valid answers were completed.

As recently established, the MEQ30 comprises four dimensions, or factors: mystical (15 items), positive mood (6 items), transcendence of time and space (6 items) and ineffability (3 items). This factor structure was submitted to confirmatory factor analysis, assessing goodness of fit using five criteria: goodness of fit index (GFI), adjusted GFI (AGFI), Bentler Comparative Fit, Bentler-Bonett normed fit index (NFI) and root mean square error of approximation (RMSEA) estimate. Factors were also submitted to reliability analysis using Cronbach's alpha. Analyses were performed using the Statistical Analysis System (SAS) System for Windows (SAS Institute Inc, Cary, NC, USA) and R version 3.0.2 (The R Foundation for Statistical Computing).

The survey for validation was approved by the Ethics Committee of Ethics from the University of Campinas and online respondents gave informed consent before starting to fill the form.

Results

Regarding the translation, there was a perfect correspondence between the SOCQ received by email with the 43 items of the original version of the MEQ available online¹⁷. Between the original and BT versions of the SOCQ, there were some modifications in the title and instructions. The title appeared in BT as "*Questionnaire of Altered States of Consciousness*", with the introduction of the term "altered" revealing a mistake in the first translation to Portuguese (T1). This was then corrected by removing "altered" ("alterados") from the title in the updated Portuguese version (T2). All three versions, T1, T2 and BT are fully available in the accompanying Harvard dataverse (URL:<http://dx.doi.org/10.7910/DVN/E8EEC4>). There were also small changes between the original and BT instructions on how to use the questionnaire, without alterations of meaning, which can all be consulted in the "instruction changes"

file in the dataverse. There were differences in 84 items between the original English and the BT. The unchanged items are 15, 16, 21, 37, 43, 45, 49, 52, 60, 64, 65, 68, 70, 87, 88 and 97. Differences between BT and the original version for all other items than those listed above can be viewed in Table 1 of the dataverse. Common differences included the terms *sense* and *feeling*, *awareness* and *consciousness* and also *convincing* and *credible*. From the 84 items which changed from the original to BT, corrections were done for 62 items in the Brazilian version T2. These were items 2, 4, 7-10, 12, 14, 17-20, 22-25, 27, 29, 31, 32, 34, 35, 37, 38, 42-44, 46, 48, 51, 54-57, 59, 61-63, 65, 66, 68, 69, 72-74, 76, 77, 80-82, 84-87, 91, 93-97, 99, 100. All these changes are detailed in Table 2 of the dataverse. In item 24 a mistake was found in the original version received, which states "Feelings of being important than [...]" while the correct should be "Feelings of being *more* important than [...]". In the Brazilian version it was therefore translated as if the original was "Feelings of being more important than".

Concerning the survey for validation of the MEQ, demographic characteristics, reported drug and drug setting are detailed in Table 1. Education and income were higher than the average Brazilian population. Mean age of participants was 28.9 (standard deviation: 9,1). Male respondents corresponded to 55.6% of the sample. A considerable number of different psychedelics were reported, but the most frequent answers were ayahuasca (n = 636; 42.3%), LSD (n = 535; 35.6%), psychedelic mushrooms or psilocybin (n = 152, 10.1%), and MDMA or ecstasy (n = 91; 6.1%).

Table 2 shows the five criteria of goodness of fit that were used, two with satisfactory results and the others were close to the cutoff point. The standard errors of non-standardized coefficients showed values different from zero, indicating adequacy of fit. Also, the distribution of normalized residuals is symmetrical. Considering all these characteristics of the model, it was considered acceptable for our dataset. The theoretical structure for the MEQ that was tested, with factors, items and loads are detailed in Table 3. In the reliability analysis, one factor presented excellent ($\alpha \geq 0.9$), two good ($0.9 > \alpha \geq 0.8$) and one acceptable ($0.8 > \alpha \geq 0.7$) reliability. Cronbach's alpha for the four factors were as following: mystical (0.95); positive mood (0.71); transcendence of time/space (0.83); and ineffability (0.81).

Discussion

Translation

The comparison between the original English version with the back translation revealed few errors in the first translation (T1), which could easily be corrected generating a reliable Brazilian Portuguese version of the full 100 item SOCQ. Of special importance, however, is the translation of the English terms *consciousness* and *awareness*, both of which translate to the same Brazilian Portuguese word: *consciência*. Although there is a different usage in English for these two words, the exact difference is hard to specify, and there are different options about them in the English language. The Oxford Dictionary for example defines *consciousness* as "*the state of being aware of and responsive to one's surrounding*" or as "*a person's awareness or perception of something*". *Awareness*, on the other hand, is defined as "*knowledge or perception of a situation or fact*" or as "*concern about and well-informed interest in a particular situation or development*". These definitions make it clear the similarity between these two terms in English, with both definitions of consciousness including the word *aware* (or *awareness*). However, there seems to be a crucial difference, with *consciousness* including, but not being equal to, *awareness*. In this regard, for instances where *awareness* was translated as *consciência* and therefore back translated as *consciousness*, there might be differences in meaning which are very important to the subject under study while using the SOCQ. Therefore, following the above definitions for *awareness*, which include the concept of *perception* or *well-informed interest*, we changed the translation of items 74 and 95 from *consciência* to *percepção*, for which the

literal back translation would be *perception*. The term “percepção” seems a more adequate translation for *awareness* in some cases, being considered a synonym for it, which *consciousness* is not. On the other hand, in items 3, 19, 29, 41 and 99 we opted to maintain the word “consciência” as the translation of “awareness” because it seems to better preserve the meaning of the original items. It is difficult to establish at this point, however, if this option is really the best match for the meaning of *awareness* and if we would be measuring similar concepts when using the present Brazilian version of the Questionnaire. This can only be assessed in a future study actually applying the questionnaire to people who had mystical like experiences, in order to statistically validate it according to previous research already done for the English version¹⁵. Most of the remaining differences between the original questionnaire and the BT version are of minor significance, not

affecting the understanding of the sentences nor the meaning of it. It is our hope that the updated version presented in this article have solved all of these.

Validation

Regarding the survey for validation of the MEQ30, some limitations must be kept in mind. This study has a population that is better educated and has a higher income comparing to the average Brazilian population. On the other hand, this sample seems to be representative of ritual and recreational users of psychedelics in Brazil. This also makes this sample more similar to samples in higher income countries. Though this is useful for comparison, one must proceed with caution in Brazilian samples with lower income and educational level. Also, considering that

Table 1. Demographic information and information about psychedelic experience evaluated with the States of Consciousness Questionnaire/30-item Mystical Experience Questionnaire (n = 1504), Jan-Feb 2015

Demographic information				Information about the reported psychedelic experience			
		n	%			n	%
Sex	Male	836	55,6%	Substance used	Ayahuasca	636	42,3%
	Female	668	44,4%		Mushrooms/psilocybin	152	10,1%
Age				LSD	535	35,6%	
	18-21	343	22,8%	MDMA/ecstasy	91	6,1%	
	22-28	513	34,1%	DMT/changa	22	1,5%	
	29-40	489	32,5%	Peyote/wachuma/mescaline	18	1,2%	
	≥ 41	159	10,6%	<i>Argyreia nervosa</i> /LSA	17	1,1%	
Educational level				<i>Salvia divinorum</i>	11	0,7%	
	Elementary or less	49	3,3%	Jurema	10	0,7%	
	High school	709	47,1%	25-NBOMe	6	0,4%	
	University	559	37,2%	Other	6	0,4%	
Monthly income (US\$)	Masters/Doctorate	187	12,4%	Time since experience			
	< 525	137	9,1%		< 24 hours	117	7,8%
	525-950	292	19,4%		24 - 48 hours	77	5,1%
	951-1660	368	24,5%		48 hours - 1 week	162	10,8%
	1661-3510	417	27,7%		1 week - 1 month	405	26,9%
	3511-6180	197	13,1%		1 - 6 months	341	22,7%
	> 6180	93	6,2%		6 months - 1 year	105	7,0%
Occupational status				> 1 year	297	19,7%	
	Student	471	31,3%	Ritual use			
	Employee	301	20,0%		No	843	56,1%
	Freelancer	296	19,7%		Yes	661	43,9%
	Civil servant	179	11,9%				
	Businessman	121	8,0%		Guided use		
Unemployed	87	5,8%	No			760	50,5%
Other	49	3,3%	Yes	744	49,5%		
Has a religion	No	1.089	72,4%				
	Yes	415	27,6%				

Table 2. Goodness-of-fit indexes from the confirmatory factor analysis of the Brazilian Portuguese version of the 30-item Mystical Experience Questionnaire in 1504 subjects, Jan-Feb 2015

Index	Estimate	Reference
Goodness-of-fit index (GFI)	0.8387	≥ 0.85
Adjusted GFI	0.8101	≥ 0.80
Bentler comparative fit index	0.8751	≥ 0.90
Bentler-Bonett normed fit index	0.8620	≥ 0.90
Root mean square error of approximation estimate	0.0733	≤ 0.08

Table 3. Factors and items and respective factor loads of the confirmatory factor analysis of the Brazilian Portuguese version of the 30-item Mystical Experience Questionnaire in 1504 subjects, Jan-Feb 2015

Factor/Item	Load
Factor 1: Mystical	
<i>Internal Unity</i>	
35. Freedom from the limitations of your personal self and feeling a unity or bond with what was felt to be greater than your personal self.	0.85
41. Experience of pure being and pure awareness (beyond the world of sense impressions).	0.83
54. Experience of oneness in relation to an "inner world" within.	0.86
77. Experience of the fusion of your personal self into a larger whole.	0.81
83. Experience of unity with ultimate reality.	0.87
12. Feeling that you experienced eternity or infinity.	0.81
<i>External Unity</i>	
14. Experience of oneness or unity with objects and/or persons perceived in your surroundings.	0.79
47. Experience of the insight that "all is One".	0.86
74. Awareness of the life or living presence in all things.	0.85
<i>Noetic Quality</i>	
9. Gain of insightful knowledge experienced at an intuitive level.	0.72
22. Certainty of encounter with ultimate reality	0.85
69. You are convinced now, as you look back on your experience, that in it you encountered ultimate reality	0.81
<i>Sacredness</i>	
36. Sense of being at a spiritual height.	0.85
55. Sense of reverence.	0.80
73. Feeling that you experienced something profoundly sacred and holy.	0.87
Factor 2: Positive Mood	
5. Experience of amazement.	0.88
18. Feelings of tenderness and gentleness	0.66
30. Feelings of peace and tranquility.	0.73
43. Experience of ecstasy	0.85
80. Sense of awe or awesomeness.	0.88
87. Feelings of joy.	0.90
Factor 3: Transcendence of Time and Space	
2. Loss of your usual sense of time.	0.71
15. Loss of your usual sense of space.	0.73
29. Loss of usual awareness of where you were.	0.46
34. Sense of being "outside of" time, beyond past and future.	0.74
48. Being in a realm with no space boundaries.	0.80
65. Experience of timelessness.	0.83
Factor 4: Ineffability	
6. Sense that the experience cannot be described adequately in words.	0.87
23. Feeling that you could not do justice to your experience by describing it in words.	0.95
86. Feeling that it would be difficult to communicate your own experience to others who have not had similar experiences.	0.79

almost 20% of the subjects reported use of psychedelics more than one year ago, recall bias can be present and influence this data. As in Brazil some psychedelics reported in this survey, like LSD and MDMA, are illicit, it is impossible to assess if 'LSD' or 'MDMA' users really used these substances or others that might be present in the materials obtained in the illegal market.

On the other hand, the sample is very diverse in terms of profile of substances used and their respective settings, and included ritual and recreational users, either in guided or non-guided experiences, and in a vast array of drugs, though the most common were ayahuasca, LSD, psilocybin and MDMA. This variability is desirable in a validation study, and the high number of respondents represent the largest Brazilian sample of psychedelic users assessed and reported so far.

Taking all this in consideration and examining the results from the confirmatory factor analysis and the reliability analysis, we can affirm that the Brazilian version of the MEQ30 both fits the original model and is a reliable questionnaire.

Given the recent increase in interest in ayahuasca studies in Brazil and the increased interest in psychedelic studies internationally,

we hope this publication helps to better investigate the occurrence or not of well-defined and measured spiritual experiences in practices with ayahuasca or studies involving psychedelics like psilocybin¹⁷⁻²¹ or with other psychedelics such as the phenethylamine 3,4-Methylenedioxyamphetamine (MDA)²⁷. Furthermore, although the SOCQ/MEQ has been used mostly in studies with this kind of psychoactive substances, the MEQ30 may be of interest to researchers interested in the theme of spirituality and states of consciousness in other settings not necessarily involving the use of psychoactive substances.

Research funding

This costs of this work were partially covered by Instituto Plantando Consciencia, a Brazilian non-profit organization.

Disclosure

The authors declare that there are no conflicts of interest.

Acknowledgements

The authors received no specific funding for this research. The costs for the online survey were covered by *Instituto Plantando Consciência*.

References

- Koenig HG. Religion, spirituality and psychiatry: a new era in mental health care. *Rev Psiquiatr Clín*. 2007;34(Supl 1):5-7.
- Koenig HG. Religion, spirituality and psychotic disorders. *Rev Psiq Clín*. 2007;34(Supl. 1):40-8.
- Moreira-Almeida A. Spirituality and health: past and future of a controversial and challenging relationship. *Rev Psiq Clín*. 2007;34(Supl. 1):3-4.
- Cook CCH. Addiction and spirituality. *Addiction*. 2004;99(5):539-51.
- Miller WR. Addiction and spirituality. *Subst Use Misuse*. 2013;48(12):1258-9.
- Solari-Twadell PA, Kub J. Spirituality in Addictions Research: Addressing prevention, treatment, and recovery. *J Addict Nurs*. 2013;24(4):207-8
- Bonelli RM, Koenig HG. Mental disorders, religion and spirituality 1990 to 2010: a systematic evidence-based review. *J Relig Health*. 2013;52(2):657-73.
- Peselow E, Pi S, Lopez E, Besada A, IsHak WW. The impact of spirituality before and after treatment of major depressive disorder. *Innov Clin Neurosci*. 2014;11(3-4):17-23.
- Lindeman M, Blomqvist S, Takada M. Distinguishing spirituality from other constructs: not a matter of well-being but of belief in supernatural spirits. *J Nerv Ment Dis*. 2012;200(2):167-73.
- Garssen B, Visser A. Distinguishing spirituality from other constructs: commentary on Lindeman et al. *J Nerv Ment Dis*. 2014;202(2):177.
- Lindeman M. Spirituality studies are in need of differentia: a reply to Garssen and Visser. *J Nerv Ment Dis*. 2014;202(2):178.
- James W. *The Varieties of Religious Experience*. Harvard University Press; 1985. p. 1.
- Stace WT. *Mysticism and philosophy*. Mcmillan; 1961.
- Pahnke WN. *Drugs and Mysticism – An analysis of the relationship between Psychedelic Drugs and the Mystical Consciousness*. Thesis Presented to The Committee on Higher Degrees in History and Philosophy of Religion – Harvard University. 1963. p. 1-342.
- Maclean KA, Leoutsakos JMS, Johnson MW, Griffiths RR. Factor Analysis of the Mystical Experience Questionnaire: A Study of Experiences Occasioned by the Hallucinogen Psilocybin. *J Sci Study Relig*. 2012;51(4):721-37.
- Barret FS, Johnson MW, Griffiths, RR. Validation of the revised Mystical Experience Questionnaire in experimental sessions with psilocybin. *J Psychopharmacol* 2015;29(11):1182-90.
- Griffiths RR, Richards WA, Mccann U, Jesse R. Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology*. 2006;187(3):268-83.
- Nichols DE. Commentary on: Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance by Griffiths et al. *Psychopharmacology*. 2006;187(3):284-6.
- Griffiths RR, Richards W, Johnson M, Mccann U, Jesse R. 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.
- Griffiths RR, Johnson MW, Richards WA, Richards BD, Mccann U, Jesse R. Psilocybin occasioned mystical-type experiences: immediate and persisting dose-related effects. *Psychopharmacology*. 2011;218(4):649-65.
- Maclean KA, Johnson MW, Griffiths RR. Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *Journal of psychopharmacology (Oxford, England)*. 2011;25(11):1453-61.
- Labate BC, Feeney K. Ayahuasca and the process of regulation in Brazil and internationally: Implications and challenges. *International Int J Drug Policy*. 2012;23(2):154-61.
- Labate BC. Ayahuasca Religions in Acre: Cultural Heritage in the Brazilian Borderlands. *Anthropology of Consciousness*. 2012;23(1):87-102.
- Labate BC. A reinvenção do uso da ayahuasca nos centros urbanos. *Mana*. 2004;11(2):535-604.
- Labate BC, Cavnar C. The expansion of the field of research on ayahuasca: some reflections about the ayahuasca track at the 2010 MAPS “Psychedelic Science in the 21st Century” conference. *Int J Drug Policy*. 2011;22(2):174-8.
- Guillemin F. Cross-Cultural Adaptation and Validation of Health-Status Measures. *Scand J Rheumatol*. 1995;24(2):61-3.
- Baggott MJ, Siegrist JD, Galloway GP, Robertson LC, Coyle JR, Mendelson JE. Investigating the mechanisms of hallucinogen-induced visions using 3,4-methylenedioxyamphetamine (MDA): a randomized controlled trial in humans. *PLoS One*. 2010;5(12):e14074.