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A Psychometric Evaluation of the Dutch Revised Mystical Experience Questionnaire

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ABSTRACT

In the Netherlands, scientific interest in psychedelics and their subjective effects has been increasing. The present study examined the reliability, construct and predictive validity of the Dutch 30-item Revised Mystical Experience Questionnaire (MEQ30), a self-report measure that has been used to assess subjective and mystical experiences occasioned by psychedelics. In an online survey, 322 Dutch-speaking adults retrospectively reported on profound experiences with psychedelics. Confirmatory factor analyses demonstrated that both a four-factor structure and the same model extended with the MEQ30-total score as a second-order latent variable fit the data. Factor scores showed good internal reliability ($\alpha =$ between .81 and .94) and were significantly higher in participants that beforehand endorsed having had a mystical experience compared to those that did not, providing evidence for the construct validity of the questionnaire as a measure for self-reported mystical experiences. Additionally, MEQ30 scores significantly predicted the meaningfulness and spiritual significance of the psychedelic experience, as well as self-reported positive changes in well-being, life satisfaction and behavior, providing preliminary evidence for the predictive validity of the Dutch MEQ30. Findings suggest the reliability and validity of the Dutch MEQ30 and support the use of the scale in future studies on the subjective effects of psychedelics.

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Mystical experience; psychedelics; validity; reliability; Dutch; confirmatory factor analysis

Introduction

After a twenty-five-year hiatus, psychedelics have reemerged into the field of clinical research. Especially in the last decade, there has been a strong increase in research, primarily focused on psychedelics as aids to psychotherapy, for instance in the treatment of post-traumatic stress disorder (Smith et al. 2022), and depression (Pearson, Siegel, and Gold 2021). These trials have demonstrated promising safety and efficacy findings (Gukasyan et al. 2022; Mitchell et al. 2021).

While there are several hypotheses about the mechanism of change of therapy with psychedelics, one highlights the occurrence of mystical experiences as an important factor (Johnson et al. 2019). Psychedelics can occasion mystical experiences that are similar to those experienced among meditators or mystics (Griffiths et al. 2006, 2011; Pahnke 1963). In clinical trials, their occurrence has been associated with symptom improvement, such as a reduction of substance abuse behaviors, depressive symptoms and end-of-life psychological distress (Bogenschutz et al. 2015; Garcia-Romeu, Griffiths, and Johnson 2015; Griffiths et al. 2016; Roseman, Nutt, and Carhart-Harris 2018; Ross

et al. 2016). Also, their occurrence has been associated with increases in the personality trait openness (MacLean, Johnson, and Griffiths 2011), sustained, positive changes in attitudes, mood and behavior (Griffiths et al. 2011), relationship with nature and with oneself, and creativity (Kangaslampi, Hausen, and Rauteenmaa 2020). However, no causal relationship has thus far been demonstrated and recent criticism of the use of a mysticism framework emphasizes caution with the interpretation of these findings (see Sanders and Zijlmans 2021).

The Mystical Experience Questionnaire (MEQ30) was developed to quantify and study mystical experiences. Consisting of 30 items, this self-report questionnaire aims at assessing the occurrences and properties of single, discrete mystical experiences occasioned by psychedelics (MacLean et al. 2012; Pahnke 1963). Its original version, which consisted of 43 items, was developed based on a theoretical framework that described different aspects of a mystical experience: 1) unity: a sense of pure awareness and unity with the surroundings; 2) sacredness: the experience is felt to be profoundly sacred or holy; 3) deeply felt positive mood: the experience is

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intensely pleasant and marked by feelings of peace, love, awe and ecstasy; 4) noetic quality: a sense of encountering the ultimate truth; 5) transcendence of time and space: existence beyond the concepts of time and space; 6) ineffability: difficulty explaining the experience in words (for a review, see Stace 1960). The questionnaire was condensed to the 30-item version by exploratory factor analysis (EFA; MacLean et al. 2012).

As research with psychedelics is expanding also in Dutch-speaking populations, there is a need to validate the Dutch translation of the MEQ30 in order to measure some of the subjective effects of psychedelic experiences. For this reason, the current study investigated the factor structure, the internal consistency reliability, and the construct and predictive validity of the Dutch MEQ30. We asked participants that reported profound experiences after the use of psychedelics and psychedelic-like agents, such as classic psychedelics, entactogens, dissociative substances and cannabis to fill in an online survey, which included the 30 items of the Dutch MEQ30.

Methods

Participants

The study was approved by the ethical committee of the Vrije Universiteit Amsterdam in April 2020 (Vaste Commissie Wetenschap en Ethiek). Recruitment took place via word of mouth and via newsletters, online fora and social media groups that attract individuals interested in psychedelics and spirituality. Participants were recruited with the question “Have you had a profound, personally meaningful experience with psychedelics?.” The term mystical experience was avoided intentionally to minimize response bias. The only times this term was used was during debriefing and in the mystical-experience probe, explained below.

To take part in the study, participants were required to confirm that they: (1) were between 16 and 65 years old, (2) could speak Dutch fluently, (3) had not taken the survey before, and (4) have had a profound, personally meaningful experience with a psychedelic or psychedelic-like substance in the preceding 14 months. The inclusion of time and upper age constraints aimed to minimize recall bias, as previous research has shown that retrospective reports of psychedelic experiences remain stable for at least 14 months among participants aged 24 to 65 (Griffiths et al. 2008). The term “psychedelic” was broadly defined, allowing not only classic psychedelics but also psychedelic-like agents, such as ketamine or cannabis, at the base of participants’ psychedelic experiences. This choice was based on previous studies that

reported mystical-type subjective effects after the use of psychedelic-like agents, such as cannabis (Earleywine et al. 2021; Ferrara 2021) or ketamine (Breeksema et al. 2023; Rothberg et al. 2021). To clarify this broad inclusion to participants, examples of psychedelic and psychedelic-like substances were given in the information letter preceding the survey, sorted by category (i.e., classic psychedelics, entactogens, dissociatives, cannabis).

Five hundred participants followed the survey link in the recruitment period from April to August 2020. All participants gave informed consent for participation. In 177 cases the survey ended prematurely, either because age requirements were not met ($n = 4$), because participants had not had a profound, personally meaningful experience with a psychedelic substance in the past 14 months ($N = 32$), or because of premature, voluntary termination of the survey without giving a reason ($N = 141$). Data were excluded for one participant who, at the end of the survey, indicated that he had never used any psychedelic substances and opposes this type of research. Eventually, 322 participants met the inclusion criteria and completed the survey. This sample size meets the minimum sample size recommendations for confirmatory factor analysis (CFA) and exceeds sample size requirements for the remaining statistical analyses conducted in this study (Kline 2011).

Table 1 presents the demographic characteristics of the sample. 52% of participants were male and their age ranged from 16 to 65 years ($M = 36.01$, $SD = 11.2$). The majority of the sample was Dutch, had completed some type of tertiary education and was either employed or working as a freelancer.

Survey

Demographics

The Qualtrics (Qualtrics 2005) survey included information regarding participant gender, age, ethnicity, education level and occupational status. Additionally, participants estimated their previous experience with psychedelic substances by the number of psychedelic sessions they had experienced in their lives. Experience was estimated separately for the following three groups: classic psychedelics (e.g., ayahuasca, LSD, psilocybin), entactogens (e.g., MDMA), and dissociatives (e.g., ketamine, salvia divinorum). Also, levels of spirituality and religiosity were evaluated (“To what extent do you consider yourself a spiritual/religious person?”). Participants responded to these questions on a four-point scale (0 = “not at all spiritual/religious;”

Table 1. Demographic characteristics of the sample.

Characteristics	<i>n</i>	%
Gender		
Male	169	53
Female	152	47
Other	1	<1
Age		
16–25	64	20
26–35	98	30
36–45	87	27
46–55	53	16
56–65	20	6
Ethnicity		
Dutch	280	87
Belgian	17	5
Indonesian	4	1
German	3	<1
Other	18	6
Educational level		
Primary education	9	3
Secondary education	56	17
Tertiary education	251	78
Doctoral degree	6	2
Occupational status		
Employee	147	46
Freelancer	63	20
Student	51	16
Unemployed	21	7
Other	40	12
Spirituality		
Not at all spiritual	37	12
Slightly spiritual	104	32
Moderately spiritual	133	41
Very spiritual	48	15
Religiosity		
Not at all religious	231	72
Slightly religious	61	19
Moderately religious	26	8
Very religious	4	1
Estimated number of previous psychedelic experiences ^{ab}		
≤10	59	18
11–100	188	58
101–300	54	17
>301	20	6

All percentages may not total 100% due to rounding.

^aOne missing value.

^bPrevious psychedelic experience was quantified by asking participants how many times they have consumed classic psychedelics, entactogenic or dissociative substance before.

1 = “slightly spiritual/religious;” 2 = “moderately spiritual/religious;” 3 = “very spiritual/religious”).

Probe questions

The MEQ30 is answered in regard to a single profound experience. Therefore, the second part of the survey guided participants in choosing the most profound psychedelic experience they had had in the past 14 months (Figure 1). Two probe questions, based on MacLean et al. (2012), facilitated this process. The first question was the meaningful-experience probe (“During a psychedelic session in the past 14 months, would you say that you have had a profound, personally meaningful experience?”). Participants that responded negatively to this question were excluded from further participation. Participants that responded positively

received a second probe question, the mystical-experience probe. This was a modification of the Bourque question, used previously to quantify the occurrence of mystical experiences in large populations (Back and Bourque 1970; Hood, Hill, and Spilka 2009). The modified question reads: “During a psychedelic session in the past 14 months, would you say that you have had a spiritual or mystical experience, thus a moment of sudden spiritual awakening or insight?” In contrary to the first probe question, participants that responded negatively to the mystical-experience probe were not excluded from the study. Instead, they were instructed to answer the subsequent questions of the survey in regard to the most profound and personally meaningful experience that they have had in the preceding 14 months. Participants that responded positively to the mystical-experience probe were instructed to respond to the remaining questions in regard to aforementioned mystical experience or, if they had had several, in regard to the most profound one.

Chosen psychedelic session

Subsequent questions assessed the characteristics of the chosen psychedelic sessions. Participants indicated how much time had passed since the session, which psychedelic substance they had used, in which setting the session took place, whether they were accompanied by a trip sitter, and whether other people were present during the session.

Measures

Mystical experience questionnaire. Participants completed the Dutch MEQ30 in regard to the psychedelic session previously chosen using the probe questions. The items are rated on a six-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];” 5 = “extreme [more than ever before in my life and stronger than 4]”). The Dutch MEQ30 has been translated using the forward-backward translation method. The questionnaire was initially translated to Dutch by two independent translators proficient in both languages. Next, the two translations were reconciled into one interim translation, which was then translated back to English. All translations were then examined by a multidisciplinary review committee, and consensus was reached regarding the Dutch translation. The translation was then piloted with outsiders that had no previous knowledge of the MEQ30. Feedback from this pilot was used to finalize the items of the questionnaire. The items of the MEQ30 can be found in Figure 2.

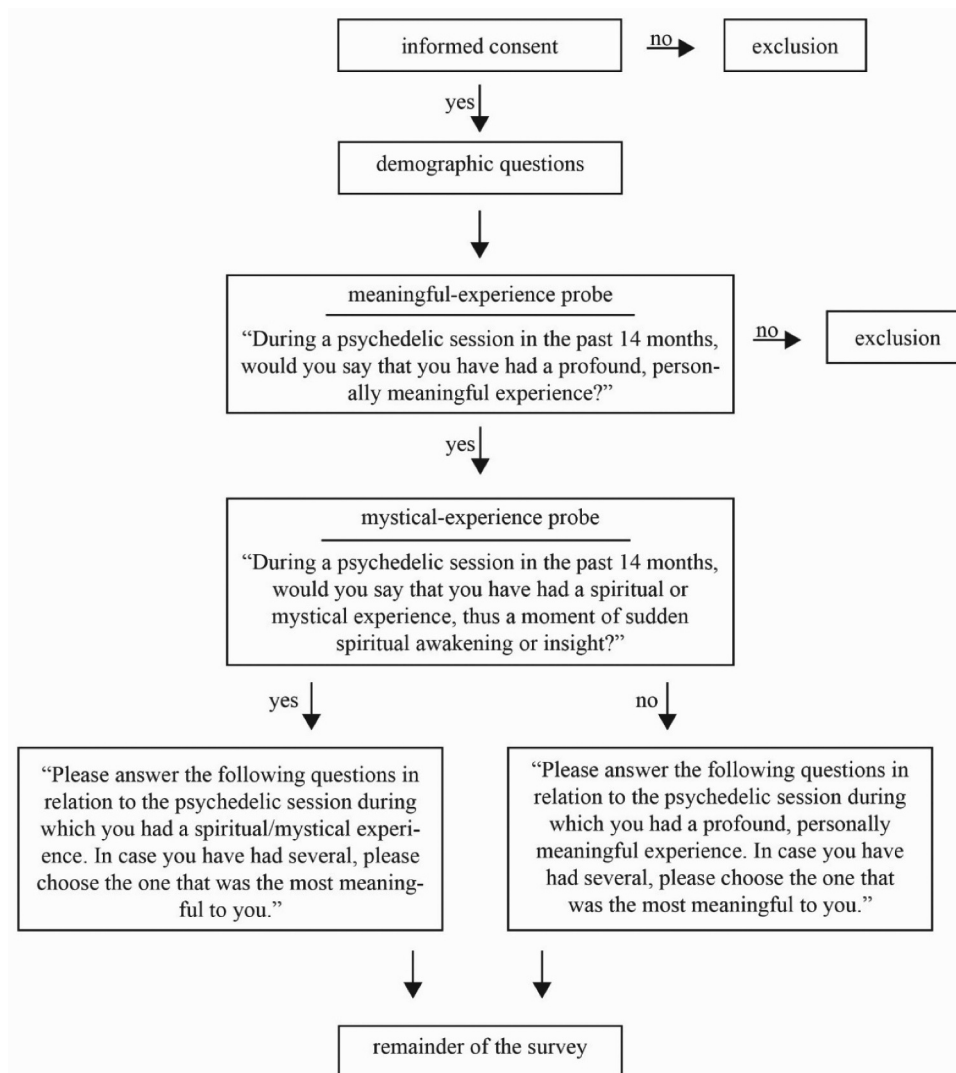


Figure 1. Visualization of guidance provided for selecting a psychedelic experience.

Persisting effects questionnaire. The Persisting Effects Questionnaire (PEQ) in its original form is a 145-item questionnaire that measures changes in attitudes, moods and behaviors and it has been used to assess lasting effects of psychedelic experiences (Griffiths et al. 2008, 2011). Instead of all 145 items, the current study included only four items that evaluate the meaningfulness and the spiritual significance of the psychedelic experience and the effect of the experience on participants' well-being and life satisfaction. The four items were: 1) "How personally meaningful was the experience?" (1="no more than routine, everyday experiences," 2="similar to meaningful experiences that occur on average once a week," 3="similar to meaningful experiences that occur on average once a month," 4="similar to meaningful experiences that occur on average once a year," 5="similar to meaningful experiences that occur on average once every 5 years,"

6="among the top 10 most meaningful experiences of my life," 7="among the top 5 most meaningful experiences of my life," and 8="the single most meaningful experience of my life"), 2) "Indicate the degree to which the experience was spiritually significant to you." (1="not at all," 2="slightly," 3="moderately," 4="very much," 5="among the top 5 most spiritually significant experiences of my life," and 6="the single most spiritually significant experience of my life"), 3) "Do you believe that the experience and your contemplation of the experience have led to a change in your current sense of personal well-being or life satisfaction?" (+3="increased very much"; +2="increased moderately"; +1="increased slightly"; 0="no change"; -1="decreased slightly"; -2="decreased moderately"; -3="decreased very much"), 4) "Your behavior has changed in ways you consider positive since the experience." (0="none, not at all"; 1="so slight, cannot

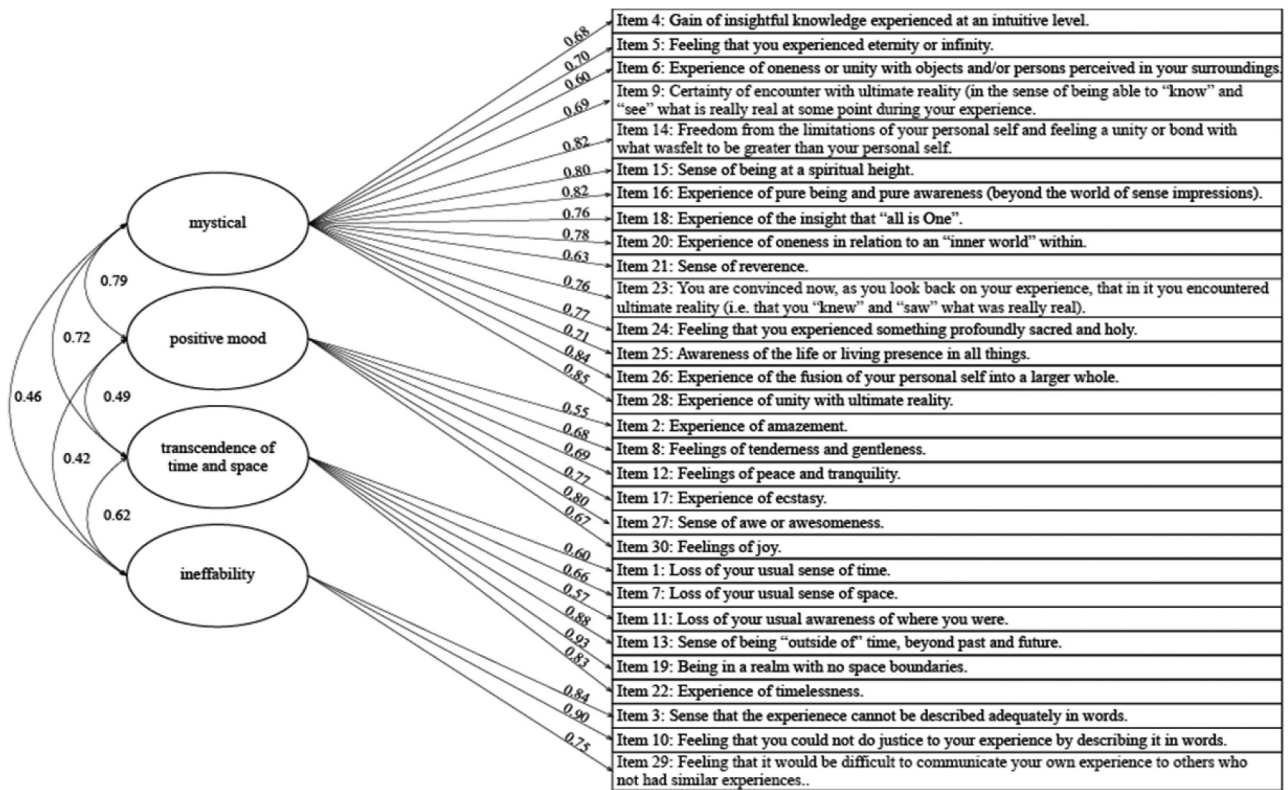


Figure 2. Path diagram of the four-factor model. The figure displays the four-factor model of the Dutch Revised Mystical Experience Questionnaire that demonstrated model fit in confirmatory factor analysis. Factor correlations and standardized factor loadings are represented.

decide”; 2=“slight”; 3=“moderate”; 4=“strong”; 5=“extreme”). The psychometric properties of the PEQ have not yet been assessed.

Data analysis

All analyses were performed in R 4.0.0 (R Core Team 2014). CFA was performed using the lavaan toolbox (Rosseel 2012). MEQ30 data were fit to two different models: a four-factor model and a two-factor model. The four-factor model was the result of EFA and CFA performed on the 43-item predecessor of the MEQ30 (Barrett, Johnson, and Griffiths 2015; MacLean et al. 2012; Schenberg et al. 2017). In this factor structure, items 4, 5, 6, 9, 14, 15, 16, 18, 20, 21, 23, 24, 25, 26 and 28 loaded onto factor 1, called Mystical. Items 2, 8, 12, 17, 27 and 30 loaded onto factor 2, called Positive Mood. Items 1, 7, 11, 13, 19 and 22 loaded onto factor 3, called Transcendence of Time and Space and items 3, 10 and 29 loaded onto factor 4, called Ineffability. The two-factor model was the result of EFA performed by Bouso et al. (2016). In this model, items 4, 5, 8, 9, 12, 14, 15, 16, 17, 18, 20, 21, 23, 24, 25, 26, 28 and 30 loaded onto factor 1, called Mystical Ecstasy. The remaining

items, 1, 2, 3, 6, 7, 10, 11, 13, 19, 22, 27 and 29, loaded onto factor 2, called Transdimensionality. In addition, a third model was tested by extending the best-fitting model with a second-order latent variable, the MEQ30-total score. This explored whether a second-order latent variable may account for correlation between the first-level latent variables. This analysis was conducted to explore whether the dimensions of the MEQ30 represent manifestations of an underlying generative mystical experience variable, as reported by Barrett, Johnson, and Griffiths (2015), Bouso et al. (2016) and Kangaslampi, Hausen, and Rauteenmaa (2020).

Significant result ($p < .05$) of the Henze-Zirkler test indicated non-normal distribution of the data (Henze and Zirkler 1990). Due to this distribution and the ordinal nature of the indicator variables, model parameters were estimated with the Unweighted Least Squares (ULS) estimation method. This method uses a polychoric correlation matrix and has demonstrated superiority to other estimation methods commonly used for ordinal data: compared to the method of Diagonally Weighted Least Squares, ULS provides more accurate parameter estimations, standard errors and chi-square statistics (Forero, Maydeu-Olivares, and

Gallardo-Pujol 2009; Shi, Lee, and Maydeu-Olivares 2019). Compared to robust Maximum Likelihood estimations, ULS demonstrates superiority in various domains, especially when sample sizes are small (Li 2016).

Latent variable scaling was achieved by setting the factor loading of the first indicator of each factor to 1. Robust standard errors and mean- and variance-adjusted test statistics were calculated. A combination of fit indices was employed to evaluate model fit: the comparative fit index (CFI), the Standardized Root Mean Squared Error (SRMR) and the ratio between the chi-square statistic and the degrees of freedom (χ^2/df). A model was considered to fit the data when (1) the CFI $\geq .90$ (Hu and Bentler 1999), (2) the SRMR $\leq .08$ (Hu and Bentler 1999), and (3) the χ^2/df ratio ≤ 3 . Despite common practice, the current study did not employ chi-square statistic as a test for model fit. The chi-square statistic is affected by sample size, model size and data distribution and, therefore, did not serve as useful for the current study (West, Taylor, and Wu 2012). Similarly, the commonly reported Root Mean Squared Error of Approximation (RMSEA) was not used as a test for close model fit as it tends to both under-reject mis-specified models and over-reject correctly specified models when samples are relatively small (Hu and Bentler 1999). A direct comparison demonstrated that SRMR is a more appropriate test for close fit with ordinal data than RMSEA (Shi, Maydeu-Olivares, and Rosseel 2020).

The current study also evaluated the reliability, construct validity and predictive validity of the Dutch MEQ30. Reliability was assessed by estimating the internal consistency of the questionnaire. For this, Cronbach's alpha and McDonald's hierarchical (ω_h) and total (ω_{total}) omega coefficients were calculated for each of the factors of the best-fitting model (Cronbach 1951; Kalkbrenner 2021). To assess the construct validity, independent samples *t*-tests were conducted to analyze whether standardized factor scores differed significantly between participants that did and did not endorse having had a mystical experience in response to the mystical-experience probe. To correct for multiple comparisons, Bonferroni correction was applied by handling a *p*-value of α/n , where *n* is the number of conducted comparisons (Bonferroni 1936). This analysis provided an indication of the construct validity of the Dutch MEQ30 as a measure for self-claimed mystical experiences.

To assess the predictive validity of the MEQ30, scores of the PEQ were standardized and combined into two sum scores: 1) the Meaningfulness/Spirituality score, which comprised the first and second item of the PEQ; and 2) the Changes in Well-being, Life Satisfaction and

Behavior score, which comprised the second and third item of the PEQ. Predictive validity of the PEQ30 was assessed by regressing the Meaningfulness/Spirituality score and the Changes in Well-being, Life Satisfaction and Behavior score on the MEQ30 total score.

Results

Descriptive statistics

Participants' levels of spirituality, religiosity and experience with psychedelics are reported in Table 1. The sample displayed higher levels of spirituality ($M = 1.60$, $SD = .88$) than levels of religiosity ($M = 0.39$, $SD = .69$). The amount of previous experience with psychedelic substances (i.e., classic psychedelics, entactogens and dissociatives, excluding cannabis as highly frequent cannabis use of some participants would have hindered interpretation of results) was diverse, ranging from 1 to 2000 previous sessions ($M = 101$, $SD = 219$).

Characteristics of the reported psychedelic experiences are displayed in Table 2. Substances used most frequently during the reported experiences were psilocybin (30%), ayahuasca (30%) and LSD (14%), and the largest proportion of reported sessions took place in recreative or social settings (53%). Sessions in which psychedelics were used took place, on average, five months prior to participation in the current study ($M = 5.3$, $SD = 4.6$). Most participants (87%) endorsed having had a mystical experience during the session.

Reliability and validity statistics

Of the two models fit with CFA, only the four-factor model ($\chi^2/\text{df} = 2.22$; CFI = .98; SRMR = .08) demonstrated acceptable model fit. The two-factor model did not meet the required cutoff values (Table 3). For this reason, the four-factor model was extended with a second-order latent variable, which also demonstrated acceptable model fit ($\chi^2/\text{df} = 2.62$; CFI = .98; SRMR = .08). Path diagrams of the four-factor and the second-order latent variable model, including the standardized factor loadings and factor correlations, are presented in Figures 2 and 3, respectively.

Internal consistencies were good to excellent for the Mystical factor ($\alpha = .94$, 95% CI [.93, .95], $\omega_h = .81$, $\omega_{\text{total}} = .95$), the Positive Mood factor ($\alpha = .81$, 95% CI [.78, .85], $\omega_h = .79$, $\omega_{\text{total}} = .90$), the Transcendence of Time and Space factor ($\alpha = .85$, 95% CI [.83, .88], $\omega_h = .74$, $\omega_{\text{total}} = .90$) and the Ineffability factor ($\alpha = .82$, 95% CI [.79, .86], $\omega_{\text{total}} = .83$; ω_h not available for three-item subscale). The PEQ total score demonstrated good reliability as well ($\alpha = .79$, 95% CI [.76, .83], $\omega_h = .69$, $\omega_{\text{total}} = .87$).

Table 2. Characteristics of the psychedelic session participants reported on.

Characteristics	<i>n</i>	%
Substance used ^a		
Psilocybin	97	30
Ayahuasca	96	30
LSD	46	14
DMT	15	5
2C-B	11	3
MDMA	9	3
Ketamine	8	3
Combination of substances ^b	8	3
5-MeO-DMT	6	2
Cannabis	6	2
Mescaline	4	1
Ibogaine	3	1
Other ^c	12	4
Time since session		
<1 week	20	6
1 week – 1 month	55	17
1–6 months	130	40
6–14 months	117	36
Setting		
Recreative/social setting	172	53
Retreat	73	23
Therapeutic aim	70	22
Other	7	2
Trip sitter		
Yes	161	50
No	161	50
Experienced a mystical experience ^d		
Yes	281	87
No	41	13

All percentages may not total 100% due to rounding. LSD = lysergic acid diethylamide; 2C-B = 2,5-dimethoxy-4-bromophenethylamine; DMT = N, N-dimethyltryptamine; MDMA = 3,4-methylenedioxymethamphetamine; 5-MeO-DMT = 5-methoxy-N,N-dimethyltryptamine.

^aOne missing values.

^bParticipants that had combined substances reported either LSD or MDMA as at least one of the substances. Two participants did not specify which substances they had used, however, they confirmed that the psychedelic experience was with a psychedelic(-like) substance.

^cTwo participants used *salvia divinorum*, two used 6-allyl-6-nor-lysergic acid diethylamide (AL-LAD), two used 4-hydroxy-N-ethyl-N-methyltryptamine (4-HO-MET), one used phenylcyclohexyl piperidine (PCP), one used the seeds of the *Anadenanthera peregrina* plant ("yopo"), one used 5-Methoxy-N-methyl-N-isopropyltryptamine (5-MEO-MIPT), one used 4-AcO-DMT, one used 6-(2-aminopropyl)benzofuran (6-APD) and one used 3-MeO-2'-oxo-PCPr (MXPr).

^dThe reported proportions represent the subjective judgments of participants regarding whether they have had a mystical experience. These judgments were assessed prior to the survey with a probe question.

Table 3. Goodness-of-fit indicators of the three models compared in confirmatory factor analyses.

Model	χ^2/df	CFI	SRMR
Four-factor model	2.22	.98	.08
Two-factor model	3.68	.96	.10
Second-order model	2.62	.98	.08

χ^2/df = ratio between chi-square and degrees of freedom; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Squared Error. Model fit was considered when $\chi^2/df \leq 3$, CFI $\geq .90$ and SRMR $\leq .08$.

Table 4 presents the standardized factor scores of participants that responded positively and negatively to the mystical-experience probe. Participants that endorsed having had a mystical experience had significantly higher factor scores on the Dutch MEQ30

compared to participants that did not endorse having had a mystical experience.

Lastly, scores on the Dutch MEQ30 significantly predicted how meaningful and spiritually significant participants found the psychedelic experiences, as measured with the Meaningfulness/Spirituality sum score of the PEQ ($\beta^\circ = .63$, $t = 14.62$, $p < .01$), indicating that higher scores on the Dutch MEQ30 predicted higher scores on the Meaningfulness/Spirituality sum score. The MEQ30 total scores explained a significant proportion of variance in Meaningfulness/Spirituality scores, $R^2 = .40$, $F(1, 320) = 213.69$, $p < .01$.

In addition, scores on the Dutch MEQ30 significantly predicted perceived changes in well-being, life satisfaction and behavior, as measured with the Changes in Well-being, Life Satisfaction and Behavior sum score of the PEQ ($\beta^\circ = .54$, $t = 11.49$, $p < .01$), indicating that higher scores on the Dutch MEQ30 predicted higher scores on the Changes in Well-being, Life Satisfaction and Behavior sum score. The MEQ30 total scores explained a significant proportion of variance in Changes in Well-being, Life Satisfaction and Behavior score, $R^2 = .29$, $F(1, 320) = 132.07$, $p < .01$.

Discussion

The lack of a validated Dutch measure of mystical experiences formed the rationale for the present study, which assessed the psychometric properties of a Dutch translation of the MEQ30. The results provide preliminary evidence for the internal consistency reliability and the construct and predictive validity of the Dutch MEQ30. Together, these results suggest the MEQ30's ability to capture relevant aspects of mystical experiences in its Dutch translation.

The questionnaire displays the same four-factor structure as the original English MEQ30 (Barrett, Johnson, and Griffiths 2015; MacLean et al. 2012). This is in line with factor analyses of the English, Finnish, French and Portuguese versions of the questionnaire and it further corroborates the theoretical framework that several dimensions constitute a mystical experience (Fauvel et al. 2022; Kangaslampi, Hausen, and Rauteenmaa 2020; Schenberg et al. 2017). We found that the factor loadings of the Dutch MEQ30 were slightly lower compared to earlier studies, with a notable discrepancy in item 2. In the current study, item 2 had a factor loading of .55 and .56 (in the four-factor and second-order latent variable model, respectively) while previous factor analyses found factor loadings ranging from .69 to .88 (Barrett, Johnson, and Griffiths 2015; Kangaslampi, Hausen, and Rauteenmaa

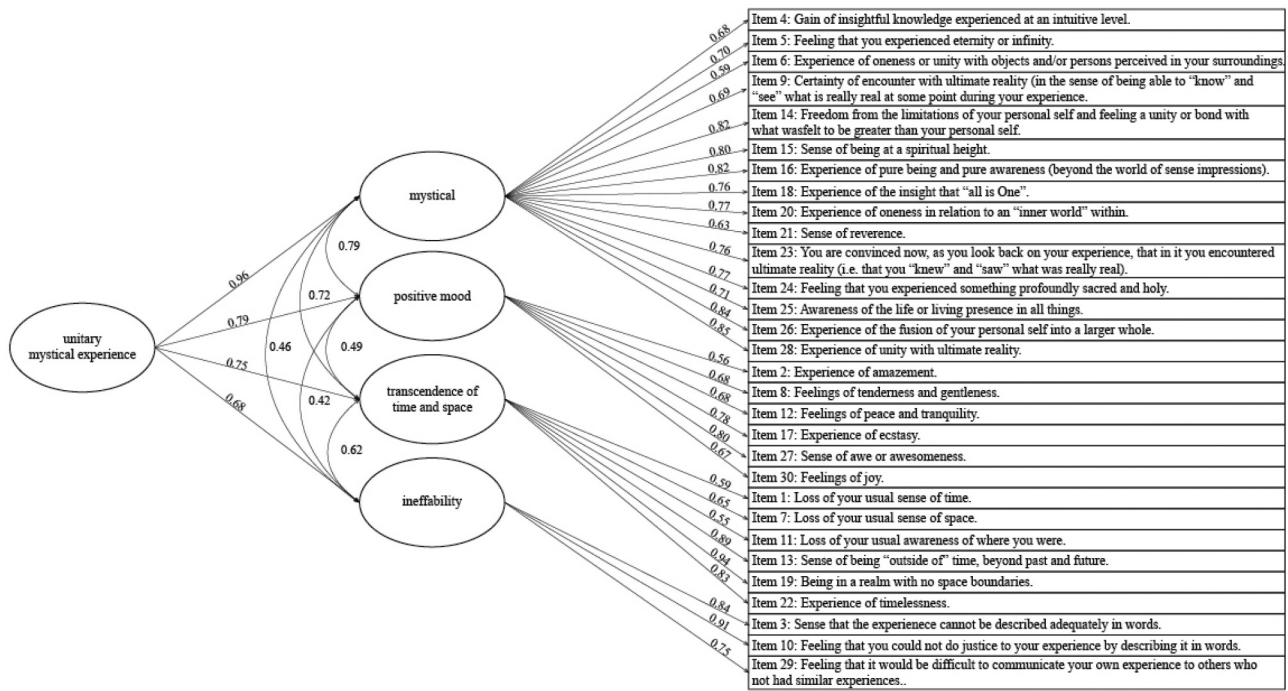


Figure 3. Path diagram of the second-order latent variable Model. The figure displays the four-factor model of the Dutch Revised Mystical Experience Questionnaire that demonstrated model fit in confirmatory factor analysis. Factor correlations and standardized factor loadings are presented.

Table 4. Differences in factor scores on the Dutch revised mystical experience questionnaire between participants with and without self-reported mystical experience.

Factor Scores	Yes (N = 281)	No (N = 41)
Mystical	.20 (.82)*	-1.39 (.99)
Positive Mood	.09 (.96)*	-0.65 (1.07)
Transcendence of Time and Space	.12 (.95)*	-0.85 (.92)
Ineffability	.08 (.94)*	-0.56 (1.23)

The table presents the standardized factor score means with standard deviations in parentheses. Bonferroni correction was applied to correct for multiple comparisons. As a result, the statistical threshold was set to $p < .01$. All comparisons differed significantly between the groups ($*p < .01$).

2020; Schenberg et al. 2017). An explanation may concern the way the item is translated: item 2 asks about “Experience of amazement”, which is translated to “Ervaren van verwondering” in the Dutch MEQ30. Merriam-Webster (n.d.) proposes words like “awe”, “admiration” or “wonder” as synonyms for the word “amazement”, which demonstrates that the word indicates a state of “positive surprise”. On the other hand, the Dutch word “verwondering” implies a state of “confused surprise”. What differs between the two words is the positive connotation that the word “amazement” has, but which is absent in its Dutch counterpart. Differences are diminutive but since item 2 loads onto the factor Positive Mood, the omittance of the positive connotation may have produced the observed differences in factor loadings. Nonetheless, this and all other items’ factor loadings would have met the scale

inclusion criteria in the original publication by MacLean et al. (2012), which advocates that, despite comparably low factor loadings in item 2, no modification is necessary for the Dutch MEQ30. These results provide evidence for the construct validity of the Dutch MEQ30.

In this study the second-order latent variable model also fit the data. This finding provides support for the theory of an underlying generative experience that manifests itself in multiple dimensions of a mystical experience (Barrett, Johnson, and Griffiths 2015; Bouso et al. 2016; Kangaslampi, Hausen, and Rauteenmaa 2020). In addition, the finding substantiates the presence of a second-order MEQ30-total score variable. These results are in line with comparable findings by Barrett, Johnson, and Griffiths (2015) and Bouso et al. (2016).

Including a mystical-experience probe permitted an additional analysis of construct validity. As hypothesized, participants that endorsed having had a mystical experience had significantly higher factor scores compared to those that did not. This finding is in line with MacLean et al. (2012) and supports the construct validity of the Dutch MEQ30 as a measure for self-claimed mystical experiences. We note that this finding is limited to self-claimed mystical experiences, as no external validation of the presence or absence of a mystical experience was available.

Additionally, study findings provide evidence for the internal consistency reliability and the predictive validity of the Dutch MEQ30. Cronbach's alpha and McDonald's omega of the four factors were good to excellent, which indicates that items belonging to the same factor are closely related to each other. This is in accordance with previous psychometric evaluations (Barrett, Johnson, and Griffiths 2015; Bouso et al. 2016; Kangaslampi, Hausen, and Rauteenmaa 2020; MacLean et al. 2012) and demonstrates the internal consistency reliability of the Dutch MEQ30. Furthermore, scores on the MEQ30 significantly predicted both how meaningful and spiritually significant participants found their psychedelic experiences, as well as perceived changes in well-being, life satisfaction and behavior after the psychedelic experience, as measured with the PEQ. As mystical experiences are thought to be meaningful and change-evoking moments (Griffiths et al. 2006), it was hypothesized that higher scores on the Dutch MEQ30 predict more self-reported, positive changes in behavior, life satisfaction and well-being, as well as retrospectively perceived meaningfulness and spiritual significance of the psychedelic experience. The findings of this study supported this hypothesis, and provide evidence for the predictive validity of the Dutch MEQ30. However, the PEQ used in this study has not yet undergone psychometric evaluation. The present study demonstrated that the internal consistency of the PEQ is good, however, no information regarding its validity is available. Using this unvalidated questionnaire to evaluate the predictive validity of the Dutch MEQ30 has, therefore, limited conclusiveness and evidence should be considered preliminary.

Several limitations may influence the obtained results. Given the focus of this study, recruitment aimed at a very specific group of people, which resulted in a biased sample that is not representative of the general Dutch-speaking population. The sample was highly educated (i.e., 78% received tertiary education or higher) and displayed low ethnic diversity (i.e., 87% of the sample were Dutch). It may be the case that in other Dutch-speaking ethnic groups, or among persons

with lower education levels, other results would have been obtained. Generalizability of the results to different samples is, thus, limited. Furthermore, participants were recruited on fora, social media and websites that address the topics of psychedelics and spirituality. Users of those platforms may advocate psychedelics and may have had more overall positive experiences with those substances than the average psychedelic user, resulting in a potential bias. Lastly, based on this study no conclusions can be drawn on other psychometric aspects, like, for instance, the discriminant or external validity of the MEQ30. For example, assessing the intensity of the psychedelic experience would have been an informative addition to the results of this study as it would have further demonstrated the specificity of the MEQ30.

Considering these limitations, there is an abundant space for further analyzing the psychometric properties of the Dutch MEQ30. Future research could concentrate on evaluating other aspects of validity and reliability (e.g., the discriminant or external validity of the questionnaire) to broaden our understanding of the psychometric properties of the MEQ30. The current study could be extended by exploring the psychometric properties of the questionnaire for samples with participants that took psychedelics in therapeutic frameworks, as this will most likely be the focus of future clinical trials in the Netherlands. Similarly, psychometric evaluations of the MEQ30 in less educated and more ethnically diverse samples may constitute a meaningful addition to current knowledge, as it is likely that those participating in future clinical trials with psychedelic-assisted psychotherapy will differ in educational levels and ethnicity.

These limitations notwithstanding, this study offers the first psychometric evaluation of a Dutch measure for mystical experiences. Results provide evidence for the reliability and validity of the Dutch MEQ30 as a measure of mystical experiences evoked by psychedelics. These results support the use of the Dutch MEQ30 in future studies on mystical experiences and the subjective effects of psychedelics. Recent research has suggested that mystical experience may play a role in the clinically relevant effects of therapy with psychedelics. The current study provides ground for further exploration of this hypothesis in Dutch clinical populations.

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References

- Back, K. W., and L. B. Bourque. 1970. Can feelings be enumerated? *Behavioral Science* 15 (6):487–96. doi:10.1002/bs.3830150603.
- Barrett, F. S., M. W. Johnson, and R. R. Griffiths. 2015. Validation of the revised mystical experience questionnaire in experimental sessions with psilocybin. *Journal of Psychopharmacology* 29 (11):1182–90. doi:10.1177/0269881115609019.
- Bogenschutz, M. P., A. A. Forchimes, J. A. Pommy, C. E. Wilcox, P. C. R. Barbosa, and R. J. Strassman. 2015. Psilocybin-assisted treatment for alcohol dependence: A proof-of-concept study. *Journal of Psychopharmacology* 29 (3):289–99. doi:10.1177/0269881114565144.
- Bonferroni, C. 1936. Teoria statistica delle classi e calcolo delle probabilita. *Publicazioni del R Istituto Superiore di Scienze Economiche e Commerciali di Firenze* 8:3–62.
- Bouso, J. C., E. J. Pedrero-Pérez, S. Gandy, and M. Á. Alcázar-Córcoles. 2016. Measuring the subjective: Revisiting the psychometric properties of three rating scales that assess the acute effects of hallucinogens. *Human Psychopharmacology: Clinical & Experimental* 31 (5):356–72. doi:10.1002/hup.2545.
- Breeksema, J. J., A. Niemeijer, B. Kuin, J. Veraart, E. Vermetten, J. Kamphuis, and W. van den Brink, R. Schoevers. 2023. Phenomenology and therapeutic potential of patient experiences during oral esketamine treatment for treatment-resistant depression: An interpretative phenomenological study. *Psychopharmacology (Berl)* 240 (7):1547–60. doi:10.1007/s00213-023-06388-6.
- Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. *psychometrika* 16 (3):297–334. doi:10.1007/BF02310555.
- Earleywine, M., L. F. Ueno, M. N. Mian, and B. R. Altman. 2021. Cannabis-induced oceanic boundlessness. *Journal of Psychopharmacology* 35 (7):841–47. doi:10.1177/0269881121997099.
- Fauvel, B., S. Kangaslampi, L. Strika-Bruneau, B. Roméo, and P. Piolino. 2022. Validation of a French version of the mystical experience questionnaire with retrospective reports of the most significant psychedelic experience among French users. *Journal of Psychoactive Drugs* 55 (2):1–10. doi:10.1080/02791072.2022.2059796.
- Ferrara, M. S. 2021. Peak-experience and the entheogenic use of cannabis in world religions. *Journal of Psychedelic Studies* 4 (3):179–91. doi:10.1556/2054.2020.00122.
- Forero, C. G., A. Maydeu-Olivares, and D. Gallardo-Pujol. 2009. Factor analysis with ordinal indicators: A Monte Carlo study comparing DWLS and ULS estimation. *Structural Equation Modeling* 16 (4):625–41. doi:10.1080/10705510903203573.
- Garcia-Romeu, A., R. Griffiths, and M. Johnson. 2015. Psilocybin-occasioned mystical experiences in the treatment of tobacco addiction. *Current Drug Abuse Reviews* 7 (3):157–64. doi:10.2174/1874473708666150107121331.
- Griffiths, R. R., M. W. Johnson, M. A. Carducci, A. Umbricht, W. A. Richards, B. D. Richards, and M. A. Klinedinst. 2016. Psilocybin produces substantial and sustained decreases in depression and anxiety in patients with life-threatening cancer: A randomized double-blind trial. *Journal of Psychopharmacology* 30 (12):1181–97. doi:10.1177/0269881116675513.
- Griffiths, R. R., M. W. Johnson, W. A. Richards, B. D. Richards, U. McCann, and R. Jesse. 2011. Psilocybin occasioned mystical-type experiences: Immediate and persisting dose-related effects. *Psychopharmacology* 218 (4):649–65. doi:10.1007/s00213-011-2358-5.
- Griffiths, R. R., W. A. Richards, M. W. Johnson, U. D. McCann, and R. Jesse. 2008. Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later. *Journal of Psychopharmacology* 22 (6):621–32. doi:10.1177/0269881108094300.
- Griffiths, R. R., W. A. Richards, U. McCann, and R. Jesse. 2006. Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology* 187 (3):268–83. doi:10.1007/s00213-006-0457-5.
- Gukasyan, N., A. K. Davis, F. S. Barrett, M. P. Cosimano, N. D. Sepeda, M. W. Johnson, and R. R. Griffiths. 2022. Efficacy and safety of psilocybin-assisted treatment for major depressive disorder: Prospective 12-month follow-up. *Journal of Psychopharmacology* 36 (2):151–58. doi:10.1177/02698811211073759.
- Henze, N., and B. Zirkler. 1990. A class of invariant consistent tests for multivariate normality. *Communications in Statistics-Theory and Methods* 19 (10):3595–617. doi:10.1080/03610929008830400.
- Hood, R. W., P. C. Hill, and B. Spilka. 2009. *The psychology of religion: An empirical approach*. New York: Guilford Publications.
- Hu, L. T., and P. M. Bentler. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal* 6 (1):1–55. doi:10.1080/10705519909540118.
- Johnson, M. W., P. S. Hendricks, F. S. Barrett, and R. R. Griffiths. 2019. Classic psychedelics: An integrative review of epidemiology, therapeutics, mystical experience, and brain network function. *Pharmacology & Therapeutics* 197:83–102. doi:10.1016/j.pharmthera.2018.11.010.
- Kalkbrenner, M. T. 2021. Alpha, omega, and H internal consistency reliability estimates: Reviewing these options and when to use them. *Counseling Outcome Research and Evaluation* 1–12. doi:10.1080/21501378.2021.1940118.
- Kangaslampi, S., A. Hausen, and T. Rauteenmaa. 2020. Mystical experiences in retrospective reports of first times using a psychedelic in Finland. *Journal of Psychoactive Drugs* 52 (4):309–18. doi:10.1080/02791072.2020.1767321.
- Kline, R. B. 2011. *Principles and practice of structural equation modeling*. New York, NY: Guilford.
- Li, C.-H. 2016. The performance of ML, DWLS, and ULS estimation with robust corrections in structural equation

- models with ordinal variables. *Psychological Methods* 21 (3):369–87. doi:10.1037/met0000093.
- MacLean, K. A., M. W. Johnson, and R. R. Griffiths. 2011. Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *Journal of Psychopharmacology* 25 (11):1453–61. doi:10.1177/0269881111420188.
- MacLean, K. A., J. M. S. Leoutsakos, M. W. Johnson, and R. R. Griffiths. 2012. Factor analysis of the mystical experience questionnaire: A study of experiences occasioned by the hallucinogen psilocybin. *Journal for the Scientific Study of Religion* 51 (4):721–37. doi:10.1111/j.1468-5906.2012.01685.x.
- Merriam-Webster. (n.d.). Amazement. *Merriam-Webster. Com Dictionary*. Accessed December 13, 2020. <https://www.merriam-webster.com/dictionary/amazement>.
- Mitchell, J. M., M. Bogenschutz, A. Lilienstein, C. Harrison, S. Kleiman, K. Parker-Guilbert, and G. M. Ot'alara, W. Garas, C. Paleos, I. Gorman. 2021. MDMA-assisted therapy for severe PTSD: A randomized, double-blind, placebo-controlled phase 3 study. *Nature Medicine* 27 (6):1025–33. doi:10.1038/s41591-021-01336-3.
- Pahnke, W. N. 1963. *Drugs and mysticism: An analysis of the relationship between psychedelic drugs and the mystical consciousness: A thesis*. Harvard University.
- Pearson, C., J. Siegel, and J. A. Gold. 2021. Psilocybin-assisted psychotherapy for depression: Emerging research on a psychedelic compound with a rich history. *Journal of the Neurological Sciences* 434:120096. doi:10.1016/j.jns.2021.120096.
- Qualtrics. (2005). Qualtrics (version April 2020). Provo, Utah, USA. <https://www.qualtrics.com>.
- R Core Team. (2014). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <http://www.R-project.org/>.
- Roseman, L., D. J. Nutt, and R. L. Carhart-Harris. 2018. Quality of acute psychedelic experience predicts therapeutic efficacy of psilocybin for treatment-resistant depression. *Frontiers in Pharmacology* 8:974. doi:10.3389/fphar.2017.00974.
- Ross, S., A. Bossis, J. Guss, G. Agin-Liebes, T. Malone, B. Cohen, and S. E. Mennenga, A. Belser, K. Kalliontzi, J. Babb. 2016. Rapid and sustained symptom reduction following psilocybin treatment for anxiety and depression in patients with life-threatening cancer: A randomized controlled trial. *Journal of Psychopharmacology* 30 (12):1165–80. doi:10.1177/0269881116675512.
- Rosseel, Y. 2012. Lavaan: An R package for structural equation modeling and more. Version 0.5–12 (BETA). *Journal of Statistical Software* 48 (2):1–36. doi:10.18637/jss.v048.i02.
- Rothberg, R. L., N. Azhari, N. A. Haug, and E. Dakwar. 2021. Mystical-type experiences occasioned by ketamine mediate its impact on at-risk drinking: Results from a randomized, controlled trial. *Journal of Psychopharmacology* 35 (2):150–58. doi:10.1177/0269881120970879.
- Sanders, J. W., and J. Zijlmans. 2021. Moving past mysticism in psychedelic science. *ACS Pharmacology and Translational Science* 4 (3):1253–55. doi:10.1021/acspsci.1c00097.
- Schenberg, E. E., L. F. Tofoli, D. Rezinovsky, and D. X. D. Silveira. 2017. Translation and cultural adaptation of the states of consciousness questionnaire (SOCQ) and statistical validation of the mystical experience questionnaire (MEQ30) in Brazilian Portuguese. *Archives of Clinical Psychiatry (São Paulo)* 44 (1):1–5. doi:10.1590/0101-60830000000105.
- Shi, D., T. Lee, and A. Maydeu-Olivares. 2019. Understanding the model size effect on SEM fit indices. *Educational and Psychological Measurement* 79 (2):310–34. doi:10.1177/0013164418783530.
- Shi, D., A. Maydeu-Olivares, and Y. Rosseel. 2020. Assessing fit in ordinal factor analysis models: SRMR vs. RMSEA. *Structural Equation Modeling: A Multidisciplinary Journal* 27 (1):1–15. doi:10.1080/10705511.2019.1611434.
- Smith, K. W., D. J. Sicignano, A. V. Hernandez, and C. M. White. 2022. MDMA-assisted psychotherapy for treatment of posttraumatic stress disorder: A systematic review with meta-analysis. *The Journal of Clinical Pharmacology* 62 (4):463–71. doi:10.1002/jcph.1995.
- Stace, W. T. 1960. *Mysticism and philosophy*. New York: MacMillan Press.
- West, S. G., A. B. Taylor, and W. Wu. 2012. Model fit and model selection in structural equation modeling. *Handbook of Structural Equation Modeling* 1:209–31.