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Internal Structure and Invariance of a Brief Version of the Marijuana Motives Measure (MMM-P15) in a Peruvian Population of Marijuana users

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Título: Estructura Interna e Invarianza de una Versión Breve del Marijuana Motives Measure (MMM-P15) en Población Peruana de Consumidores de Marihuana.

Resumen: *Antecedentes:* La identificación de los motivos por los cuales se consume marihuana se ha visto apoyada por instrumentos como el MMM. A pesar de su importancia, aún no se cuenta con versiones breves válidas de este en países latinoamericanos. Este trabajo busca cubrir esta carencia aportando evidencia de validez y confiabilidad, así como la invarianza estructural del MMM. Método: La muestra comprende 1164 consumidores de marihuana, varones y mujeres, con edades entre 18 y 49 años, de Lima y Callao. *Resultados:* El análisis factorial halló una estructura pentafactorial. La versión breve (MMM-P15) y extensa (MMM) muestran favorables propiedades de estructura y consistencia interna (ω > .88, H > .84) con adecuados índices de ajuste del instrumento corto (RMSEA = .058 [IC 90% .050, .067], SRMR = .044, GFI = .99, TLI = .99, CFI = .99). Asimismo, ambas versiones mantienen la invarianza según el sexo y se encontró evidencia de validez interna (AVE > .50) y con otros constructos (CAST y SWLS). *Conclusiones:* El MMM-P15 evidencia propiedades psicométricas que respaldan su uso tanto en hombres y mujeres consumidores de marihuana, además es un instrumento corto, versátil y útil para fines de investigación incluso en contextos clínicos.

Palabras clave: Análisis factorial confirmatorio. Consistencia interna. Motivos. Marihuana. Consumidores peruanos.

Abstract: *Background:* The identification of the reasons for marijuana use has been supported by instruments such as the MMM. Despite its importance, there are still no valid brief versions of this instrument in Latin American countries. This paper seeks to fill this gap by providing evidence of validity and reliability, as well as the structural invariance of the MMM. *Method:* The sample consisted of 1164 male and female marijuana users, aged between 18 and 49 years, from Lima and Callao. *Results:* The factor analysis found a penta-factorial structure. The brief version (MMM-P15) and the wide MMM showed favorable properties from structure and reliability (ω > .88, H > .84) with appropriate indicators of the short instrument adjustment (RMSEA = .058 [CI 90% .050, .067], SRMR = .044, TLI = .99, CFI = .99). Likewise, both versions maintain the invariance of the instrument according to sex and evidence of internal validity was found (AVE > .50). Aside from bringing evidence of validity with other constructs like CAST and SWLS scale. *Conclusions:* The MMM-P15 shows psychometric properties that support its use in both male and female marijuana users, and it is a short, versatile, and useful instrument for research purposes even in clinical settings.

Keywords: Confirmatory factor analysis. Internal consistency. Motives. Marijuana. Peruvian consumers.

Introduction

Marijuana is recognized as one of the most controversial and socially accepted illegal drugs, becoming the most consumed drug during the last decade (Díaz-Geada et al., 2021; United Nations Office on Drugs and Crime [UNODC], 2021a). In Europe, prevalence is five times higher than other illicit drugs (Díaz-Geada et al., 2021; UNODC, 2021a). In Africa, annual prevalence was 6.4% and in Asia there are 61.5 million users (UNODC, 2021b). In North America, prevalence reached 14% and in South America 14.5%, with users aged 18-34 years being the heaviest users. In Peru, it is the most consumed illegal substance by the population aged 12 to 65 years and 1 out of every 2 users develops dependence (Inter-American Drug Abuse Control Commission [CICAD], 2019).

The onset of marijuana use is multi-causal, with multiple motivations for it. As explanatory models for understanding motivations are consolidated (Cooper, 1994; Matalí et al., 2018), knowledge about them will bring benefits from a preventive and psychotherapeutic perspective, ensuring greater success in interventions (Garrison et al., 2021; Genrich et al., 2021; Pons, 2008). Therefore, it is very important to assess motivations, which would not be possible without the availability of instruments adapted to the Peruvian context and that guarantee acceptable psychometric properties to measure this construct (Carretero-Dios & Pérez, 2005; Carretero-Dios & Pérez, 2007; Muñiz et al., 2013; Muñiz et al., 2019).

Since the initial proposals that were developed on motivational models to explain drug use (Cooper, 1994), several evaluative tools have emerged that focus on quantitatively exploring the various motives that people use to consume drugs. Such is the case of the Marijuana Motives Measure (MMM) (Simons et al., 1998), an instrument that studies five fundamental motives for marijuana use: Enhancement, conformity, expansion, social and coping. These five elements play a predictive role in marijuana use, as well as in the problems derived from its use (Garrison et al., 2021; Simons et al., 2000).

In addition, although the MMM has been initially reviewed in a North American context and in other languages (Simons et al., 1998), it has generated several investigations that have found the instrument to be a reliable tool with excellent evidence of validity that supports its application. For

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example, the study by Simons et al. (1998) conducted in marijuana users, found a structure of five dimensions called: Expansion, Coping, Enhancement, Conformity and Social, with a favorable reliability (α > .85); however, some items of these showed low factor loadings, as was the case of item 16 (λ < .067) or loadings in factors other than the established one (item 15).

Benschop et al. (2015), in the Netherlands, explored the psychometric properties of the instrument in young adult marijuana users, confirming the five-factor structure, although they found low fit indices (CFI = .90; RMSEA = .066) and alpha coefficients between .72 and .85, and also had to remove problematic items (2, 8 and 9) with low factor loadings (λ < .40).

Subsequently, the need for an instrument to support the assessment and analysis of marijuana use has led to the adaptation of the MMM to Spanish language (Matalí et al., 2018), reporting optimal evidence of validity and reliability. Subsequently, Mezquita et al. (2019) proposed a brief version of the MMM for adolescents and adults between 16 and 58 years of age who have reported using marijuana at least once in their lifetime. The finding supports the five postulated dimensions, but the brief model proposed shows better parsimony and goodness of fit than the extended version.

Additionally, the study by Mezquita et al. (2019) found that by removing certain problematic items (2, 5, 8, 9, 13, 15, 16 and 17), which were also reported in previous studies (Benschop et al., 2015), the instrument improves in fit and maintains high loadings on all its dimensions (λ > .70), also demonstrating high internal consistency coefficients omega or alpha (> .79), in addition, through the Multiple Group Confirmatory Factor Analysis (MGCFA) technique, the metric invariance of the instrument was supported, which supports its use in men and women. Likewise, Matalí et al. (2018) conducted a validation with adolescents from a psychiatry service finding the same penta-factorial structure, with high internal consistency coefficients in almost all its dimensions (α > .72) with the exception of Conformity (*a* =.64); however, low factor loadings were found in items 5 and 15 (λ < .40), which had already been detected as problematic (Benschop et al., 2015; Mezquita et al., 2019; Simons et al., 1998).

This research has its main objective as to examine the evidence of validity and reliability of a brief version of the MMM, through different procedures such as exploratory factor analysis (EFA), confirmatory factor analysis (CFA), validity evidence related to other constructs, and internal consistency coefficients alpha and omega. At the same time, we sought to explore the invariance of the MMM measurement from the Multiple Indicators - Multiple Causes (MIMIC) approach according to gender because there are precedents where variations in substance use between men and women are recognized (UNODC, 2021a; Zamora et al., 2005).

Method

Participants

The sample was non-probabilistic (snowball) and consisted of 1164 Peruvian consumers of marijuana from various districts of Lima and Callao, 69% of them are male and the remaining 31% female, aged between 18 and 49 years, (*M* = 22.17, *D.S.*= 3.9); in regards to the educational levels, 14.7% showed highschool education (basic obligatory), 18.7% level for superior technician and 66.6% with university studies.

Likewise, 100% of the participants reported having consumed marijuana at some time in their lives, 91.6% consumed it in the last year, 85.1% in the last six months and 75.4% in the last month.

Instruments

Marihuana Motives Measure (MMM) Questionnaire: Used to assess the motives for marijuana use in the Spanish adapted version (Matalí et al., 2018). The MMM consists of 25 items distributed in five subscales called Coping, Conformism, Enhancement, Social and Expansion, each scale consists of five items with a five-point Likert scale format, 1 (never/almost never) to 5 (almost always/always). Based on the MMM, the present study reviews the brief Spanish version of the Marijuana Motives Measure proposed by Mezquita et al. (2019), which consists of 15 items, with factors and Likert scale format similar to the full version (MMM). This brief version reported adequate evidence of validity (CFI = .958, GFI = .959, RMSEA = .047) and reliability (ordinal omega = .90), as well as presence of metric and scalar invariance by sex.

Cannabis Abuse Screening Test (CAST), is a questionnaire designed by the Observatoire Français des Drogues et Toxicomanies [OFDT] (Legleye et al., 2007) to assess problematic cannabis use. It is a unidimensional questionnaire that assesses possible abuse problems experienced by marijuana users, as well as the negative consequences of marijuana use. It is a six-item questionnaire with a five-point Likert scale format, with a minimum value of 1 (Never) to a maximum of 5 (Very often). The CAST presents adequate psychometric properties of validity and reliability, and internal consistency that exceeds .80 in several studies and has been shown, through factor analysis, to be unidimensional, presenting adequate fit indices (Legleye et al., 2007; Legleye et al., 2013; Legleye, 2018; Rial et al., 2022).

Satisfaction With Life Scale (SWLS, Diener et al., 1985) is a 5-item instrument, and was designed for the adult population. The scale is unidimensional, and presents Likert-type response options ranging from strongly disagree to strongly agree. Adequate psychometric properties have been reported for the Peruvian context, reporting that the instrument presents acceptable evidence of validity related to its internal

structure, as well as favorable internal consistency reliability (Calderón-De la Cruz et al., 2018; Sancho et al., 2019).

Procedure

The research was conducted in compliance with the ethical guidelines of the Declaration of Helsinki necessary for the execution of the study and in accordance with the Code of Ethics of the College of Psychologists of Peru. The research protocol was approved by an evaluation committee of the Research Office of the Universidad Nacional Federico Villarreal.

In this sense, the participants were informed of the objective of the research, as well as asked to participate on a voluntary basis, for which they were asked to provide the respective informed consent. Sampling was conducted face-to-face in late 2019 and early 2020 before the declaration of the pandemic. Physical surveys were used and subsequently transcribed into a database.

Subsequently, after collecting the data, we proceeded to perform the statistical analyses using Excel sheets, the free software Factor (Ferrando & Lorenzo-Seva, 2017) for the EFA, and the Lavaan library of the R software, version 3.5.2 (RStudio team, 2015) for CFA.

Data analysis

Given that the instrument has not been validated in the Peruvian context, it is considered appropriate to analyze whether the latent structure hypothesized in previous studies showed the same characteristics in the aforementioned population. In this sense, the first strategy was to conduct an EFA with half of the total sample (Brown, 2015) and then conduct a CFA with the remaining proportion.

Prior to the EFA, the descriptive analysis of the variables was developed, removing those observations that were far from the multivariate centroid by means of the Mahalanobis distance, in addition to analyzing the ceiling and floor effect of each item (Terwee et al., 2007) and identifying the Standardized Skew Index (SSI) (Malgady, 2007) with respect to these. Then, in the univariate analysis, the limits corresponding to the skewness and kurtosis coefficients (+/- 1.5) were established, as well as the linearity of the variables and the absence of multicollinearity problems. Furthermore, taking into account that the items of the instrument present an ordinal Likert-type scaling, the EFA (N1 = 582) was provided by the polychoric correlation matrix. As a previous step to the reduction of the factors Bartlett's test, KMO and the determinant were examined. Next, unweighted least squares (ULS) was proposed as an extraction method, since it avoids the appearance of Heywood cases, the number of factors was determined through parallel analysis and the rotation of the factors was carried out using the oblique method weighted oblimin.

Subsequently, and based on previous studies, a CFA of the extended version (MMM) of the instrument (Simons et al. 1998) and of a brief version of the instrument (Mezquita et al., 2019) in a Peruvian sample (MMM-P15) is proposed. A CFA was performed with the remaining sample (N2 = 582) using the WLSMV estimator applied to the polychoric correlations matrix (see Table 2). Also, fit indices were considered according to the suggestion of Hair et al. (2014) (TLI ≥ .92, CFI ≥.92, SRMR ≤ .08), MacCallum et al. (1996) (RMSEA ≤ .08) and Wu (2013) (1 ≤ X2/gl ≤ 5). The omega coefficients of internal consistency (Elosua & Zumbo, 2008 (ω > .70), ordinal alpha, alpha, and of construct reliability or Hancock's H (H > .80) are added, as well as a calculation of the Average Variance Extracted (AVE) to obtain cut-off points that allow estimating the convergent (AVE > .50) and discriminant internal validity of the test. In addition, evidence of validity related to other constructs (Cannabis Abuse and Satisfaction with Life) was provided.

Subsequently, for both proposed models (MMM, MMM-P15), the hypothesis of invariance of the intercept is proposed from the Multiple Indicators - Multiple Causes (MIMIC) approach (Brown, 2015) which is suggested to be used when there are small or modest samples such as those used in the study. The proposed MIMIC model analyzes whether the covariate sex has a direct influence on the five latent dimensions of the instrument. When this significant influence is not found, it is considered that the latent dimensions remain invariant to the influence of the covariate. In addition, a saturated MIMIC model was proposed in which the covariate explains all the items of the instrument at the same time. This was proposed with the intention of analyzing the influence of problems with the Differential Item Functioning (DIF) of the scale if the difference in goodness of fit between the MIMIC model and the saturated model is significant (Δ CFI ≤ .01, Δ TLI ≤ .01, Δ RMSEA ≤.01). Likewise, it is feasible to obtain the latent means of the instrument, which provide information regarding the difference in units with respect to the scores obtained by both men and women in relation to each of the underlying constructs.

Results

Exploratory Factor Analysis of the Marijuana Motives Measure

The preliminary descriptive analysis showed the presence of outliers, which were removed using the Mahalanobis technique (p <.001). Likewise, the skewness (-.3 a 1.33) and kurtosis (-1.30 a .87) values are within the expected limits. In the same way, the ceiling and floor effect of the data were identified and it was found that the floor effect affects almost all the variables used, but it was not found that these are mostly influenced by the ceiling effect. Additionally, the SSI of each variable was found and most of them show values within the expected limits (SSI ≤ .5) (see Table 1).

Table 1
Descriptive statistics, skewness, kurtosis, floor and ceiling effect and SSI of the EFA of the MMM (N1 = 582).

Ítem	M	SD	g1	g2	Min%	Max%	SSI
1	1.5	1.3	0.5	-1	29	10	0.2
2	0.8	1.1	1.3	0.8	55	3.6	0.5
3	1.7	1.4	0.3	-1.1	26	12	0.1
4	1.6	1.4	0.3	-1.2	**27**	**13**	0.1
5	1.2	1.3	0.8	-0.7	44	5.8	0.2
6	1.6	1.3	0.3	-1	26	11	0.1
7	2.3	1.3	-0.3	-1.1	14	21	-0.1
8	0.8	1.1	1.4	0.9	61	3.1	0.6
9	1.9	1.4	0.1	-1.3	21	14	0.0
10	2	1.4	0.0	-1.3	20	19	0.0
11	1.7	1.4	0.2	-1.2	26	13	0.1
12	0.9	1.2	1.2	0.3	54	4.8	0.4
13	2.2	1.4	-0.3	-1.2	14	22	-0.1
14	1.7	1.4	0.2	-1.2	25	12	0.1
15	1.3	1.3	0.6	-0.8	37	8.4	0.2
16	1.7	1.3	0.2	-1.1	23	9.8	0.1
17	1.6	1.4	0.4	-1.2	29	14	0.1
18	2.1	1.4	-0.1	-1.2	16	22	0.0
19	0.9	1.2	1.2	0.4	56	4.3	0.4
20	0.8	1.1	1.3	0.7	59	3.6	0.5
21	1.3	1.3	0.6	-0.9	38	7.9	0.2
22	1.6	1.4	0.2	-1.2	29	10	0.1
23	1.6	1.4	0.3	-1.2	30	11	0.1
24	1.6	1.4	0.3	-1.2	29	10	0.1
25	1.8	1.4	0.1	-1.3	24	15	0.0

Note: g1, Fisher's skewness; g2, Fisher's kurtosis; M, mean; S.D, standard deviation; SSI, Standardized Skew Index; Mín. %, percentage of people with minimal score; Máx. %, percentage from maximum score.

Prior to the EFA, the linearity of the variables was checked, the absence of multicollinearity, and the hypothesis of multivariate normality of the Mardia test was rejected (p = .000), although this does not pose any problem for the execution of the EFA (see Table 2) In addition, a Bartlett's test coefficient (p = .000) contrary to an identity matrix was identified, the KMO (.95) is very good.

Although the parallel analysis suggested considering two dimensions, this option was discarded as previous research does not support this possibility and is more oriented towards a five- or occasionally a four-dimensional construct (see Table 3). It should also be noted that the five hypothesized dimensions explain 79.5% of the variance in the data. In addition, the communality is found in all items with high values between .60 -.88.

After the oblique rotation of the factors, it was identified that the factor loadings contribute significantly to the respective dimension ($\lambda > .30$) with the exception of the Social dimension, which showed low saturations ($\lambda < .30$) in two items (5, 16) (see Table 4) Regarding the internal consistency of the instrument (see Table 4), showed favorable alpha, ordinal alpha, and omega coefficients, except for the Social scale in which a low value was obtained (**ω=**.62), as well as the H coefficients of construct reliability are high, except for Social (.62).

Table 2
Matrix of polychoric correlations of the EFA from the MMM in their extended version (N1 =582).

Ítem	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	1																								
2	.60	1																							
3	.59	.57	1																						
4	.76	.57	.60	1																					
5	.52	.65	.61	.59	1																				
6	.55	.44	.59	.67	.58	1																			
7	.34	.18	.47	.45	.36	.53	1																		
8	.54	.76	.49	.59	.64	.44	.20	1																	
9	.36	.40	.53	.47	.46	.55	.68	.41	1																
10	.37	.36	.51	.44	.40	.54	.68	.30	.69	1															
11	.47	.47	.74	.57	.59	.57	.53	.46	.64	.63	1														
12	.57	.71	.58	.62	.66	.49	.22	.78	.44	.34	.59	1													
13	.34	.25	.45	.48	.39	.52	.77	.26	.68	.68	.59	.32	1												
14	.52	.50	.78	.58	.61	.60	.55	.49	.61	.58	.83	.58	.59	1											
15	.58	.61	.60	.67	.61	.56	.42	.62	.52	.40	.61	.66	.46	.65	1										
16	.50	.47	.60	.52	.53	.57	.54	.44	.54	.53	.61	.50	.56	.66	.52	1									
17	.76	.54	.51	.72	.55	.60	.39	.56	.43	.36	.44	.54	.39	.51	.59	.48	1								
18	.32	.28	.44	.43	.41	.55	.71	.25	.67	.67	.57	.30	.74	.56	.38	.58	.40	1							
19	.60	.76	.57	.64	.65	.46	.21	.81	.41	.33	.57	.84	.27	.59	.66	.51	.54	.31	1						
20	.62	.78	.62	.67	.66	.46	.23	.81	.39	.35	.57	.82	.31	.57	.66	.51	.58	.28	.88	1					
21	.51	.55	.47	.59	.47	.57	.41	.56	.47	.48	.49	.57	.49	.51	.59	.53	.50	.47	.65	.67	1				
22	.48	.47	.51	.54	.46	.60	.57	.45	.61	.56	.55	.47	.63	.55	.61	.58	.47	.62	.50	.54	.72	1			
23	.51	.46	.49	.58	.39	.56	.54	.43	.57	.55	.49	.48	.60	.52	.57	.56	.50	.60	.53	.54	.70	.83	1		
24	.49	.43	.50	.55	.46	.61	.54	.40	.58	.57	.51	.45	.59	.53	.55	.58	.50	.59	.49	.51	.71	.77	.81	1	
25	.55	.47	.59	.57	.52	.60	.56	.40	.60	.58	.59	.45	.59	.62	.58	.61	.54	.59	.51	.53	.68	.75	.77	.81	1

Table 3
Determination of the number of factors based on the eigenvalues and the parallel analysis of the MMM previous to the EFA (N1 =582).

Explained variance based on eigenvalues				Parallel analysis by optimal implementation			
Variable	E.V	%Var	%C.P%	Variable	R.D	M.V	95% M.V.
1	14.13871	0.56555	0.56555	1	58.6532*	8.0498	8.7833
2	2.85233	0.11409	0.67964	2	11.8067*	7.5345	8.194
3	1.25448	0.05018	0.72982	3	4.9274	7.1498	7.7654
4	0.96621	0.03865	0.76847	4	4	6.7897	7.3155
5	0.66821	0.02673	0.7952	5	2.5193	6.4644	6.9506

Note: E.V. = eigenvalues; %Var = variance proportion; % C.P. = proportion of accumulated variance

Note: R.D = Real - data % of variance. M.V = Mean of random % of variance. 95% M.V = 95% percentile of random % of variance

Table 4
Factor loadings of the EFA of the Marijuana Motives Measure and inter-factor correlations of the MMM (N1 =582).

Items	F1	F2	F3	F4	F5
1	-.07	.04	.08	**.81***	.08
2	-.05	**.68**	.07	.131	.08
3	.15	.06	.03	.29	**.59***
4	.14	.167	.05	**.64***	.05
5	.19	.46	-.09	.20	**.22**
6	.33	.00	.13	**.41***	.14
7	**.87***	-.08	-.03	.08	.00
8	.06	**.94**	-.06	.03	-.07
9	**.75**	.26	-.00	-.10	.06
10	**.71***	.10	.06	-.06	.11
11	.42	.18	-.05	.01	**.58***
12	-.00	**.75***	.037	.05	.17
13	**.83**	.04	.077	-.03	.00
14	.34	.08	-.00	.15	**.61***
15	.12	.33	.15	**.30**	.19
16	.35	.13	.16	.14	**.24**
17	.12	.10	-.01	**.77**	-.06
18	**.80***	.05	.09	-.05	-.00
19	-.09	**.80***	.16	.02	.13
20	-.11	**.80***	.18	.09	.13
21	.08	.32	**.57**	.07	-.04
22	.27	.10	**.63***	.04	-.00
23	.19	.05	**.73***	.10	-.06
24	.19	-.03	**.72***	.14	.02
25	.18	-.08	**.60**	.21	.18
F1	1				
F2	.275	1			
F3	.568	.472	1		
F4	.434	.631	.455	1	
F5	.371	.468	.326	.342	1
α	.87	.90	.88	.87	.87
α1	.89	.94	.91	.89	.89
ω	.89	.89	.79	.73	.62
H	.90	.93	.80	.81	.62

Note: F1= Enhancement, F2 = Conformism, F3 = Expansion, F4 = Coping, F5 = Social, H = Hancock coefficient, ω = Omega coefficient, α = alpha coefficient, α1 = ordinal alpha. In bold: items with their respective scale. *: Items from MMM-P15.

Confirmatory Factor Analysis of the Marijuana Motives Measure

The next step consisted of carrying out a CFA in which a factorial structure of five dimensions was hypothesized, as was found in the previous EFA. Accordingly, descriptive data were obtained prior to the use of the confirmatory technique in which skewness (-.20 a 1.37) and kurtosis (-1.20 a 1.05) values were observed within the expected levels with the exception of item 8 (g1 = 1.8, g2 = 2.64); however, items (2, 8, 12, 19, 20) were observed with values outside the expected cut-off point (SSI < .5). Additionally, the floor effect was again present in almost all the variables analyzed (see Table 5).

Table 5
Descriptive statistics, skewness, kurtosis, floor and ceiling effect and SSI of CFA from MMM (N2 = 582).

Item	M	SD	g1	g2	Min%	Max%	SSI
1	1.32	1.55	0.46	-1	26.1	11	0.1
2	0.98	0.76	1.25	0.97	52.2	1.72	1.08
3	1.31	1.63	0.48	-0.9	21.7	13.4	0.09
4	1.32	1.49	0.53	-0.9	28.5	10.8	0.12
5	1.2	1.04	0.99	0	44.5	5.5	0.46
6	1.29	1.5	0.59	-0.8	25.4	11	0.13
7	1.32	2.3	-0.2	-1.2	10.5	24.4	-0.02
8	0.96	0.56	1.8	2.64	67.2	2.06	2.87
9	1.34	1.75	0.2	-1.2	22.7	12.7	0.03
10	1.34	1.79	0.18	-1.2	21.8	13.2	0.03
11	1.31	1.61	0.43	-0.9	23.5	11.9	0.08
12	1.07	0.81	1.19	0.52	54.1	2.41	0.91
13	1.35	2.21	-0.2	-1.2	13.8	21.5	-0.02
14	1.33	1.59	0.41	-1	25.6	11.2	0.08
15	1.31	1.31	0.62	-0.8	37.8	7.73	0.18
16	1.32	1.69	0.32	-1.1	22.3	12.5	0.06
17	1.39	1.58	0.43	-1.1	29	13.8	0.09
18	1.3	2.01	0.02	-1.1	14.6	16.2	0.00
19	0.98	0.69	1.37	1.05	59.1	1.37	1.44
20	0.98	0.7	1.31	0.92	58.3	1.37	1.34
21	1.17	1.14	0.78	-0.3	39	4.64	0.3
22	1.23	1.36	0.6	-0.7	29.7	6.7	0.16
23	1.27	1.48	0.44	-0.9	28.7	7.73	0.1
24	1.38	1.53	0.45	-1.1	30.9	12.2	0.1
25	1.33	1.76	0.2	-1.1	22.2	12.9	0.03

Note: g1 = Fisher's skewness, g2 = Fisher's kurtosis, M = mean, SD = standard deviation, SSI = Standardized Skew Index, Mín. % = percentage of people with minimal score, Máx. % = percentage of maximum score

Then, the confirmatory factor analysis of both versions (MMM, MMM-P15) was carried out considering the five dimensions proposed in the previous EFA. In this sense, the proposed latent structure of the MMM shows favorable fit indices (RMSEA = .075 [CI 90% .071, .080], SRMR = .063, GFI = .99, TLI = .99, CFI = .99) and the factor

loadings show high values (λ > .73) in all items (Figure 1). Additionally, the omega coefficients are high in all five

dimensions (ω > .90) in the same way as in the case of the construct reliability of all dimensions (H > .90). Regarding the internal discriminant validity, it was found that the AVE is greater than the average of the correlation of the factor loadings squared, which would indicate favorably that the dimensions are differentiated from each other; in the same way, these values indicate that the dimensions considered are independent, supporting the convergent validity of the instrument (AVE > .50) (see Table 6).

With respect to the MMM-P15, the CFA performed, improves notably in goodness of fit (RMSEA = .058 [CI 90% .050, .067], SRMR = .044, GFI= .99, TLI =

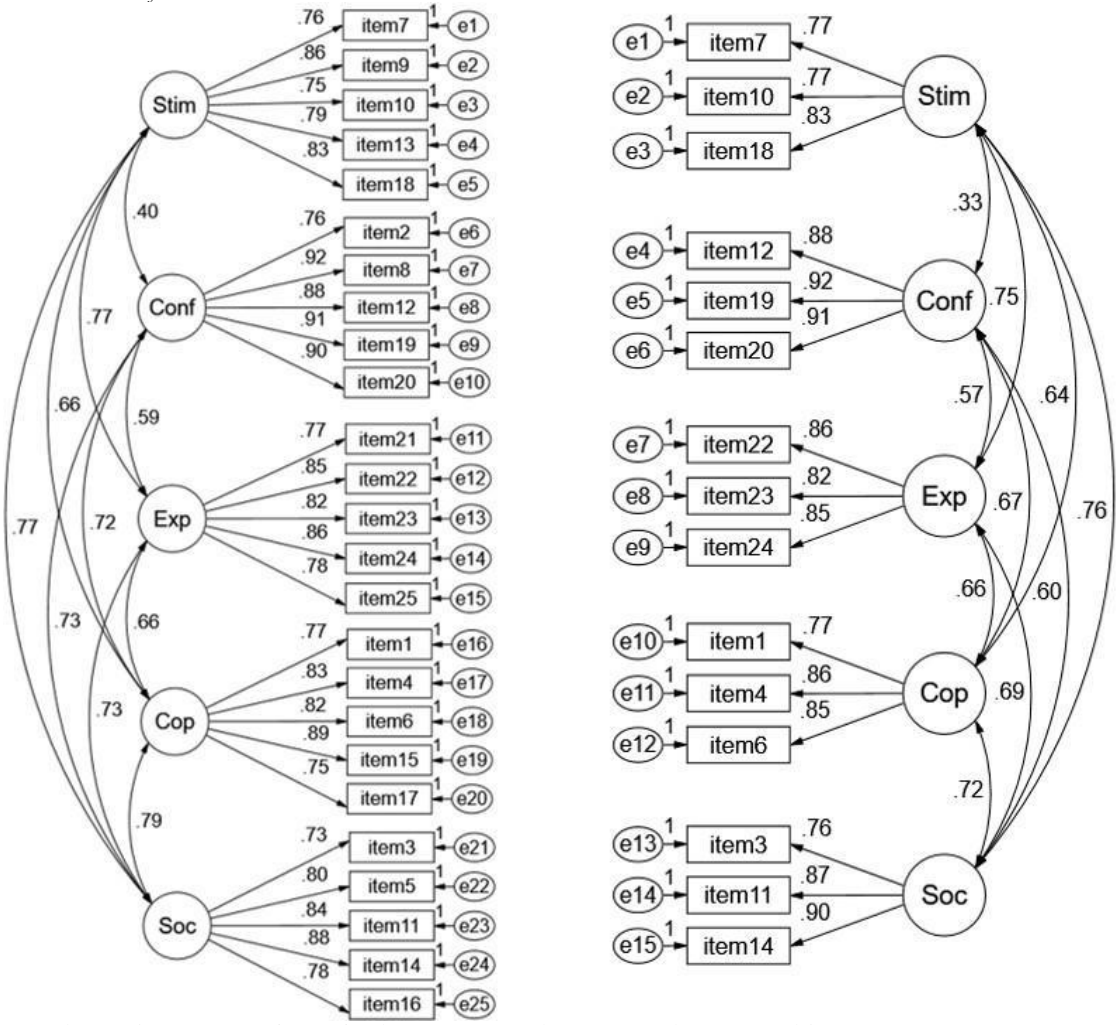
.99, CFI= .99), shows high factor loadings (λ > .76) in all its items (See Figure 1). In the same way, high internal consistency coefficients (ω > .88) are observed in almost all its dimensions; even in Enhancement the omega is high (ω = .83) and the same happens with the reliability of the construct (H > .84). Furthermore, the internal discriminant validity and convergent validity of the brief version (AVE > .50) are supported (see Table 6).

Table 6
AVE, reliability of the MMM and MMM-P15 (N2=582).

	MMM					MMM-P15				
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
ω	.90	.94	.91	.91	.90	.83	.93	.88	.87	.88
H	.90	.95	.91	.92	.92	.84	.93	.88	.87	.90
α	.90	.92	.91	.88	.88	.84	.91	.89	.83	.89
α1	.92	.95	.94	.90	.91	.87	.95	.92	.86	.92
AVE	.64	.77	.68	.66	.65	.62	.82	.71	.69	.71

Note: F1 = Enhancement, F2 = Conformism, F3 = Expansion, F4 = Coping, F5 = Social, H = Hancock coefficient, ω = Omega coefficient, AVE = Average Variance Extracted, α = alpha coefficient, α1 = ordinal alpha.

Figure 1
Factorial structures of MMM and MMM-P15.



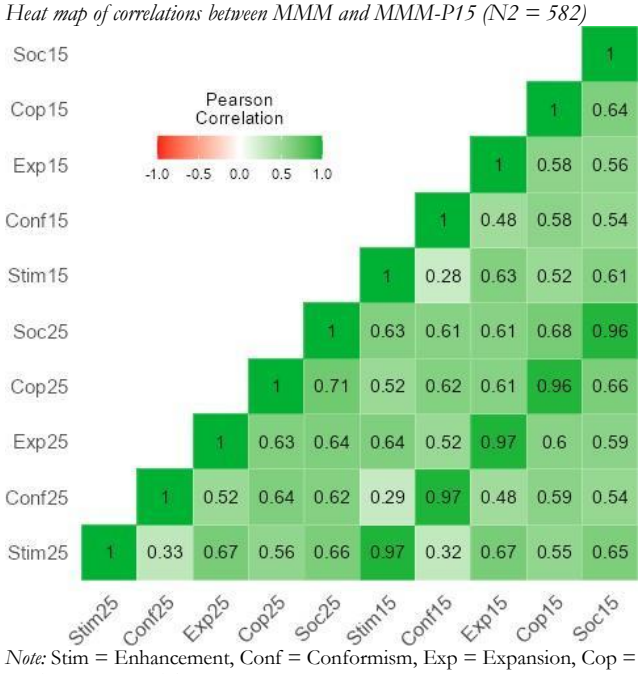
Note: Stim = Enhancement, Conf = Conformism, Exp = Expansion, Cop = Coping, Soc = Social.

Relationships between the factors of MMM and MMM-P15

It is observed in Figure 2 that the MMM and MMM-P15 factors present high correlations (≥ .96). The intra-factorial correlations in MMM vary between .52 and .71, with the exception of the correlation between Stim25 and Conf25 (r = .33). As for the intra-factorial correlations of MMM-P15, these range from .48 to .64, with the exception of the correlation between Stim15 and Conf15 (r = .28). The intra-factorial correlation coefficients for both instruments are moderate and of large effect size.

Figure 2

Heat map of correlations between MMM and MMM-P15 (N2 = 582)



Note: Stim = Enhancement, Conf = Conformism, Exp = Expansion, Cop = Coping, Soc = Social

Measuring Invariance - Multiple Indicators Multiple Causes (MIMIC)

After conducting the CFA, we continued with the analysis of invariance from the MIMIC approach for the MMM. Accordingly, a model was proposed in which the covariate "sex" explains the five latent dimensions of the instrument. As observed, it was not found that the presence of the covariate shows a direct effect on the latent dimensions, even though an exploratory model was tested in which an item affected by the covariate is added to the MIMIC model. This process was carried out for all the items and none of them was influenced by the covariate studied, which allows us to affirm the invariance. Subsequently, the MIMIC model of invariant intercept was compared with a saturated model in which the covariate maintains a direct effect on all the items of the instrument. Even in this case, the difference in the variance of the goodness-of-fit indices between the two models does not indicate systematic problems in the instrument analyzed, affirming the hypothesis of intercept invariance. In addition, latent mean differences were found for each of the dimensions mentioned above, finding that in the case of Enhancement and Conformity, females score .044 and .097 units higher than males, but in Expansion, Coping and Social, males score .081, .025 and .065 units higher than females (see Table 7).

The same procedure was followed for the MMM-P15 and the findings show that the MIMIC model of the MMM-P15 shows better goodness-of-fit indices than the extended version and, in addition, provides evidence of the structural invariance of the instrument since the influence of the sex covariate is not supported. Likewise, the latent mean differences are reported, finding values similar to those reported in the extended version (see Table 7).

Table 7

Goodness-of-fit indices of the CFA, MIMIC invariant intercept model, saturated model of the Marijuana Motives Measure and difference of the latent means of the five dimensions of the MMM and the MMM-P15 (N2=582).

Model	GFI	CFI	TLI	RMSEA	SRMR	Δ CFI	Δ TLI	Δ RMSEA
AFC -MMM	.989	.990	.988	.076	.063			
AFC- MMM-P15	.994	.995	.994	.058	.044			
MIMIC-MMM	.987	.990	.989	.073	.063			
MIMIC -MMMP15	.993	.995	.995	.054	.044			
Saturated -MMM	.987	.990	.988	.076	.063	.000	.001	-.003
Saturated – MMM-P15	.993	.995	.994	.058	.044	.000	.000	-.004
	F1	F2	F3	F4	F5			
Difference of means - MMM	.044	.097	-.081	-.025	-.065			
Difference of means - MMM-P15	.007	.088	-.100	-.065	-.055			
p-value-MMM	.651	.342	.411	.798	.496			
p-value-MMM-P15	.946	.393	.328	.519	.575			
Standard error -MMM	.096	.102	099	.096	.096			
Standard error -MMM- P15	.099	.103	.103	.101	.099			

Note: F1= Enhancement, F2 = Conformism, F3 = Expansion, F4 = Coping, F5 = Social, Δ = Variance of CFI, TLI or RMSEA.

According to what has been observed, the short version maintains the structural and consistency properties of the long version intact, as well as contributing to its use in both male and female populations. However, it is shown to be a more parsimonious model and avoids the inclusion of items that may be problematic, especially when the aim is to obtain homogeneous instruments in different contexts.

Evidence of validity related to other constructs

Table 8 shows that the construct Motives for Marijuana Use (MMM-P15) as its dimensions show negative relationships with the construct Satisfaction with Life, all relationships are statistically significant and with a practical significance represented in all cases by a small (r > .10) but important effect size (Cohen, 1988; Dominguez-Lara, 2018). Regarding motives for consumption (MMM-P15) and Cannabis Abuse, positive relationships are observed with a large effect size of significance magnitude (r > .50).

Table 8
Correlation coefficients and their 95% CIs between MMM-P15 and Satisfaction with Life and Cannabis Abuse (N2=582).

	Stim15	Conf15	Exp15	Cop15	Soc15	MMM-P15
SV	-.14**	-.12**	-.14**	-.15**	-.15**	-.17**
	[-.19, -.08]	[-.17, -.06]	[-.19, -.08]	[-.20, -.09]	[-.20, -.09]	[-.23, -.11]
CA	.53** [.49, .57]	.48** [.44, .52]	.54** [.50, .58]	.57** [.53, .61]	.56** [.52, .60]	.65** [.62, .68]

Note: ** p < .001, SV = Satisfaction with Life, CA = Cannabis Abuse, Stim15 = Enhancement, Conf15 = Conformism, Exp15 = Expansion, Cop15 = Coping, Soc15 = Social.

Descriptive analysis and comparison of means for MMM-P15

Table 9 shows that when comparing the means between males and females, a significant difference was found for small effect size (d > .20) only in the expansion factor (Exp15), but not for the other factors (d < .20) of MMM-P15.

Table 9
Descriptive analysis for the total sample and differentiation between males and females of MMM-P15 (N2=582).

	Total Sample		Male (799)		Female (365)				
	Mean	SD	Mean	SD	Mean	SD	t	p	d
Stim15	6.24	3.45	6.34	3.41	6.03	3.53	1.436	0.151	0.09
Conf15	2.37	2.98	2.38	3.01	2.33	2.91	0.239	0.811	0.02
Exp15	4.61	3.56	4.83	3.59	4.11	3.43	3.248	0.001	0.21
Cop15	4.64	3.41	4.78	3.46	4.32	3.27	2.175	0.03	0.14
Soc15	4.96	3.58	5.07	3.55	4.71	3.62	1.613	0.107	0.10

Note: Stim15 = Enhancement, Conf15 = Conformism, Exp15 = Expansion, Cop15 = Coping, Soc15 = Social.

Discussion

Although occasionally the short versions tend to show greater problems of structure and internal consistency, this is not the case of the MMM-P15, which reveals encouraging evidence that is described below.

A EFA was conducted with the intention of identifying the underlying penta- factorial structure of the MMM. However, despite the fact that in the EFA the parallel analysis suggested employing only two dimensions, we opted to maintain the five- dimensional structure supported in previous studies (Benschop et al., 2015; Matalí et al., 2018; Mezquita et al., 2019; Simons et al., 1998). However, while the studies by Matalì et al. (2018) and Simons et al. (1998) used techniques currently discouraged for the use of the EFA (Ferrando & Anguiano-Carrasco, 2010) such as principal component analysis and the use of eigenvalues, which determined the five dimensions mentioned, as did the review by Benschop et al. (2015), subsequent analyses under the CFA found support for the five-dimension version (Benschop et al., 2015; Mezquita et al., 2019).

On the other hand, the version proposed by Mezquita et al. (2019), considered here, did not perform a CFA with which comparisons could be made with respect to the parallel analysis employed. Furthermore, it should be noted that, although the Factor software used in the parallel analysis suggests considering two dimensions, this recommendation is made when the program is not indicated the number of dimensions of the construct, but executes it by default (assuming zero factors), that is, without considering the theoretical proposal of the construct under study. However, when the parallel analysis was used again, but considering the five factors indicated by theory and previous studies, the five-factor model continues to remain as an option with favorable support in the EFA, which is reflected in the percentage of variance of the parallel analysis. Furthermore, the goodness of fit of the EFA reflects favorable coefficients (GFI = .99; RMSR = .017) and the same structure with five dimensions is replicated in the CFA in the same way as previous works already mentioned (Benschop et al., 2015; Mezquita et al., 2019). Furthermore, the process of the decision to retain the five factors is supported by the recom-

mendations of Lloret-Segura et al. (2014), who postulate as appropriate criteria for factor retention 1) various objective measures, which in our study were correspond to the satisfactory fit indices as well as the factor loadings for saturations, 2) the interpretability of a solution of five factors is consistent given that the construct is about the motives for consuming marijuana, and 3) the starting theory, which corresponds to the proposal of the authors who built the instrument (Simons et al., 1998), as well as with those who carried out the adaptation in its full version (Matalí et al., 2018) as short to the Spanish language (Mezquita et al., 2019). However, further studies could consider whether it is The suggestion made by default by the Factor program is relevant to delve into the two dimensions, although, for the time being, there is no theoretical support for this and empirical in the articles published, as it is difficult to find any empirical data on can theoretically support more complex second-order or hierarchical models in relation to consumption motives.

It is added that this proposal enjoys the theoretical support associated with the five consumption motives, which implies assuming a theoretical decision guided by psychometric evidence. Regarding the EFA findings, it was found that the five- dimensional structure explains a high percentage of the variance (79.5%) and the communalities of each item are also high, which indicates that each item of the instrument contributes significantly to each dimension. However, low factorial saturations were found in items 5 and 16, these items have also presented problems in previous studies (Matalí et al., 2018; Mezquita et al.; 2019, Simons et al., 1998), which already alerts to the complications that their inclusion in the instrument may bring and supports the brief version of Mezquita et al. (2019) and that of the present study.

Likewise, internal consistency showed acceptable values (ω >.73) with the exception of the Social scale (ω = .62), which is explained due to items with low factor loadings.

However, although the Social dimension had lower internal consistency values (ω) compared to the CFA of the MMM and the MMM-P15, this is explained by the assumptions considered in both the EFA and the CFA, such as the use of non- standardized and standardized loadings, respectively. In addition, it should be considered that the CFA assumes that an item only loads on one factor, which facilitates obtaining higher factor saturations compared to the EFA, the latter being an inconclusive exploratory procedure. Furthermore, when analyzing the ordinal alpha, a measure relevant to ordinal scales as compared to the alpha coefficient, it obtains a favorable value (α1>.89), which is in agreement with the findings of the subsequent CFA.

In the descriptive analysis a floor effect was found in items 5 and 16; that is, when asked the questions of item 16 "To celebrate special occasions with friends" and 5 "To be sociable", participants tend to respond mostly that they "never - almost never" use marijuana in those circumstances. This is probably related to the fact that, although the use of marijuana has a certain acceptance in contexts similar to those of the sample used, its use is still not fully accepted as a form of social celebration capable of being shared by all the members of their social circle (items 16), even more so if we consider that discomfort with the use of the substance by one or two members is enough for this celebration to be interrupted. Furthermore, in the narrative of marijuana users, the use of the substance in situations that allow them to enjoy the hallucinogenic effects in a more personal environment or isolated from the hustle and bustle is more present. Also, it is likely that this item is too general in its semantics since "a special occasion" can have different connotations. Similarly, in item 5, marijuana use does not have the same social function as other substances such as alcohol. Probably, users do not feel that using marijuana allows them to be sociable and may even find it difficult to be prone to rejection or social judgement from non-using peers in their social circle.

It is striking that in the Social dimension, the one most prone to different cultural idiosyncrasies in instruments validated in different contexts than the Peruvian sample, a low internal consistency is obtained. This would seem to reflect that there are certain items more prone to cultural variations that are not sensitive to the measurement of social motives for marijuana use. In this sense, we should try to find items that are stable even in the same study sample.

In addition, previous studies have already mentioned that some of the items of the remaining dimensions have also been shown to be problematic. For example, Benschop et al. (2015) removed items 2 and 8 of the Conformity scale and item 9 of Enhancement; item 15 would be noted by Simons et al. (1998). Mezquita et al. (2019) would avoid, in addition to the above, items 13 from Enhancement, 17 from Coping, and 21 - 25 from Expansion.

As a conclusion from EFA, it is assumed that the MMM shows a penta-factorial latent structure with empirical support and has favorable internal consistency indices. Likewise, the presence of items 5 and 16 whose influence on the coping dimension does not seem to be relevant is noted. Subsequently, considering that previous studies have found that the presence of certain items prevents obtaining better properties of the MMM, we postulated a brief version according to Mezquita et al. (2019).

Once the penta-factorial structure had been endorsed, we went on to carry out the CFA of both the brief version MMM-P15 and the extended version of the MMM instrument. The extended version of the MMM has an acceptable goodness of fit (RMSEA = .075 [CI 90% .071, .080], SRMR = .063, GFI= .99, TLI = .99, CFI= .99), high factor loadings (λ > .73) and maintains high internal consistency coefficients (ω > .90) as well as high construct reliability (H > .90), but it is the short version that far outperforms in parsimony (RMSEA = .058 [CI 90% .050, .067], SRMR = .044, GFI = .99, TLI = .99, CFI = .99), (λ > .76) and although it maintains slightly lower internal consistency coefficients than its competitor, these are high (ω > .88, H > .84). As can be

seen, the exclusion of items 16 and 5 of the Social scale does not significantly alter the internal consistency of the instrument, since even the brief version of the scale, with only three items, shows an omega and H coefficient > .88. This supports the proposal to keep in this dimension items less prone to cultural norms peculiar to each study population. As noted when removing the problematic items found in the previous EFA (5 and 16), in addition to not including items already observed in previous studies (Matalí et al., 2018; Mezquita et al., 2019; Simons et al., 1998), the MMM-P15 retains and improves its psychometric properties.

In accordance with the CFA, validity evidence related to other constructs the MMM-P15 showed large effect correlations (r >.50) with the CAST, which makes sense since the latter identifies marijuana abusers while the MMM-P15 locates the reasons why they use marijuana (Lee et al., 2017; Matalí et al., 2018; Mezquita et al., 2019). On the other hand, the negative correlations between MMM-P15 and the life satisfaction construct showed a small but significant effect size, findings that are consistent with the theory since it is expected that marijuana use, whatever the reason for it, is strongly associated with avoidance behavior or management of some emotional discomfort that could translate into problems related to not being satisfied with life (Duarte et al., 2012; Lee et al., 2017; Matalí et al., 2018; Simons et al., 2005). Furthermore, the obtained AVE (AVE > .50) also supports the internal discriminant and convergent validity of the MMM-P15. Additionally, the correlations of the MMM-P15 factors with the original MMM version were high, which supports the use of the MMM-P15 as an adequate measure of marijuana use motives.

Then, in accordance with the need to use valid instruments that maintain the construct stable in different groups of the same sample, the analysis of structural invariance was carried out through the MIMIC procedure of both the brief and the extensive version. The findings are consistent with the previous study of Mezquita et al. (2019) in which the metric invariance hypothesis of their version is maintained. In the case of Mezquita et al. (2019), the CFA of the five correlated factors evidenced a CFI = .958, RMSEA of .047 which is very similar to MMM-P15 (CFI = .995, RMSEA = .058); however, the proposed MMM-P15 MIMIC model of MMM-P15 assumes the prior restrictions of metric invariance and tests for intercept invariance. Furthermore, the present study supports the hypothesis of invariant intercept proposed in the MIMIC model in both the short version and its extended counterpart, albeit with better fit indices in the short scale. From the above, it can be concluded that there is evidence for using both the short and long version of the instrument in both male and female populations.

Among the limitations of the study, it is noted that the manuscript developed is a non-probabilistic study; however, the aforementioned findings show a favorable outlook in subsequent versions that replicate it. Likewise, in health contexts it would be pertinent to have access to a clinical sample in which to support or question what was observed, even more so if it is considered that marijuana use is one of the main problems in health facilities in the Andean country. In addition, it should be noted that the short version of the MMM-P15 was carried out with the same sample as the MMM (N_2), so it is recommended that in the future short versions such as the MMM-P15 be evaluated in samples other than those considered in its long version.

As a final assessment, it is noted that the brief version has adequate psychometric properties related to latent structure, internal consistency, convergent and discriminant internal validity and structural invariance. Even its penta-factorial structure shows a better fit than the extended version and its internal consistency shows high values that would even allow the instrument to be used in clinical samples in which the most rigorous characteristics of the instrument are expected. Moreover, short instruments tend to be more versatile, especially when there is not enough time to apply an extended version, which is very frequent in clinical contexts. On the other hand, the MMM shows similar acceptable characteristics, although certain items have already been observed in the present and previous studies. In that sense, we agree with the reduced Hispanic version of Mezquita et al. (2019) and empirically support the use of the brief version of the MMM-P15 in Peruvian sample, which will allow subsequent studies to replicate the findings, especially in Latin American countries in which to date no validations of this instrument have been carried out despite the need for studies of this type; in addition, the MMM-P15 is an important contribution to the measurement of the motivations that explain the consumption of marijuana in users of both sexes in the Peruvian and Latin American context, a region in which there is a need for brief instruments with adequate psychometric properties that contribute to early detection and intervention for this worrying problem.

Conclusions

Among the conclusions, it should be noted that: 1) The MMM-P15 shows a factorial structure defined in five dimensions with items that contribute significantly to each one of them and shows greater parsimony than its extended version; moreover, the internal consistency coefficients support the precision of the instrument's measurement. Additionally, structural invariance supports the use of the MMM-P15 in male and female marijuana users. 2) Although the MMM also obtained similar psychometric properties to its reduced version, it has reported problems in some of its items.
However, as it is an extensive version, it brings with it difficulties for its application, even more so in healthcare contexts where attention time is short.

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References

Benschop, A., Liebregts, N., Van der Pol, P., Schaap, R., Buisman, R., Van Laar, M., Van den Brink, W., Graaf, R. & Korf, D. (2015). Reliability and validity of the Marijuana Motives Measure among young adult frequent cannabis users and associations with cannabis dependence. *Addictive Behaviors, 40*, 91-95. https://doi.org/10.1016/j.addbeh.2014.09.003.

Brown, T. (2015). *Confirmatory Factor Analysis for applied research*. Guilford Press.

Calderón-De la Cruz, G., Lozano, F., Cantuarias, A., & Ibarra, L. (2018). Validación de la Escala de Satisfacción con la Vida en trabajadores peruanos. *Liberabit, 24*(2), 249-264. https://doi.org/10.24265/liberabit.2018.v24n2.06

Carretero-Dios, H. & Pérez, C (2005). Norms to development and to review instrumental studies. *International Journal of Clinical and Health Psychology*, *5*(3), 521-551. Retrieved from: https://www.redalyc.org/pdf/337/33705307.pdf

Carretero-Dios, H. & Pérez, C (2007). Standards for the development and review of instrumental studies: Considerations about test selection in psychological research. *International Journal of Clinical and Health Psychology*, *7*(3), 863-862. Retrieved from: http://www.aepc.es/ijchp/carretero_es.pdf

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed). Erlbaum.

Cooper, M. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6*(2), 117–128. https://doi.org/10.1037/1040-3590.6.2.117

Díaz-Geada, A., Obradors-Rial, N., Baena, A., Teixidó-Compañó, E., Colillas-Malet, E., Mallah, N., Moure-Rodríguez, L., Caamaño-Isorna, F., & Barón-García, T. (2021). Contextual Determinants in Alcohol, Tobacco and Cannabis Consumption, Mood and Bullying during Adolescence. *International Journal of Environmental Research and Public Health, 18*, 8480. https://doi.org/10.3390/ijerph18168480

Diener, E., Emmons, R., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment,* 49, 71-75. https://doi.org/10.1207/s15327752jpa4901_13

Dominguez-Lara, S. (2018). Magnitud del efecto, una guía rápida. *Educación Médica*, *19*(4), 251-254. https://doi.org/10.1016/j.edumed.2017.07.002

Duarte, C., Varela, M., Salazar, I., Lema, L., & Tamayo, J. (2012). Motivaciones y recursos para el consumo de sustancias psicoactivas en universitarios. *Hacia la Promoción de la Salud*, *17*(1), 92 - 104. Retrieved from: http://www.scielo.org.co/pdf/hpsal/v17n1/v17n1a07.pdf

Elosua, P. & Zumbo, B. (2008). Coeficientes de fiabilidad para escalas de respuesta categórica ordenada. *Psicothema, 20*(4),896-901. Retrieved from: https://www.redalyc.org/articulo.oa?id=72720458

Ferrando, P. J. & Anguiano-Carrasco, C. (2010). El análisis factorial como técnica de investigación en psicología. *Papeles del psicólogo, 31*(1),18-33. Retrieved from: https://www.papelesdelpsicologo.es/pdf/1793.pdf

Ferrando, P. J. & Lorenzo-Seva, U. (2017). Program FACTOR at 10: Origins, development and future directions. *Psicothema 29*(2), 236-240 https://doi.org/ 10.7334/psicothema 2016.304

Garrison, E., Gilligan, C., Ladd, B. & Anderson, K. (2021). Social Anxiety, Cannabis Use Motives, and Social Context's Impact on Willingness to Use Cannabis. *International Journal of Environmental Research and Public Health, 18*, 4882. https://doi.org/10.3390/ijerph18094882

Genrich, G., Zeller, C. & Znoj, H. J. (2021). Interactions of protective behavioral strategies and cannabis use motives: An online survey among past-month users. *PLoS One, 16*(3), e0247387. https://doi.org/10.1371/journal.pone.0247387

Hair, J., Black, W., Babin, B., & Anderson, R. (2014). *Multivariate data analysis*. (7th Edition). Pearson.

Inter-American Drug Abuse Control Commission. (2019). *Informe sobre el consumo de drogas en las Américas*. Retrieved from: http://www.cicad.oas.org/oid/Informe%20sobre%20el%20consumo%20de%20dr ogas%20en%20las%20Am%C3%A9ricas%202019.pdf

Lee, C., Derefinko, K., Heather, D., Milich, R. & Lynam, D. (2017). Cross-lagged relations between motives and substance use: Can use strengthen your motivation over time? *Drug and Alcohol Dependence, 178*(1), 544-550. https://doi.org/10.1016/j.drugalcdep.2017.05.027

Legleye, S., Pontiek, D., Kraus, L., Morand, E. & Falissard, B. (2013). A validation of the Cannabis Abuse Screening Test (CAST) using a latent class analysis of the DSM-IV among adolescents. *International Journal Methods in Psychiatric Research*, *22*(1), 16–26. https://doi.org/10.1002/mpr.1378

Legleye, S. (2018). The Cannabis Abuse Screening Test and the DSM-5 in the general population: Optimal thresholds and underlying common structure using multiple factor analysis. *International Journal of Methods in Psychiatric Research*, *27*(2), e1597. https://doi.org/10.1002/mpr.1597

Legleye, S., Karila L., Beck F., & Reynaud, M. (2007). Validation of the CAST, a general population Cannabis Abuse Screening Test. *Journal of Substance Use, 12*(4), 233-242. https://doi.org/10.1080/14659890701476532

Lloret-Segura, S., Ferreres-Traver, A., Hernández-Baeza, A., & Tomas-Marco, I. (2014). El Análisis Factorial Exploratorio de los Ítems: una guía práctica, revisada y actualizada. *Anales de Psicología/Annals of Psychology, 30*(3), 1151-1169. https://dx.doi.org/10.6018/analesps.30.3.199361

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power Analysis and determination of sample size for covariance structure modeling of fit involving a particular measure of model. *Psychological Methods, 13*(2), 130–149. https://doi.apa.org/doi/10.1037/1082-989X.1.2.130

Malgady, R. (2007). How skewed are psychological data? A standardized index of effect size. *The Journal of General Psychology, 134*(3), 355-359. https://doi.org/10.3200/GENP.134.3.355-360

Matalí, J., Simons, J., Pardo, M., Lleras, M., Pérez, A. & Andión, O. (2018). Spanish version validation of the Marihuana Motives Measure in a drug-consuming adolescent sample. *Adicciones, 20*(10), 1-9. https://doi.org/10.20882/adicciones.947

Mezquita, L., Ruiz, L., Martínez, N., Ibáñez, M. & Generós, O. (2019). Development and Validation of the Marijuana Motives Measure Short Form. *Adicciones, 31*(2), 106-115. https://doi.org/10.20882/adicciones.979

Muñiz, J. & Fonseca-Pedrero, E. (2019). Diez pasos para la construcción de un test. *Psicothema, 31*(1), 7-16. https://doi.org/10.7334/psicothema2018.291

Muñiz, J., Elosua, P., & Hambleton, R. (2013). Directrices para la traducción y adaptación de los tests: segunda edición. *Psicothema, 25*(2), 151-157. https://doi.org/10.7334/psicothema2013.24.

Pons, X. (2008). Modelos interpretativos del consumo de drogas. *Polis, 4*(2), 157-186. Retrieved from: http://www.scielo.org.mx/pdf/polis/v4n2/v4n2a6.pdf

Rial, A., García-Couceiro, N., Gómez, P., Mallah, N., Varela, J., Flórez-Menéndez, G., & Isorna, M. (2022). Psychometric properties of CAST for early detection of problematic cannabis use in Spanish adolescents. *Addictive Behaviors*, *129*, 107288. https://doi.org/10.1016/j.addbeh.2022.107288

RStudio Team (2015). *RStudio: Integrated Development for R. RStudio*. Retrieved from: https://www.rstudio.com/

Sancho, P., Caycho-Rodríguez, T., Ventura-León, J., Tomás, J., & Reyes-Bossio, M. (2019). Does the Spanish version of the SWLS measure the same in Spain and Peru? *Revista Española de Geriatría y Gerontología, 54*(6), 329-333. doi.org/10.1016/j.regg.2019.04.003

Simons, J., Correia, C. & Carey, K. (2000). A comparison of motives for marijuana and alcohol use among experienced users. *Addictive Behaviors, 25*(1), 153-160. https://doi.org/10.1016/S0306-4603(98)00104-X

Simons, J., Correia, C., Carey, K. & Borsari, B. (1998). Validating a Five-Factor Marijuana Motives Measure: Relations with Use, Problems, and Alcohol Motives. *Journal of Counseling Psychology, 45*(3), 265-273. https://psycnet.apa.org/doi/10.1037/0022-0167.45.3.265

Simons, J., Gaher, R., Correia, C., Hansen, C. & Christopher, M. (2005). An Affective– Motivational Model of Marijuana and Alcohol Problems Among College Students. *Psychology of Addictive Behaviors, 19*(3), 326-334. https://psycnet.apa.org/doi/10.1037/0893-164X.19.3.326

Terwee, C. B., Bot, S. D., Boer, M. R. van der Windt, D. A., Knol, D. L., Dekker, J., Bouter, L. M., & de Vet, H. C. (2007). Quality criteria were proposed for measurement properties of health status questionnaires.

Journal of Clinical Epidemiology, 60(1), 34-42. https://doi.org/10.1016/j.jclinepi.2006.03.012

United Nations Office on Drugs and Crime. (2021a). *Informe Mundial sobre las Drogas 2021: los efectos de la pandemia aumentan los riesgos de las drogas, mientras los jóvenes subestiman los peligros del cannabis*. Retrieved from: https://www.unodc.org/peruandecuador/es/noticias/2021/informe-mundial-sobre- drogas-2021.html

United Nations Office on Drugs and Crime. (2021b). *Drug Market Trends: Cannabis Opioids*. https://www.unodc.org/res/wdr2021/field/WDR21_Booklet_3.pdf

Wu, M. L. (2013). *Questionnaire Statistical Analysis Practice-SPSS Operation and Application*. Chongqing University Press.

Zamora, B., Sirvent, C. & Palacios, L. (2005). Diferencias de género en la adicción e implicaciones terapéuticas. *Salud y Drogas*, *5*(2), 81-97. Retrieved from: http://www.redalyc.org/articulo.oa?id=83905205.