ORIGINAL

Factor Structure and Reliability of MOS Social Support Survey among Mexican Women with Breast Cancer

Estructura Factorial y Confiabilidad de la Escala MOS de Apoyo Social en Mujeres Mexicanas con Cáncer de Mama

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Abstract

Background: Social Support (SS) has been an important variable to consider in the psychosocial understanding of patients with cancer. Objective: To test the 3-factor model for the Medical Outcomes Study Social Support Survey (MOS SSS) and estimate its internal consistency reliability in Mexican women with Breast Cancer (BC). Method: 300 women diagnosed with BC were enrolled in a convenience sampling. Participants were asked to complete the Spanish version of the MOS SSS (Argentina). After the approval of the Ethics and Research Review Board of Instituto Nacional de Cancerología, the Mexican adaptation was created through three phases: 1) linguistically adaptation; 2) presentation of the corrected and integrated version to another expert, and 3) pilot study. Results: The MOS SSS obtained a factorial structure with 13 items distributed among three factors. A high internal consistency (Alpha=0.912) and an acceptable explained-variance value (67%) were obtained; finally, the confirmatory analysis determined a proper adjustment with that structure. Conclusions: This instrument has adequate psychometric properties and is useful for evaluation and culturally appropriate to the clinical management of SS.

Keywords: **Breast Cancer, Female, Social Support, Psychometrics, Social Networks, Surveys, Mexico.**

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Resumen

Antecedentes: el apoyo social (AS) ha sido una variable importante a considerar en la comprensión psicosocial de los pacientes con cáncer. Objetivo: evaluar el modelo de 3 factores de la escala de apoyo social MOS (*Medical Outcomes Study Social Support Survey*, MOS SSS) en mujeres mexicanas con cáncer de mama (CaMa). Método: 300 pacientes con diagnóstico de cáncer de mama aceptaron participar en el estudio a través de un muestreo por conveniencia, en el que se les pidió que contestaran la versión de la escala de AS MOS en español (Argentina). Después de la aprobación de los comités de ética e investigación del Instituto Nacional de Cancerología, la adaptación mexicana se realizó por fases: 1) adaptación lingüística, presentación de la versión integrada y corregida a expertos y estudio piloto. Resultados: la versión de MOS en español de México obtuvo una estructura factorial con 13 ítems distribuidos entre los tres factores. La consistencia interna (Alpha=0.912) y la varianza explicada fueron aceptables (67%). Finalmente, el análisis confirmatorio determinó una estructura con un ajuste apropiado. Conclusiones: El instrumento obtenido mostró propiedades psicométricas adecuadas y útiles para la evaluación y el manejo clínico culturalmente apropiado del AS.

Palabras Clave: Cáncer de Mama, Mujeres, Apoyo Social, Psicometría, Tamaño de la Red Social, México.

Breast Cancer (BC) represents a worldwide public health problem (Sánchez, Sánchez, & Erazo, 2015) and Mexico is no exception. BC is the leading cause of death, the annual incidence estimated for BC is approximately 204 per 100,000 cases, with an estimated mortality of 14.2% (Ferlay et al., 2019).

In patients with BC with clinically advanced stages, high levels of social support (SS) have associated with decreased levels of anxiety and depression (Cousson-Gelie, Bruchon-Schweitzer, Dilhuydy, & Jutand, 2007; Jatoi et al., 2016; Kim et al., 2016; Koopman, Hermanson, Diamond, Angell, & Spiegel, 1998; Ng et al., 2015; Suwankhong & Liamputtong, 2016). Furthermore, it has been determined that SS influences the patient's psychosocial adjustment to the disease (Rizalar, Ozbas, Akyolcu, & Gungor, 2014). Moreover, research has identified that in the survival phase, increased levels of SS was associated with a better quality of life (Cheng, Sit, Chan, So, Choi, & Cheng, 2013; Huang & Hsu, 2013; Sammarco & Konecny, 2008).

SS has been described as a resource that can assist or comfort individuals who must confront cancer's negative consequences or stressful situations in the health–disease process (Kim, Lee, & Kang, 2016; Sherbourne & Stewart, 1991). SS refers to an essential function of social interaction, which is defined as the perception of support by which patients can be supported by their family and social networks (Sherbourne & Stewart, 1991).

One of the most used psychometric instruments that evaluate SS in patients with chronic diseases is the Medical Outcomes Study Social Support Survey (MOS-SSS) (Sherbourne & Stewart, 1991). This instrument stands out because it was created within a hospital context, maintaining the advantages of shortness and simplicity.

A functional SS conceptual framework guided the original version. This model assumes that interpersonal relationships provide particular functions (Sherbourne & Stewart, 1991). Several components of MOSS-SSS, although named differently, converge on a common set of dimensions: affective, informational, instrumental (or material) (Sherbourne & Stewart, 1991). These factors were found highly correlated, as would be expected if they represent the dimension of a common higher-order factor; however, results from the multitrait and confirmatory factor analyses supported the scoring of subscales. Therefore, there is a unique variance in each social subscale, and, results also supported the construction of an overall index that combines 19 items (Sherbourne & Stewart, 1991).

The current version has been validated and adapted to diverse languages and cultures (Spanish and

English), and in distinct Latin-American populations—Argentina, Colombia, Brazil, and Chile—as well as in patients with chronic diseases (HIV-AIDS, different types of neoplasms [among these BC]), obtaining consistent results with the original version regarding its internal consistency and validity (Ashing-Giwa & Rosales, 2013; Baca, 2016; Costa, Salamero, & Gil 2007; Gómez-Campelo, Pérez-Moreno, de Burgos-Lunar, Bragado-Álvarez, Jiménez-García, & Salinero-Fort, 2014; Martínez et al., 2017).

Particularly, despite the good psychometric properties of the versions in Spanish, there are still diverse versions on the factorial structure and the item's amount. For instance, the version from Colombia (general population), California and Spain (BC patients) has four factors with 19 items; all versions showed overall reliability from .96 to-94 and explained variance 64-81% (Baca, 2016; Gómez-Campelo et al., 2014; Londoño et al., 2012). In contrast, the Mexican version in HIV and the Argentine in general population obtained two and three factors, respectively, with 18 items. The reliability indicators showed .91 and 97; explained variance from 59.8-72%, respectively (Martínez, Sánchez, Aguilar, & Rodríguez, 2014; Rodríguez-Espínola & Enrique, 2007).

Considering that patient population and cross-cultural issues may affect the psychometric properties of an instrument and based on the epidemiological trend of BC in Mexican women as a growing cancer public health issue, and on the known impact that SS has on the health–disease process, it is relevant and useful to evaluate the two psychometric properties of the MOS SSS (Sherbourne & Stewart, 1991) exclusively on Mexican patients with BC. The objectives of this study were to test the 3-factor model proposed for Spanish-Argentine version of the MOS SSS (Rodríguez-Espínola & Enrique, 2007) and estimate its internal consistency reliability and of its factors.

Method

Participants

Women diagnosed with BC, older than 18 years, and who were receiving medical care at the Instituto Nacional de Cancerología (INCan) in Mexico City, were included in this study by a convenience sampling. The calculation was done by including five patients for each of the 20 items of the survey's original version (Nunnally & Bernstein, 1994). The following inclusion criteria were considered: patients with BC diagnosis, who knew how to read and write in Spanish. We eliminated patients who did not respond to >10% of the items of the instrument.

Instrument

The Spanish-Argentine version of the MOS SSS (Rodríguez-Espínola & Enrique, 2007) was used for the Spanish-Mexican adaptation, with 19 items grouped into three factors in terms of the SS functionality: (a) emotional/informational support (EIS), which integrates guideline and feedback on possible solutions to the individual's problems, care, empathy, and love; (b) affection support (AS), which entails companionship, and (c) instrumental support (IS), which refers to a tangible support. The instrument contains an additional item that evaluates the network size.

The Spanish-Argentine version had an internal consistency of 0.919 Cronbach's alpha coefficient and explained 59.86% of the total variance. This version was selected because it has the most similar factorial structure to the original, and their use of the Spanish language matched to Spanish-Mexican.

Procedure

After the protocol was approved by The Ethics and Research Review Board of the INCan (015/018IBI) (CEI/968/15), we proceeded to the survey's adaptation to the Mexican population and language, according to standardized procedures (Cull, Sprangers, Bjordal, Aaronson, West, & Bottomley, 2002). The adaptation process consisted of three phases: 1) two experts evaluated the original content for linguistically adaptation; 2) presentation of the corrected and integrated version to another expert, who examined the differences between versions and integrated them

in one version; 3) The version obtained was pilot-tested in 10 patients with characteristics of the target population. The patients were surveyed about each item's clarity, their understanding of words, and the complexity of the item. Based on the results, the final version was elaborated.

Potentially eligible patients were identified and given a verbal explanation of the study's objectives and data confidentiality. Those who agreed to participate were asked to provide their written informed consent. Due to the low literacy of most Mexican cancer patients and to maximize standardization, the scale was administered by a trained research psychologist in a face-to-face interview in a private office (Doubova, Aguirre-Hernandez, Gutiérrez-de la Barrera, Infante-Castañeda, & Pérez-Cuevas, 2015; Gálvez-Hernández et al., in press). The research psychologist recorded participants' responses for each item of the final version of the survey and ensured that each application was completed. In case of missing data, the application was removed from the analysis. All personal data was kept private and confidential.

To validate this version, four analysis were performed: 1) an independent samples t-test to determine item discrimination property; 2) the reliability of the scale was evaluated by Cronbach's alpha coefficient; 3) the factorial validity was evaluated using principal components factor analysis (Exploratory Factor Analysis —EFA—). The principal components factor analysis was selected in order to continue the statistical analyses used in previous validations (Baca, 2016; Rodríguez-Espínola & Enrique, 2007; Sherbourne & Stewart, 1991), and according to Costello and Osborne (2005) this factor analysis is an appropriate procedure when variable is non-normal distributed. The criteria for factor validity was a group with less than three items for confirmation of a factor (Nunnally & Bernstein, 1994); 4) a Confirmatory Factor Analysis (CFA) was performed to empirically review if the structure obtained in the EFA could be verified in the MOS-SSS among Mexican BC patients.

Latent variables' variance loading was set at 1.0. Variances of error terms were specified as free parameters, and maximum likelihood estimation methods were used. Goodness-of-fit (GFI) was evaluated using the goodness-of-fit statistics of the chi-square test and fit indexes as follows: Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index-Non-Normed Fit Index (TL-INNFI). The greater the probability associated with the chi-square test, the closer the fit between the model and the perfect fit; values of 0.06 for RMSEA and of 0.90 for CFI and TLINNFI are indicative of good fit between the hypothesized model and the observed data (Jackson, Gillaspy, & Purc-Stephenson, 2009). Additionality Average Variance Extracted (AVE) and McDonald´s Coefficient Omega were estimated in order to identify the instrument convergent validity. Adequate convergent validity was accepted when we observed a AVE >0.50 and a Coefficient Omega >0.70 (Borsboom, Mellenbergh, & van Heerden, 2004).

Based on the level of literacy of the patients, it was tested as a short version of the instrument. Another EFA was performed, item's elimination was established in three criteria: 1) factor loading needed to be <0.40; 2) or a group with less than three items for confirmation of a factor (Nunally & Berstain, 1994), and 3) items attributed to 2 factors were removed. In case all criteria were met, in terms of explained variance and CFA index, this version would be maintained.

A p value of 0.05 or less than was adopted as the significance level in all of the statistical analyses, and all p values reported are two-tailed. All statistical procedures were conducted using the SPSS 22.0 J version software for Windows.

Results

Patients' Characteristics

A total of 330 women with BC were invited from June 2015 to August 2016, 300 consented to participate; 20 (6%) refused to participate; 10 (3%) patients were removed because they were repeated (in database) or did not provide evaluable forms. The mean age was 50 years (SD=10.4 years). More than one-half of the patients were married and had finished secondary school. A total of 44% of these patients reported not

having an occupation. The majority were Catholic (84%) (see Table 1).

Nearly 70% of the sample was found in clinical stages II–III; 51% were under active treatment, and 28% under surveillance. A total of 24% of the sample had undergone multidisciplinary cancer treatment, mainly (40%) surgery and chemotherapy (Table 2).

Psychometric analysis

Before initiating the analyses, item 1 was excluded from all the validation tests because its format and objective are not found in the remainder of the items. The remainder of the items demonstrated adequate distribution among the response options (asymmetry <2). All the items exhibited the capacity to discriminate between the extreme scoring groups; they were retained for subsequent analyses.

A principal axis factoring EFA with oblimin rotation was performed with the 19 items (Item 1 was excluded). This analysis showed a KMO=.910 with significant Bartlett's sphericity test (p=.000) that indicated the non-identity of the correlation's matrix and an adequate sample size. The factorial structure explained 56.07% of the total explained variance that was distributed in three factors. High internal consistency showed a Cronbach's alpha coefficient = 0.938.

The CFA showed non-normal multivariate distribution with a c.r. kurtosis > 2.0. The CFA of the 19 items version showed good adjustment, as indicated

Table 1
Sociodemographic characteristics of Mexican patients with Breast Cancer (BC): Medical Outcome Survey (MOS) N=300

Age (years)	Mean = 50.47 (range, 25–82 years)	
	Frequency	Percentage (%)
Marital status		
Single	71	23.7
Married	170	56.7
Divorced	39	13.0
Widowed	20	6.7
Education level		
No formal education	10	3.3
Primary	81	27.0
Secondary	67	22.3
High school	91	30.4
Undergraduate degree	49	16.3
Post-graduate degree	2	0.7
Occupation		
None	132	44.0
Homemaker	66	22.0
Employee	59	19.7
Self-employed	25	8.3
Other	18	6.0
Religion		
None	9	3.0
Catholic	262	87.3
Christian	19	6.3
Other	10	3.3

Table 2
Clinical characteristics of Mexican patients with Breast Cancer (BC): Medical Outcomes Study Social Support Survey

N = 300	Frequency	Percentage (%)
Clinical stage		
0	16	5.4
I	11	3.6
II	105	35
III	110	37
IV	36	12
Not staged yet	22	7.3
Status		
Under active treatment	154	51
Active surveillance	108	36
Palliative care	20	6.7
Recurrence	13	4.3
Under selection process	5	1.7
Treatment*		
Only one treatment (Surgery, Chemotherapy)	54	18
Surgery	186	62
Chemotherapy	189	63
Radiotherapy	129	43
Hormonotherapy	86	28

by the following values: CMIN/df = 2.964 p = 0.000; NFI = 0.884; RFI = 0.869; CFI = 0.919, and RMSEA = 0.081, with a 95% confidence interval (95% CI) between 0.072 and 0.090 (Table 3). The convergent validity was acceptable, the AVE values for each factor were 0.57, 0.43, and 0.54 respectively; the McDonald's Omega Coefficients were 0.82 for the factor 1, 0.80 for the factor 2, and 0.74 for the factor 3.

To evaluate discriminative validity, correlation between factors were estimated. Analyses showed F1 - F2 (r=0.846, p<0.01), F1 - F3 (r=0.498, p<0.01), and F2 - F3 (r=0.561, p>0.01). Correlations between factors were lower EVA square root, therefore factors 2 and 3 showed adequate discriminative validity.

A factorial structure with 13 final items, distributed in three factors, was obtained from the evaluation of the short version. This structure explained 57% of the total explained variance, which is distributed uniformly among the factors. Additionally, high internal consistency is exhibited through Cronbach's alpha coefficient = 0.912. Compared to the original structure, the items 3,8,14 and 19 were eliminated from the EIS. From the AF, we discarded the Item 2; and, from the IS, we dispensed Item 11. Item 7 and 8, deriving from the EIS, were incorporated into the AF (Table 4).

The CFA of the short version, the model obtained showed slightly better adjustment, as indicated by the following values: CMIN/df = 2.259, p = 0.000; NFI = 0.934; RFI = 0.911; CFI = 0.961, and RMSEA = 0.065, with a 95% confidence interval (95% CI) between 0.051 and 0.079 (Table 3 and Figure 1). The convergent validity was adequate because the AVE values for each factor were 0.69, 0.55, and 0.55 respectively; and the McDonald's Omega Coefficients were 0.82 for the factor 1, 0.77 for the factor 2, and 0.63 for the factor 3.

In order to evaluate discriminative validity, correlation between factors were estimated. Analyses showed F1 - F2 (r=0.468, p<0.01), F1 - F3 (r=0.468, p<0.01), and F2 - F3 (r=0.718, p>0.01). Correlations between factors were lower EVA square root, therefore factors showed adequate discriminative validity.

The item 1 (which evaluates the size of the social network) demonstrated a mean of 11.13 (SD = 10.21) with a range of 1–60. This item demonstrated a positive correlation in terms of the obtained scores in the EIS —Factor 1— (r = 0.277; p <0.001); AS —Factor 2— (r = 0.227; p <0.000); IS —Factor 3— (r = 0.182; p = 0.002), and the total of the score (r = 0.280; p <0.000). In addition, it discriminated among the extremes of the total scores obtained (t = –13.147; gl = 89; p <0.001). For these reasons, we decided to retain the item in the structure of the survey as an independent component that contributes to the understanding of SS.

In sum, the Mexican version of the MOS SSS for BC obtained two factorial structures with good adjustment: a large (19 item) and a short version (13 items), both distributed among three factors: (a) EIS; (b) IS, and (c) AS, plus one item that evaluates the size of the patient's SS network (Figure 1).

Additionally, we found (in standardized score) that patients with BC reported that AS was the highest perceived support (M=87.23; SD=19.19), followed by IS (M=80; SD=24.62); EIS was the lowest factor (M=79.75; SD=25.19).

Table 3
Variance, means, and Cronbach's alpha coefficients of short and large version of the instrument (n = 300)

Factors	Explained variance		Mean (SD)		Cronbach's alpha		*p*	
Version	S	L	S	L	S	L	S	L
Factor 1	22.6	22.3	25.44	29.59	0.888	0.902	<.001	<.001
Factor 2	20.26	19.67	22.45	30.92	0.854	0.883	<.001	<.001
Factor 3	14.56	14.02	12.62	17.02	0.768	0.776	<.001	<.001
Total	**57.00**	**56.07**	**60.51**	**81.86**	**0.912**	**0.938**	**<.001**	**<.001**

Table 4
Distribution of the items of the factorial analysis with Oblimin rotation of the Spanish Mexican version of MOS-SSS: Short and large version

Item	Items	Factor		
		1	2	3
	Factor 1. Emotional-Informational			
17	Turn to for suggestions	0.767	0.264	0.243
16	Share worries with	0.754	0.283	0.248
9	Confide in	0.707	0.31	0.135
4	Give you good advice	0.643	0.409	0.084
13	Give advice you really want	0.545	0.399	0.285
3	Listen to you	0.461	0.348	0.24
11	*Get together with your relaxation*	*0.474*	*-.059*	*-.383*
8	*Help you understand a situation*	*.443*	*-.040*	*-.305*
	Factor 2. Affection			
7	Have a good time with	0.313	0.694	0.13
18	Do something enjoyable with	0.369	0.669	0.132
10	Hug you	0.319	0.662	0.246
6	Show love and affection	0.255	0.6	0.319
20	Love you	0.31	0.558	0.281
14	*Help you get your mind off things*	*.210*	*-.522*	*.081*
19	*Understand your problems*	*.252*	*-.489*	*.167*
13	*Advice you really want*	*.357*	*-.408*	*.064*
	Factor 3. Tangible			
12	Prepare meals	0.156	0.171	0.844
15	Help with daily chores	0.151	0.147	0.688
5	Take to doctor	0.199	0.231	0.541
2	*If you were confined to bed*	*.073*	*-.067*	*.540*

Discussion

The objectives of this study were to test the 3-factor model proposed for Spanish-Argentine version of the MOS SSS (Rodríguez-Espínola & Enrique, 2007) and estimate its internal consistency reliability and of its factors.

This study evaluates the classic MOS-SSS, which comprises 19 self-administered, and a short version for reducing participant burden (Gómez-Campelo et al., 2014) and for adaptation to Mexican patients with BC, who have low levels of literacy.

The three-factor structure of both versions of the MOS-SSS in Mexican women with BC are similar to the results in the Spanish-language version samples of healthy participants and patients with BC, as well as in Latin-American samples, such as the Colombian, Argentinian, Brazilian, and Peruvian ones, and even with samples of immigrant Mexican women residing in the U.S. (these include healthy participants and patients with BC) (Ashing-Giwa & Rosales, 2013; Baca, 2016; Costa et al., 2007; Londoño et al., 2012; Rodríguez-Espínola & Enrique, 2007; Soares et al., 2012). This factorial structure has been considered fundamental for capturing SS (Londoño et al., 2012).

Similar to other versions of MOS-SSS, the positive social companionship factor (included in the original version) was eliminated (Sherbourne & Stewart, 1991), possibly because these experiences do not apply for these specific populations (e.g., understanding of the problems and share private worries and fears) or because these items are redundant in terms of the affective result they represent (love and affection and hugs).

Because of the similarities of the large version to the previous versions, it is the short one which we are interested to analyze. This version highlights its internal factorial structure. For instance, the EIS factor resulting has fewer items compared to versions of patients with BC and healthy participants (Ashing-Giwa & Rosales, 2013; Baca, 2016; Costa et al., 2007; Martínez et al., 2014; Sherbourne & Stewart, 1991). This condition could imply that SS includes sharing concerns and fears and receiving advice for Mexican patients with BC.

In comparison with the original scale, Items 3, 8, and 19 were not included (listen to you, give information and understand your problems). It is possible that this occurs because patients perceive that these activities correspond to healthcare professionals to a greater extent than to relatives and friends (Costa et al., 2016).

The IS factor was the shortest eliminating the Item Help if confined to bed, which is consistent with

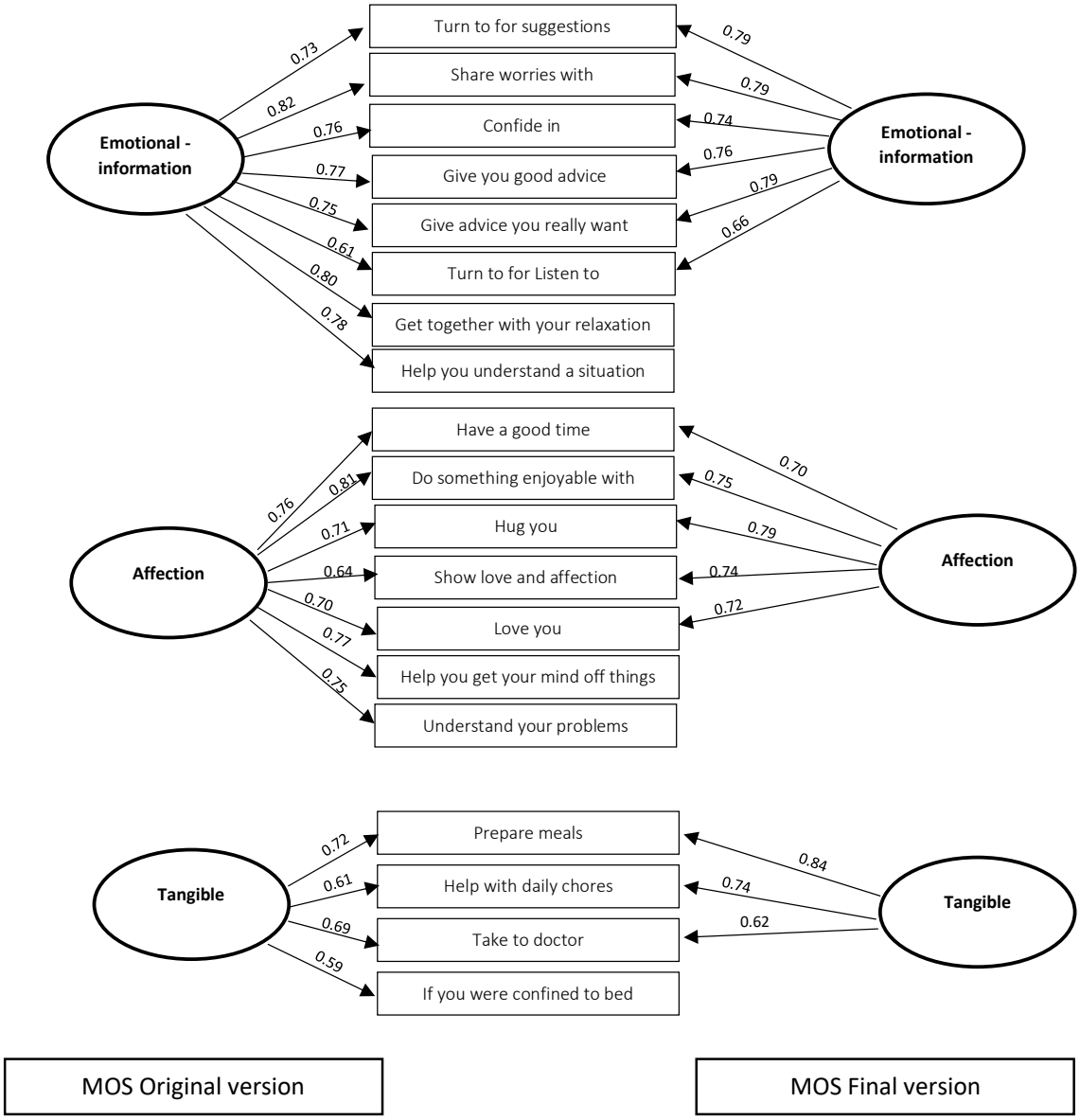

Figure 1. Original Model of three correlated factor model and final model of three correlated-factor model. Both were estimated by Maximum Likelihood in the sample of 300 participants.

Mexican version of patients with HIV (Martínez et al., 2014). A possible explanation is that most patients with BC receive ambulatory treatment and have few hospitalizations, therefore, they do not need support in this area (Cantero-Ronquillo, Mederos-Curbelo, Romero-Díaz, & Barrera-Ortega, 2007).

The obtained structure of the AS factor, observed in other validations in Spanish, could mean that for these populations this support includes love, affection, and hugs, opportunities to enjoy happy moments, to have fun, and to feel loved. These results indicate that positive social companionship is conceived as part of an affective act, perceived as a sign of love and empathy (Revilla-Ahumada, Luna-del Castillo, Bailón-Muñoz, & Medina-Moruno, 2005) and is associated with the resulting emotion.

The sample from a sole cancer care center can give rise to a bias in the data. However, INCan has patients from several cities of the country. Besides, the non-probabilistic sampling could be a limitation, therefore, the findings obtained by inferential statistics could be considered cautiously.

The advantage of the instrument is that its factorial structure allows evaluation of SS in conjunction with and graduating it in three of its main functions, thus evaluating network size, which has been found to be a significant indicator of SS to these patients with BC.

The importance of this study lies in providing two Spanish-Mexican versions of MOS-SSS for patients with BC, one for its application in clinical scenarios (short one), and the other (classic version) for its contribution to the understanding of the psychosocial variables that influence the BC phenomenon, as a research tool (being comparable with previous versions).

The short version highlights, despite the number of survey items, because it preserves the adequate psychometric properties (explained variance and reliability) and it is more practical for daily use. These qualities facilitate a sensitive identification for psychological intervention (Huang & Hsu, 2013; Kim et al., 2016; Rizalar et al., 2014) for these patients.

In conclusion, obtaining the suitable psychometric properties of a particular culture is necessary and provides an instrument that allows the clinical and research application for this population, this supports that when SS manifests itself in a culturally appropriate approach, the psychological results improve (Wong & Lu, 2017).

In future studies, the implementation of the instrument in other health centers will help to achieve a more representative version of the sample; it will also be very beneficial to obtain temporal reliability, construction validity, convergent-discriminatory validity or concurrent and predictive validity. Besides, the determination of the scoring and interpretation norm of the test will improve the clinical use of this instrument for patients with BC.

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