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Psychometric analysis of the sexual machismo scale in university students

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Abstract--The psychometric analysis of the sexual machismo scale in the Peruvian context was carried out by employing confirmatory factor analysis in a sample of 2470 university students from a public university in the city of Arequipa. The sample consisted of 1235 randomly selected males and 1235 randomly selected females. The 12-item Sexual Machismo Scale, which has been previously developed and validated in other contexts, was used. The results indicate a

unidimensional factor structure and that there are minimal differences in the factor structure of the scale for female and male students. In addition, both factor structures present adequate goodness-of-fit indices. Likewise, McDonald's Omega coefficient showed high-reliability indices for the total scale. It is concluded that the scale shows adequate validity and reliability indicators for the measurement of sexual machismo in university students in the Peruvian context.

Keywords--Sexual machismo, Psychometrics, College students, Validity and reliability.

Introduction

Machismo is a naturalized social problem especially in the Latin American context (Mejía *et al.*, 2021), in addition, machismo is expressed as a form of sexism, highlighting the ideas, beliefs and perspectives of the role played by men in their social space (Vilet & Galán, 2021). According to the analyzed bibliography of personality theory, masculinity and ambivalent sexism, socially discriminated men may have macho responses to confront and empower their masculinity, however, the constructs have been unreliable due to the lack of concordance between sex and masculine or feminine characteristics (Hendy *et al.*, 2022). Likewise, the belief that men are superior to women can lead to risky behaviors in sexual health and integral wellbeing, so machismo is based on cultural institutions such as the family. In addition, machismo is a form of violence against women, making a distinction between the rights and duties of men and women (Silva *et al.*, 2020; Stephens *et al.*, 2017).

Therefore, sexual machismo is the result of machismo and hostile sexism, identified by inappropriate sexual beliefs, attitudes and behaviors in people who may lack responsibility, discipline and social order (Sánchez *et al.*, 2020). Research related to the study of sexual machismo in university students reports that Peruvian students present high machista attitudes with some type of emotional maladjustment, anger control problems, and violent behaviors that put their partners at risk, in addition, sexual machismo was associated with the consumption of psychoactive substances, mainly alcohol, tobacco and/or illegal drugs. It was also related to religion, with non-believers having high scores for sexual machismo; in addition, age is an intervening factor that explains that machismo is accentuated at an older age and that university women are the ones who reject sexual machismo, evidencing the acute social problem that this represents for Peruvian society (Mamani *et al.*, 2020; Mejía *et al.*, 2019; Huerta *et al.*, 2021; Ceballos *et al.*, 2022).

Regarding the validation of instruments intended to measure sexual machismo, some prominent authors adapted the inventory of ambivalent sexism (Lemus *et al.*, 2008). In Chile, Cárdenas *et al.* (2010) adapted and validated the inventory of ambivalent sexism in university students. In Mexico, the masculinity-femininity inventory (IMAFE) was taken as a reference to measure femininity, masculinity, machismo and submissiveness based on personality traits; however, Montalvo

and García (2007) constructed the instrument to measure machismo in men of middle socioeconomic status. Díaz *et al.* (2010) created the sexual machismo scale (EMS), to evaluate, in men and women, the level of machismo/sexism (sexual health risk behaviors).

In this sense, most studies sought to validate and construct an instrument to measure sexism through a significant process; however, for the Peruvian context in the Arequipa Region, the validation of an instrument that measures attitudes related to sexual machismo in university students has not been identified, the most relevant of which are highlighted below. Rottenbacher (2010) conducted a quantitative correlational study on ambivalent sexism, male paternalism and political ideology using the right-wing authoritarianism scale (RWA), social dominance orientation scale (SDO), as well as the ambivalent sexism questionnaire. Guillen (2014) constructed the street sexual harassment questionnaire within his study applied the ambivalent sexism questionnaire. As can be seen, one of the limitations in the study of macho sexual attitudes in the Peruvian population is the absence of valid and reliable evaluation instruments. Therefore, it was proposed to analyze the psychometric properties of the sexual machismo scale in Peruvian university students.

Methodology

The instrumental study analyzes the psychometric properties of a measurement instrument.

Participants

The sample consisted of 3004 students from a public university in the city of Arequipa, chosen randomly. Of these, 1235 students were male (42.2%) and 1769 students were female (58.9%). To have equivalent samples, all males were considered and the sample of females was randomized, while the final sample of the study consisted of 1235 male students and 1235 female students ($n=2470$). The age range for both males and females was 16 to 30 years, the age of the students in general presents ($M= 20.24$, $SD= 2.48$), for males ($M= 20.53$, $SD= 2.64$) and for females ($M= 19.95$, $SD= 2.27$). 72.1% are from the area of social sciences and 27.9% are from the area of engineering.

Instruments

The Sexual Machismo Scale (EMS-Sexismo-12) by Díaz *et al.* (2010) was applied, the scale consists of 12 items with Likert scale type scores, from 1 (strongly disagree) to 5 (strongly agree), the original instrument consisted of 24 items, which was subjected to PFA with the principal components method and varimax rotation, providing a unidimensional scale of 12 items. This scale was subjected to a CFA, where the variance explained for machismo in the CFA was 98.1% and acceptable goodness-of-fit statistics were found.

Procedure

For the application of the instrument, the scale was adapted to the google forms format, then the instrument was applied individually to the students through social networks and emails after informing them of the objective of the research, the instructions of the scale and the confidentiality of the data provided, accepting to participate voluntarily (admitting the respective informed consent).

Data analysis

The data were subjected to confirmatory factor analysis with the SPSS 25 statistical program. The maximum likelihood (ML) method was used (López-Aguado & Gutiérrez-Provecho, 2019) since the assumption of multivariate normality was met, i.e., the univariate skewness and kurtosis indices are not excessively high (Skewness less than 2 and kurtosis less than 7 in absolute value). In that sense, it is indicated that ML can be used since it is a robust method for small deviations from normality. Likewise, the authors Díaz *et al.* (2010) indicate that there are differences between men and women, and that variance is evident when analyzing the tau-equivalent models. Therefore, a scale is invariant when the relationships between items and constructs are identical for the groups being compared (in the study there are minimal differences). The model was verified through goodness-of-fit measures. It was proposed to use the criterion $\chi^2/df < 2$ or $\chi^2/df < 5$ as a measure of fit. The Goodness of Fit Index (GFI) and the Comparative Fit Index (CFI) where values above .90 indicate a good fit. The root means square error of approximation (RMSEA), where values up to .08 indicate reasonable fit (Lopez, 2019). Finally, reliability was estimated using the Omega (ω) (Ventura-León & Caycho-Rodríguez, 2017).

Results

Table 1 presents the descriptive analysis of the items, finding high and dispersed arithmetic means in items 2, 4, 11 and 12. It is observed that item 7 ($M= 1.77$), and item 6 ($M= 1.55$) are low and dispersed. The descriptive statistics show that none of the items presents high values of skewness and kurtosis, considering that values within the threshold ± 1.5 indicate slight variations from normal (Sagaró & Zamora, 2020) so that the distributions are not excessively non-normal.

Table 1
Item analysis

	M	95% IC	σ	g_1	g_2
Item 1	1.99	1.944, 2.031	1.218	.957	.198
Item 2	2.05	2.008, 2.092	1.144	.813	-.075
Item 3	1.89	1.847, 1.926	1.001	1.035	.594
Item 4	2.10	2.056, 2.143	1.232	.751	-.174
Item 5	1.67	1.633, 1.712	.979	1.470	1.574
Item 6	1.55	1.517, 1.592	.903	1.911	3.298
Item 7	1.77	1.726, 1.809	1.104	1.282	.889
Item 8	1.72	1.680, 1.762	1.069	1.471	1.521
Item 9	1.65	1.612, 1.690	.988	1.591	1.969

Item 10	1.87	1.833, 1.917	1.130	1.139	.619
Item 11	2.39	2.350, 2.437	1.222	.255	-.636
Item 12	2.05	2.004, 2.092	1.258	.768	-.304

Note: n = 2470; M= Median; 95% IC= Confidence Interval at 95%; σ = Variance; g_1 = Asymmetry; g_2 = Kurtosis

Two factorial structures were modeled in the female sex (Table 2), model 1, with eight items and model 2 with nine items. The CFA does not confirm the theoretical model proposed by the authors, since items 2, 3, 7 and 11 were eliminated from model 1. From model 2, items 3, 7 and 11 were eliminated. Item 3, referring to “only the man has sexual experience”, item 7 “The man needs to have several sexual partners” and item 11 “The man should begin his sexual life in adolescence”, these items are eliminated because they probably refer only to the male sex and since this scale was also answered by women, these items saturate the model. Likewise, of the two models proposed in the university students, model 1 is the one that best meets the goodness of fit, whose values are: (S-B χ^2 (20) = 105.918, $p < .05$; S-B χ^2/gf = 5.29; GFI= .978; CFI= .976; RMSEA=.059 [.048, .070]; AIC= 137.918).

Table 2
Statistical fit indices of 2 models of the Sexual Machismo Scale (EMS-Sexismo-12) in female university students (N= 1235)

Women	Items of each model	χ^2 (gl)	χ^2/gf	GFI	CFI	RMSEA [IC 90%]	AIC
Model 1	1,4,5,6,8,9,10,12	105.918 (20)	5.29	.978	.976	.059 (.048, .070)	137.918
Model 2	1,2,4,5,6,8,9,10,12	128.562 (26)	4.95	.977	.974	.057 (.047, .066)	166.652

Note: GFI= Goodness of fit index; CFI= Comparative Fit Index; RMSEA= Root Mean Square Error of Approximation; AIC= Akaike's Information Criteria.

Figure 1 shows that the factor loadings of model 1 in the university students are greater than .46 and the omega coefficient is .86. The results confirm the eight-item model (Model 1) and to accept the reliability through the omega coefficient, these are between .70 and .90 (Ventura-León & Caycho-Rodríguez, 2017).

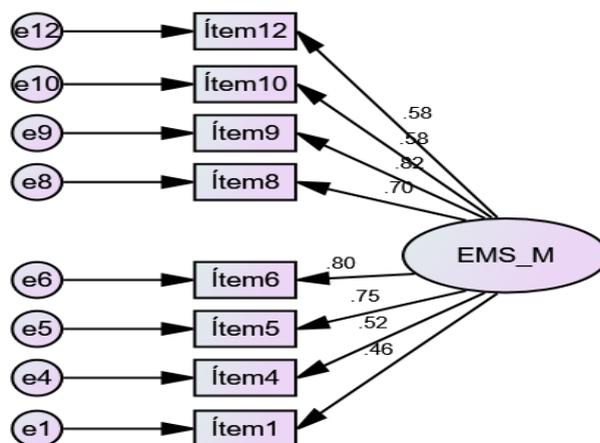


Figure 1. Confirmatory factor analysis of the Sexual Machismo scale (EMS-Sexismo-12) in university students

Likewise, two factorial structures were modeled in the male sex (Table 3), model 1, with 10 items and model 2 with eight items. The CFA does not confirm the theoretical model proposed by the authors, since items 6 and 7 of model 1 and items 3, 6, 7 and 11 of model 2 were eliminated. Item 3, referring to “only the man has sexual experience”, item 6 “A woman should accept the infidelities of her partner”, item 7 “The man needs to have several sexual partners” and item 11 “The man should initiate his sexual life in adolescence”, these items are eliminated because they saturate the model. Of the two models proposed in the university students, model 2 is the one that best meets the goodness of fit, whose values are: (S-B χ^2 (18) = 90.168, $p < .05$; S-B χ^2 /gl= 5.01; GFI= .983; CFI= .978; RMSEA=.057 [.046, .069]; AIC= 126.168).

Table 3
Statistical fit indices of 2 models of the Sexual Machismo Scale (EMS-Sexismo-12) in university students (N= 1235)

Males	Items of each model	χ^2 (gl)	χ^2 /gl	GFI	CFI	RMSEA [IC 90%]	AIC
Model 1	1,2,3,4,5, 8,9,10,11,12	128.523 (29)	4.43	.98	.977	.053 (.044, .062)	180.523
Model 2	1,2,4,5, 8,9,10,12	90.168 (18)	5.01	.983	.978	.057 (.046, .069)	126.168

Note: GFI= Goodness of fit index; CFI= Comparative Fit Index; RMSEA= Root Mean Square Error of Approximation; AIC= Akaike's Information Criteria.

Figure 2 shows that the factor loadings of model 2 in university students are higher than .53 and the omega coefficient is .85. The results confirm the eight-item model (Model 2); however, covariances of the errors with values less than .21 are observed between items 2 and 4 (.13) and items 10 and 12 (.21).

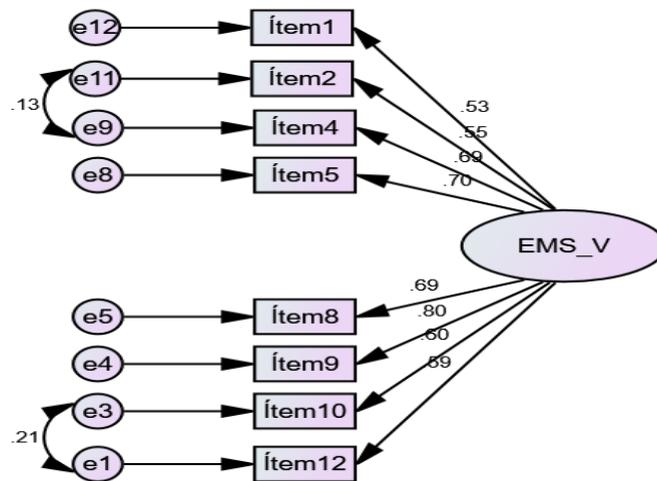


Figure 2. Confirmatory factor analysis of the Sexual Machismo scale (EMS-Sexismo-12) in university students

Table 4 shows the factor structure of the sexual machismo scale in both sexes (N= 2470), which shows covariance among the errors, when considering the 12 items (model 1), which is why model 2 of eight items (the same items of the factor structure in university students) is accepted, showing good good goodness-of-fit values (S-B χ^2 (18) = 116.38, $p < .05$; S-B χ^2 /gl= 6.46; GFI= .988; CFI= .987; RMSEA=.047 [.039, .055]; AIC= 152.38).

Table 4
Statistical fit indices of 2 models of the Sexual Machismo Scale (EMS-Sexismo-12) (N= 2470)

Total	Items of each model	χ^2 (gl)	χ^2 /gl	GFI	CFI	RMSEA [IC 90%]	AIC
Model 1	1,2,3,4,5,6,7,8,9,10,11,12	220.447 (39)	5.65	.985	.987	.043 (.038, .049)	298.447
Model 2	1,2,4,5,8,9,10,12	116.38 (18)	6.46	.988	.987	.047 (.039, .055)	152.38

Note: GFI= Goodness of fit index; CFI= Comparative Fit Index; RMSEA= Root Mean Square Error of Approximation; AIC= Akaike's Information Criteria.

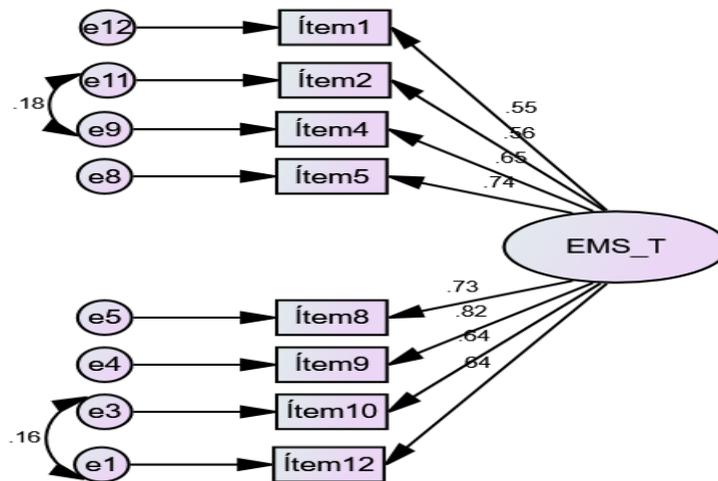


Figure 3. Confirmatory factor analysis of the Sexual Machismo scale

Figure 3 shows that the factor loadings in male and female university students are higher than .55. The results confirm the eight-item model (Model 2); however, error covariances with values below .18 are observed between items 2 and 4 (.18) and items 10 and 12 (.16).

Reliability

In the Omega coefficient, a value of .86 was found, it can be affirmed that the scores of the instrument present a high internal consistency, so the evaluated instrument has high reliability.

Discussion

Today's society lives in an environment where stereotypes generate an imbalance between men and women, this imbalance is also called sexism, and affects both sexes, bringing disruptions at the level of quality of life and mental health. The present research sought to construct and validate the psychometric properties of the Sexual Machismo Scale (EMS-Sexismo-12, by Diaz *et al.*, 2010) with a sample of 2470 university students, made up of 50% men and 50% women, aged 16 to 30 years, to select the items that would make up the factorial structure. When interpreting the results, item 6 corresponding to whether “a woman should accept her partner's infidelity” was eliminated, as well as item 7 “men need to have several sexual partners” and item 11 “men should begin their sexual life in adolescence”, since they possibly only refer to the male sex, partly because our sociocultural nuance sustains these beliefs. The term sexism refers to the establishment of an unequal hierarchy, exerting its influence from the transmission of different models for both women and men, presenting itself as a natural matter since sexism is the ideological procedure through which an unequal social order is presented as natural (Mejía *et al.*, 2021).

Also, the analysis of the scale that evaluates the sexist beliefs that men and women may have concerning the sexuality of their sex and the opposite sex was elaborated considering its application in the Arequipa Region, and the scale was composed as follows: 8 items (1,4,5,6,8,9,10,12) for the female sex and 8 items (1,2,4,5, 8,9,10,12) for the male sex. This indicates that the items explain and measure the sexism construct for both males and females since they meet the goodness-of-fit values of a CFA. However, it should be noted that the items taken into account for women differ from the general scale in the items (2,3,7,11), since these items conjecture, according to Lemus *et al.* (2008), the maintenance of power and a distinctive identity by men concerning women, concerning the general scale. In contrast to the items proposed for men, which are more in line with the general scale. Nevertheless, it should be taken into account that one of the ways of understanding masculinity and femininity is by taking into account a series of personal characteristics. Since ancient times, both sexes have been understood as a single dimension, leaving aside how each sex sees and perceives the world. In the same way, roles were related to whether one was a man or a woman. However, this conception was questioned as two different dimensions. Thus, both men and women are much more similar in their psychology than traditionally assumed.

However, the contribution of this instrument is to achieve greater precision in measuring the degree of the machismo of men and women, regarding sexual issues, therefore, if we use the general scale, there will be a bias towards the masculine, so it is suggested that a scale for men and one for women should be used. The instrument can be used for research on gender and sexual preference since it measures the personal beliefs of each individual related to machismo. Therefore, it is concluded that the research was able to validate and analyze the psychometric properties of the sexual machismo scale (EMS-Sexismo-12), being a tool that can be used by professionals and obtain reliable and valid measures. In this sense, it is expected that the scale will be used as an important tool in the intervention of the problem and thus reduce the machista and sexist attitudes that exist in the country, especially in the Arequipa Region.

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