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Measurement and Evaluation in Counseling and Development

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/uecd20

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To cite this article: Paul A. Carrola, Eunae Han, Johana Rocha, Alberto Castro Valles, Maria Nieves González Valles, Jorge Ramón Lozano Martínez & Juan Alejandro Anguiano (16 Sep 2024): Evaluation of the Spanish Version of the Machismo Measure with Mexican Men Who Have a History of Domestic Violence, Measurement and Evaluation in Counseling and Development, DOI: 10.1080/07481756.2024.2401438

To link to this article: https://doi.org/10.1080/07481756.2024.2401438

Published online: 16 Sep 2024.

MEASUREMENT AND EVALUATION IN COUNSELING AND DEVELOPMENT
https://doi.org/10.1080/07481756.2024.2401438

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ASSESSMENT, DEVELOPMENT, AND VALIDATION

Evaluation of the Spanish Version of the Machismo Measure with Mexican Men Who Have a History of Domestic Violence

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ABSTRACT

Gender bias attitudes such as hypermasculinity and machismo have been connected to violence against women in general. The concept of machismo plays a unique role in these phenomena on the U.S.-Mexico border. The construct of machismo has been measured with men in the general population who identify as Hispanic but has not been measured with men who live in a Hispanic country and have committed acts of domestic violence. The purpose of this study was to investigate the psychometric properties of the Machismo measure among Mexican men who have a history of domestic violence and to explore the difference in scores based on demographic information. Confirmatory measurement models were used to evaluate the factor structure of the instrument and item characteristics. Findings from 210 participants demonstrated that the original model with 20 items was rejected and suggested to drop several items. Specific implications for counseling research and interventions are discussed.

SIGNIFICANCE STATEMENT

Machismo has been investigated as an important factor in preventing and remediating domestic violence. This study aimed to understand how to measure culturally based gender biased attitudes of Mexican men with a history of domestic violence and ultimately assist interventions for this population in the United States and Mexico.

KEYWORDS

machismo; domestic violence; U.S.-Mexico border

Domestic violence is a multidimensional societal problem that affects a high number of American families. Estimates indicate that domestic violence accounts for 21% of all violent crimes and that the majority of domestic violence is committed against women (76%), compared to 24% committed against men (Truman & Morgan, 2014). The economic costs of intimate partner violence (IPV) to society are enormous with estimates of about 3.6 Trillion dollars that result from the lifetime effects of sexual violence, physical violence, and stalking (Peterson et al., 2018). Data from 2003-2014 indicated that over half (55.3%) of all female homicides were IPV (Petrosky et al., 2017). These numbers are considerable, given the strong implications for domestic violence prevention efforts and the need for effective interventions.

The relationship between different dimensions of masculinity (e.g. hypermasculinity, masculine identity, & macho personality) and violence was highlighted in past research (Corprew et al., 2014; Gage & Lease, 2021; Harrington et al., 2021; Krivoshchekov et al., 2023; Mancera et al., 2018; Nuñez et al., 2016). Krivoshchekov et al. (2023) found strong correlations between traditional masculinity ideology and attitudes toward violence, traditional masculinity and sexual

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harassment, and status/power over women and male violence against women. According to their meta-analysis, both traditional masculinity ideologies (i.e. attitudes, behaviors) and domains (e.g. heterosexual self-presentation, status, violence) influence men's violence against women. More specific research connected men's feelings of low power in relationships to physical aggression (Harrington et al., 2021). Further research found that men who strongly support traditional masculinity beliefs are likely to more readily embrace myths about IPV, and this connection is partially influenced by their attitudes toward sexism and dominance in relationships (Gage & Lease, 2021). According to Gage and Lease (2021), the direct impact of masculinity ideology on IPV myth acceptance indicates that adhering to traditional masculine norms is linked to minimizing the prevalence and seriousness of IPV and increased tendency to excuse male perpetrators of IPV against females while assigning blame to the victims. In studying the different dimensions of hypermasculinity (i.e. extreme hypermasculine, traditional hypermasculine, non-hypermasculine, and traditional masculine), Corprew et al. (2014) reported a significant positive correlation between all four dimensions and hostility toward women. For example, extreme hypermasculinity displayed the highest levels of antifeminine attitudes and devaluation of emotion while traditional hypermasculinity presented the highest levels of dominance and aggression, and sexual identity.

Cultural Implications

Previous research posits that male violence in intimate relationships was based on views of gender roles and norms which facilitate the subordination of women (Mancera et al., 2018; McCarthy et al., 2018). Other cultural concepts were connected to domestic violence. Traditionally, a negative view of hypermasculinity was linked to the concept of "machismo" in Mexican American men (Arciniega et al., 2008). Additionally, the term "machista" has been used to describe negative aspects of masculinity, such as aggression, antisocial behaviors, bravery, dominance, sexism, and reserved emotions (Carducci et al., 2021; Nuñez et al., 2016). Particularly in Mexican culture, many domestic violence offender characteristics reveal the cultural influence of machismo (Orozco, 2016). Variables such as machismo have developed over the evolution of the Hispanic culture and require culturally sensitive responses when addressing their interactions with public health concerns such as domestic violence.

Further exploration of the cultural influences on domestic violence has also found specific relationships between culturally influenced masculinity (i.e. machismo) and domestic violence behavior. De la Rubia and Rosales (2013) reported a relationship between machismo and domestic violence in a population of Mexican men and women in heterosexual relationships. This evidence implies that machismo can influence the occurrence of domestic violence. Enculturation of heterosexual men into the macho ideology is pervasive as the macho script rules influence perception into viewing affects such as distress and fear as inferior or feminine, while praising and honoring superior or masculine affects such as excitement and danger (Vandello & Bosson, 2013). To the degree that dominant culture variables shape cognition, behavior and affect, the construct of machismo has become part of men's cultural identity or cultural self, that is the socially prescribed images that have become internalized as the culturally ideal (Mancera et al., 2018; Nuñez et al., 2016).

Domestic violence is multidimensional, and many perpetrator variables play a role in facilitating the expression of aggression and violence of men toward women. An important cultural variable that is related to gender and intimate partner dynamics is the concept of machismo; which typically involves the domination of women who are viewed as inferior and responsible for raising children and serving men (Arciniega et al., 2008). In some cultures, this attitude is acceptable; being particularly prevalent in the Mexican culture (Nuñez et al., 2016). Gaining an understanding of its relationship with domestic violence and specifically IPV is crucial in developing comprehensive effective interventions for perpetrators.

In an effort to more accurately measure the concept of machismo, Arciniega et al. (2008) developed the Machismo Measure (M-measure). This measure identifies both positive and negative aspects of machismo that are termed *Traditional Machismo* and *Caballerismo*. While this is a valuable tool, the measure has not been normed with a population of Hispanic men who have an identified history of domestic violence. Reliability evidence for the M-measure has been demonstrated as good in previous studies. In their study with college Latino males, Estrada and Jimenez (2018) showed reliability coefficients at .74 and .84 for the cabellerismo and machismo subscales respectively. Hendy et al. (2022) reported reliability coefficients at .84 for both subscales in their study with over 1,500 Latino males in the United States. Validity evidence for the measure has been somewhat limited, but the factor structure was examined by Estrada et al. (2011) who reported good model fits for a two-factor orthogonal model (CFI =.971, RMSEA = .078, SRMR = .069).

However, it should be noted that the Spanish version with Spanish-speaking participants in Mexico does not provide strong reliability or validity evidence. The measure was translated into Spanish by Gonzalez-Guarda et al. (2013) but the subscales reported evidence of low reliability (α = .59 for Traditional Machismo and α = .48 for Caballerismo), so the overall measure was not used in their analysis and further psychometrics form this study are not available. It is important to note the sample in this study was Hispanic women with reported origins from multiple countries. This significantly limited any comparisons with the current sample, which highlights the importance of evaluating the full measure in this study. More recently, Robles et al. (2024) conducted a Spanish and English measurement invariance study with the M-measure among Latino sexual minority men. Robles and colleagues found that the direct translated Spanish version did *not* demonstrate a good fit for the two-factor model (CFI = .90, SRMR = .09, RMSEA = .09), so instead they proposed a three-factor model.

The history of violence in Mexico and specifically in the border city of Juárez Mexico included disturbing rates of femicide as well as domestic violence (Chew & Limas, 2020; García-Del Moral, 2020; Staudt, 2008) and has had negative consequences for mental health professionals who work with the resulting psychological effects (Carrola et al., 2022). The unique cultural and economic context of the U.S.-Mexico border can exacerbate what some scholars cite as 'border sexual conquest' (Téllez et al., 2018). The unique context of the U.S.-Mexico border require specific research into how effective domestic violence interventions might be implemented. Research in this area can contribute to a better understanding of how cultural factors influence domestic violence and particularly how unique cultural factors on the U.S.-Mexico border might contribute to domestic violence. According to previous studies, some demographic variables, such as less education and age, were associated with traditional machismo (Arciniega et al., 2008). Identifying demographic variables that relate to machismo is critical for counselors to better understand their clients given that conceptualizations of masculinity (e.g. hypermasculinity, traditional masculinity & macho personality) have been linked to violent behavior and attitudes about domestic violence. Further, this awareness is crucial for mental health counselors as cultural factors are not limited to geographical borders and need to be addressed from a global perspective. More acutely, these cultural factors need to be addressed with neighboring countries that share large borders and a significant flow of migration.

Purpose of Study

The original purpose of the Machismo measure (M-measure) development was to represent a measurement of machismo that was inclusive of positive aspects (Arciniega et al., 2008). The current study aimed to examine the psychometric properties of the M-measure with a Mexican population who have a history of committing domestic violence. Specifically, we first examined the factor structure of the M-measure and then investigated the evidence of relations with other variables such as Hypermasculinity Index-Revised (HMI-R). Lastly, we aimed to identify

demographic variables that differentiate the score of the M-measure. We expect being able to measure a multidimensional construct of machismo with a sample of men in Mexico with a history of domestic violence would lead to a greater understanding of the relationship between gender biased attitudes within a cultural context and domestic violence.

Methods

Inclusion and Exclusion Criteria

We recruited 215 Mexican men with a history of domestic violence in a large metropolitan city in Mexico. The study inclusion criteria for research participation were Mexican men who had been required to attend counseling services by the Mexican Justice system for perpetrating domestic violence. After data cleaning, we excluded five responses that significantly (exceeding 10%) missed answering the M-measure or demonstrated straight-line responses, which may indicate a lack of intention from the participants.

Participant Characteristics

The demographic characteristics of the remaining 210 participants were reported as follows: The mean age was 35.1 ($SD = 10.0$), ranging from 19 to 64. Most participants reported being single (37.1%), followed by married (23.8%), cohabiting (20.5%), divorced/separated (16.2%), and widower (2.4%). Most participants reported that they completed middle school (37.1%), followed by 28.1% who reported that they completed high school, 14.8% reported that they did not complete middle school, 10% reported that they completed some college, 6.7% reported that they have a college degree, and 2.4% reported that they have a graduate degree. There were two missing responses to the education question. Regarding religious affiliation, most participants reported not having a religion (71.9%), while others mentioned practicing religious activities (27.6), besides 1 missing response. The mean salary of participants was 12078.3 MXN ($SD = 16046.0$) in Mexican dollars, which is comparable to 603.9 USD ($SD = 802.3$) in the US collars, ranging from 0 to 200000 MXN.

Measurement of Constructs

Machismo Measure (M-measure)

M-measure, developed by Arciniega et al. in 2008, is a 20-item questionnaire to measure *machismo* and gender bias attitudes within a cultural context. This tool, *developed in English,* was developed to capture a comprehensive concept of *machismo*, aiming to understand a positive aspect of machismo compared to the previous concept that focuses on the negative and restricted view of hypermasculinity. M-measure is a 7-point Likert scale from very strongly disagree (1) to very strongly agree (7) and consists of two factors: (a) Traditional Machismo and (b) Caballerismo. Example items for each factor were as follows: (a) Traditional Machismo: Men are superior to women, and (b) Caballerismo: Men should respect their elders. Each factor score uses the mean score of 10 items, offering the participant's level of two types of machismos. The original developer of the measure only reported the internal consistency estimates for the parcels ranging from .61 to .86. The measure was translated into Spanish by Gonzalez-Guarda et al. (2013) and reported evidence of low reliability (α = .59 for Traditional Machismo and α = .48 for Caballerismo) while Robles et al. (2024) reported good internal consistency for both traditional machismo (α = .92) and caballerismo (α = .96) among Latino sexual minority men using Spanish translated version.

Due to the nonlinear connections between ordinal item responses and the latent factors we assessed, reliability in the current study depended on specific factors and was described by a

quantity called test information. To simplify interpretation, the test information function derived from the items was converted into a conventional reliability measure, which ranges from 0 to 1, using the formula: reliability = information/(information + 1). As shown in Figure 1, the reliabilities of traditional machismo were ≥ .80 from −1.2 *SD* below the mean to +3.6 *SD* above the mean while the reliabilities of caballerismo were ≥ .80 from −2.4 *SD* below the mean to the mean, indicating sensitivity over a wide range of each latent factors in the current sample.

Hypermasculinity Index-Revised (HMI-R)

The revised Hypermasculinity Index, developed by Peters et al. (2007), is a 27-item questionnaire intended to measure personality characteristics and cultural standards that prioritize masculine and "macho" traits. The hypermasculinity index is a 10-point Likert scale that uses a phase completion format where respondents complete a phrase by selecting from a continuum that offers two opposing options. The Hypermasculinity Index-Revised consists of three factors: (a) Danger as exciting ($n = 8$), (b) Fighting ($n = 9$), and (c) Sexual attitudes ($n = 10$). Example items for each factor were as follows: (a) Danger as exciting: I'd rather… gamble than play it safe vs. play it safe than gamble, (b) Fighting: If you insult me… be prepared to back it up vs. I'll try to turn the other cheek, and (c) Sexual attitudes: In my opinion… some women are good for only one thing vs. all women deserve the same respect as men. Peters et al. (2007) used the total score of the HMI-R and reported Cronbach's alpha coefficient as .90.

This instrument was only available in English and required translation into Spanish. As such, we followed Lenz et al. (2017) 6-stage process for translating counseling assessment for the HMI-R. After confirming with the instrument's original author that no translated version existed, we were authorized to create a Spanish translation. Our translation team comprised two members: a Spanish-speaking educator from a psychology graduate program in Mexico, and a bilingual counselor educator in the United States. The first team member conducted an item-by-item translation, which was then reviewed by another international educator. Discrepancies were reconciled, and a consensus was reached. The second team member performed a back translation into English. We piloted the adapted instrument with four bilingual graduate students from the target population, who provided feedback on readability, comprehension, terminology, and context, which was integrated into the final Spanish version. In the current sample, the reliabilities

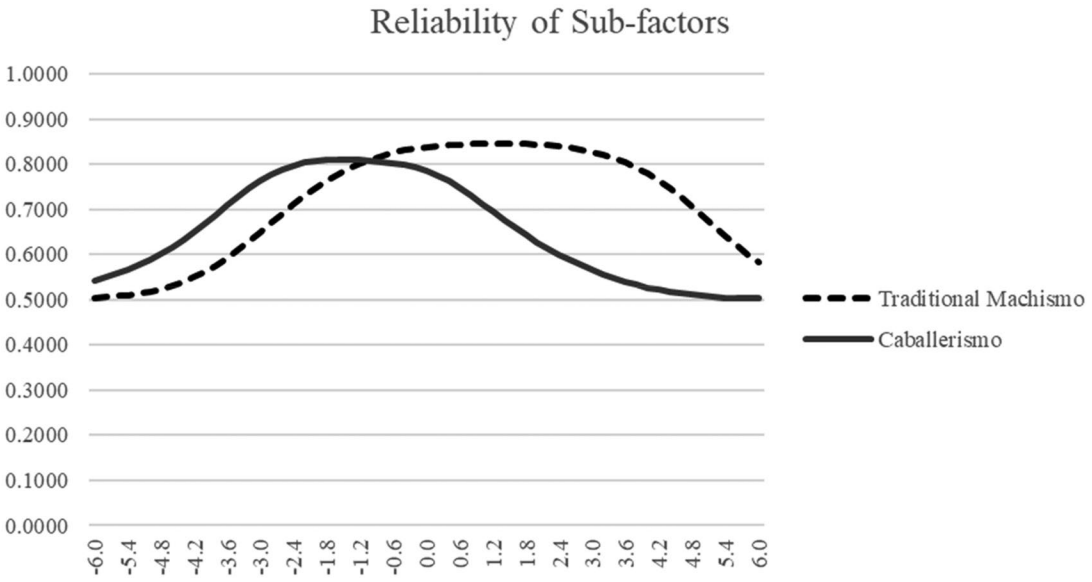

Figure 1. Reliability of traditional Machismo and Caballerismo.

of each factor were ≥ .80 from −0.5 *SD* below the mean to +3.0 *SD* above the mean (Danger as exciting), from −1.5 *SD* below the mean to +3.5 *SD* above the mean (Fighting), and from −3.5 *SD* below the mean to +1.0 *SD* above the mean (Sexual Attitudes), indicating sensitivity over a wide range of latent factors.

Sampling Procedures

Institutional Review Board (IRB) approval was obtained through the first author's institutional affiliation. This approval included letters of support from the governmental agency and university in Mexico that collaborated on this project. Additionally, informed consent documents and procedures to address informed consent and mitigate the risk to participants were approved through the IRB application.

The survey materials, demographic questions and informed consent were presented to participants after they were referred to counseling services at the local governmental agency. Data was collected before they began counseling services at the agency they were referred to. Because this was a vulnerable population and they were in the legal system due to their past violent behavior, steps were taken to ensure their protection from possible consequences related to their participation or possible coercion to participate. The next steps included the following: (1) participants were continually advised (before and after completion of the study materials) that the study was voluntary and nonparticipation was not going to impact their treatment progress or legal status, (2) all agency staff were trained on informed consent, confidentiality, and were continually advised that the study was voluntary and nonparticipation was not going to have an impact on treatment progress or legal status, and (3) after completing the surveys, participants were advised that they could decide not to have their surveys included in the study.

Data Collection

Participants were recruited from a government agency in a border city in Mexico. The research team developed a relationship with the director of this agency, and they agreed to recruit participants for both the study and to use the results to inform the work at the counseling center. Data collection was facilitated by members of the research team in Mexico. During treatment intake, potential participants were provided with the request for participation and the informed consent documents. The agency initially maintained custody of the surveys but they did not have any identifying information and the surveys were kept separate from the participants' files. Once the target sample was obtained, the agency submitted the completed surveys to the primary investigator for analysis.

Analytic Plan

Data Diagnosis

Preliminary analysis involved cleaning and handling missing data, verifying the accuracy of values, and inspecting the distribution of item responses. First, data cleaning was initiated by checking any straight-lining answers (Zhang & Conrad, 2014) or any significant (more than 10%) missing in the M-measure through visual inspection. After this data cleaning, the number of available responses was 210. Then, data verification was conducted to check if data were correctly entered and had realistic values. The coding error was identified by comparing the physical copy of the survey and corrected. Then, the proportion of complete responses was computed for each item. We found all items except salary had less than 5% missingness, and the total missingness for each scale was as follows: M-measure (.00) and HMI-R (.02). We examined the pattern of missingness and Little's MCAR test (Nicholson et al., 2017) suggested that values were missing entirely at chance (χ^2 (5008) = 5125.77, $p > .05$).

Lastly, the item response distribution was examined using boxplots, histograms, and cutoff values of 2.0 for skewness and 7.0 for kurtosis (Byrne, 2010). Most items did not demonstrate a symmetric distribution (which was the same as the previous study conducted by the measure developers; see Arciniega et al., 2008). Mardia's test of multivariate normality (Enomoto et al., 2019) was also significant ($z = 209.58$, $p < .01$), indicating that the data were not characterized as multivariate normal. Although the underlying assumptions for factor analysis similarly apply to both continuous and categorical variables, the models and estimation for continuous data, such as interval or ratio scales, are unsuitable for item-level data characterized by categorical nature (Wirth & Edwards, 2007). As such, we decided to treat the items as ordinal and use item factor analysis (IFA; i.e. confirmatory measurement models for ordinal response formats) using weighted least square mean and variance adjusted (WLSMV) limited-information estimation with the THETA parameterization and a probit link function. Further, confirmatory measurement models for ordinal response formats allow researchers to easily transform the parameters to the item response theory (IRT) parameters, which is beneficial for researchers and practitioners to understand the meaning of item functions.

Statistical Power and Precision

Due to the complexity of calculating the sample size, we used the guidelines from Wolf et al. (2013) to determine the minimum sample size of the current study. Based on the number of factors (2), the number of indicators for each factor (10), and the magnitude of factor loadings (.65), we aimed to recruit over 200 participants. In addition, we calculated the prior sample size requirement using *lavaan* and *semPower2* package within R (Moshagen & Bader, 2023), which recommended the number of participants of 190 with desired power of .80, alpha of .05, and factor correlation of .25 with 10 indicators for each factor.

Primary Analysis

The fit indices of the model demonstrate how well the item factor model aligns with the item polychoric correlation matrices. A larger sample size enhances the likelihood of rejecting the χ^2 test for absolute fit due to its ability to detect even minor discrepancies. Consequently, additional fit indicators like the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA) were considered. The overall adequacy of the model is evaluated as follows: a p value of $\geq .05$ for χ^2, higher CFI and TLI values suggesting a better fit, and lower SRMR and RMSEA values indicating an improved fit. Following previous studies' recommendations (Dimitrov, 2014; Ximénez et al., 2022), an acceptable model fit requires CFI and TLI values of at least .90, accompanied by SRMR at or below .09 and RMSEA at or below .08. An excellent model fit necessitates CFI and TLI values of at least .95, along with SRMR and RMSEA values of .06.

To examine evidence with other variables, bivariate correlations between the M-measure and the HMI-R were assessed for the relationships between the two instruments. This analysis was based on the item level with a final factor model of Machismo measure (M-measure) and the previously existing three-factor model of the Hypermasculinity Index-Revised (HMI-R). The bivariate correlations between the latent variables of two measurements were calculated and the *p*value of $< .05$ was used to identify the significant value.

Secondary Analysis

A *t*-test is a statistical method used to compare the means of two groups to determine if the difference between the groups is statistically significant while *Analysis of Variance* (ANOVA) is used to compare the means of three or more groups to determine if there are significant differences among them. To identify the demographic variables associated with the score of machismo subscale, we used an independent *t*-test and ANOVA, with the same *p*value of $< .05$. With the demographic variables with significant differences from ANOVA analysis, the effect size of *eta*

squared was interpreted as follows based on the guidelines proposed by Cohen (1988): A small effect size (0 to 0.05), medium effect size (0.06 to 0.13), and large effect size (0.14 or higher).

Results

Evidence of Internal Structure

The first model with 20 items consisted of two factors—10 items measuring Traditional Machismo and 10 items measuring Caballerismo—and those factors were correlated. The model exhibited *unacceptable* global fit, according to $\chi^2(169) = 456.05$ ($p < .001$), CFI = .73, TLI = .70, and RMSEA = .09 (see Table 1 for the entire fit indicators). Aligning with the previous study of the M-measure (Arciniega et al., 2008), the correlation between two factors was not significant ($r = .04$, $p = .16$). Thus, each sub-factor model was examined to see if there were any significant issues.

The first sub-factor (Traditional Machismo) model with 10 items demonstrated *excellent* global fit according to most indicators, including CFI = .98, TLI = .97, RMSEA = .05, and SRMR = .04. In the contrast, the second sub-factor (Caballerismo) model with 10 items exhibited *unacceptable* global fit, according to $\chi^2(35) = 127.86$ ($p < .001$), CFI = .79, and TLI = .73., RMSEA = .11. To identify the local misfit, factor loadings and modification indices were examined. Two items (15 and 17) were eliminated from this process. Specifically, item 15 (men must exhibit fairness in all situations) had a low factor loading of .21, which is less than the typical criteria of .30). Item 17 ("A woman is expected to be loyal to her husband") exhibited statistical misfits with other items, and the meaning of the item was noticeably different from that of others. In particular, while other items focused on the attitudes of men, item 17 specifically addressed women. Although we acknowledge that the viewpoint toward women is conceptually included in Machismo, including the only item about attitudes toward women can cause issues in measuring the overall concept. In conclusion, the revised second sub-factor (Caballerismo) model with 8 items exhibited *acceptable* global fit, according to CFI = .93, RMSEA = .08, and SRMR = .04.

Based on the examinations of each sub-factor, the modified two-factor model with 18 items—10 items measuring Traditional Machismo and 8 items measuring Caballerismo—was examined. The model exhibited *unacceptable* global fit, according to $\chi^2(134) = 339.63$ ($p < .001$), CFI = .79, TLI = .76, and RMSEA = .09. With this model, we examined factor loadings and modification indices again, and found three significant issues. First, item 12 (Men should be willing to fight to defend their family) indicated a low factor loading of .29 so we eliminated this item. Second, the correlation between the two factors was still not significant, which is aligned with the previous study (Arciniega et al., 2008). Lastly, local misfits (residual covariances) indicated two items that caused significant issues to model fits (items 6 & 10). Based on these issues, we created an uncorrelated two-factor model after dropping three items and added several residual covariances.

The final two-factor model with 15 items—9 items measuring Traditional Machismo and 6 items measuring Caballerismo—fixed factor correlation to 0 so that each factor is independent

Table 1. Item Factor Analysis Testing Results.

Model	# items	# Free	χ^2 Value	χ^2 DF	CFI	TLI	RMSEA	SRMR
Initial Model	20	141	456.05	169	0.73	0.70	0.09	0.09
Individual MT	10	70	51.96	35	0.98	0.97	0.05	0.04
Individual MCa	10	70	127.86	35	0.79	0.73	0.11	0.07
Individual MCb	8	56	46.06	20	0.93	0.89	0.08	0.04
Modified Model	18	127	339.63	134	0.79	0.76	0.09	0.08
Final Model	15	107	158.53	88	0.91	0.90	0.06	0.07

Note. All χ^2 p value were <.0001, # items = Number of items, # Free = Number of free parameters, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, RMSEA = Root Mean Squared Error of Approximation, SRMR = Standardized Root-Mean-Square Residual. Individual MT = original Traditional Machismo factor, Individual MCa = original Caballerismo factor, Individual MCb = revised Caballerismo factor.

of each other. The model exhibited acceptable global fit, according to $\chi^2(88) = 158.53$ ($p < .001$), CFI = .91, TLI = .90, RMSEA = .06, and SRMR = .07. In this model, two residual covariances across two factors were added based on common item wording and the patterns with corresponding modification indices*: obligating words such as should, must, or never* (item 19 with 20 & item 9 with 19). It is important to note that this final model is specific to the current sample (i.e. Mexican men with a history of domestic violence) and should not be interpreted to apply to samples outside of this demographic.

The model parameters we obtained from the IFA model were converted into item response theory parameters (IRT) (see Table 2). With a factor mean of 0 and a factor variance of 1, the item discrimination (a_i) in Item Response Theory (IRT) is equivalent to the factor loading (λ_i) in item factor analysis (IFA), as indicated by Paek et al. (2018). The item difficulty (b_{ic}) in IRT can be calculated as τ_{ic}/λ_i. The IRT item difficulty (b_{ic}) represents the latent factor score at which the predicted probability is 0.50. This measure proves valuable in illustrating the extent of differentiation among response options across the latent factor among participants. As shown in Table 2 and Figure 2, the item discrimination values in the top plot varied across items, generally staying within the range of around 0.3 to 0.8. Some items from traditional machismo subscales (items 1, & 18) and caballerismo (items 5 & 20) had higher values of more than .60 compared to the others. The item difficulty values in the bottom plot of Figure 2 demonstrated multiple difficulty thresholds corresponding to different response categories. Most thresholds for items of traditional machismo extended above the mean of the latent factor while those of caballerismo ranged below the mean of the latent factor. For example, items 3 or 14 demonstrated a wide-spread range in difficulty thresholds, while item 20 had less spread range.

Evidence for Relations with Other Variables

We explored bivariate correlations between the latent variables of two measurements (see Table 3). Results of this analysis showed that while the HMI-R had strong intra-factor correlations within the three latent variables (Danger as exciting, Sexual attitudes, and Fighting), the M-measure showed a small, non-significant negative correlation between traditional machismo and caballerismo. Regarding inter-scale comparisons, the correlations between the Hypermasculinity Index-Revised nd the Machismo measure were small. Specifically, *traditional*

Table 2. Item Response Theory Item Parameters for Machismo Measure.

Items	a	b1	b2	b3	b4	b5	b6
Traditional Machismo							
1	0.65	0.37	1.45	1.57	2.42	2.72	3.04
3	0.43	−1.17	0.77	1.29	1.78	2.50	3.29
8	0.49	−1.63	−0.71	−0.11	0.73	1.40	2.76
9	0.58	−1.43	−0.33	−0.02	0.66	1.26	2.04
11	0.59	−0.32	0.58	0.86	1.51	1.80	2.41
13	0.53	−0.53	0.77	1.23	1.80	2.65	3.25
14	0.53	−0.22	1.36	1.78	2.56	3.22	4.10
16	0.57	−1.05	0.13	0.49	1.15	1.78	2.47
18	0.63	−0.62	0.54	0.92	1.70	2.22	3.73
Caballerismo							
2	0.48	−3.08	−2.64	−2.48	−2.30	−1.46	−0.04
4	0.52	−1.95	−1.38	−1.26	−0.93	−0.83	0.36
5	0.72	−2.33	−2.00	−1.95	−1.65	−1.30	−0.22
7	0.49	−2.93	−2.22	−1.68	−1.02	−0.33	0.99
19	0.42	−3.40	−2.56	−2.27	−1.90	−1.44	0.48
20	0.68	−2.24	−1.90	−1.82	−1.65	−1.52	−0.63
Residual Covariance				Estimate			S.E.
Item 9 with 19				0.33			0.10
Item 19 with 20				0.41			0.09

Note. The item parameters were standardized and were conventional for reporting IRT parameters. *a* = item discrimination that corresponds to the factor loading in IFA, *bi* = item difficulties that represent the latent factor score where the predicted probability reaches .50.

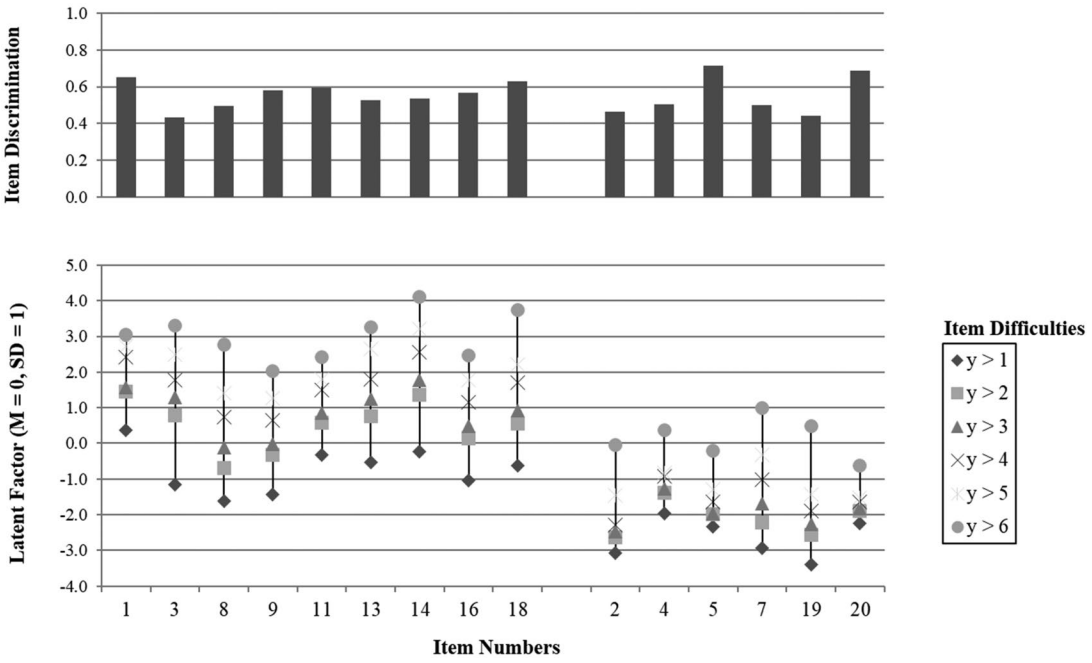

Figure 2. Item discrimination and item difficulties based on the final model.

Table 3. Bivariate Correlations Between Latent Variables.

	Traditional Machismo	Caballerismo	Dangerous as Exciting	Fighting	Sexual Attitudes
Traditional Machismo	10				
Caballerismo	−0.116	10			
Danger as Exciting	0.230	−0.146	10		
Fighting	**0.28***	−0.127	**0.93***	10	
Sexual Attitudes	−0.130	0.137	**−0.99***	**−0.93***	10

Note:
*$p < .05$.

machismo of the M-measure had significant correlations with *Fighting* (r = .28; *small*) of the HMI-R but had a nonsignificant correlation with the *sexual attitudes* or *Danger as Exciting*. Conversely, *caballerismo* of the M-measure showed no significant correlations with any of the constructs from the HMI-R.

Differences Based on Demographic Variables

Switching from item-level analysis to sub-scale level analysis, missing values from the M-measure were estimated based on a regression model that predicted missing values from other variables in the dataset while missing values in demographic information were not estimated. We calculated the mean and the standard deviation of the traditional machismo ($M = 2.8$, $SD = 1.0$, $n = 210$) and caballerismo ($M = 4.8$, $SD = 0.9$, $n = 210$) based on the revised version of the Machismo measure (i.e. six caballerismo items and nine traditional machismo items).

To investigate the group differences based on age, we used a cut score of 30 years old aligning with the previous study (Arciniega et al., 2008). In the current sample, there was no difference in the traditional machismo, $t(207) = 0.76$, $p = .49$, and caballerismo $t(207) = -0.58$, $p = .80$ based on the two different age groups.

To compare the groups based on educational level, we used four different educational levels: (1) Did not complete middle school, (2) Middle school, (3) High school, and (4) some college and graduate degrees. In the current sample, there was a difference in the traditional machismo based on educational level, $F(3, 204) = 3\ .32$, $p = .02$, $\eta 2 = .047$, while there was no difference in caballerismo based on educational level, $F(3, 204) = 0.41$, $p = .75$. The eta squared value of .047 represented a small effect size. However, subsequent post hoc Tukey HSD's test did not indicate any specific differences in the traditional machismo scale. The mean and standard deviation of the traditional machismo scores for each group with different educational levels were as follows: Did not complete middle school ($M = 3.0$, $SD = 0.9$, $n = 31$), Middle School ($M = 3.0$, $SD = 1.0$, $n = 78$), High school ($M = 2.5$, $SD = 0.9$, $n = 59$), and some college and graduate degree ($M = 2.6$, $SD = 1.2$, $n = 40$).

To compare the groups based on marital status, we collapsed two groups with small number of participants—widower and single—into one category, living alone. In the current sample, there was no difference in the traditional machismo, $F(3, 206) = 2\ .59$, $p = .05$, and caballerismo based on marital status, $F(3, 206) = 0.81$, $p = .49$.

When looking at differences based on religious practice, we used the original binominal variable asking the presence of religious practice. In the current sample, there was no difference in the traditional machismo, $t(207) = 0.84$, $p = .41$, and caballerismo $t(207) = -0.99$, $p = .16$ based on whether they committed to religious practice or not.

Discussion

The original purpose of the machismo measure's development was to establish a defined measure of machismo that included both positive and negative characteristics (Arciniega et al., 2008). The current study expanded this by utilizing a sample that has more specific cultural and clinical demographics (e.g. men living in México who have a history of domestic violence). It is important to note the significance of this difference as it relates directly to the possible clinical application of the measure in providing counseling or batterer intervention to Mexican men who have a history of domestic violence.

The overall hypothesis was that participants in the current study (i.e. men in México with a history of domestic violence) would respond to the items on the Machismo measure in a similar way as participants in the original study by Arciniega et al. (2008). We found the preexisting factor structure model that the test developers suggested was not confirmed with the current sample. More specifically, the results demonstrated that several items, such as items 12 and 15, in the caballerismo subscale had low factor loadings to capture the concept of positive machismo (i.e. caballerismo) and other items, such as 17, demonstrated statistical misfit and contained a somewhat different content regarding women compared to men. Items 6 and 10 were in a similar case to have both statistical misfits and conceptual uniqueness in discussing family issues. As aforementioned, we recognize that attitudes toward women or family are conceptually encompassed within machismo, but relying on a single item about attitudes toward women or only one item on family for each sub-scale can lead to problems in accurately measuring the overall concept. This implies that the concept of machismo is complicated and multifaceted, so we need a sophisticated understanding of the concept. Further, the sample in the current study may have had different interpretations of the concept of caballerismo, suggesting that a modified inventory might be more appropriate in measuring machismo with populations with a history of domestic violence.

Additionally, the unacceptable model fit of the initial model and how it was primarily attributed to items on the caballerismo scale raised questions about the possible relationship between how men in Mexico view caballerismo and their propensity to commit acts of domestic violence. It is not clear if the difference in how the current sample interpreted the caballerismo factor is due to cultural factors related to living in Mexico or their history of domestic violence. While

the current study does not provide evidence of either of these relationships, it uncovers the importance of exploring these relationships.

Meanwhile, the findings on the traditional machismo subscale implied that most items except one (item 6) work well to capture the concept with the current sample, and provided evidence of reliability, especially for people with a level of traditional machismo from 1.2 standard deviations below to 3.6 standard deviations above the mean. Based on this evidence of reliability, we suggest using both sub-scales of traditional machismo and caballerismo to measure people who may demonstrate a different level of machismo, because two sub-scales would be beneficial to assess the wide range of latent factor (machismo). Another interesting finding with the traditional machismo subscale was a small correlation of 0.28 with the variable of *fighting* of the HMI-R. This small correlation, while significant, suggested a different aspect of the underlying concepts, which highlights the need for further investigation into the complex and multifaceted concepts of machismo. Further, the authors adopted the final model with zero correlation between traditional machismo and caballerismo, which is the same as the previous study (Arciniega et al., 2008) that supports two independent factors. Given the conceptual relationship between these two types of machismos, the consistent findings of no relationship between traditional machismo and caballerismo are noteworthy. In other words, two constructs have been viewed as sharing traits but scoring high one does not preclude manifesting traits in the other.

Overall, results from demographic differences imply that traditional machismo and caballerismo are relatively stable within the current sample of Mexican men with a history of domestic violence across different age groups, different marital statuses, and whether religious practice exists or not. Specifically, demographic variables such as marital status or religious practice did not differentiate the scores of both machismos. In addition, the findings showed that men aged over 30 did not have decreased scores on traditional machismo or caballerismo compared to younger men. The lack of difference according to age group is important to note, as in the previous study by Arciniega et al. (2008), scores on traditional machismo among men after the age of 30 had greatly decreased scores compared to younger men. Whereas caballerismo scores were not different with participants under 30 years old compared to those over 30 years old in both the current study and the previous study.

Despite no significant differences in both machismos according to age, religion, and marital status, traditional machismo may be more susceptible to change with education. This is important to highlight due to the significance of the sample and possible domestic violence interventions. The current results of significant ANOVA but non-significant post hoc analysis require careful consideration, which differs from some previous research that found traditional machismo scores to be lower with participants with higher levels of education (Arciniega et al., 2008; Estrada et al., 2011). Besides statistical significance, mean scores on traditional machismo were lower with participants who reported their highest education as high school, some college, and graduate degree compared to people who did not complete middle school or only completed middle school. Typically, the significant ANOVA results suggest there would be some effect across the group, collectively. However, no significant differences in specific group pairs warrant further investigation and more understanding of the difference. As such, an increased sample size in future study may improve the power of post-hoc tests. Further, the unique characteristics of living in México and having a documented history of domestic violence may account for the long-term commitment to these attitudes although further analysis would be needed to discern the unique contribution of these characteristics to the stability of traditional machismo and caballerismo.

Meanwhile, it should be noted that other research aligns with the results of the current study in finding that education or age was not associated with changes in traditional machismo or caballerismo beliefs (Estrada et al., 2011; Hendy et al., 2022). This evidence suggests further investigation of the concept of machismo and more focus on both populations of Latino men that live in the United States and those that live in Spanish speaking countries. As previously

stated, the samples used in these previous studies were from Mexican/Latino men living in the United States with no identified history of domestic violence and consequently comparisons with the current study should be made with caution and within the context of these demographics.

The most relevant comparison to make with the current study is with the previous study by Arciniega et al. (2008). Primarily, this comparison highlights that the caballerismo subscale of the machismo measure might be less appropriate in measuring caballerismo in Mexican men with a history of domestic violence than men in the United States who identify as Mexican American. Although some previous studies, such as Estrada et al. (2011), Estrada and Jimenez (2018) or Hendy et al. (2022), used the machismo measure with Mexican American men without reports of concerns regarding the caballerismo subscale, Robles et al. (2024) recently proposed a three-factor model with a Spanish version of the measure with sexual minority men in the U.S. What is also notable about of these previous studies is that they used samples in the United States and included other participant demographics (e.g. identifying as a sexual minority group & not identifying a history of domestic violence) that were significantly different than the current sample.

Multiple cultural or clinical factors might explain why the previously established caballerismo subscale demonstrated the lack of evidence in validity with the sample in the current study. It is possible that the concept of caballerismo may include aspects of American culture that are not equally shared in Mexican social norms. It is also possible that the history of domestic violence identified with the current sample contributed to different conceptualizations of caballerismo compared to the previous studies. Finally, it is possible that the translated version used in the current study generated different linguistic meanings from the original English version.

Implications

The results from the current study inform how the Spanish version of the M-measure might effectively be used with Spanish-speaking men who live in Mexico or have Mexican origins and have a history of domestic violence. While using the adapted 15-item measure might be beneficial, mental health practitioners in Mexico and the United States working with clients who share these demographics can focus their assessment by only using the adapted nine-item traditional machismo subscale to assess the baseline score before or in the first intake session. This can assist practitioners by allowing them to get more targeted information about their clients' gender-biased attitudes and also utilize a shorter assessment. Obtaining an assessment of clients' attitudes about traditional machismo at the very early stage of counseling can identify individuals' gender-biased attitudes within the context of an intimate relationship and explore with clients how these attitudes might be related to past instances of domestic violence. Beyond the baseline check, mental health practitioners can facilitate conversations about clients' beliefs in sex and gender during direct counseling services. The M-measure is useful for counselors to assess clients' cultural identity and help them process beliefs about domestic violence or relational conflict.

The most direct benefit of this study is for mental health professionals in Mexico, particularly in northern Mexican cities on the U.S.-Mexico border. Mexican mental health professionals in these areas can use the adapted Spanish version of the machismo measure as an additional tool to address gender biased attitudes and the potential relationship with intimate partner conflict or violence. This can be addressed in individual, couples and family counseling and in instances when clients are mandated to attend counseling for domestic violence. The machismo measure is also useful from a global perspective and particularly in the United States due to the significant past and ongoing of migration from Mexico. When using the measure with U.S. born Latin/Mexican American clients or Latin/Mexican immigrants, counselors should consider that caballerismo may be more or less clearly defined with different Hispanic groups and consider the limitations of using the caballerismo scale with these groups.

Limitations

The primary limitation of this study is the specific characteristics of the sample population. The results are limited in generalizability to the current sample of men in Mexico who have a documented history of domestic violence. While this is a significant limitation in generalizability, it was our focus to explore the machismo beliefs of this unique population as we wanted to directly establish the usefulness of the machismo measure with this group of men, and we further believe that the machismo measure potentially has the most utility with this population for purposes of domestic violence interventions. Additionally, the current study achieved a sufficient sample size based on our prior calculation for power, especially given the uniqueness of the population. It is our hope that focusing on this clinical sample is an asset to the current study. Nevertheless, we anticipate further studies with larger and more diverse samples will produce more robust findings, especially given the multifaceted concept of machismo. Another limitation is that this is a cross-sectional study and data was not collected over time to see if change could be measured with time or due to an intervention.

Future Research

Future research is encouraged to address several critical areas to enhance our understanding of the concept of machismo and intervention strategies for Mexican men with a history of domestic violence. First, our study demonstrated the nature of complicated and multifaceted concepts of machismo, especially caballerismo. The original M-measure is valuable in measuring positive machismo but needs a comprehensive exploration of its meaning within different contexts and its implication for behaviors within the Mexican community. As such, future studies warrant investigation of the meaning and nature of caballerismo, examining how it influences attitudes and behaviors among Mexican men. Another important direction for future research should focus on using our revised scale to explore evidence of relationships between interpretations of traditional machismo and caballerismo and domestic violence with men in Mexico by utilizing a larger sample of Mexican men with equal representation that report a history of domestic violence and those that do not.

Lastly, subsequent research could also focus on using the machismo measure with this same population in a pre and post intervention (e.g. required counseling services) study. This type of study could evaluate the effectiveness of different interventions in changing machismo beliefs that are linked to violent or abusive behavior. Additionally, future research can explore how survivors of domestic violence in Mexico perceive the influence of machismo beliefs on domestic violence and how beliefs have influenced their roles in romantic relationships.

Conclusion

Machismo as a two-factor construct has not been used with men in Mexico or other Latin American countries who have a history of domestic violence. With this study, mental health professionals in Mexico and the United States can have empirical support to measure traditional machismo accurately with Mexican men who have a history of domestic violence. This evidence can further research with the machismo measure to explore effective interventions for men in Mexico who are receiving counseling for domestic violence. This evidence can also be used to support the use of the measure to help clients process their beliefs about machismo and how this may be impacting their relationships. The results also have significant implications for counselors in the United States and elsewhere as we become a more diverse society and work to address global mental health issues.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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