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Validation of the attitude towards sexuality scale in two samples of university students

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There exists a scale, developed in Mexico, aimed to measure attitude towards sexuality. Good metric properties have been reported for this scale, but there have been no studies aimed at corroborating those observations. This study aims to verify the validity, as well as the invariance between two samples, of the three-factor model originally proposed for the scale, to estimate its internal consistency reliability, to describe its distribution, and to verify its concurrent validity in relation to the attitude towards homosexuality. Two incidental samples of 402 psychology students and 198 medical students were recruited. The Attitude towards Sexuality Scale (ASS-20) was applied to both samples. Likewise, the attitude towards homosexuality scale was also applied to the psychology students, whereas the factor of subtle rejection towards gay men, taken from the Mexican adaptation of Herek's Attitude towards Lesbians and Gay Men Scale, was applied to medical students. Single-factor, correlated-factor, hierarchical, and bifactor models were tested. Multigroup confirmatory factor analysis revealed that the correlated-factor model had the best data fit as well as convergent and discriminant validity properties in both samples, although it was not invariant. The internal consistency of the scale was good. The total scores in ASS-20 followed a normal distribution and their average showed a liberal attitude with no difference between both samples. The correlation of ASS-20 with the two scales of attitude towards homosexuality was medium. It is concluded that AAS-20 shows internal consistency reliability, structural validity, and concurrent validity in relation to attitude towards homosexuality.

Key words: Attitude, sexuality, homosexuality, psychometrics, students.

INTRODUCTION

The attitude towards sexuality

Sexuality is an aspect of human behavior towards which society traditionally exercises strong control due to its implications for human bonding, progeny, inheritance, and motivation. Although some societies are more liberal and others more repressive of human sexuality, none of them stop exercising control over sexuality or stop dictating the canon of morality, normality, and abnormality regarding sexual behavior (Clark, 2019).

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In Latin America, repressive discourses of sexuality that consider pornography and masturbation as something "sinful", homosexuality as something "against the law of God", and promiscuity and infidelity in women as something "immoral and deserving disgrace" have prevailed from the Colony to our times; it is only in the most cosmopolitan cities these discourses have lost strength although have not disappeared (Sanabria, 2019). On the other hand, social networks in which adolescents are constantly immersed (such as Twitter, Instagram, and YouTube) do not usually echo these repressive values. Likewise, civic education and secular sex education in public schools also do not support traditional moralizing discourses. On the contrary, homophobia is fought and gender equality is defended. Nevertheless, some of those people who provide this education, as well as many families to which adolescents belong and the churches they attend, defend moralizing repressive discourses. Thus, we live in a society in change and with contradictions (Imhoff et al., 2020; Moral, 2010; Pinos-Abad et al., 2017).

The students of the degrees of psychology and medicine, among which the present validation study of a measurement instrument is carried out, are evolutionarily late adolescents or are entering their adulthood and are economically dependent on their parents. They are immersed in these contradictory discourses, but they are being formed to contribute to the scientific and secular discourse about human sexual behavior. What is the attitude of these young people? What effect does this attitude have on various areas of your present behavior and on their professional work? These are relevant questions and their answers require reliable and valid measuring instruments.

If the objective to be assessed is the attitude towards sexuality, we first need to define such attitude. Attitude towards sexuality can be defined as a predisposition to express opinions, feel and act in the face of sexual objects (pornography), situations (nudity), different people (homosexuals, transvestites, transsexuals), social norms or customs (fidelity, virginity), and sexual behaviors (masturbation, oral sex, anal sex) (Moral and Ortega, 2008).

Measurement of attitude towards sexuality

There are several scales used to measure attitude towards sexuality. Some examples are the Sexual Conservatism Scale by Burt (1980) and the Brief Sexual Attitude Scale by Hendrick et al. (2006) developed in the United States. In Spanish language countries, there are some scales, such as the scale created by Lima-Serrano et al. (2013) in Spain and the scales developed by Honold (2005) and Moral and Ortega (2008) in Mexico.

The 20-item Attitude towards Sexuality Scale (ASS-20) by Moral and Ortega (2008) is a multifactorial scale with good properties developed in the context of Mexican psychology students. The items of the ASS-20 were prepared from a qualitative study with a focus group. From 26 initially designed items, 20 were selected based on their properties of discriminability, internal consistency, and factorial configuration. In a sample of 395 students, the overall internal consistency was good (Cronbach's α = 0.84), the scores on the scale followed a normal distribution (Kolmogorov-Sminrov Z = 1.10, Lillefors' p = 0.17) and its average (M = 2.37; 95% CI: 2.32, 2.42; range 1-5) reflected a liberal attitude with no difference between both sexes. The number of factors was determined by the Cattell's criterion and was three. When extracting three factors by Principal Axis Factoring, 31.6% of the total variance was explained. After rotating the factor matrix by the Varimax method, a first factor with seven indicators was obtained and was named *appraisement of Virginity and Condemnation of Pornography* (VCP) due to its content (items 2, 4, 6, 8, 11, 15, and 19). Its internal consistency reliability was acceptable (α = 0.75) and its scores adjusted to normal distribution (Kolmogorov-Smirnov Z = 0.94, Lillefors' p = 0.34). The second factor with six indicators (items 1, 7, 9, 13, 14, and 17) was named *rejection of Masturbation and Sex* (MAS), its internal consistency reliability was also acceptable (Cronbach's α = 0.72), its distribution was positively skewed, and did not follow a normal distribution (Kolmogorov-Smirnov Z = 2.12, Lillefors' p < 0.01). The third factor with seven indicators (items 3, 5, 10, 12, 16, 18, and 20) was named *sexual Shyness, Shame and Modesty* (SSM), had a questionable internal consistency reliability (Cronbach's α = 0.67), its distribution was also skewed to the right, and did not follow a normal distribution (Z_{KS} = 1.70, p = 0.01). By confirmatory factor analysis, estimating the parameters through the Maximum Likelihood method, the model of three correlated factors presented adequate fit indices: the relative chi-square (χ^2/df = 2.61) was lower than 3, the Standardized Root Mean Square Residual (SRMR = 0.06) and the Root Mean Square Error of Approximation (RMSEA = 0.07) were lower than 0.08, and the Population Gamma Index (PGI = 0.93), Adjusted Population Gamma Index (APGI = 0.91), and Jöreskog's Goodness of Fit Indices (GFI = 0.93 and AGFI = 0.91) were higher than 0.90. The correlations between the three factors were positive and with an association strength that ranged from medium (r = 0.45 for the correlations of both the first and the second factor with the third factor) to high (r = 0.54 for the correlation between the first two factors), and therefore there was discriminant validity between the three factors (Moral and Ortega, 2008).

Honold (2005)'s 25-item Attitude towards Sexuality Scale (ASS-25), in its original study carried out with a sample composed of 150 women and 150 men, all of them psychology students, showed an acceptable overall internal consistency reliability (Cronbach's α = 0.72), and

a structure of eight components that explained 57.4% of the total variance. The number of components to retain was determined using the Kaiser's criterion (eigenvalues greater than 1). The distribution of the total scores on the scale showed positive asymmetry and reflected a very conservative attitude with no difference between both sexes (Honold, 2005). Trejo-Pérez and Díaz-Loving (2013) eliminated one item and obtained an acceptable overall internal consistency reliability (Cronbach's α = 0.74). They determined the number of components by the Cattell's criterion and it was four. These four factors explained 72.9% of the total variance. After an orthogonal rotation by the Varimax method, the first component reached an acceptable internal consistency reliability (Cronbach's α = 0.75) and was named "sexism and stereotypes". The second component showed a questionable internal consistency reliability (Cronbach's α = 0.67) and was named "morality". The third component had an unacceptable internal consistency reliability (Cronbach's α = 0.49) and was named "restricted sexuality". The fourth presented a fair internal consistency (Cronbach's α = 0.54) and was named "myths and taboos". In Mexico, Moral-Ortega ASS-20 compared Honold's ASS-25 had better psychometric properties.

Problem statement

The AAS-20 has been applied in other studies (Moral and Ortega, 2009; Moral, 2010), but its three-factor structure and other metric properties have not been subsequently verified. In the present study, the three factors are specified not only through the correlated-factor model, as in previous studies, but also through the hierarchical model and the bifactor model. In the correlated-factor model, each item is directly determined by a factor and a measurement error, and the factors are linearly interrelated. In the hierarchical model, each item is determined indirectly by a general higher-order factor and directly by a hierarchical lower-order factor and a measurement error. In the bifactor model, each item is directly determined by a general factor, a specific factor, and a measurement error. It should be noted that the use of a general score is theoretically justified in the last two models, whereas its justification is merely practical or utilitarian in the correlated-factor model (Domínguez-Lara and Rodríguez, 2017). In the three aforementioned models, it is required to check the convergent validity of each factor and the discriminant validity between the factors (Gignac and Kretzschmar, 2017). There exists convergent validity in a factor if the proportion of covariance between the items explained by the factor is higher than that explained by chance, that is, by non-attributable factors. There exists discriminant validity between two factors if a substantive proportion of variance shared between the items is exclusively attributable to the factor to which they belong and not to the other factor (Henseler et al., 2015). If the variances attributable to the specific factors are trivial or the proportions of variance shared between the factors are unitary, then a single factor underlies (Gignac and Kretzschmar, 2017); consequently, the one-factor model must be tested as an alternative hypothesis to multi-factor model.

The objectives of this study are to test the validity of the three-factor model proposed in the original study carried out by Moral and Ortega (2008) using two samples, one composed of psychology students (as in the original study) and another one composed of medical students; to estimate the internal consistency reliability (variance proportion of the test scores measured without error); to describe the distributions of the scores on the scale and its factors; and finally, to verify the convergent validity in relation to the attitude towards male homosexuality, using two different measurement instruments.

The bifactor model is expected to have the best fit and good properties of convergent and discriminant validity, especially compared to the one-factor model, although it may not be strictly invariant between both types of students. Likewise, good reliability is expected in the scale and acceptable in its three factors, normal distribution in the scale and the factor of appraisement of virginity and condemnation of pornography, as well as a distribution with positive skewness in the other two factors (Moral and Ortega, 2009). Finally, the expectation is that there is a positive correlation with a medium strength of association between the attitude of rejection towards sexuality and the attitude of rejection towards gay men (Moral and Valle, 2014), since the attitude of rejection towards sexuality is usually consistent with prejudices towards sexual minorities, whose sexuality is disqualified as unnatural and promiscuous (Kite et al., 2020).

MATERIALS AND METHODS

Research design

The present non-experimental study is instrumental in its objectives and its design is cross-sectional.

Participants

The inclusion criteria were: being a student in the first semesters of the psychology and medicine career and age 18 to 26 years. The exclusion criterion was to express refusal to participate and the elimination criterion was to leave two o more questions unanswered in the two scales that were applied. Non-probability convenience sampling was used. The printed questionnaire was applied in the classrooms by the article authors. All participants invited to the study gave their consent and no case was required to be eliminated due to incomplete data. A sample composed of 402 psychology students and 198 medical students was obtained.

Table 1 describes and statistically compares the sociodemographic and sexual behavior variables of both samples. There was a difference in the sex ratio. In the sample of psychology

Table 1. Frequencies of sociodemographic and sexual behavior variables and their comparison between both samples.

Variable label	Value label	Psychology (n = 402)	Medicine (n = 198)	Pooled (n =600)	Statistical test	p
Sex	Woman	302 (75.1%)	99 (59%)	401 (66.8%)	Yates $\chi^2(1)$	< 0.001
	Man	100 (24.9%)	99 (50%)	199 (33.2%)		
Age (years old)	17-18	95 (23.6%)	16 (8.1%)	111 (18.5%)	Welch t(495.27)	0.037
	19	133 (33.1%)	53 (26.8%)	186 (31%)		
	20	94 (23.4%)	89 (44.9%)	183 (30.5%)		
	21	43 (10.7%)	31 (15.7%)	74 (12.3%)		
	22	18 (4.5%)	4 (2%)	22 (3.7%)		
	23-26	19 (4.7%)	5 (2.5%)	24 (4%)		
Marital status	Single	393 (97.8%)	198 (100%)	591 (98.5%)	$\chi^2(1)$	exacta < 0.001
	Other	9 (2.2%)	0 (0%)	9 (1.5%)		
Subjective socio-economic status	Lower-middle	44 (10.9%)	0 (0%)	44 (7.3%)	$\chi^2(1)$	0.034
	Middle-middle	306 (76.1%)	49 (24.7%)	355 (59.2%)		
	Upper-middle	52 (12.9%)	139 (70.2%)	191 (31.8%)		
	Higher	0 (0%)	10 (5.1%)	10 (1.7%)		
Religious affiliation	Roman Catholics	312 (77.6%)	156 (78.8%)	468 (78%)	$\chi^2(3)$	0.776
	Non-Catholic Christians	25 (6.2%)	15 (7.6%)	40 (6.7%)		
	Non-Christians	12 (3%)	6 (3%)	18 (3%)		
	None	53 (13.2%)	21 (10.6%)	74 (12.3%)		
Religiosity	N	52 (13%)	19 (9.6%)	71 (11.9%)	MW Z_U	0.407
	VI	60 (15%)	33 (16.7%)	93 (15.5%)		
	I	125 (31.2%)	56 (28.3%)	181 (30.2%)		
	F	119 (29.7%)	70 (35.4%)	189 (31.6%)		
	VF	45 (11.2%)	20 (10.1%)	65 (10.9%)		
Active sex life	No	171 (42.5%)	102 (52%)	273 (45.7%)	Yates $\chi^2(1)$	0.036
	Yes	231 (57.5%)	94 (48%)	325 (54.3%)		
Homosexual behavior	No	387 (96.3%)	185 (93.4%)	572 (95.3%)	Yates $\chi^2(1)$	0.180
	Yes	15 (3.7%)	13 (6.6%)	28 (4.7%)		

Notes: religiosity = frequency of attendance at religious services of the religion of ascription: n = never or no religious affiliation, vi = very infrequently; i = infrequently; f = frequently, and vf = very frequently. statistical test to compare two independent samples: yates $\chi^2(1)$ = pearson's chi-square test for homogeneity using the yates' continuity correction for the 2x2 contingency table, welch t (495.27) = student's t test applied to continuous variable of age with welch's formula due to the assumption of variance homogeneity was rejected by levene's test (f[1, 598] = 17.42, p < 0.001), χ^2(df) = pearson's chi-square test for homogeneity with 1 o 3 degree of freedom (df), mw z_u = mann-whitney u test using normal approximation. p = probability value. with pearson's chi-square tests, asymptotic probability values were reported when all the expected frequencies were higher than or equal to 1 and at least 80% higher than 5; when these conditions were not fulfilled, the exact probability value was calculated (exact). With mann-whitney test, the probability asymptotic value for a two-tailed test was reported. With t-test, the probability value for a two-tailed test was reported.

students there were three women per one man while in the sample of medical students there was one woman per one man. The effect size of career/university on sex ratio was small (Cramer's V = 0.25). Psychology students (M = 19.59; 95% CI: 19.44, 19.74) were significantly younger (MD = -0.23; 95% CI: -0.45, -0.01) than medical students (M = 19.82; 95% CI: 19.66, 19.99), although the effect size of career/university on age was trivial (Hedges' g = 0.16; 95% CI: -0.01, 0.33). The mean age in both samples corresponded to the late adolescence stage. There were also differences in the distribution of marital status. All medical students were single whereas 2.2% of psychology students reported other marital status (married, cohabiting, and separated). The effect size of career/university on marital status was trivial (Cramer's V = 0.09). In subjective socioeconomic status, there was a clear difference, and this was higher in medical students. This is because the medical students came from a private university and the psychology students from a public one. The size effect of the career/university on the subjective socioeconomic status was large (Rosenthal's r = 0.61). The distribution of religious affiliation was homogeneous between both samples. Overall, 78% of students reported being

Roman Catholics, 12.3% having no religion (agnostics or atheists), 6.7% being non-Catholic Christians and 3% belonging to a non-Christian religion. There was no difference in the median of attendance at religious services between the two samples and it corresponded to “infrequent”. The percentage of people with an active sexual life was higher among psychology students (57.5%) than among medical students (48%). This difference was maintained when controlling for age (Mantel-Haenszel’s $\chi^2[1] = 5.18$, $p = 0.023$; fulfilling the assumption of homogeneity of the odds ratio among the five age groups by the Breslow-Day test: $\chi^2[5] = 7.54$, $p = 0.184$). However, the effect size of sample/university on being sexually active was trivial (Cramer’s $V = 0.09$). The frequency of homosexual behaviors was statistically not different between both samples. Overall, 95.3% reported not having had homosexual behaviors compared to 4.7% who did (Table 1).

Instruments of measurement

The questionnaire is made up of the informed consent form, the sociodemographic data sheet, and two attitude scales, one towards sexuality and the other towards homosexuality. Twenty-item Attitude towards Sexuality Scale (ASS-20) (Moral and Ortega, 2008). Is composed of 20 items with a Likert-type response scale with five ordered categories of agreement level: SD = Strongly Disagree, D = Disagree, nAnD = neither Agree nor Disagree, A = Agree, and SA = Strongly Agree (Annex). Higher score reflects an attitude of greater rejection. The items 1, 3, 5, 6, 7, 9, 11, 13, 15, 17, and 19 are positively-keyed items and are scored in this way: TD = 1, SD = 2, nAnD = 3, SA = 4, and TA = 5. The items 2, 4, 8, 10, 12, 14, 16, 18, and 20 are negatively-keyed and are scored in this way: TD = 5, BD = 4, nAnD = 3, BA = 2, and TA = 1. The ASS-20 total score is obtained as an average score on the 20 items. First, the scores on the 20 items are summed and then this sum is divided by 20. The range of scores on the ASS-20 varies on a continuum from 1 to 5. By dividing this continuum into five intervals with the same amplitude (amplitude = [maximum value in the item - minimum value in the item] / number of values in the item = [5-1]/5 = 0.8), the score on the scale can be interpreted in an absolute sense from the response label of the items. A score from 1 to 1.79 reflects an attitude of decided acceptance, from 1.80 to 2.59 an attitude of acceptance, from 2.6 to 3.39 an ambiguous or ambivalent attitude, from 3.4 to 4.19 an attitude of rejection, and from 4.20 to 5 an attitude of decided rejection. The ASS-20 is made up of three factors: appraisement of virginity and condemnation of pornography (VCP) (items 2, 4, 6, 8, 11, 15, and 19), rejection of masturbation and sex (MAS) (items 1, 7, 9, 13, 14, and 17) and sexual shyness, shame and modesty (SSM) (items 3, 5, 10, 12, 16, 18, and 20). Its metric properties were presented in the Introduction section.

Ten-item Attitude towards Homosexuality Scale (AHS-10) (Moral and Ortega, 2008): It comprised 10 items with a Likert-type response scale with five ordered categories. Higher score reflects higher rejection of male homosexuality. The items 1, 3, 5, 7, and 9 are positively-keyed items and are scored from 1 to 5. The items 2, 4, 6, 8, and 10 are negatively-keyed items and are scored from 5 to 1. The AHS-10 score is obtained as an average score on the 10 items. First, the scores on the 10 items are summed and then this sum is divided by 10. The range of AHS-10 varies on a continuum from 1 to 5 and can be interpreted in the same way as the ASS-20. The overall internal consistency reliability was good (Cronbach’s α from 0.84 to 0.87), its structure was one factor by Kaiser’s criterion, the single-factor model showed an acceptable fit to the data by Maximum Likelihood, and the scores on AHS-10 followed a normal distribution (Moral and Ortega, 2008; Moral and Martínez-Sulvarán, 2011). The AHS-10 was administrated only among psychology students and its reliability in this sample was excellent (ordinal $\alpha = 0.90$).

Subscale of Subtle rejection Attitude Towards Gay men (ATG-S) (Moral and Valle, 2011) from the Attitudes Towards Lesbians and Gay men (ATLG) Scale (Herek, 1984): It comprised five items with a Likert-type response scale with five ordered categories that are scored from 1 to 9. It is derived from the three-factor structure reported by Moral and Valle (2011) for the ATLG scale. Higher scores show greater rejection. The contents included are: qualification of male homosexuality as a natural sexual orientation and sex between men as a natural behavior, marriage between two men, the adoption of children by homosexual couples, and homosexuality in a male child. It is composed of three positively keyed items (G1, G5, and G7), which are scored: 1 = totally agree, 3 = agree, 5 = neither agree nor disagree, 7 = disagree, and 9 = totally disagree, as well as two negatively-keyed items (G8 and G9), which are scored from 9 = totally agree to 1 = totally disagree. The ATG-S score is obtained as an average score in the 5 items. First, the scores on the five items are summed and then this sum is divided by 5. The range of scores on the ATG-S varies on a continuum from 1 to 9. By dividing this continuum into five intervals with the same amplitude (a = [9-1]/5 = 1.6), the score on the scale can be interpreted in an absolute sense from the response label of the items. A score from 1 to 2.59 reflects an attitude of decided acceptance, from 2.60 to 4.19 an attitude of acceptance, from 4.20 to 5.79 an ambiguous attitude, from 5.80 to 7.39 an attitude of rejection, and from 7.40 to 9 an attitude of decided rejection. Its overall internal consistency reliability was adequate (Cronbach’s $\alpha = 0.78$). The distribution of scores on ATG-S was mesokurtic ($Z_K = -0.18$), but showed slight positive asymmetry ($Z_{Sk} = 4.77$); therefore, it did not fit a model of normal distribution (Moral and Valle, 2014). The ATG-S was administrated only among medical students and its reliability in this sample was good (ordinal $\alpha = 0.86$).

Procedure

The permission and approval of the academic authorities of the two faculties in which the data were collected was obtained. The informed consent of the students was requested for their participation in the research. This appeared on the first page of the questionnaire. No personally identifiable information was requested to guarantee the anonymity of the responses. The name and email address of those responsible for the research were provided to request information in relation to any concern raised by this study. In this way, the ethical research standards of the American Psychological Association (2017) were fulfilled.

Data analysis

For the first objective of testing the validity and invariance of four hypothetical models across the two types of students, multigroup confirmatory factor analysis was used. Models nested in constraints (equality of parameters between the two samples) were defined. The discrepancy function was optimized through the Unweighted Least Squares method. Moment matrices (arithmetic mean, standard deviation, and polychoric correlation) were used as input data. The nested model with constraints on intercepts could not be tested, because we opted for this method, which is suitable for ordinal variables, such as items with a Likert-type scale. The standard deviation, 95% confidence interval, and the significance test for each parameter were calculated through Bias-Corrected Percentiles with the extraction of 2,000 bootstrap samples. The parameters between the two samples were compared by the Z test, using the bootstrap standard error of each parameter. The fit of the models to the data was assessed using eight indices: χ^2/df = relative chi-square, GFI = Goodness-of-Fit Index, AGFI = Adjusted Goodness-of-Fit Index, NFI = Normed Fit Index, CFI = Comparative Fit Index, RFI = Relative Fit Index, SRMR = Standardized Root

Mean Square Residual, and RMSEA = Root Mean Square Error of Approximation. It was stipulated that values for $\chi^2/df \leq 2$, GFI, NFI, CFI and RFI ≥ 0.95, AGFI ≥ 0.90, and SRMR and RMSEA ≤ 0.05 reflect a close fit. On the other hand, values for $\chi^2/df \leq 3$, GFI, NFI, CFI and RFI ≥ 0.90, AGFI ≥ 0.85, SRMR < 0.10 and RMSEA < 0.08 reflect an acceptable fit. The equivalence in goodness of fit between the nested models was evaluated by the quotient between the difference in chi-square statistics and the difference in their degrees of freedom ($\Delta\chi^2/\Delta df \leq 3$ for acceptable value and ≤ 2 for a close value)' the difference in the Akaike Information Criterion (ΔAIC < 7 for acceptable value and < 2 for a close value) and the difference in the GFI, NFI, CFI, RFI, RMSEA and SRMR statistics (ΔGFI, ΔNFI, ΔCFI, ΔRFI, ΔRMSEA, and ΔSRMR ≤ 0.01) (Byrne, 2016).

In the single-factor and correlated-factor models, the convergent validity of each factor was established through three criteria: omega coefficient or compound reliability (ω) ≥ 0.70, average of the standardized measurement weights $M_\lambda > 0.50$, and Mean Variance Extracted (AVE) ≥ 0.25 for 7 or 12 indicators and 0.28 for 6 indicators (Moral, 2019).

In the correlated-factor model, the discriminant validity between factors was established through the heterotrait-monotrait ratio of correlations (HTMT). The HTMT is calculated as the ratio between the arithmetic mean of the n*m non-redundant correlations of the items crossed between two factors and the geometric mean of the means of the [n*(n-1)]/2 or [m*(m-1)]/2 non-redundant correlations between the n or m items of each factor. It was stipulated that an HTMT value ≤ 0.85 reflects discriminant validity or at least ≤ 0.90 (Henseler et al., 2015).

In the hierarchical model, two sub-models are distinguished. On one hand, there is the higher-order submodel that corresponds to the direct effect of the general higher-order factor (GF) on the three hierarchical lower-order factors (HF). On the other hand, there is the lower-order submodel that corresponds to both the indirect effect of the general higher-order factor and the direct effect of the hierarchical lower-order factor on each item of a content domain. In the higher-order submodel, only convergent validity is assessed and it was done as in the single-factor model (ω ≥ 0.70, $M_\lambda > 0.50$ and AVE ≥ 0.44 for three indicators). In the lower-order submodel, as in the bifactor model, both convergent and divergent validity are checked for items in each content domain. The discriminant validity or contribution of each (hierarchical and high-order or specific and general) factor was assessed thorough six indices: the Average Variance Explained by the hierarchical lower-order factor (AVE_HF) and general higher-order factor (AVE_GF) or by the specific factor (AVE_SF) and general factor (AVE_GF), the Common Variance Explained by the hierarchical lower-order factor (ECV_HF) and general higher-order factor (ECV_GF) or by the specific factor (ECV_SF) and general factor (ECV_GF), as well as McDonald's hierarchical omega related to the hierarchical lower-order factor (ωh_HF) and general higher-order factor (ωh_GF) or to the specific factor (ωh_SF) and general factor (ωh_GF). Values between 0.30 and 0.70 for ωh_ and ECV_ indices reflect a significant and balanced contribution; values below 0.30 indicate a poor contribution, and values above 0.70 an excessive contribution (Brunner et al., 2012; Domínguez-Lara and Rodríguez, 2017). Considering the minimum AVE_ values (≥ 0.44 for three indicators, ≥ 0.28 for six indicators and ≥ 0.25 for seven indicators or more) and a contribution of at least 30%, the minimum AVE values for the hierarchical lower-order factor (AVE_HF), specific factor (AVE_SF) or higher-order or general factor (AVE_GF) should be 0.14, 0.09, and 0.08, respectively. The maximum value would be 0.70 for a maximum contribution of 70% when explaining 100% of the variance (Moral, 2019). Convergent validity was established from the total effect or sum of direct effect of lower-order hierarchical factor and indirect effect of general higher-order factor (hierarchical model) or the sum of direct effects of specific and general factors (bifactor model). As previously, three criteria were used: AVE_ total ≥ 0.25 for seven or twelve indicators and 0.28 for six indicators, $M_{\lambda\_total} > 0.50$ and ωh_total ≥ 0.70.

For the second objective, the internal consistency reliability of each factor was calculated through the ordinal alpha coefficient (ordinal α), which is obtained by calculating the standardized alpha coefficient from the polychoric correlation matrix. It was stipulated that ordinal α values between 0.70 and 0.79 reflect an acceptable internal consistency, between 0.80 and 0.89 good, and ≥ 0.90 excellent (Viladrich et al., 2017). Interval estimations with a 95% confidence level were calculated using the formula of Feldt et al. (1987) and coefficients between the two samples were compared through Feldt's (1969) test.

For the third objective of describing the distributions, fitting the scores to a normal distribution was tested using the D'Agostino K^2 test (D'Agostino et al., 1990). This test is based on the transformation to normality of the coefficients of skewness (D' Agostino, 1970) and kurtosis (Anscombe and Glynn, 1983). This statistic (D'Agostino and Pearson, 1973) was also calculated using the Fisher-Pearson standardized moment coefficients of skewness and kurtosis (Fisher, 1930). Following the suggestion made by D'Agostino et al. (1990), it was complemented with the normal quantile-quantile plot, which was quantitatively assessed through the correlation between the theoretical and empirical quantiles. A 95% confidence interval for the correlation that includes 1 reflects a good fit to normality.

As the model with constraints on intercepts could not be tested, the means between the two samples were compared through Hotelling's T^2 test, assuming homogeneity of covariances between the two samples. This assumption was checked using Box's M test. The assumption of multivariate normality was tested by the multivariate version of the Jarque-Bera test (Koizumi et al., 2009). Following the recommendations of the study on the power of multivariate normality statistics (Joenssen and Vogel, 2014), multivariate asymmetry was calculated by the Kankainen-Taskinen-Oja (2007) U statistic, which follows a chi-square distribution with both degrees of freedom as variables are included in its calculation (*k*). The standardized value of this statistic (Z_U) was also calculated, using the Wilson-Hilferty (1931) transformation of chi-squared variables to normality. Multivariate kurtosis was calculated using the Mardia's statistic b_2, which follows a standard normal distribution by subtracting its mathematical expectation or mean, $\mu_{b2} = k*(k + 2)$, and dividing this difference by its standard error: $\sigma_{b2} = \sqrt{[(8*k*(k + 2))/n]}$, where n is the sample size (Mardia, 1970). On the other hand, the means among the factors within each sample were compared using repeated measures analysis of variance. Pairwise comparisons were made by the paired-sample t-test with the Bonferroni's correction for significance level.

For the fourth objective of concurrent validity, the correlations were calculated by Pearson's product-moment coefficient (r), their significance (H_0: ρ = 0) was tested by Fisher's Z test, and Fisher's transformation was also used to calculate 95% confidence intervals, following SPSS convention. Bivariate normality was verified by tests based on asymmetry (Kankainen-Taskinen-Oja U-test), kurtosis (Mardia's Z-test), and multivariate version of the Jarque-Bera test, using two previous multivariate statistics. In all cases, there was a good approximation to bivariate normality. Values of $|r| < 0.10$ were interpreted as a trivial association strength, between 0.10 and 0.29 weak, between 0.30 and 0.49 medium, between 0.50 and 0.69 strong, between 0.70 and 0.89 very strong, and ≥ 0.90 perfect. The same thresholds were also used to interpret the size of the effect of the factors on their indicators estimated through the standardized measurement weights (Byrne, 2016). The significance of the difference in Pearson's correlation coefficients between the two samples were tested using Fisher's Z test and within each sample using Steiger's Z test. The significance level was set at 0.05 and the calculations were made with the programs SPSS 24, module R version 2.4 for SPSS 24, AMOS 16, and Real Statistics Resource Pack for Excel 2013.

RESULTS

Testing the fit and invariance of hypothetical models across psychology and medical students, convergent validity of each factor, and discriminant validity between factors

Table 2 shows the fit indices of the four hypothesized models for the ASS-20 (1F = single factor, CF-3 = three correlated factors, HM-3 = hierarchical model with one general higher-order factor and three hierarchical lower-order factors, and BM-3 = bifactor model with one general factor and three specific factors). Since a multigroup analysis was performed, models nested in constrains were specified within each of the four hypothesized models. The four common nested models in the four hypothesized models were: the unconstrained model (UC), with constraints on measurement weights (MW), with constraints on the structural covariances (SC), and with constraints on measurement error variances (ME). The hierarchical model (HM-3) had two additional nested models: on the structural weights (SW) and on the structural error variances (SE), which were associated with the higher-order submodel or direct effect of the general higher-order factor on the three hierarchical lower-order factors. Table 2 shows the comparison between goodness-of-fit indices between the factorial model with the best fit (BM-3) and the other factorial models (1F, CF-3, and HM-3). Table 3 shows the convergent validity indices of the single-factor model (1F) and three correlated factors (CF-3), and the discriminant validity indices between the factors of this last model. Table 4 shows the convergent and discriminant validity indices of the hierarchical model (HM-3) and bifactor model (BM-3).

The one-factor model

The one-factor model (1F) showed that all its parameters were significant in the four nested models when being estimated in both student samples. In the nested with constraints on measurement error variances (ME), whose estimates are exactly the same for both samples, the single factor with 20 indicators showed convergent validity: M_{λ} = 0.53, with a minimum of 0.41 and a maximum of 0.76, AVE = 0.30 > 0.25 and ω = 0.99 > 0.70 (Table 3).

The fit of the unconstrained model (UC) was close through four indices (GFI, AGFI, CFI, and RMSEA) and acceptable through four (χ^2/df, NFI, RFI, and SRMR) (Table 2). In this model, there were significant differences in 8 out of the 20 (40%) measurement weights, the structural or factor variance, and 5 out of the 20 (25%) error variances between the two samples. The variance of the factor (Z = -2.97, p = 0.003) and the measurement weights of items 9 (Z = -3.04, p = 0.002), 14 (Z = -2.08, p = 0.038), and 19 (Z = -2.28, p = 0.023) were higher in medical students than in psychology students. In addition, the measurement weights of items 4 (Z = -2.26, p = 0.024), 6 (Z = -4.14, p < 0.001), 15 (Z = -3.14, p = 0.002), and 17 (Z = -3.67, p < 0.001) were higher and their error variances were lower in medical students than in psychology students. On the contrary, the measurement weight of item 13 (Z = 2.17, p = 0.030) was higher and its error variance was lower (Z = -4.86, p < 0.001) in psychology students than in medical students. The goodness of fit of the unconstrained model (UC) was higher when is compared to the other three nested models for single-factor model ($\Delta\chi^2$/df > 3, ΔAIC > 10, ΔGFI, ΔAGFI, ΔNFI, ΔCFI, and ΔRFI > 01). In the nested model with constraints on measurement error variances (ME), which presented the worst fit among the nested models for the one-factor model, the fit was acceptable through seven indices, although bad through one (RMSEA > 0.08) (Table 2). The goodness of fit of the single-factor model (1F), compared to the other three hypothesized models (CF-3, HM-3, and BM-3), was the lowest in each of the four nested models through the indices $\Delta\chi^2$/df > 3, ΔAIC > 10, ΔGFI, ΔAGFI, ΔNFI, ΔCFI, ΔRFI, ΔRMSEA, and ΔSRMR > 01 (Table 2).

The three correlated factor model

The model of three correlated factors (CF-3) showed that all its parameters were significant in the four nested models when they were estimated in the two samples of students. In the nested with constraints on measurement error variances (ME), whose estimated values are the same in the two samples, the three factors showed convergent validity (M_{λ} from 0.53 to 0.67 > 0.50, AVE from 0.29 to 0.45 > 0.28, ω from 0.95 to 0.99 > 0.70) and discriminant (HTMT from 0.61 to 0.86 < 0.90) (Table 3).

The fit of the unconstrained model (UC) was good through seven indices and acceptable through one (SRMR = 0.06) (Table 2). In this model, there were significant differences in 6 out of the 20 (30%) measurement weights, in one out of the three (33.3%) structural variances, one out of the three (33.3%) structural correlations, and 5 out of the 20 (25%) measurement error variances. The measurement weights of items 6 (Z = -4.13, p < 0.001), 15 (Z = -3.01, p = 0.003), and 17 (Z = -3.27, p = 0.001) were higher and their error variances were lower (Z = 2.81, p = 0.005 in item 6; Z = 3.07, p = 0.002 in item 15; and Z = 3.01, p = 0.003 in item 17) in medical students than in psychology students. In addition, the correlation between the first two factors (Z = -2.21, p = 0.027) and the measurement weights of items 9 (Z = -2.85, p = 0.004) and 19 (Z = -1.97, p = 0.049) were higher in medical students than in psychology students. On the contrary, the measurement weight of item 13 (Z = 2.66, p = 0.008) was higher and its error variance lower (Z = -5.15, p < 0.001) in psychology

Table 2. Multigroup analysis for the four hypothesized models for ASS-20: fit indices and goodness-of-fit comparison between the model with the best fit (BM-3) and the rest of the models.

Indices	1F	CF-3	HF-3	BM-3	1F	CF-3	HF-3	BM-3
	UC				MW			
χ^2	692.986	355.137	355.137	282.918	893.133	510.764	510.764	489.367
df	340	334	334	300	359	351	351	336
χ^2/df	2.038	1.063	1.063	0.943	2.488	1.455	1.455	1.456
GFI	0.958	0.979	0.979	0.983	0.946	0.969	0.969	0.971
AGFI	0.949	0.973	0.973	0.976	0.937	0.963	0.963	0.963
NFI	0.935	0.967	0.967	0.974	0.917	0.952	0.952	0.954
CFI	0.967	0.998	0.998	1	0.950	0.985	0.985	0.985
RFI	0.928	0.962	0.962	0.967	0.912	0.948	0.948	0.948
RMSEA	0.042	0.010	0.010	0	0.050	0.028	0.028	0.028
RMR SR	0.078	0.057	0.057	0.050	0.084	0.063	0.063	0.060
AIC	852.986	527.137	527.137	522.918	1015.133	648.764	648.764	657.367
$\Delta\chi^2/\Delta df$	10.252	2.124	2.124	-	17.555	1.426	1.426	
ΔAIC	330.068	4.219	4.219		357.766	-8.603	-8.603	
ΔNFI	0.039	0.007	0.007		0.037	0.002	0.002	
ΔCFI	0.033	0.002	0.002		0.035	0.001	0.001	
ΔRFI	0.039	0.005	0.005		0.036	0	0	
ΔRMSEA	0.042	0.010	0.010		0.022	0.000	0.000	
ΔSRMR	0.027	0.006	0.006		0.024	0.003	0.003	
		SC				ME		
χ^2	1028.244	690.409	632.983	640.807	1072.956	735.122	735.122	685.519
df	360	357	354	340	380	377	377	360
χ^2/df	2.856	1.934	1.788	1.885	2.824	1.950	1.950	1.904
GFI	0.938	0.959	0.962	0.962	0.936	0.956	0.956	0.959
AGFI	0.928	0.951	0.955	0.953	0.929	0.951	0.951	0.952
NFI	0.904	0.936	0.941	0.940	0.900	0.931	0.931	0.936
CFI	0.938	0.968	0.973	0.971	0.935	0.965	0.965	0.968
RFI	0.899	0.931	0.937	0.933	0.900	0.931	0.931	0.932
RMSEA	0.056	0.039	0.036	0.038	0.055	0.040	0.040	0.039
SRMR	0.085	0.066	0.065	0.062	0.083	0.064	0.064	0.060
AIC	1148.244	816.409	764.983	800.807	1152.956	821.122	821.122	805.519
$\Delta\chi^2/\Delta df$	19.372	2.918	-0.559		19.372	2.918	2.918	
ΔAIC	347.437	15.602	-35.824		347.437	15.603	15.603	
ΔNFI	0.036	0.004	-0.001		0.036	0.005	0.005	
ΔCFI	0.033	0.003	-0.002		0.033	0.003	0.003	
ΔRFI	0.034	0.002	-0.004		0.032	0.001	0.001	
ΔRMSEA	0.017	0.001	-0.002		0.016	0.001	0.001	
ΔSRMR	0.023	0.004	0.003		0.024	0.004	0.004	

Notes: Models hypothesized for the ASS-20: 1F = single-factor model, CF-3 = model with three correlated factors, HF-3 = hierarchical model with one general higher-order factor and three hierarchical lower-order factors, and BM-3 = bifactor model with three specific factors and a general factor. Models nested in constraints: UC = unconstrained model, MW = with constraints on the measurement weights, SC = with constraints on the structural covariances, and ME = with constraints on the measurement error variances.

students than in medical students. The variance of the third factor of sexual shyness, shame and modesty was higher in psychology students than in medical students (Z = 2.32, p = 0.020).

The goodness of fit of the unconstrained model (UC) was greater compared to the other three nested models for correlated-factor model ($\Delta\chi^2$/df > 3, ΔAIC > 10, ΔGFI, ΔAGFI, ΔNFI, ΔCFI, ΔRFI, and ΔSRMR > 01). In the nested model with constraints on measurement errors (ME), which had the worst fit among the nested models for the correlated-factor model, the fit was good through seven indices and acceptable through one (SRMR = 0.06)

Table 3. Single-factor (1F) and three correlated-factor (CF-3) models: internal consistency and convergent validity of the factors and discriminant validity between the factors.

Model	Factor	Ordinal α (95% CI)			From ME model			HTMT			
		Psy	Med	Pool	AVE	M_λ	ω		Psy	Med	Pool
1F	GF	0.879 (0.861, 0.895)	0.905 (0.885, 0.922)	0.887 (0.873, 0.899)	0.295	0.535	0.993				
CF-3	VCP	0.792 (0.759, 0.820)	0.850 (0.816, 0.878)	0.813 (0.789, 0.834)	0.394	0.620	0.961	O	0.674	0.753	0.699
								MAS	0.624	0.749	0.661
								SSM	0.613	0.662	0.630
	MAS	0.836 (0.810, 0.859)	0.859 (0.826, 0.886)	0.844 (0.824, 0.862)	0.454	0.667	0.958	SSM	0.799	0.860	0.819
	SSM	0.701 (0.654, 0.742)	0.705 (0.638, 0.760)	0.702 (0.664, 0.736)	0.285	0.530	0.947				

Samples: Psy = 402 psychology students, Med = 198 medical students, and Pool = pooled sample composed of 600 health science students resulting from the union of both samples. GF = items 1 to 20 that make up the general factor of attitude (ASS-20), VCP = items 2, 4, 6, 8, 11, 15, and 19 that make up the appraisement of virginity and condemnation of pornography factor, MAS = items 1, 7, 9 , 13, 14, and 17 that make up the rejection of masturbation and sex factor, SSM = items 3, 5, 10, 12, 16, 18, and 20 that make up the sexual shyness, shame and modesty factor. Ordinal α = ordinal alpha coefficient based on the average of the polychoric correlations. 95% CI = 95% confidence interval, using the formula of Feldt et al. (1987). ME = convergent validity measures calculated with the standardized measurement weights of the nested model with constraints on the measurement error variances for the single-factor model (GF) or correlated-factor model (F1, F2 and F3): AVE = Average Variance Extracted, M_λ = arithmetic mean of the measurement weights and ω = omega or composite reliability coefficient. HTMT = heterotrait-monotrait ratio of polychoric correlations in the sample of psychology or medical students or in pooled sample, either among the three factors (O = overall) or between two factors (F1 and F2, F1 and F3 and F2 and F3).

Table 4. Convergent validity and contribution of the general factor and the hierarchical or specific factors (discriminant validity).

ASS-20		Mλ			AVE			ECV		ωh		
Hierarchical model with a general higher-order factor and three hierarchized lower-order factors												
		GF	HF	Total	GF	HF	Total	GF	HF	GF	HF	Total
Higher-order submodel				0.840			0.714					0.881
Lower-order submodel	VCP	0.448	0.429	0.620	0.205	0.189	0.394	0.521	0.479	0.425	0.391	0.816
	MAS	0.618	0.250	0.667	0.390	0.064	0.454	0.859	0.141	0.713	0.117	0.830
	SSM	0.462	0.260	0.530	0.216	0.068	0.285	0.760	0.240	0.558	0.176	0.733
	Overall	0.504	0.316	0.603	0.265	0.109	0.374			0.659	0.259	0.919
Bifactor model with a general factor and three specific factors												
		GF	SF	Total	GF	SF	Total	GF	SF	GF	SF	Total
VCP		0.448	0.430	0.625	0.206	0.196	0.402	0.513	0.487	0.426	0.393	0.819
MAS		0.620	0.251	0.686	0.391	0.092	0.483	0.810	0.190	0.720	0.118	0.838
SSM		0.461	0.267	0.541	0.216	0.079	0.295	0.733	0.267	0.552	0.186	0.738
Overall		0.504	0.319	0.614	0.265	0.124	0.389	0.682	0.318	0.657	0.264	0.921

Notes: ASS-20 = 20-item Attitude Towards Sexuality Scale, VCP = items 2, 4, 6, 8, 11, 15, and 19 related to the appraisement of virginity and condemnation of pornography, MAS = items 1, 7, 9, 13, 14, and 17 related to the rejection of masturbation and sex, SSM = items 3, 5, 10, 12, 16, 18, and 20 related to sexual shyness, shame and modesty, and Overall: items from 1 to 20 related to attitude towards sexuality. Models: Model: GF = general factor, HF = hierarchical factor, SF = specific factor, and Total = sum of the effects of the general factor and the hierarchical or specific factor. Mλ = Arithmetic mean of the measurement weights, AVE = mean variance extracted, ECV = explained common variance and ωh = hierarchical omega coefficient. In the hierarchical model, two submodels are distinguished: the higher-order submodel that corresponds to the direct effect of the general factor on the three hierarchical factors, and the lower-order submodel that corresponds to the indirect effect of the general factor and the direct effect of the hierarchical factor on the items from a content domain.

(Table 2 and Figure 1). The goodness of fit of the three correlated factor model (CF-3) was equivalent to that of the hierarchical model (HM-3), except in the nested model with constraints on structural covariances, which was better in the hierarchical model through the indices $\chi^2/df = 19.14 > 3$ and $\Delta AIC = 51.43 > 7$. With respect to the

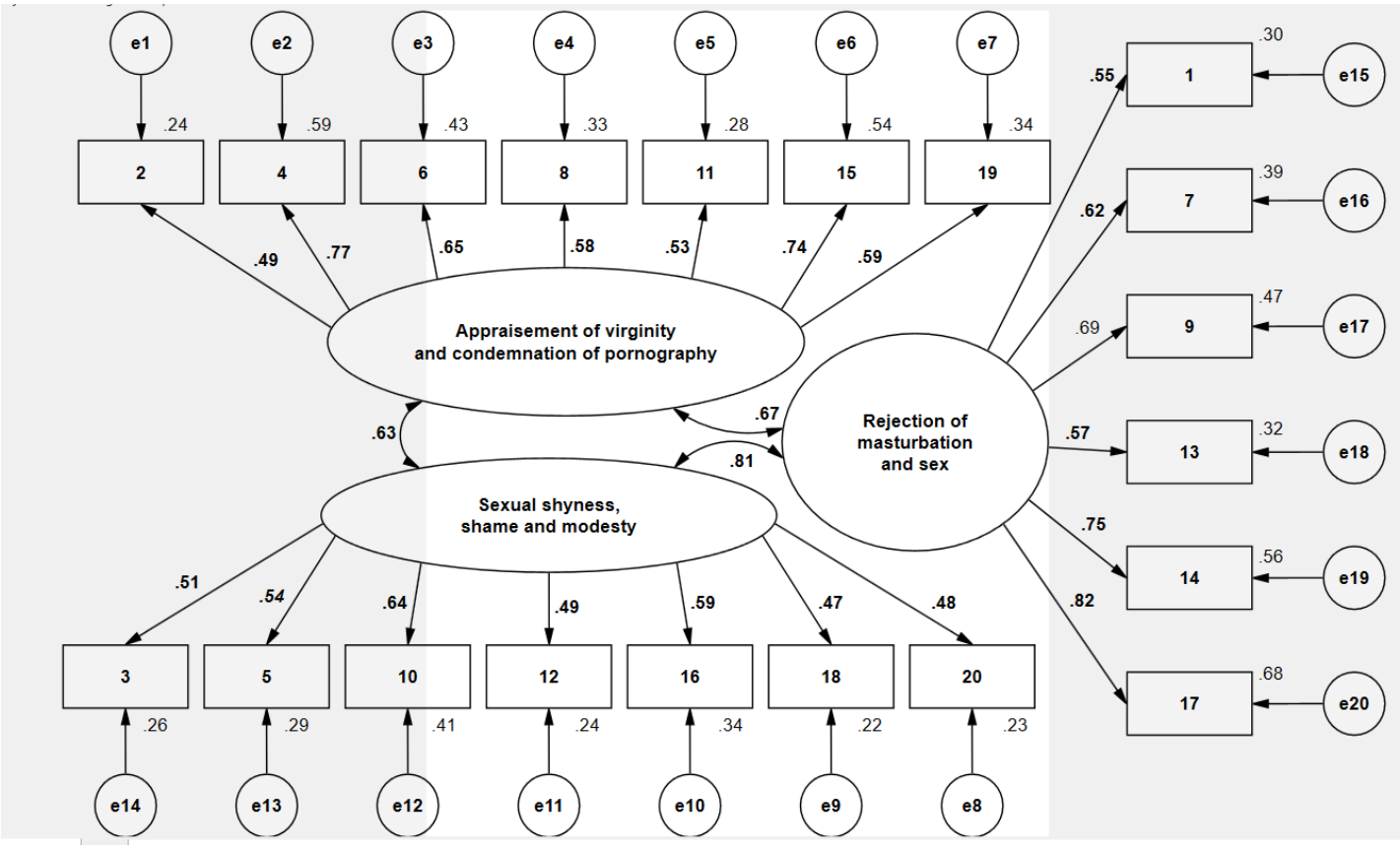

Figure 1. Model with constraints on measurement error variances (ME) for the three correlated factor model (CF-3).

bifactor model (BM-3), the only index that showed a difference was Akaike's index. This index favored the three correlated factor model in the nested model with constraints on the measurement weights (ΔAIC = -8.60), but favored the bifactor model in the nested models with constraints on the structural covariances (ΔAIC = 15.60) and on error variances (ΔAIC = 15.60) (Table 2).

The hierarchical model

The hierarchical model (HM-3) showed that all its parameters were significant in the six nested models when being estimated in the two samples of students. In the higher-order submodel, the general factor showed convergent validity (AVE = 0.71 > 0.44 and ω = 0.88 > 0.70). In the lower-order submodel, the three hierarchical factors also showed convergent validity with a measurement weight mean > 0.50 (M_{λ} from 0.53 to 0.67), the AVE > 0.28 (AVE_total from 0.29 to 0.45) and ωh > 0.70 (ωh_total from 0.83 to 0.73). However, the direct effect of the hierarchical factor was poor both in the masturbation factor and in that of sexual shyness, shame and modesty (AVE_HF < 0.08, ωh_HF and ECV_HF < 0.30); even in the total evaluation the effect of the hierarchical factors was poor (ωh_HF = 0.26 and mean of ECV_HF = 0.29 < 0.30).

The fit of the unconstrained model (UC) was close through seven indices and acceptable through one (SRMR = 0.06) (Table 2). In this model, in the higher-order submodel the structural weights and structural error variances were equivalent between the two samples. However, in the lower-order model, there were significant differences in six out of the 20 (30%) (total) measurement weights and five out of the 20 (20%) measurement error variances. The measurement weights of virginity and condemnation of pornography factor on items 6 (Z = -4.13, p < 0.001), 15 (Z = -3.01, p = 0.003), and 19 (Z = -1.97, p = 0.049), as well as the measurement weights of the masturbation factor on items 9 (Z = -2.85, p = 0.004) and 17 (Z = -3.27, p = 0.001) were higher in medical students than in psychology students. In addition, the measurement error variances of items 4 (Z = 3.09, p = 0.002), 6 (Z = 2.81, p = 0.005), 15 (Z = 3.07, p = 0.002), and 17 (Z = 3.01, p = 0.003) were lower in medical students than in psychology students. On the contrary, the weight of the masturbation factor on item 13 was higher (Z = 2.66, p = 0.008) and its error variance was lower (Z = -5.15, p < 0.001) in psychology students than in medical students.

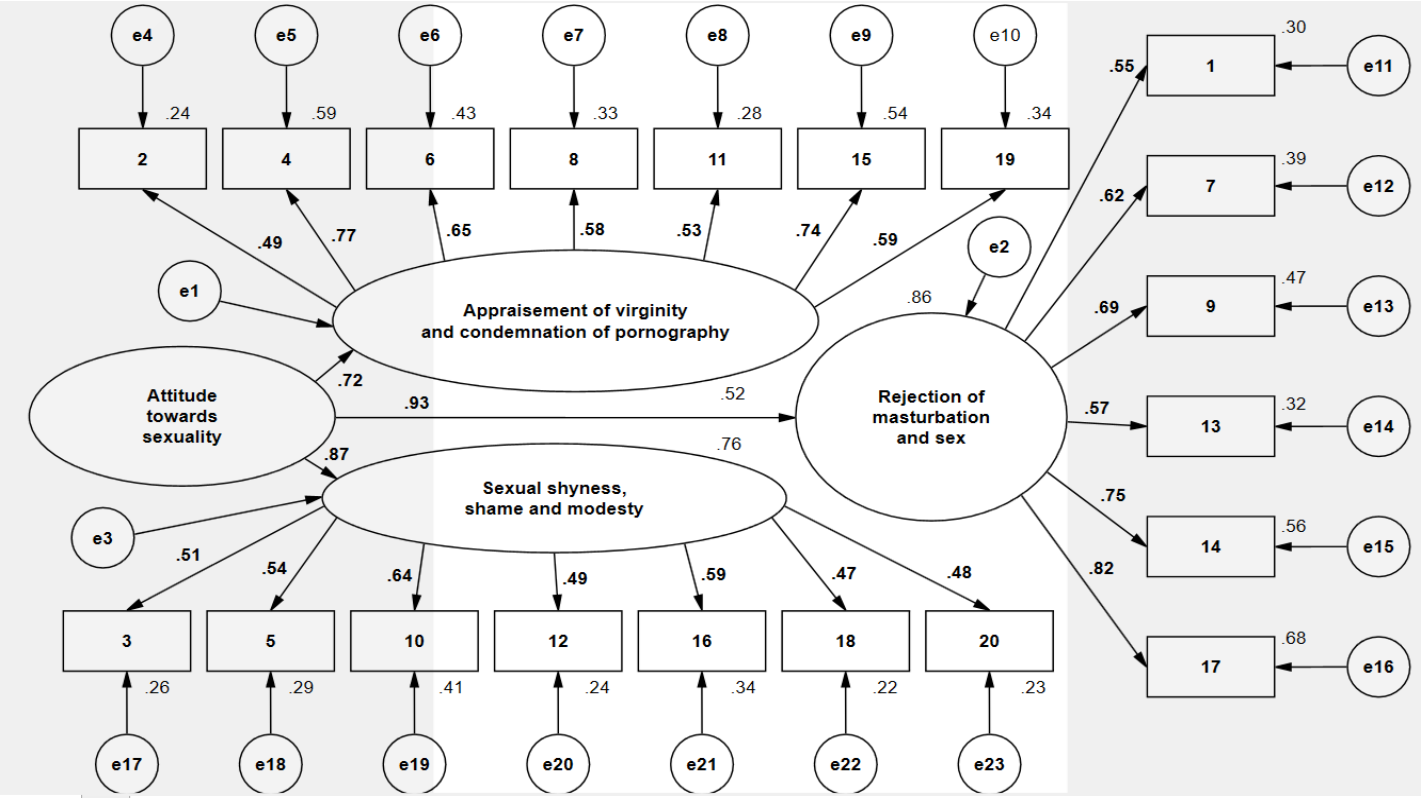

Figure 2. Model with constraints on measurement error variances (ME) for the hierarchical factor model (HM-3).

The goodness of fit of the unconstrained model (UC) was better compared to the other five nested models for hierarchical model through the indices $\Delta\chi^2/df > 3$, ΔAIC > 10, ΔGFI, ΔAGFI, ΔCFI, ΔRFI and ΔRMSEA > 01 In the model with constraints on measurement error variances (ME), which had the worst fit among the nested models for the hierarchical model, the fit was close through five indices and acceptable through three (NFI, RFI, and SRMR) (Table 2 and Figure 2). The goodness of fit of the hierarchical model (HM-3) was equivalent to that of the correlated-factor model (CF-3), except in the nested model with constraints on structural covariances, which was better in the hierarchical model through the indices χ^2/df and ΔAIC, as previously mentioned. With respect to the bifactor model (BM-3), the only index that showed a difference was Akaike's index. This index favored the hierarchical model in the nested models with constraints on the measurement weights (ΔAIC = -8.60) and on the structural variances (ΔAIC = -35.82), but it favored the bifactor model in the nested model with constraints on measurement error variances (ΔAIC = 15.60) (Table 2).

The bifactor model

In the unconstrained model (UC), 10 out of the 40 measurement weights were not significant. The weight of the specific factor of masturbation was not significant for items 1 and 7 in both samples and for items 9, 13, and 14 in the sample of medical students. The weight of the specific factor of sexual shyness, shame and modesty was not significant for item 12 in both samples and for items 3, 5, 10, and 16 in the sample of medical students. When all the parameters are restricted (ME), 5 out of the 40 measurement weights were not significant: the weight of the masturbation factor for items 1, 7, and 14, and the weights of the sexual shyness, shame and modesty factor for items 3 and 5.

The three specific factors and the general factor showed convergent validity (*M*λ_total from 0.54 to 0.69 > 0.50, AVE_total from 0.30 to 0.48 > 0.28, ω_total from 0.74 to 0.92 > 0.70). The effect of the specific factor was poor both on the six masturbation items (ECV_SF = 0.19 and ωh = 0.12 < 0.30) and in the seven items of sexual shyness, shame and modesty (AVE_SF < 0.08, ECV_SF = 0.27 and ωh = 0.19 < 0.30). On the contrary, the effect of the general factor was excessive on these two factors (ECV_GF = 0.81 and ωh_GF = 0.72 in masturbation and ECV_GF = 0.73 in sexual shyness, shame and modesty) (Table 4).

The goodness of fit of the unconstrained model (UC) was close through the eight indices (Table 2). In this nested model, there were differences in 9 out of the 40 (22.5%) measurement weights and in 4 out of the 20

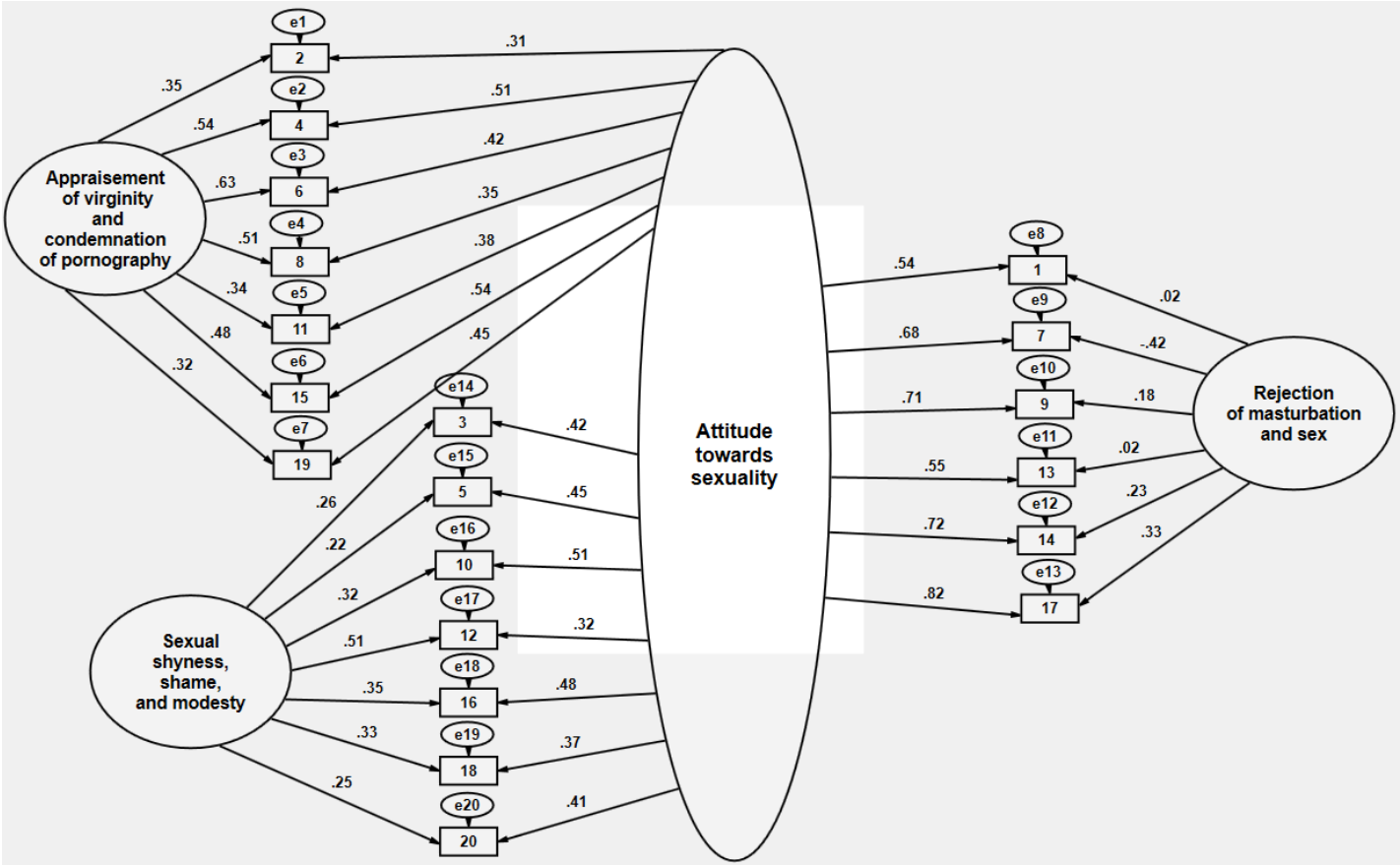

Figure 3. Model with constraints on measurement error variances (ME) for the bifactor model (BM).

(20%) variances of measurement errors. The general factor had higher weight on items 3 (Z = -6.59, p < 0.001), 6 (Z = -3.33, p = 0.001), 7 (Z = -3.21, p = 0.001), 9 (Z = -2.27, p = 0.023), 14 (Z = -2.41, p = 0.016), and 19 (Z = -2.01, p = 0.045) in medical students than in psychology students. On the contrary, the weights of the masturbation factor on items 9 (Z = 5.15, p < 0.001) and 13 (Z = 2.66, p = 0.008) were higher in psychology students than in medical students. However, the general factor had higher weight on item 17 (Z = 2.89, p = 0.004) in psychology students than in medical students. The measurement error variances of item 8 (Z = -2.13, p = 0.033) and 13 (Z = -2.87, p = 0.004) were higher in medical students than in psychology students. On the contrary, the measurement error variances of items 4 (Z = 4.41, p < 0.001) and 15 (Z = 4.54, p < 0.001) were higher in psychology students than in medical students.

The goodness of fit of the unconstrained model (UC) was better compared to the other three nested models ($\Delta\chi^2$/df > 3, ΔAIC > 10, ΔGFI, ΔAGFI, ΔCFI, ΔRFI, and ΔRMSEA > 0.01). In the model with constraints on measurement error variances (ME), which had the worst fit among the four nested models for the bifactor model, the fit was close through five indices and acceptable through three (NFI, RFI, and SRMR) (Table 2 and Figure 3). The goodness of fit of the bifactor model (BM-3) was better than that of the single-factor model (1F), but was not clearly differential with respect to the correlated-factor model (CF-3) and the hierarchical model (HM-3), since only one index was differential (ΔAIC) and this was contradictory from one nested model to another.

Taking into account all the properties, the bifactor model (BM-3) was not invariant between the two samples, like the previous hypothetical models. Although it had the best fit to the data, this was not clearly better than the fit of the correlated-factor (CF-3) and hierarchical (HM-3) models. It had non-significant parameters (measurement weights of two specific factors) and presented discriminant validity problems in the content domains of masturbation and sexual shyness, shame and modesty with an excessive contribution of the general factor to the detriment of the specific factor. Consequently, it was not a good model. The hierarchical model (HM-3) shared the same discriminant validity problem between the general higher-order factor and the hierarchical lower-order factor in the domains of masturbation and sexual shyness, shame and modesty as the bifactor model.

The correlated-factor model (CF-3) yields the model with the best properties. All its parameters were significant and its three factors showed convergent and discriminant validity. Its fit in the unconstrained model between both student samples was close through seven indices and acceptable through one, as well as equivalent to that of the other two three-factor models (HM-3 and BM-3) and better than the single-factor model (1F). Even though its fit worsened when parameters were constrained between the two samples, this ranged from good through five indices to acceptable through three in the model with all the constrained parameters (ME), and never was bad. Therefore, it was a good model, but not invariant between psychology and medical students.

Internal consistency reliability

The overall internal consistency reliability was good (ordinal α = 0.89; 95% CI: 0.87, 0.90), without difference between both samples (F[401, 197] = 1.27; 95% CI: 0.99, 1.61; right tail p = 0.055). Also, the reliability of the masturbation factor was good (ordinal α = 0.84; 95% CI: 0.82, 0.86) and without difference between both samples (F[401, 197] = 1.16; 95% CI: 0.91, 1.47; right tail p = 0.229). The reliability of the sexual shyness, shame and modesty factor was acceptable (ordinal α = 0.70; 95% CI: 0.66, 0.74) and without difference between both samples (F[401, 197] = 1.01; 95% CI: 0.79, 1.28; right tail p = 0.924).

Regarding the appraisement of virginity and condemnation of pornography factor, there was a significant difference (F[401, 197] = 1.39; 95% CI: 1.08, 1.76; right tail p = 0.010). Its reliability was acceptable among psychology students (ordinal α = 0.79; 95% CI: 0.76, 0.82) and good among medical students (ordinal α = 0.85; 95% CI: 0.82, 0.88). The reliability of this factor in the pooled sample was good (ordinal α = 0.81; 95% CI: 0.79, 0.83) (Table 3).

Description of the distribution of the ASS-20 and its three factors

In Table 5, the descriptive statistics and normality tests are presented for the ASS-20 total score and its three factors in both student samples and in the pooled sample. The scores on the ASS-20 and appraisement of virginity and condemnation of pornography factor followed a normal distribution in both student samples and in the pooled sample. The distribution of scores on the rejection of masturbation and sex factor showed positive skewness or long tail to the right in psychology students (Z_{Sk} = 4.09 > 1.96), platykurtosis or shortened tails in medical students (Z_K = -2.04 <-1.96) and both positive skewness and platykurtosis in the pooled sample (Z_{Sk} = 4.68 > 1.96 and Z_K = -2.25 < -1.96, respectively); therefore it did not follow a normal distribution model. Scores on attitude towards sexual shyness, shame and modesty factor showed platykurtosis or shortened tails in psychology students and in the total sample, and thus they also deviated from normality. As in previous cases, the deviation from normality was slight. In medical students, the correlation between the theoretical (t) and empirical (e) quantiles in the normal quantile-quantile plot was unitary (r_{et} = 0.99, [0.97, 1.01]), the null hypothesis of normality is maintained with a p value greater than 0.01 with the D'Agostino-Pearson test using D'Agostino et al.'s (1990) population formulas (K^2 = 7.41, right tail p = 0.025) and er than 0.05 with Fisher's (1930) unbiased formulas (χ^2[2] = 4.56, right tail p = 0.102). Its mean (M = 2.34; 95% CI: 2.25, 2.43), median (Mdn = 2.43), and mode (Mo = 2.43, 11.1% of the scores) had very close values, and the histogram profile described a bell-shaped curve; consequently, its approximation to normality was acceptable.

Attitudinal levels and mean differences among factors and between men and women

In the psychology students, the mean on appraisement of virginity and the condemnation of pornography showed an ambiguous attitude (2.6 < M = 2.92 < 3.4). The attitudes were liberal in the ASS-20 total score and the other two factors (Table 5). When comparing the means of the three factors, there was a significant difference (F[1.91, 764.60] = 534.96, p < 0.001; without assuming homogeneity of variances: Mauschly's W = 0.93, χ^2[2, N = 198] = 14.71, p = 0.001 and using the Greenhouse-Geisser correction for the degrees of freedom). The effect size of each factor on the attitudinal level was very large (η_p^2 = 0.57 and ε_p^2 = 0.72 > 0.14).

Likewise, in the medical students, the mean on appraisement of virginity and the condemnation of pornography showed an ambiguous attitude (2.6 < M = 2.88 < 3.4) and the attitudes were liberal in the total score and the other two factors (1.8 < M < 2.6) (Table 5). When comparing the means of the three factors, there was a significant difference (F[1.865, 367.430] = 169.09, p < 0.001; without assuming homogeneity of variances: Mauschly's W = 0.95, χ2 [2, N = 402] = 20.06, p = 0.001 and using the Greenhouse-Geisser correction for the degrees of freedom). The effect size of each factor on the attitudinal level was very large (η_p^2 = 0.46 and ε_p^2 = 0.61 > 0.14). When making pairwise comparisons by Student's paired t test with the Bonferroni correction for significance level (α_c = 0.017), there was a significant difference between the three pairs both in psychology and medical students. The most liberal attitude was towards masturbation and the least liberal was in appraisement of virginity and condemnation of pornography.

When comparing the means in the three factors between both samples by Hotelling's T^2 test, there was a

Table 5. Descriptive statistics and normality tests.

Sta.	Sample of psychology students				Sample of medical students				Pooled sample			
	ASS	**VCP**	**MAS**	**SSM**	**ASS**	**VCP**	**MAS**	**SSM**	**ASS**	**VCP**	**MAS**	**SSM**
n	402	402	402	402	198	198	198	198	600	600	600	600
Min	1	1	1	1	1.10	1.29	1	1	1	1	1	1
Max	4.05	5	4	3.86	4.15	5	3.83	3.71	4.15	5	4	3.86
M	2.36	2.92	1.81	2.29	2.43	2.88	2.01	2.34	2.39	2.91	1.88	2.30
(CI)	(2.31, 2.42)	(2.85, 2.99)	(1.75, 1.87)	(2.22, 2.35)	(2.35, 2.52)	(2.77, 2.99)	(1.91, 2.11)	(2.25, 2.43)	(2.34, 2.43)	(2.85, 2.97)	(1.82, 1.93)	(2.25, 2.35)
SD	0.54	0.74	0.61	0.64	0.60	0.81	0.70	0.63	0.56	0.76	0.65	0.64
Tests for normality												
$Z_{\sqrt{b1}}$	-0.04	-0.17	**3.92**	-0.54	0.18	**1.98**	1.80	-1.18	0.28	1.18	**4.50**	-1.11
Z_{b2}	-1.73	-0.51	-1.69	**-3.80**	-1.66	-0.31	**-3.02**	**-2.45**	**-2.26**	-0.71	**-2.86**	**-4.75**
K^2	2.98	0.29	**18.25**	**14.73**	2.79	4.03	**12.36**	**7.41**	5.16	1.88	**28.42**	**23.82**
p	0.225	0.865	**<0.001**	**0.001**	0.248	.133	**0.002**	**0.025**	.076	0.391	**<0.001**	**<.001**
Z_{Sk}	-0.04	-0.16	**4.09**	-0.54	0.18	**1.99**	1.81	-1.17	0.28	1.17	**4.68**	-1.11
Z_K	-1.49	-0.58	-1.46	**-2.62**	-1.37	-0.41	**-2.04**	-1.78	-1.89	-0.73	**-2.25**	**-3.21**
χ^2	2.21	0.35	**18.87**	**7.12**	1.90	4.15	**7.41**	4.56	3.63	1.91	**27.02**	**11.54**
p	0.331	0.838	**<0.001**	**0.028**	0.387	0.125	**0.024**	0.102	0.163	0.385	**<0.001**	**0.003**
r_{et}	0.997	0.998	**0.973**	0.992	0.996	0.992	0.981	0.992	0.997	0.997	**0.975**	0.992
(CI)	(0.989, 1)	(0.991, 1)	**(0.951, 0.996)**	(0.980, 1)	(0.983, 10.01)	(0.975, 10.01)	(0.953, 10.01)	(0.973, 10.01)	(0.992, 1)	(0.991, 1)	**(0.958, 0.993)**	(0.982, 1)
Percentiles												
P10	1.65	2	1	1.33	1.60	1.86	1	1.43	1.65	1.86	1	1.43
P20	1.85	2.29	1.17	1.71	1.90	2.14	1.33	1.71	1.85	2.29	1.17	1.71
P25	1.94	2.43	1.33	1.86	2	2.29	1.50	1.86	1.95	2.43	1.33	1.86
P30	2.05	2.57	1.33	1.86	2.10	2.43	1.50	2	2.05	2.43	1.50	1.86
P40	2.25	2.71	1.50	2.14	2.23	2.57	1.67	2.14	2.25	2.71	1.67	2.14
P50	2.40	3	1.67	2.29	2.40	2.86	2	2.43	2.40	2.86	1.83	2.29
P60	2.55	3.14	2	2.43	2.62	3	2.17	2.57	2.55	3.14	2	2.57
P70	2.66	3.29	2.17	2.71	2.80	3.29	2.50	2.71	2.70	3.29	2.17	2.71
P75	2.75	3.43	2.33	2.71	2.90	3.43	2.54	2.86	2.80	3.43	2.33	2.71
P80	2.85	3.57	2.33	2.86	3	3.57	2.67	2.89	2.90	3.57	2.50	2.86
P90	3	3.86	2.67	3.14	3.20	4	3	3.14	3.10	3.99	2.83	3.14

Sta. = Statistic: n = sample size, Min = sample minimum value, Max = sample maximum value, M (CI) = point estimation for mean and 95% confidence interval based on the Student's t-distribution, SD = sample standard deviation. Tests of normality: $Z_{\sqrt{b1}}$ = standardized population coefficient of skewness using D'Agostino transformation to normality, Z_{b2} = standardized population kurtosis using Anscombe-Glynn transformation to normality, K^2 = test statistics calculated through the formulas of D'Agostino et al. (1990), p = right tail probability value under null hypothesis of normal distribution, Z_{Sk} = standardized value of Fisher's sample coefficient of skewness. Z_K = standardized value of Fisher's sample coefficient of kurtosis, χ^2 = D'Agostino-Pearson test statistics calculated through Fisher's unbiased formulas, p = right tail probability value under null hypothesis of normal distribution. Normal quantile-quantile plot: r_{et} (CI) = Pearson's product-moment correlation coefficient between empirical quantiles (e) and theoretical (t) quantiles of a standard normal distribution, as well as its 95% confidence interval based on the Student's t-distribution with n - 2 degree of freedom. It was highlighted in bold when the coefficient or the test shows deviation from normality for a significance level of 0.05. Sample quantiles using linear interpolation of the expectations for the order statistics for the standard uniform distribution [0, 1]: P10 = tenth percentile, P20 = twentieth percentile, P25 = twenty-fifth percentile or first quartile, P30 = thirtieth percentile, P40 = fortieth percentile, P50 = fiftieth percentile, second quartile o median, P60 = sixtieth percentile, P70 = seventieth percentile, P75 = seventy-fifth percentile or third quartile, P80 = eightieth percentile, and P90 = ninetieth percentile. ASS = 20-item Attitude towards Sexuality Scale = Sum(item 1 to item 20)/20, VCP = Appraisement of Virginity and Condemnation of Pornography = (item 2 + item 4 + item 6 + item 8 + item 11 + item 15 + item 19)/7, MAS = Rejection of Masturbation and Sex (item 1 + item 7 + item 9 + item 13 + item 14 + item 17)/6, SSM = Sexual Shyness, Shame, and Modesty = (item 3 + item 5 + item 10 + item 12 + item 16 + item 18 + item 20)/7.

significant difference (T^2 = 22.54, F[3, 594] = 7.49, p < 0.001; assuming homogeneity of covariances between both samples by Box's M test: M = 10.489, F[6, 1021 920.86] = 1.74, p = 0.108). When making pairwise comparisons, the mean attitude towards masturbation was significantly higher in medical students than in psychology students (MD = -0.21; 95% CI: -0.36, -0.05). In the other two factors, the difference was not significant.

The multivariate distribution of the three factors presented mesokurtosis by the Mardia statistic both in the sample of psychology students (b_2 = 14.95, Z_b^2 = -0.10, two tail p = 0.921) and medical students (b_2 = 14.22, Z_{b2} = - 0.01, two tail p = 0.994) as in the pooled sample (b_2 = 14.57, Z_{b2} = -0.964, two tail p = 0.335). It also presented symmetry in the sample of psychology students (U[3] = 4.70, right tail p = 0.195, Z_U = 0.87 with the Wilson-Hilferty transformation of a chi-square variable to normality), but it showed very slight skewness in the sample of medical students (U[3] = 9.77, right tail p = 0.021, Z_U = 2.04) and in the pooled sample (U[3] = 9.08, right tail p = 0.028, Z_U = 1.91). By multivariate version of Jarque-Bera test ($\chi^2[3+1 = 4] = U + Z_{b2}^2$), the null hypothesis of multivariate normality would hold in the sample of psychology students with a significance level of 0.05 ($\chi^2[4]$ = 4.71, right tail p = 0.318). In the sample of medical students ($\chi^2[4]$ = 9.77, right tail p = 0.044) and in the pooled sample ($\chi^2[4]$ = 10.01, right tail p = 0.040), the 95% confidence level should be increased to 96% to maintain the null hypothesis of normality. If the test statistic is calculated using the Wilson-Hilferty transformation to normality applied to the chi-square statistic of skewness ($\chi^2[2] = Z_U^2 + Z_{b2}^2$), the assumption of multivariate normality would hold in all three samples ($\chi^2[2]$ = 0.76, right tail p = 0.684 in psychology students, $\chi^2[2]$ = 4.18, p = 0.124 in medical students, and $\chi^2[2]$ = 4.59, p = 0.101 in pooled sample). Consequently, there was a good approximation to multivariate normality as required by the Hotelling's T^2 and Box's M tests.

Concurrent validity in relation to the attitude towards gay men

The AHS-10 was only administrated in the sample of psychology students. Its mean (M = 2.24; 95% CI: 2.17, 2.31) and median (Mdn = 2.20) overlapped, reflecting an attitude of acceptance [1.8, 2.6). The distribution of AHS-10 total scores was mesokurtic (Z_K = 0.55), but was skewed slightly to right (Z_{Sk} = 3.48), and thus it did not adjust to normality (D'Agostino K^2 = 11.93, right tail p = 0.003; with Fisher's unbiased formulas: $\chi^2[2]$ = 12.44, p = 0.002). However, the correlation between the theoretical (t) and empirical (e) quantiles in the normal quantile-quantile plot was unitary (r_{et} = 0.997; 95% CI: 0.989, 1.005) and the histogram profile described a bell-shaped curve. Consequently, the distribution of AHS-10 total scores approached a normal distribution.

ATG-S was administered only in the sample of medical students. Its mean (M = 4.62; 95% CI: 4.35, 4.89) and median (Mdn = 4.60) overlapped, reflecting an ambiguous attitude [4.2, 5.8). The histogram profile described a bell-shaped curve. The distribution of ATG-S total scores was symmetric (Z_{Sk} = 0.73) and mesokurtic (Z_K = -1.69), and followed to normal distribution (D'Agostino K^2 = 5.65, right tail p = 0.059; with Fisher's formulas: $\chi^2[2]$ = 3.39, right tail p = 0.183). The correlation between the theoretical (t) and empirical (e) quantiles in the normal quantile-quantile plot was unitary (r_{et} = 0.99; 95% CI: 0.98, 1.01). Consequently, the distribution of ATG-S total scores followed a normal distribution. Table 6 shows the correlations between ASS-20 and the two scales of attitude towards male homosexuality. All the correlations were significant, direct, and statistically equivalent between both samples. The strength of the association of the ASS-20 and its first two factors was medium with the two scales of attitude towards homosexuality; on the other hand, strength of the association of the sexual shyness, shame and modesty factor was small; the greater the rejection of sexuality, the greater the rejection of gay men.

When comparing the four correlations within the sample of psychology students, considering the Bonferroni's correction for the significance level due to multiple comparisons (α = 0.05/6 = 0.0083), the correlation of AHS-10 with the ASS-20 total score was significantly higher than with the VCP and SSM factors (Steiger's Z = 2.79, two tail p = 0.005; and Steiger's Z = 4.85, two tail p < 0.001, respectively). There was no significant difference between the correlations of three factors with AHS-10 (Table 7). Within the sample of medical students, the correlation of ATG-S with SSM was significantly lower than with the ASS-20 total score (Steiger's Z = 4.87, two tail p < 0.001) and with the VCP factor (Steiger's Z = 3.11, two tail p = 0.002) (Table 7). Additionally, the correlation of AHS-10 or ATG-S with MAS would be significantly higher than with SSM in each of the samples, but without the Bonferroni's correction (Steiger's Z = 2.58, two tail p = 0.010 in psychology students; and Steiger's Z = 2.407, two tail p = 0.016 in medical students) (Table 7).

DISCUSSION

Factor structure of ASS-20

The first objective of the study was to verify whether the three-factor model proposed by Moral and Ortega (2008) was valid in psychology and medical students and even invariant across the two types of students. Previously, only a correlated-factor model had been tested (Moral and Ortega, 2009). In this study, two additional models are specified that theoretically justify the calculation of a total score, apart from the factor scores. On the one

Table 6. Correlation of the ASS-20 and its three factors with the two attitude scales towards gay men.

Scales	AHS-10 (n = 402)	ATG-S (n = 198)	Z	p
ASS-20	0.427*** [0.344, 0.504]	0.476*** [0.361, 0.577]	-0.705	0.481
VCP	0.351*** [0.262, 0.434]	0.483*** [0.369, 0.583]	-1.835	0.067
MAS	0.404*** [0.319, 0.483]	0.420*** [0.298, 0.528]	-0.221	0.825
SSM	0.289*** [0.197, 0.376]	0.282*** [0.149, 0.405]	0.087	0.930

ASS = 20-item Attitude towards Sexuality Scale, VCP = Appraisement of Virginity and Condemnation of Pornography, MAS = Rejection of Masturbation and Sex, and SSM = Sexual Shyness, Shame and Modesty, AHS-10 = 10-item Attitude towards Homosexuality Scale, ATG-S = Attitude of Subtle rejection Towards Gay Men. The 95% confidence intervals for the Pearson product-moment correlation coefficients were calculated using the Fisher's transformation. Significance level in a two-tailed test: *** $p \leq 0.001$.

Table 7. Comparison of the correlations within each sample through the Steiger's *Z* test.

Psychology students			Medical students		
$r_{12} - r_{13}$	Z	p	$r_{12} - r_{13}$	Z	p
$r_{(AHS-10,ASS-20)} - r_{(AHS-10,VCP)}$	**2.792**	**0.005**	$r_{(ATG-S,ASS-20)} - r_{(ATG-S,VCP)}$	-0.213	0.832
$r_{(AHS-10,ASS-20)} - r_{(AHS-10,MAS)}$	0.777	0.437	$r_{(AGT-S,ASS-20)} - r_{(ATG-S,MAS)}$	1.645	0.100
$r_{(AHS-10,ASS-20)} - r_{(AHS-10,SSM)}$	**4.850**	**< 0.001**	$r_{(ATG-S,ASS-20)} - r_{(ATG-S,SSM)}$	**4.870**	**< 0.001**
$r_{(AHS-10,VCP)} - r_{(AHS-10,MAS)}$	-1.126	0.260	$r_{(ATG-S,VCP)} - r_{(ATG-S,MAS)}$	1.127	0.260
$r_{(AHS-10,VCP)} - r_{(AHS-10,SSM)}$	0.952	0.341	$r_{(ATG-S,VCP)} - r_{(ATG-S,SSM)}$	**3.113**	**0.002**
$r_{(AHS-10,MAS)} - r_{(AHS-10,SSM)}$	*2.579*	*0.010*	$r_{(ATG-S,MAS)} - r_{(ATG-S,SSM)}$	*2.407*	*0.016*

ASS-20 = 20-item Attitude towards Sexuality Scale, VCP = Appraisement of Virginity and Condemnation of Pornography, MAS = Rejection of Masturbation and Sex, and SSM = Sexual Shyness, Shame and Modesty, AHS-10 = 10-item Attitude towards Homosexuality Scale, ATG-S = Attitude of Subtle rejection Towards Gay. Significant correlations with a significance level of 0.05 after applying the Bonferroni correction are highlighted in bold ($\alpha_c = 0.05/6 = 0.0083$), and without this correction ($\alpha = 0.05$) are highlighted in italics.

hand, there is the bifactor model in which each item is directly determined by a general factor of attitude towards sexuality and one of the three specific factors (Domínguez-Lara and Rodríguez, 2017; Reise, 2012). On the other hand, there is the hierarchical model in which each item is directly determined by one of the three hierarchical lower-order factors and indirectly by the general higher-order factor of attitude towards sexuality (lower-order submodel); in turn, the three hierarchical lower-order factors are directly determined by the general higher-order factor (higher-order submodel) (Brunner et al., 2012).

The bifactor model was expected to present the best fit and invariance properties between both types of students (Cucina and Byle, 2017; Reise, 2012). Furthermore, its three specific factors were also expected to have convergent and discriminant validity. This expectation was not fulfilled. Its goodness of fit was equivalent to the correlated-factor model. It had some non-significant parameters and showed discriminant validity problems with an excessive weight of the general factor to the detriment of the specific factor on the six masturbation items and on the seven items of sexual shyness, shame and modesty. Consequently, it was a bad model. The hierarchical model also showed discriminant validity problems with a poor hierarchical factor effect on the six masturbation items and on the seven sexual shyness, shame and modesty items. The correlated-factor model was the best model. Its goodness of fit was equivalent to the bifactor and hierarchical models, and showed convergent in its three factors and discriminant validity between them.

When stating that the correlated-factor model better represents the interrelation between the 20 items, the calculation of a total score is not theoretically justified as in the bifactor and hierarchical models. The justification for its calculation becomes merely practical, based on the positive interrelation between the factors, as well as on its usefulness, such as having cut-off points to classify people in ordered categories (liberal, ambiguous, and conservative attitude). The unconstrained model for correlated-factor model had the best fit compared to the other nested models, which was close, and had parameters with significant differences between both samples, as it also happened with the bifactor and hierarchical models. Therefore, it is a valid model for both types of students, but not invariant. What differences does the correlated-factor model show?

Masturbation is more frequently defined in terms of "mental dirt" (item 13) among psychology students than among medical students; on the other hand, masturbation is also frequently defined in terms of a psychopathological phenomenon (item 9) and practice that deteriorates health (item 17) among medical students than among psychology students. Another difference is that the positive linear association between the masturbation factor and the appraisement of virginity and condemnation of pornography factor was stronger among medical students than among psychology students (six tenths of the explained variance versus four tenths). Moreover, the importance given to remain virgin until marriage (item 6), to assume that premarital sex is immoral (item 15) and to consider pornography as a corrupting influence to mind (item 19) are more defined indicators of the appraisement of virginity and condemnation of pornography among medical students than among psychology students. Another difference is that the sexual shyness, shame and modesty factor had lower variability (more uniformity) among medical students than among psychology students.

Reliability of ASS-20 and its factors

The second objective of the study was to estimate the internal consistency reliability of ASS-20 and its three factors. In accordance with expectations (Moral and Ortega, 2008, 2009), the level of overall internal consistency reliability in the pooled sample was good, and it was also so for the first two factors (the factor that assesses appraisement of virginity and condemnation of pornography, and the other one related to rejection of masturbation and sex). There was no difference between both samples in the internal consistency values of the scale and the first factor (appraisement of virginity and condemnation of pornography); there was a difference in the second factor (rejection of masturbation and sex), which showed higher internal consistency among medical students (good) than among psychology students (acceptable). This higher consistency, together with the more defined weights of items 9 (masturbating is for sick minds) and 17 (masturbation is bad), indicate that the image of masturbation as a psychopathological phenomenon is widely shared among medical students. Also, according to expectations, the factor with the lower internal consistency, at an acceptable level, was sexual shyness, shame, and modesty. As it was the case for the scale and the first factor, this third factor did not show any significant difference between both samples.

Distributions and averages of the scores on ASS-20 and its factors

The third objective of this study was to describe the distributions of scores on ASS-20 and its three factors. According to expectations (Moral and Ortega, 2009), the scores on the scale and the factor for assessing appraisement of virginity and condemnation of pornography followed a normal distribution. The other two factors deviated slightly from normality. In the case of the factor related to rejection of masturbation and sex, the deviation was due to slight skewness with a long tail to the right (majority of cases on the liberal pole, with a few cases, very distant from each other, on the conservative pole) among psychology students and in the pooled sample; among medical students, this skewness was due to slight platykurtosis (lower number of cases in the tails than the expected for a normal distribution). This higher number of cases in the central area (between the two shoulders or points of inflection) than that corresponding to a normal distribution, together with the symmetry of a bell-shaped curve profile, reflects a very representative mean, which is significantly higher among medical students than among psychology students, and reflects a less liberal attitude. In addition, the higher internal consistency, the higher measurement weights, and the smaller measurement residuals in the masturbation factor among medical students than among psychology students show a great homogeneity in this attitudinal aspect among medical students. In the case of the factor of sexual shyness, shame, and modesty, the deviation from normality was due to platykurtosis in the pooled sample and in each one of the two student samples. However, leptokurtosis was very slight among medical students, only detectable with the Anscombre-Glynn transformation, but not with the Fisher's unbiased estimators, thus allowing to support the null hypothesis of normal distribution by the three statistical tests (K^2 with population or unbiased statistics and normal Q-Q plot) among medical students.

It should be noted that these deviations from normality in the scores of the last two factors of the ASS-20 are mild, so that there is a good approximation to multivariate normality. Consequently, these distributions show that there is freedom in the attitudinal expression of these young university students (Lyon, 2013). Their attitudes are determined by multiple factors with linear effects, and none of these factors has an excessive weight that could skew and concentrate the scores on the scale and distort the bell-shaped curve profile corresponding to the normal probability law (Frank, 2009; Gould, 2002).

The average attitude was liberal both on the scale as well as on the factor related to rejection of masturbation and sex and on the factor related to sexual shyness, shame, and modesty, such as it has been reported previously in other studies in the population of university students (Moral and Ortega, 2008; Menshawy et al., 2020; Salameh et al., 2016). Nevertheless, the average valuation in the appraisement of virginity and condemnation of pornography was in the range of ambiguity in both samples of students. The averages

were differential between the three factors within each sample. These attitudinal levels can be ordered according to the level of liberality in the following sequence: attitude towards masturbation, attitude towards nudity and carnality, and attitude towards virginity and pornography. The fact that the attitude towards the appraisement of virginity and the condemnation of pornography is the least liberal aspect is concordant with studies about sociohistorical premises in Mexico (Velasco-Moncada and Hernández-González, 2017; Díaz-Loving et al., 2015) and Latin America (Alarcón, 2005). These studies show that female virginity, until the wedding night, is one of the existing and still valued socio-historical premises in Latino culture.

The most liberal average appeared in the attitude towards masturbation, and this attitude was significantly more liberal among psychology students than among medical students. There was also a significant difference in the attitude towards gay men, which was liberal among psychology students and ambiguous among medical students. These differences could be attributed to the depathologization of both sexual behaviors in the scientific-academic context outside the non-psychoanalytic paradigms (Frank, 2016; Regnerus et al., 2017). Nevertheless, the classification of these behaviors as perverse still persists within the classical psychoanalytic currents, as in Freudian, Kleinian, and Lacanian schools (Frank, 2016; Kunzel, 2020). Precisely, these psychoanalytic currents originate and prevail in the medical-psychotherapeutic field (Paris, 2017), while cognitive-behavioral, constructivist, and psychosocial currents, which conceptualize both sexual behaviors as natural, prevail in the different fields of psychology (David et al., 2018).

Concurrent validity of ASS-20 regarding male homosexuality

The fourth objective of this study was to verify convergent validity of ASS-20 in relation to the attitude towards male homosexuality. The expectation was to find a positive and significant association, with no difference between both samples/scales (Moral and Valle, 2014), and this expectation was met. According to the content, the strength of association of the two scales of attitude towards homosexuality varied from medium (with the ASS-20 total score and the first two factors) to small with the third factor (sexual shyness, shame and modesty). The two most related aspects were the appraisement of virginity and condemnation of pornography and the subtle rejection of male homosexuality, with almost a quarter of shared variance. As previously mentioned, this factor reflects the more culturally conservative aspect of ASS-20. It should be noted that homosexuality has traditionally been rejected in Western culture and only in recent decades has a change occurred (Redman, 2018). First, this change was towards their tolerance and, progressively, towards their acceptance as a natural and valid expression of sexual orientation (Kite and Bryant-Lees, 2016); thus, the rejection is essentially subtle, symbolic, or overlapped.

In the present study we chose to measure the attitude towards gay men, since the adaptation of the ATLG in Mexico (Moral and Valle, 2011) allowed us to define a subtle rejection factor and because the rejection towards homosexuality in men is a more ingrained cultural aspect (Kite and Bryant-Lees, 2016). Nevertheless, the rejection towards gay men and towards lesbians is strongly related (Moral and Valle, 2011), hence it should not make a big difference if the Attitude Toward Lesbian Scale (ATL) is used to assess concurrent validity.

Study limitations

We used an incidental non-probability sampling, and thus the conclusions should be taken with due caution. There are no paired data of the participants in a short term (days or weeks) or a medium (months) or long term (years); consequently, the temporal reliability and factor model stability could not be tested. The design was non-experimental, hence we only could talk about associations between attitudes, and we could not make any causal inference.

Conclusion

Among these Mexican students of psychology from a public university and among these medical students from a private university, the model composed of three correlated factors that was originally proposed shows a close fit, convergent validity in each factor, and discriminant validity between its factors. Nevertheless, it is not invariant across the two types of students. Items 6, 15, and 17 are better explained (higher weight and lower residual) by their corresponding factor, and items 9 and 19 have a greater measurement weight among medical students than among psychology students. These five items belong to the factors related to the appraisement of virginity and condemnation of pornography and to the factor related to rejection of masturbation and sex, which show a higher correlation among medical students than among psychology students. Among psychology students, item 13 (sex is dirty) is better explained by its factor (rejection of masturbation and sex) than among medical students. The level of internal consistency reliability of ASS-20 and its first factor (appraisement of virginity and condemnation of pornography) are good, whereas it was acceptable for the factor related to sexual shyness, shame, and modesty, without any significant difference between both samples. There is a significant difference in the level of reliability of the second factor

(rejection of masturbation and sex); its level is good among medical students and acceptable among psychology students. Scores on ASS-20 and the factor related to the appraisement of virginity and condemnation of pornography follow a normal distribution. The deviations from normality in the other two factors are very mild, so that there is a good approximation to multivariate normality. The average attitude, interpreted in an absolute sense, is liberal, except for the appraisement of virginity and condemnation pornography, which is ambiguous. The only difference in means between the two samples is the more liberal attitude towards masturbation among psychology students than among medical students. ASS-20 shows convergent validity in relation to the attitude towards male homosexuality, assessed with two different instruments. The correlation of those two instruments with the ASS-20 total score and its first two factors are medium, whereas the correlation with the third factor is low; there are no differences in these correlations between both samples or both scales of attitude towards homosexuality.

Recommendations

The use of this scale is recommended to assess and study the attitude towards sexuality in Mexican health science university students. ASS-20 can be scaled using the mean and standard deviation estimated through a probability sampling method. Likewise, the study of ASS-20 is suggested at the levels of compulsory secondary school and high school, as well as among university students of other careers. Additionally, the factorial invariance across sexes, age groups, or levels of schooling should be tested. From the present data, it can be inferred that, by promoting virginity and the condemnation of pornography (cultural values that still pervade our society), rejection towards homosexuality is being encouraged, especially the implicit type of rejection; these two aspects are not independent and have a rather close association (almost a quarter of shared variance).

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ABBREVIATIONS

ASS-20, Twenty-item Attitude towards Sexuality Scale; **AHS-10,** Ten-item Attitude towards Homosexuality Scale; **ATG-S,** Subtle rejection Attitude Towards Gay men subscale from the Mexican adaptation of Attitudes Towards Lesbians and Gay men (ATLG) scale; **MAS,** ASS-20 rejection of Masturbation and Sex factor; **SSM,** AAS-20 sexual shyness, shame, and modesty factor; **VCP,** AAS-20 appraisement of Virginity and Condemnation of Pornography factor.

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ANNEX

20-item Attitude towards Sexuality Scale (ASS-20)

Indicate the degree to which you agree with the following statements, circling the option that best describes your way of feeling or thinking. The options are ordered from Strongly Disagree (SD) to Strongly Agree (SA).

SD Strongly Disagree
D Disagree
nAnD Neither Agree nor Disagree
A Agree
SA Strongly Agree

	SD	D	nAnB	A	SA
1. When I masturbate, I try or think about it; I feel a lot of guilt	1	2	3	4	5
2R. Pornography is a cultural and artistic expression worthy of respect.	5	4	3	2	1
3. I am very ashamed when talking about sex	1	2	3	4	5
4R. You can have premarital sex if you take the appropriate precautions	5	4	3	2	1
5. I would only have sex with the light off	1	2	3	4	5
6. It is important to stay a virgin until marriage	1	2	3	4	5
7. Thinking about sex causes me great anguish	5	4	3	2	1
8R. Virginity is an unimportant value to me	5	4	3	2	1
9. Masturbating is for sick minds	1	2	3	4	5
10R. I would watch a pornographic movie	5	4	3	2	1
11. It is a moral virtue to resist the temptation of carnal desire	1	2	3	4	5
12R. I would go to a nude beach	5	4	3	2	1
13. Sex is dirty	1	2	3	4	5
14R. Masturbation is normal and pleasant	5	4	3	2	1
15. Premarital sex is immoral	1	2	3	4	5
16R. The naked body is beautiful	5	4	3	2	1
17. Masturbation is bad	1	2	3	4	5
18R. Sex is an important source of pleasure in life	5	4	3	2	1
19. Pornography corrupts the mind	1	2	3	4	5
20R. I like to learn about any topic of sexuality	5	4	3	2	1

Note. R = reverse-keyed item or worded in a liberal sense in this scale of rejection towards sexuality. The table indicates how to rate the items from 1 to 5.