

Psychometric Validation of the Risky Sexual Behaviors Scale in Mexican Adults

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How to cite this article: Velasco Rojano, A. E., García-Saisó, A., Montes-Domínguez, J. L., Salgado-Cedano, Y. K., Casas-Muñoz, A. and Rodríguez-Caballero, A. Psychometric Validation of the Risky Sexual Behaviors Scale in Mexican Adults. *Revista Colombiana de Psicología*. <https://revistas.unal.edu.co/index.php/psicologia/article/view/109781>

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SCIENTIFIC RESEARCH ARTICLE

RECEIVED: JUNE 28TH, 2023—ACCEPTED: FEBRUARY 19TH, 2024

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Abstract

Sexually transmitted infections (STIs) are a growing public health problem in Latin America. One key factor in diminishing their spread is the reduction of risky sexual behaviors, which requires reliable and valid information on the subject. This study aimed to validate a scale for measuring risky sexual behaviors in adults from Mexico City. We worked with 750 participants (56.66% women and 43.34% men) between 18 and 60. An initial version of the scale was administered online after obtaining informed consent. The scale's distribution, discrimination, reliability, and validity were analyzed. A 23-item scale was obtained with good reliability (ordinal $\alpha = .91$). It exhibited a six-factor structure that explained 47% of the variance and demonstrated good fit ($\chi^2/df = 2.84$, $p < .01$; CFI = .96; RMSEA = .05, 95% CI [.04-.05]; SRMR = .08). The scale is reliable and valid for measuring risky sexual behaviors in Mexican adults.

Keywords: psychometric analysis, risky sexual behavior, adults, Mexicans.

Validación psicométrica de la escala de conductas sexuales de riesgo en adultos mexicanos

Resumen

Las infecciones de transmisión sexual son un problema de salud pública que va en aumento en América Latina, un factor clave para reducirlas es disminuir las conductas sexuales de riesgo, por lo que se requiere información confiable y válida al respecto. El objetivo fue validar una escala para medir conductas sexuales de riesgo en adultos de la Ciudad de México. Se trabajó con 750 participantes, 56.66% mujeres y 43.34% hombres, entre los 18 y los 60 años. Se aplicó una versión inicial de la escala en línea después de obtener consentimiento informado. Se llevó a cabo el análisis de la distribución, discriminación, confiabilidad y validez de escala. Se obtuvo una escala con 23 reactivos, buena confiabilidad (α ordinal=.91), con una estructura con seis factores que explica el 47% de la varianza y tiene adecuado ajuste ($\chi^2/df=2.84$, $p<.01$; CFI=.96; RMSEA=.05 95%IC (.04-.05); SRMR=.08). La escala es confiable y válida para medir conductas sexuales de riesgo en adultos mexicanos.

Palabras clave: análisis psicométrico, conductas sexuales de riesgo, adultos, mexicanos.

Introduction

Sexually transmitted infections (STIs) and Human Immunodeficiency Virus (HIV) are significant current public health problems in Latin America (United Nations Organization, 2020). Official figures on new HIV infections show a 5% increase in new cases between 2010 and 2021, resulting in 2.2 million diagnosed individuals in the region. Despite improvements in treatment coverage, more must be done to ensure prompt diagnosis and enrollment in care. About 30% of diagnosed individuals are estimated not to receive antiretroviral therapy (Joint United Nations Programme on HIV/AIDS, UNAIDS 2022).

The United Nations has called for promoting human rights for diagnosed individuals and vulnerable groups to reduce new HIV infections and address inequality. Additionally, societies must be better prepared to overcome diseases (UN, 2022). One critical action to achieve these goals is educating and empowering community members about sexuality (Alfonso & Figueroa, 2017; UNAIDS, 2022).

To successfully implement interventions that prioritize specific populations, providing information that caters to their unique needs and experiences without passing judgment is crucial. Emphasizing the significance of sexual and reproductive healthcare instead of relying on ineffective prohibitive measures that have been previously used is essential. Therefore, the access to reliable information is necessary (Alfonso, Santillano, Figueroa, Rodríguez, & García, 2020).

One key aspect to investigate is risky sexual behaviors, which, according to various authors, can potentially increase the likelihood of harmful outcomes. These behaviors include early sexual debut, unprotected sex, exchanging sex for money or goods, sexualized substance consumption, having sex with casual partners, having sex with multiple partners, and sharing sex toys (Mirzaei, Ahmadi, Saadat, & Ramezani, 2016; Rodríguez & Becerra, 2022; Saeteros, Pérez, & Sanabria, 2015).

Different fields, as medicine, psychiatry, psychology, anthropology, and public policy, have studied risky sexual behaviors. They measure them using questionnaires or alternative forms (Mirzaei et al., 2016).

The alternative forms include self-report behavior records and biological markers. Behavior records consist of diaries or logs of sexual activity over a specific period, aiming to obtain dynamic information about sexual behaviors (Morrison-Beedy, Carey, Feng, & Tu, 2008). Various potential biases can affect the accuracy of sexual contact reports. Some examples include not considering the total number of sexual encounters based on their definition, difficulty recalling specific details, and the influence of social desirability (Mirzaei et al., 2016; Schroder, Carey, & Vanable, 2003). Detecting personal biological markers for studies like prostate antigen or Y chromosome in vaginal fluids is more accurate but more complex and expensive (Giguère et al., 2019; Mirzaei et al., 2016).

Another approach to tackling these potential challenges is to measure risky sexual behaviors through questionnaires. If these questionnaires exhibit robust psychometric properties, they are less prone to biases than behavioral records and more straightforward to administer than biological markers. Questionnaires assessing risky sexual behaviors can generally be categorized into two primary types: surveys that target broader population sectors and specific questionnaires tailored for smaller populations (Mirzaei et al., 2016).

Questionnaires for measuring risky sexual behaviors generally vary in two characteristics. The first is their focus, which can be general, covering many risk behaviors (Mercer, Wellings, & Johnson, 2014; Raghupathy & Hahn-Smith, 2011), or specific to a particular behavior, for example, having sex without using a condom (Giguère et al., 2019; Rodrigues, Lopes, Pereira, Prada, & Garrido, 2020). Research studies vary in their target populations based on conditions that make them vulnerable, as age, sex work, or specific professions among university students. Examples include studies

by Pengpid & Peltzer (2021), Thepthien & Celyn (2022) for adolescents, Castilla et al. (1999) for adults, and Giguère et al. (2019) for sex workers. Some studies also focus on university students in some professions (Badillo, Mendoza, Barreto, & Díaz, 2020) or people with disabilities (Maart & Jelsma, 2010).

In Mexico, surveys conducted at a national level gather information on the sexual and reproductive health of adolescents and adults. These surveys also cover risky sexual behaviors, as the National Health and Nutrition Survey (Shamah-Levy et al., 2022). However, this survey does not include all the risky behaviors identified in the literature.

Additional data is required to enhance the control and prevention of STDs, as the existing literature is inadequate. Developing and psychometrically validating an instrument to measure risky sexual behaviors will contribute to a low-cost, high-quality tool for research development. This tool will generate reliable information on the prevalence of these behaviors and their association with public health issues as teenage pregnancies, sexually transmitted infections, and exposure to violence (Moral & Garza, 2016).

Therefore, this study aimed to develop and psychometrically validate a scale to measure risky sexual behaviors in adults in Mexico City.

Method

Study Type

An instrumental psychometric study was conducted to determine the properties of measurement instruments. Instrumental studies aim for this purpose (Montero & León, 2002).

Participants

The study included 750 adults from Mexico City selected non-probabilistically by convenience, with 56.66% (425) females and 43.34% (325) males. The participants' ages ranged from 18 to 60 years, with an average age of 26.50 ($SD = 6.57$). In terms

of sexual preference or orientation, 36% (270) identified as heterosexual, 34% (255) as homosexual, and 30% (225) as bisexual or pansexual. Regarding the participants' educational level, 4.76% (20) had primary education, 35.71% (150) had secondary education, and 59.52% (250) had university education.

To determine the appropriate sample size for RMSEA, a power analysis was conducted with 43 items, 946 degrees of freedom, a type 1 error probability of $\alpha = 0.05$, and a desired statistical power of $1 - \beta = 0.80$ (MacCallum, Browne, & Sugawara, 1996). This analysis resulted in a minimum sample size of 375 participants, an exceeded number.

The sample was divided into two balanced parts for analysis. This approach allowed for both exploratory and confirmatory studies with different samples, resulting in a more accurate representation of the relationships between variables and reducing the need to rely on the unique characteristics of a single sample (Paniagua, Alvarado, Olivares, Romero-Suárez, & Aguayo-Estremera, 2022).

Instrument

An initial scale version constructed using the Delphi methodology was applied (Dragostinov et al., 2022). Initially, a group of six experts, consisting of three physicians and three psychologists with experience in providing sexual education to adolescents, reviewed the definitions of six risky sexual behaviors proposed in the literature (Mirzaei et al., 2016; Rodríguez & Becerra, 2022; Saeteros, Pérez, & Sanabria, 2015): unprotected sex, transactional sex, sexualized substance consumption, sex with casual partners, sex with multiple partners, and sharing sex toys.

After reviewing the definitions, they proposed items to measure each behavior, forming an initial pool of 100 items. By consensus, they selected the items that best represented each behavior. For the behavior of sexualized substance consumption, they selected eight items corresponding to the main substances identified for sexualized use.

They selected seven items for the other behaviors, resulting in a version with 43 items.

The items were statements with five Likert-type response options in frequency, ranging from “never” to “always”. Additionally, an open-ended question was included: *How old were you when you had sexual intercourse for the first time?* To assess concurrent validity, a behavioral record was kept of the participants’ number of different sexual partners over six months.

Data Collection Procedure

Potential participants were contacted through social media and received an invitation explaining the purpose of the study. After obtaining informed consent, the scale was administered using an online survey system between June 13th and 25th, 2022. At the end of the survey, participants were thanked for their participation.

Ethical Considerations

This study followed the Ethical Principles for Research Involving Human Subjects established in the Declaration of Helsinki and the Regulation of the General Health Law on Health Research. An institutional research ethics committee approved the study, with record number 276/2023 (Regulation of the General Health Law on Health Research, 2014; Helsinki Declaration, 1964).

Before the study, the participants were provided with clear information about the purpose of the research and the voluntary nature of their participation. Informed consent was obtained, ensuring they understood they had the right to refuse or withdraw from the study without facing any consequences. It was explained that the study did not incur any costs or offer direct payment or benefits for participation. A privacy notice was provided by the General Law on the Protection of Personal Data Held by Obligated Subjects. It explained the mechanisms in place to safeguard the confidentiality of personal information and uphold individuals’ ARCO rights (General Law on

the Protection of Personal Data Held by Obligated Subjects, 2017).

For the security of the participants’ information, only the researchers had access to the database generated by the electronic system. They agreed to keep the information confidential and not to transfer it. Moreover, no data on participants’ names, surnames, email addresses, or postal addresses were collected. The only personal information collected was the participants’ gender and age.

Statistical Data Analysis Procedure

To psychometrically validate the scale, evidence was obtained for four basic psychometric properties, according to Edwards and Wirth (2009): distribution, discrimination, reliability, and construct validity. Specific analyses were planned for this purpose.

A frequency distribution analysis was conducted in terms of percentages to examine the distribution of responses, accompanied by the Anderson-Darling univariate normality test and the Royston multivariate normality test. These tests were chosen as they are suitable for the sample size used in scale validation (Wijekularathna, Manage, & Scariano, 2019) using the R software with the MVN package (Korkmaz, Goksuluk, & Zararsiz, 2014).

Two analyses were performed for the distribution and construct validity based on factorial structure, each using a different half of the sample. First, an exploratory factor analysis with minimum least squares extraction and oblique rotation was conducted to suit the data type (Fabrigar, Wegener, MacCallum, & Strahan, 1999). This analysis was performed using the R software with the psych package (Revelle, 2022).

Subsequently, confirmatory factor analysis was conducted with the second half of the sample since a prior hypothesis about its structure was derived from the exploratory factor analysis (Edwards & Wirth, 2009). Two structures were compared to confirm that the structure obtained in the exploratory analysis provided the best fit. The first

structure had one factor, while the second from the exploratory analysis had six factors.

The identification was performed by fixing the loading of the first item to one to define the metric of the latent variable (Kenny & Milán, 2012). A robust estimation method, diagonally weighted least squares (DWLS), was chosen due to its suitability for working with ordinal data that deviates from normality (Li, 2016; West, Taylor, & Wu, 2012). To determine if an item was adequately related to the underlying latent variable, indicating adequate discriminatory power, a lambda value > 0.40 was sought (Whittaker, 2012).

Multiple criteria were considered to evaluate the model fit. The chi-square test, divided by its degrees of freedom, needs to have a value of less than three, regardless of its probability (La Du & Tanaka, 1989). Additionally, both the standardized root mean square residual (SRMR) and the root mean square error of approximation (RMSEA) had to be less than or equal to .08 (MacCallum, Browne, & Sugawara, 1996). Finally, the comparative fit index (CFI) had to be at least .95 (Hu & Bentler,

1999). The analysis was performed using the R software with the Lavaan package (Rosseel, 2012).

To assess reliability, an analysis of internal consistency was conducted using the appropriate ordinal Alpha coefficient for the scale's data type (Trizano & Alvarado, 2016). This analysis was performed using the R software with the psych package (Revelle, 2022).

To obtain evidence of concurrent validity, Pearson product-moment correlations were calculated between the scale's factor scores and the behavioral record of the number of sexual partners. This analysis was also conducted using the R software with the psych package (Revelle, 2022).

Results

Based on the frequency distribution analysis, it was found that all response options were selected for each item. However, the group did not follow a normal distribution in the Royston multivariate normality test and individually in the Anderson-Darling univariate normality test, as seen in Table 1. (Royston = 8605.12, $p < .01$)

Table 1
Items distribution analysis

Item	Response option percentage					Anderson-Darling normality test
	Never	Few times	Some times	Many times	Always	
1	14.15	9.74	19.75	28.17	28.17	34.75**
2	92.79	4.13	1.6	1.2	0.26	242.49**
3	41.12	23.36	23.89	10.14	1.46	48.28**
4	83.57	10.41	3.73	1.73	0.53	186.45**
5	19.75	7.2	24.69	17.62	30.7	36.99**
6	87.18	4.67	4.27	1.6	2.26	210.83**
7	95.46	2.13	1.46	0.4	0.53	260.17**
8	57.94	13.08	12.95	7.47	8.54	88.20**
9	68.35	19.22	8.01	3.02	1.2	118.12**
10	83.44	11.08	2.67	1.46	1.33	184.35**
11	36.98	9.07	20.56	18.55	14.81	43.21**
12	14.68	7.34	19.62	25.5	32.84	39.99**
13	90.38	4.27	2.93	1.86	0.53	229.31**
14	81.17	13.08	3.73	1.2	0.8	172.17**
15	94.92	3.33	1.2	0.26	0.26	256.16**

16	72.76	10.68	12.41	3.2	0.93	139.34**
17	75.56	6.54	8.41	4.13	5.34	154.03**
18	25.23	3.2	9.47	16.28	45.79	76.15**
19	75.43	10.01	10.28	2.93	1.33	149.85**
20	24.43	11.21	13.75	22.96	27.63	40.94**
21	63.55	12.68	12.28	9.07	2.4	104.92**
22	90.25	4.67	2.67	1.33	1.06	226.88**
23	77.16	10.01	10.68	1.06	1.06	158.21**
24	94.39	2.13	1.86	1.06	0.53	254.73**
25	96.12	2.01	1.33	0.4	0.13	265.77**
26	93.59	2.8	2.26	0.93	0.4	249.21**
27	66.75	15.88	8.94	2.53	5.87	117.27**
28	23.36	4.01	11.08	17.48	44.05	69.16**
29	67.69	14.01	10.28	4.8	3.2	117.93**
30	53.4	21.89	14.28	3.07	7.34	75.90**
31	84.93	11.08	3.07	0.53	0.4	193.44**
32	97.73	1.20	0.67	0.13	0.27	275.10**
33	33.64	3.74	10.55	12.82	39.25	70.39**
34	89.19	3.60	3.74	1.47	2.00	222.97**
35	46.33	12.68	20.83	14.15	6.01	56.92**
36	14.95	6.27	18.82	19.49	40.45	50.07**
37	57.01	20.82	11.88	9.07	1.20	84.43**
38	62.08	13.08	16.68	4.67	3.47	97.54**
39	79.57	8.41	9.21	1.60	1.20	169.47**
40	90.91	4.93	2.93	0.66	0.53	230.59**
41	93.05	3.33	2.26	0.80	0.53	244.78**
42	22.69	1.20	7.61	4.53	63.95	125.21**
43	91.58	3.73	2.26	1.73	0.66	236.42**

**p<.01, Source: Own elaboration

For item discrimination and evidence of construct validity, the structure of the scale was examined through an exploratory factor analysis using unweighted least squares extraction and oblique rotation. A six-factor structure was found,

explaining 47% of the variance. In this analysis, 19 items were eliminated due to factor loadings below or equal to .40. The Standardized factor loadings are presented in Table 2.

Table 2

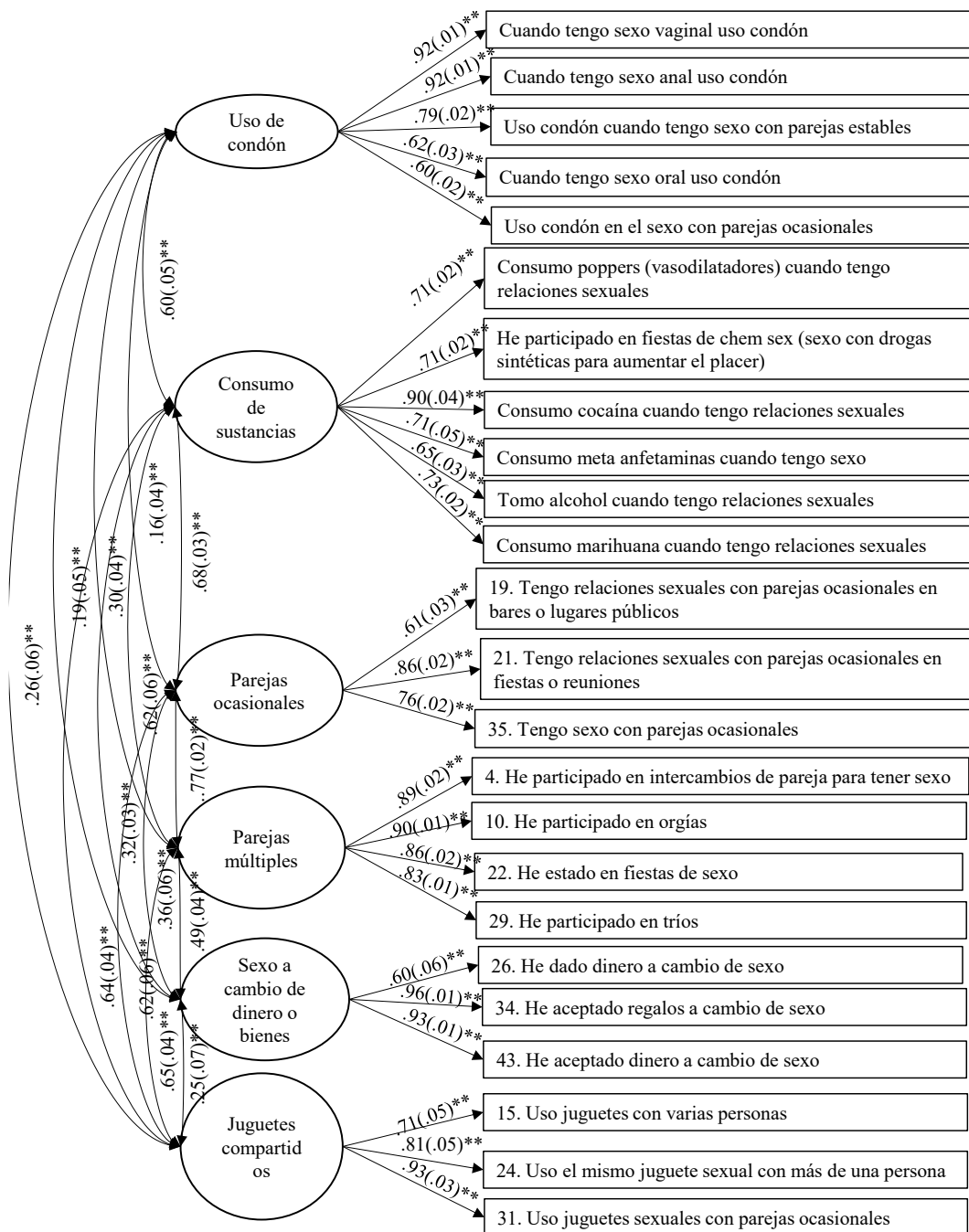
Standardized factor loadings from the exploratory factor analysis with unweighted least squares extraction and oblique rotation

Item	F1. Condomless sex	F2. Substance use in sex	F3. Sex with multiple partners	F4. Casual sex	F5. Pay or charge for sex	F6. Use of sexual toys	Communalities
3	0.91**	-0.03	0	-0.01	-0.04	0.01	0.8
12	0.88**	-0.02	0.02	-0.02	-0.06	0.03	0.77
20	0.82**	-0.01	-0.02	0	0.08	-0.04	0.68
27	0.79**	0.03	-0.06	-0.06	-0.01	0.03	0.65
28	0.74**	-0.07	0.07	0.02	0.1	-0.07	0.53
25	0.07	0.74**	0.06	0.04	-0.1	-0.04	0.59
39	-0.14	0.73**	0.08	0.1	0.04	-0.1	0.54
2	0.14	0.65**	-0.03	0.01	-0.05	-0.01	0.5
7	0.06	0.62**	0.02	0.12	-0.12	0.11	0.48
32	-0.04	0.56**	0.02	-0.08	0.2	-0.09	0.36
37	-0.02	0.53**	-0.08	-0.09	0.42	0.02	0.52
10	-0.03	0.06	0.82**	-0.07	0	0.06	0.72
4	-0.01	-0.04	0.73**	-0.04	0.06	-0.01	0.53
22	0.08	0	0.63**	-0.1	0.01	0.08	0.47
29	0.03	0	0.47**	0.03	0.01	0.33	0.43
19	-0.03	-0.02	-0.06	0.85**	0.08	-0.01	0.74
21	-0.05	0.04	-0.08	0.78**	0.06	-0.01	0.66
35	-0.07	0.06	-0.07	0.76**	0.06	-0.01	0.63
34	0.08	-0.04	0.12	0.34	0.66**	-0.02	0.59
43	0.11	-0.07	0.08	0.31	0.53**	-0.01	0.41
26	0.09	-0.06	0.04	0.38	0.49**	0.01	0.42
31	0.05	-0.01	0.09	-0.02	-0.01	0.66**	0.49
24	-0.03	-0.03	-0.18	-0.05	0.07	0.52**	0.25
15	-0.17	0	0.04	-0.02	0.01	0.47**	0.24
Eigenvalues	4.94	4.73	3.34	2.97	2.23	2.03	
Explained variance %	11%	22%	8%	7%	5%	5%	58%
variance %							

**p<.01, Source: Own elaboration

Subsequently, a confirmatory factor analysis was conducted using diagonally weighted least squares estimation. The results showed that the one-dimensional structure had a poor overall fit for explaining the data ($\chi^2/df=16.53$, $p<.01$; $CFI=.63$; $RMSEA=.14$, 95% $CI [.14-.15]$; $SRMR=.37$).

However, the six-factor model obtained from the exploratory factor analysis demonstrated good fit across all indices ($\chi^2/df=2.84$, $p<.01$; $CFI=.96$; $RMSEA=.05$, 95% $CI [.04-.05]$; $SRMR=.08$). The standardized solution of the confirmatory factor analysis is presented in Figure 1.



The reliability of the total scale was good (*ordinal alpha*=.91). The factors' reliability was also good condomless sex (*ordinal alpha*=.88), substance use during sex (*ordinal alpha*=.87), multiple partner sex (*ordinal alpha*=.91), casual partner sex (*ordinal alpha*=.78), sex in exchange for payment (*ordinal alpha*=.90), and shared use of sexual toys (*ordinal alpha*=.87).

Regarding convergent validity, the various factors within the scale displayed significant positive correlations, ranging from low to moderate, with a behavioral log that recorded the number of sexual partners over the past six months. These factors included engaging in unprotected sex ($r=.19$, $p<.001$), substance use during sexual activity ($r=.21$, $p<.001$), having multiple partners ($r=.42$, $p<.001$), engaging in casual sex ($r=.39$, $p<.001$), exchanging sex for payment ($r=.19$, $p<.001$), and sharing sexual toys ($r=.17$, $p<.001$).

Discussion

The main objective of this study was to develop and psychometrically validate a scale to measure risky sexual behaviors in adults from Mexico City. The scale underwent thorough analysis to assess its distribution, discrimination, reliability, and validity properties (Edwards & Wirth, 2009).

The psychometric analysis observed that all items exhibited distributions that deviated from a normal probability distribution, aligning with expectations for the measured construct. This suggests that the items effectively captured the variability of risky sexual behaviors. Furthermore, all retained items demonstrated discriminatory solid power, as indicated by their significant and substantial factor loadings exceeding .60 (Whitaker, 2012). The scale also showed good internal consistency, with ordinal alpha values equal to or higher than .80, indicating high reliability (Trizano & Alvarado, 2016).

Regarding the scale's validity, the results provided evidence supporting its construct validity. The coherence between the exploratory and confirmatory analysis structures, with the best-fitting

structure aligning with the existing theory on risky sexual behaviors, reinforces the scale's validity (Ondé, 2020; Ondé & Alvarado, 2022). Additionally, the significant and appropriately directed correlations with the behavioral record indicate convergent validity, although the magnitudes of the correlations were not exceptionally high. This can be attributed to the inherent variability of behavioral records and the possibility that they may not capture all aspects related to risky behaviors (Mirzaei et al., 2016; Rodríguez & Becerra, 2022; Saeteros, Pérez, & Sanabria, 2015).

The final version of the scale includes reliable information on six well-established risky sexual behaviors: unprotected sex, transactional sex, sexualized substance consumption, sex with casual partners, sex with multiple partners, and sharing sex toys documented in the literature (Mirzaei et al., 2016; Rodríguez & Becerra, 2022; Saeteros, Pérez, & Sanabria, 2015). An additional question assessing early sexual initiation was included but required a different format for analysis due to its unique nature.

The validated scale can be valuable for researching risky sexual behaviors among Mexican adults. Providing reliable assessment tools can contribute to developing effective interventions aimed at reducing sexually transmitted diseases, particularly among prioritized populations (Alfonso et al., 2020).

However, there are limitations to consider. The study's sample was limited to residents of Mexico City, warranting further research to explore the scale's properties in nationally representative samples and internationally for other countries and world regions as the Americas. Furthermore, although convergent validity was established through correlations with a behavioral record, exploring other methods to ensure validity is essential, as behavioral records may have specific limitations. In conclusion, the developed scale exhibits reliability and validity in measuring risky sexual behaviors among Mexican adults. Its comprehensive assessment of various dimensions

of risk can offer valuable insights for research and intervention efforts in this domain.

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