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Cultural Adaptation and Validation of the Barriers to HIV Testing Scale-Karolinska Version for Brazilian Men Who Have Sex With Men

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Abstract

The aim of this study was to perform the cultural adaptation and validation of the Barriers to HIV testing scale-Karolinska version for Brazilian men who have sex with men. A methodological study was conducted for cultural adaptation and validation of the scale. Reliability analyses, exploratory factor analysis, confirmatory factor analysis, and convergent and discriminant validity tests were performed. Four factors were extracted: F1, personal consequences; F2, structural barriers; F3, confidentiality; F4, economic consequences and individual concerns. Good fit indexes were obtained: (χ^2)/GL (2.71); goodness of fit index (0.94); root-mean-square error of approximation (0.052; 90% CI [0.045–0.059]); Tucker–Lewis index (0.94); normed fit index (0.93); IFI (0.95); comparative fit index (0.95). Convergent validity results were greater than 0.7 for the four factors. The adapted version of the scale showed satisfactory reliability and validity for assessing barriers to HIV testing among men who have sex with men.

Key words: HIV, HIV testing, measurement, prevention, psychometrics, sexual and gender minorities

HIV testing has undergone significant transformations throughout the history of the HIV pandemic, and it has moved from a positive test result being a probable death sentence to routine testing being part of a broader prevention plan (Redoschi et al., 2017). Combined prevention starts with regular testing for sexually active people. Among key populations, such as men who have sex with men (MSM), the recommendation is annual testing, and for those involved in situations of greater risk exposure, HIV testing is indicated once every six months or more frequently. However, testing frequency recommendations should be targeted based on an assessment of individual characteristics and exposure risk level (DiNenno et al., 2017).

Regular testing has overall health benefits because early HIV diagnosis can reduce morbidity and mortality and transmission rates. However, the prevalence of HIV testing among MSM varies according to the estimation method and social and cultural context, ranging from 53.15% to 88.2% (Bhattacharjee et al., 2020; Liu et al., 2019; Nanin et al., 2020). A systematic review with meta-analysis identified that recent and regular testing is suboptimal (Liu et al., 2019), and in a sample of 1,657 Chinese MSM, 29.7% reported biannual testing (Hill et al., 2019).

Low adherence to regular testing may be related to different access barriers faced by MSM: stigma; fear of false results; concern for secrecy; fear of disclosing sexual orientation; limited access to health services; not knowing the place where the test is performed; not having health insurance; fear of the outcome; engaging in safe sex practices; and the perception of low risk (Horridge et al., 2019; Zhang et al., 2021). Barriers are varied and may be more evident depending on the culture and social conditions of MSM. For barriers related to confidentiality, both related to the test result itself and sexual orientation, there are alternatives such as the self-test that can be performed in a place with the desired level of privacy, which includes being performed at home. Evidence indicates that self-testing contributed to the increased frequency of HIV testing among high-risk MSM (Katz et al., 2018). Other studies conducted with

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younger MSM identified fear of disclosing sexual orientation to parents, association of infection with death, issues related to communication with health professionals, and even the test result itself as additional concerns (Dowson et al., 2012; Schwarcz et al., 2011; Song et al., 2011; Wei et al., 2014; Wong et al., 2012).

Knowledge about barriers to accessing health services faced by MSM in Brazil is scarce, and there is a need for more information on the subject to guide actions that improve access to health services, with testing and timely initiation of treatment. In this sense, valid and reliable instruments can be support tools to assess the barriers to HIV testing experienced by Brazilian MSM. Scales to monitor barriers to HIV testing are scarce worldwide. The Barriers to HIV Testing Scale-Karolinska version (Wiklander et al., 2015) is a scale developed from a preexisting instrument (Awad et al., 2004) and allows the identification of different types of barriers to HIV testing, presenting itself as an option for cultural adaptation and validation for application in the Brazilian reality. Thus, the aim of this study was to culturally adapt and evaluate the psychometric properties of the Barriers to HIV testing scale-Karolinska version among Brazilian MSM.

Methods

Design

This is an instrument adaptation, methodological study. Developed in six steps, as shown in Figure 1, the Barriers to HIV Testing Scale-Karolinska version (Wiklander et al., 2015) was translated from English to Brazilian Portuguese, adapted, and validated with a sample of 1,290 MSM.

The instrument adaptation process is described in the following six steps:

Step 1—Translation. After authorization from the original author of the scale, two certified and independent translators translated the scale from English into Brazilian Portuguese.

Step 2—Assessment by the evaluators committee. A committee of evaluators met to assess the two translated versions of the scale and find a consensus version. This committee was composed of five evaluators—four experts on the subject and one member of the MSM population. All evaluators were proficient in both English and Portuguese and were all native Brazilians. Furthermore, the evaluators needed to meet at least one of the following criteria to be included: having clinical experience with people living with HIV, being a researcher in the field of HIV, having defended a thesis/dissertation in the field of HIV, or belonging to the population of interest.

This in-person meeting lasted for 65 minutes. During this meeting, the committee evaluated the instrument item by item and selected the translated item that was most related to the Brazilian culture and health context.

Step 3—Back-translation. Then, back-translation was performed by two, independent, certified translators who were different from the translators who performed the initial English to Brazilian Portuguese translations. Two versions in English were obtained, and a meeting was held between the five researchers from the committee of evaluators to obtain a consensual version. The original author of the scale had contact with the back-translated version and agreed with the version presented.

Step 4—Semantic analysis of items. This is the first step in which a sample of participants was recruited for the adaptation and validation process. The objective of this stage was to verify the comprehensibility of all the scale items by the participants who constituted the study population. Data collection for this stage took place from February 11, 2020, to February 19, 2020. Men who have sex with men were selected for semantic analysis through two social media platforms—Instagram and WhatsApp. Text messages, containing an invitation to participate, were posted on each social media platform. If individuals agreed to participate, an online questionnaire was sent; this included an online free and informed consent form. The procedure used to collect data in this stage was sending the invitation and the link through the online form to participate. The online questionnaire contained four sections: 1:free and informed consent form; 2: closed and open questions about the sociodemographic and clinical characterization of the participants; 3: questions about the assessment of the scale; and 4: semantic analysis for each item.

In total, 51 invitations were sent. Two participants did not complete the answers and therefore were excluded. In the end, 49 MSM participated in the semantic analysis. Participants were selected considering their education levels, measured according to the number of years of study completed. Invitations were purposely sent to MSM with differing levels of education.

Step 5—Pretest. After the adaptation process, the final Brazilian Portuguese version of the Barriers to HIV Testing Scale-Karolinska version was tested in a sample of MSM with the purpose of evaluating the performance of data collection in virtual environments. Data collection for this stage took place from March 10, 2020, to March 25, 2020. Fifty-three MSM participated in the pretest. Men who have sex with men were selected through intentional sampling, a nonprobabilistic sampling method (Hair et al., 2009),

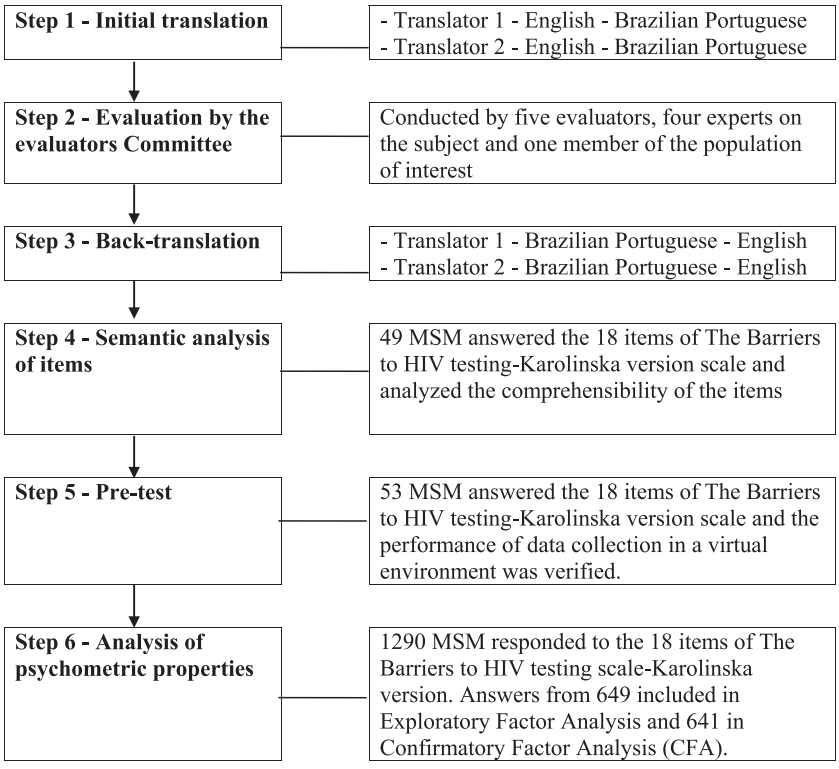

Figure 1. Flowchart of the scale adaptation and validation process.

by means of the availability of the questionnaire link on Instagram.

Step 6—Assessment of psychometric properties.

Study sample Data collection for the analysis of psychometric properties took place between the April 1, 2020 and May 19, 2020. The first response was received on April 1, 2020, and the last on May 10, 2020. Participant recruitment was done through the internet, through an online questionnaire built on the SurveyMonkey® platform. Inclusion criteria were as follows: being 18 years or older; identifying as a man; having Brazilian nationality (native or naturalized Brazilians); having access to the internet; having had sex with another man at least once in their life; and being without HIV/unknown (already tested and/or never tested for HIV) or newly diagnosed with HIV (<6 months).

The questionnaire link was published on different social networks: Instagram, Twitter, Facebook, and Grindr. The invitation message to participate in the research contained information about the research, the research objectives, and the inclusion criteria of the participants. A total of 1,830 people accessed the questionnaire link, and 1,298 answered the complete questionnaire with no data missing, which included all items in the scale. The response completion rate was 70.92%, and the average response time was 7 min. Of the 1,298 participants, eight were excluded for not meeting the preestablished inclusion criteria, which produced a final sample size of 1,290 for the psychometric analysis stage. This sample size is suitable for psychometric analyses in which authors recommend a minimum of 10 responses per item (Hair et al., 2009).

Data Analysis

Characterization of participants. Descriptive statistics were used to analyze the following variables: sociodemographic characterization such as gender identity (cisgender man, transgender man, intergender, other); sexual orientation (gay, heterosexual, bisexual, pansexual, asexual, other); age in full years; region of the country (North, Northeast, Midwest, South and Southeast); skin color (white, black, brown, yellow, do not wish to declare, other); education (no education or <1 year of study, incomplete primary education, complete primary education, incomplete secondary education, complete secondary education, incomplete higher education, complete higher education, specialization, master's, doctorate); work status (formal, informal, unemployed, retired/pensioner, student); family income (<1 minimum wage, 1–2 minimum wages, 3–4 minimum wages, 5–6 minimum wages, 7 or more minimum wages, no income); and

marital status (single, married, stable/living together, divorced, separated).

The skin color of the Brazilian population is self-declared, that is, the person is asked how he defines himself in relation to the color of his skin, according to the Brazilian Institute of Geography and Statistics. The minimum wage in Brazil was R$1,039, and the average Brazilian income was R$1,450 (IBGE, 2020)

Reliability. The reliability of the adapted version of the scale was assessed through the analysis of internal consistency using Cronbach alpha coefficient. Values range from 0 to 1, and values above 0.7 are considered acceptable (Hair et al., 2009).

Construct validity. The total sample of 1,290 participants was divided in two using an SPSS software tool for random division of cases; this was done to allow for two independent samples in conducting the factor analyses. The process resulted in two random samples, each corresponding to approximately 50% of the cases. The methodological procedure of dividing a sample into two different samples, at random, is recommended when there are large samples, as stated by Hair et al. (2009), and this resource has already been used by other authors (Todd et al., 2020). The sample for the exploratory factor analysis (EFA) consisted of 649 MSM, and the sample for the confirmatory factor analysis (CFA) was composed of 641 MSM. The two samples showed statistical differences when comparing the two groups in relation to a score calculated from the mean of the sum of the scale values.

Exploratory factor analysis. The EFA was performed to verify the behavior of the variables and the factorial structure of the scale. All assumptions for this type of analysis were verified. The matrix of correlations between the variables in which the variables were expected to be correlated was observed, which was confirmed. All correlations were statistically significant ($p < .5$). Two other tests were performed to observe the convenience of applying the factorial model: the Bartlett sphericity test and the Kaiser–Meyer–Olkin (KMO) measure of sample adequacy.

The KMO interpretation is that the closer it gets to 1, the more the perfect prediction of each variable is determined by the other variables. Values below 0.50 indicate that the factors found cannot satisfactorily describe the variations in the original data (Corrar et al., 2007), and items that did not load at 0.50 level on any factor were omitted in the results. For Bartlett test of sphericity, the p value should be observed, which is significant at $p < .001$ (Hair et al., 2009). Observing the eigenvalue criterion for determining the number of factors, only factor solutions with eigenvalues above 1 are considered. This solution is based on the Kaiser criterion (Kaiser test) or latent root criterion (Corrar et al., 2007).

Factor extraction was performed using principal components and oblimin rotation. Based on the Kaiser criterion, a number of factors were defined (Hair et al., 2009). The commonalities of each variable were also observed, and the acceptable level of explanation must be higher than 0.5 (Hair et al., 2009).

Floor and ceiling effects were also analyzed; floor effect being the percentage of participants who scored their responses at a lower level, and the ceiling effect being the percentage of participants who scored their responses at a higher level (Bennett et al., 2002). No changes were made after EFA, and thus, the final version of the scale was named.

Confirmatory factor analysis. Confirmatory factor analysis was performed after extracting the factors to assess the stability of the factor model results and the degree of generalizability of the results. The CFA is essential because only through this is it possible to describe whether the data structure is representative (Hair et al., 2009).

The assumptions for this type of analysis were respected: normal distribution of sample data, which was verified by means of univariate asymmetry (skewness) and univariate flattening or kurtosis (kurtosis). Values greater than three for skewness and greater than 10 for kurtosis were considered to violate this assumption and indicate that the estimation of the model is inadequate (Kline, 2005).

For this analysis, the maximum likelihood method was used. A total of four factors were considered. Adjustment measures were considered for estimating the model: absolute fit measures, incremental fit measures, and parsimonious fit measures. The various adjustment measures, each with their respective particularities and values, must be evaluated together for the acceptance of a final model. Isolated value analyses should not be considered.

Convergent and discriminant validity. The validity of the scale was assessed as the final stage of quality analysis. Composite reliability (CC) was used to verify the convergent validity. Values greater than 0.7 were considered satisfactory ($CC > 0.7$; Hair et al., 2009). The discriminant validity was verified using the heterotrait–monotrait ratio of correlations (HTMT) criterion (Henseler et al., 2015); the parameter is that the result of the HTMT verification is less than 0.85 if taken as a rigorous measure or less than 0.9 if taken as a more liberal measure (Henseler et al., 2015).

Adjustment measures	Reference values
Absolute fit measures	
Chi square (χ^2)	$p > .05$
Degrees of freedom (GL): χ^2/GL (Kline, 2005).	χ^2/GL<3
Goodness of fit index (GFI) (Lisboa et al., 2012).	GFI > 0.90
Root-mean-square error of approximation (RMSEA) (Hair et al., 2009).	RMSEA < 0.08
Incremental adjustment measures	
Tucker–Lewis index (TLI) (Hair et al., 2009).	TLI ≥ 0.90
Normed fit index (NFI) (Hair et al., 2009).	NFI ≥ 0.90
Comparative fit index (CFI) (Hair et al., 2009).	CFI ≥ 0.90
Incremental fit index (IFI) (Hu & Bentler, 1999).	IFI ≥ 0.95
Parsimonious fit measures	
Parcimonious normed fit index (PNFI) (Hair et al., 2009)	PNFI = 0.06–0.09
Parcimonious goodness fit index (PGFI) (Mulaik et al., 1989)	PGFI ≅ 0.5

Ethical aspects

The research project was approved by the Research Ethics Committee (CEP) of the Nursing School of Ribeirão Preto under opinion no. 3.172.445 and CAAE no. 06609319.0.0000.5393. All participants gave their free and informed consent in writing. The anonymity of the participants was guaranteed. Data were stored on the SurveyMonkey platform, during the data collection, in a private database accessed only by the main researcher.

Results

A total of 1,392 MSM from the five regions of Brazil participated in the study: 49 from the semantic analysis; 53 from the pretest; 1,290 from the assessment of psychometric properties (649 from the EFA and 641 from the CFA).

Pretest

Fifty-three MSM participated in this stage. The majority identified themselves as cisgender male (n = 48; 90.6%), gay (n = 47; 88.7%), from Piauí (n = 42; 79.2%), of brown skin color (n = 25; 44.6%), with higher education incomplete (n = 21; 39.6%), with formal work (n = 22; 41.5%), single (n = 45; 84.9%), without a steady partner (n = 31; 58.5%), used alcohol (n = 43; 81.1%), did not use tobacco (n = 46; 86.8%), had a sexual partner in the past three months (n = 22; 41.5%), and the most frequent sexual practice was the receptive anal position (passive) (n = 21; 39.6%). Participants responded to all items on the scale, with no loss of responses on any of the items.

Exploratory Factor Analysis

Results of sociodemographic characterization. A total of 649 MSM participated in this stage, 584 were cisgender men (90%), 547 identified as gay (84.3%), 448 aged 18–29 years (69%), 317 identified as White (48.8%), 194 with higher education incomplete (29.9%), 312 entered the formal labor market (48.1%), 224 with family income of up to two minimum wages (34.5%), and 550 were single (84.7%), as shown in Table 1.

Reliability Analysis

The overall reliability of the scale using Cronbach alpha was 0.89.

Exploratory Factor Analysis

The visual examination of the matrix allowed the verification that all variables were correlated and with statistically significant relationships. To verify the convenience of applying the factorial model, Bartlett sphericity tests and the KMO sample adequacy measure were performed, as shown in Table 2.

The solution defined was that of four factors, 62.09% of the variance was explained by the factorial solution. No item had high factor loadings in more than one factor.

From the factorial solution, the factors were named according to the denomination received in the original scale, except for the last one, observing the change in the grouping order: F1: personal consequences; F2: structural barriers; F3: confidentiality; and F4: economic consequences and individual concerns. The first factor is responsible for 36.66% of the variance, with an eigenvalue of 6.599. This factor is consistent with the interpretation of personal consequences, incorporating item 13 "I was afraid of losing my family," originally allocated to another factor. The second factor is

Table 1. Sociodemographic Characterization of the EFA Stage Participants (n = 649)

Variables	*n* (%)
Gender identity	
Cisgender man	584 (90.0)
Transgender man	8 (1.2)
Intergender	8 (1.2)
Other	49 (7.6)
Sexual orientation	
Gay	547 (84.3)
Heterosexual	6 (0.9)
Bisexual	71 (10.9)
Pansexual	16 (2.5)
Asexual	2 (0.3)
Other	7 (1.1)
Age (full years)	
18–29	448 (69.0)
30–39	159 (24.5)
40–49	29 (4.5)
50–59	13 (2)
60 years and more	—
Country region	
Northeast	291 (44.83)
Southeast	221 (34.05)
South	75 (11.55)
Midwest	46 (7.08)
North	16 (2.46)
Skin color	
White	317 (48.8)
Black	75 (11.6)
Brown	241 (37.1)
Yellow	9 (1.4)
Not declared	6 (0.9)
Other	1 (0.2)
Education	
No education or <1 year of study	—
Incomplete elementary school	4 (0.6)
Complete primary education	6 (0.9)
Incomplete high school	21 (3.2)
Complete high school	91 (14.0)
Incomplete university education	194 (29.9)
Complete higher education	173 (26.7)
Specialization	109 (16.8)
Master's degree	36 (5.5)
Doctorate degree	15 (2.3)
Job	
Formal work	312 (48.1)
Informal work	85 (13.1)
Unemployed	84 (12.9)
Retired/pensioner	3 (0.5)
Student	165 (25.4)
Family income[a]	
Less than 1 minimum wage	67 (10.3)
Between 1 and 2 minimum wages	224 (34.5)
Between 3 and 4 minimum wages	171 (26.3)
Between 5 and 6 minimum wages	76 (11.7)
7 or more minimum wages	96 (14.8)
No income	15 (2.3)
Marital status	
Not married	550 (84.7)
Married	25 (3.9)
Stable union	70 (10.8)
Divorced	2 (0.3)
Widower	2 (0.3)

Note. Ribeirão Preto, SP (2020). EFA = exploratory factor analysis.
[a] Minimum salary in Brazil at the time of data collection: R$1,035.00.

responsible for 11.01% of the variance, with an eigenvalue of 1.982 and comprises the structural barriers. The third factor accounts for 7.76% of the variance, with an eigenvalue of 1.398. The factor is consistent with the interpretation of confidentiality, incorporating item 5 "I didn't like the people at the test site." The fourth factor

accounts for 6.66% of the variance, with an eigenvalue of 1.199. The factor comprises economic consequences such as "health insurance" (item 10) and "employment" (item 11) and individual concerns such as "the test result" (item 9) and "no cure" (item 8), illustrated in Table 3.

Means, *SD*s and floor and ceiling effects are shown in Table 4. Floor and ceiling effects have moderate results. The internal consistency of all scales showed excellent levels, with all Cronbach alpha > 0.7.

Confirmatory Factor Analysis

Results of sociodemographic characterization. A total of 641 MSM participated in the CFA stage. As for the sociodemographic characterization, 578 were cisgender men (90.2%), 539 were gay (84.1%), 438 aged 18–29 years (68.3%), 284 were White (44.3%), 198 with incomplete higher education (30.9%), 309 entered the formal labor market (48.2%), 193 with a family income of up to two minimum wages (30.1%), and 524 were single (81.7%), according to Table 5.

Confirmatory Factor Analysis

It was observed in the normality analysis that the absolute values for skewness ranged between −1.027 and 1.011. Similarly, the Kurtosis values were all below 10, as shown in Table 6.

The initial model of the CFA was obtained, as shown in Figure 2. The fit indices were examined. The Chi-square ratio for degrees of freedom was 5.269. The GFI and RMSEA values were 0.885 and 0.082 [90% CI = 0.076–0.088], respectively, as shown in Table 7.

Fit measures were not satisfactory for the initial model. The respecification was performed by inserting the covariances of the residual errors to improve the model's adjustment. Significant covariance was observed between 13 pairs of errors of the same construct: e8-e9, e14-e12, e14-e13, e15-e13, e16-13, e16-14, e16-e15, e17-e14, e17-e15, e18-e12, e18-e13, e18-e15, and e18-e16, as shown in Figure 3.

After the adjustment procedures, through the respecification of the residual error covariances, the adjustment measures and the indicators improved: (χ^2)/DF (2.71); GFI (0.94); RMSEA (0.052; 90% CI [0.045, 0.059]); TLI (0.94); NFI (0.93); IFI (0.95); CFI (0.95), as shown in Table 8. This is the final model that presents the barriers to HIV testing and the relations between the factors and variables.

Convergent and Discriminant Validity

Convergent and discriminant validity were analyzed as the final step in checking the quality of the adapted version of the scale. The CC values were greater than 0.7 for the four factors: Factor 1 (0.87); Factor 2 (0.75); Factor 3 (0.77); and Factor 4 (0.73). Discriminant validity was verified using the HTMT criterion, and the values for the four factors were below 0.85, as shown in Table 9.

Discussion

Tested among 1,290 men who have sex with men living in the five regions of Brazil, the Barriers to HIV Testing Scale-Karolinska version was explained by four factors: F1: personal consequences; F2: structural barriers; F3: confidentiality; and F4: economic consequences and individual concerns. These four factors together accounted for 62.09% of the total variance, and the overall reliability was 0.89, according to Cronbach alpha coefficient. The model derived from the EFA was satisfactory in the confirmatory analysis, after respecification of the covariances of residual errors, resulting in a final model with good measures of absolute, incremental, and parsimonious fit. In addition, the scale showed convergent and discriminant validity.

As for the characterization of the participants, the profile identified in this research is similar to that of a large European study of 174,209 MSM, the European Men-Who-Have-Sex-With-Men Internet Survey that recruited men in 38 countries. Most were men younger

Table 2. Bartlett Sphericity Tests and the Kaiser–Meyer–Olkin Measure of Sample Adequacy

Kaiser–Meyer–Olkin Sample Adequacy Measure		**0.896**
Bartlett sphericity test	Approximate Chi-square	5,105.426
	DF	153
	Sig. (*p* value)	.000

Note. Ribeirão Preto, SP (2020). df = degree of freedom; Sig. = significance or *p* value.

Table 3. Factorial Loads and Commonalities (H^2) Based on the Principal Component Extraction Method and Oblimin Rotation (Standard Matrix) on the Barriers to HIV Testing Scale-Karolinska Version Scale Items

Item	F1	F2	F3	F4	H^2
Item 16	.833				.604
Item 15	.800				.631
Item 14	.759				.710
Item 18	.717				.558
Item 12	.661				.586
Item 13	.618				.639
Item 17	.563				.592
Item 4		.824			.695
Item 1		.746			.634
Item 2		.745			.605
Item 3		.692			.480
Item 7			.877		.790
Item 6			.812		.739
Item 5			.699		.567
Item 8				.823	.661
Item 9				.732	.553
Item 10				.694	.569
Item 11				.407	.564

Note. Ribeirão Preto, SP (2020). Name of the factors: F1, personal consequences; F2, structural barriers; F3, confidentiality; F4, economic consequences and individual concerns; items assigned to factor from highest load.

than 39 years, who had completed higher education and identified as gays (Kramer et al., 2015). Although EMIS 2010 was conducted in countries with different incomes and cultures from Brazil, there is similarity between the samples, which may be related to the profile of MSM who are interested in social networks and social networking sites. Other surveys conducted in the United States that recruited MSM over the internet showed samples with similar characteristics (Delaney et al., 2014; Fields et al., 2020).

The results obtained in the translation of the scale into Brazilian Portuguese contributed to obtaining a consensual version. The committee of evaluators assessed the two translated versions, item by item, and selected the items which fit best to build the consensual version. The evaluators who made up the committee made important considerations for improving the translation/writing of the items, and each item was evaluated for clarity, understanding, and representativeness. The items that were closest to the Brazilian context and the original content of the scale remained in the consensus version. In cases where there was disagreement between the evaluators, wording changes were suggested and added to be considered by the postcommittee version of evaluators. In this way, the consensual version came closer to the Brazilian cultural context and served as the basis for carrying out the following steps in the validation process.

In the semantic analysis of the scale items, participants from the population of interest were asked to verify the comprehensibility of all items. The results indicated that the questions are understandable, the participants had no difficulties in answering the items, and all the respondents considered that all the items presented important barriers to the performance of HIV testing. Thus, the participants of the population of interest presented a positive evaluation of the scale, giving indications that the instrument was ready to be pretested in the research field.

As for reliability, the Cronbach alpha coefficient demonstrated that the scale's internal consistency was similar to that of the original scale, which ranged from acceptable (0.78) to excellent (0.91), indicating internal consistency within the factors (Wiklander et al., 2015).

The reliability analysis was essential because it confirmed the rigor of the adaptation process and the scale quality. It was verified that the instrument preserved the reliability properties after its translation into Brazilian Portuguese and adaptation for men who have sex with men. Thus, the adapted version of the Karolinska version indicated good results and encouraged the next step of validation, which was to analyze the factor structure.

The results of the EFA indicated that the scores of the adapted version of the scale were reduced to four factors, with a total of 18 items. Compared with the original version of the scale, it was observed that the number of factors extracted remained the same (Wiklander et al., 2015). However, the allocation of items in the respective factors was different, noting that there is a limited degree of similarity.

As for the confirmation of the factor structure of the adapted version of the scale through CFA, it was observed that some adjustment indices had good results and others did not. After inserting the item error covariances, the fit indices improved the results, and an acceptable model was reached that fit the data,

Table 4. Descriptive Statistics for the Barriers to HIV Testing Scale-Karolinska Version; Number of Scale Items, Mean, *SD*; Floor/Ceiling Effect and Cronbach's Alpha (α)

Scale[a]	Number of items	Mean	DP	Effect *Floor/Ceiling* (%)[b]	α
Personal consequences	7	1.085	.63	36.49/44.95	.886
Structural barriers	4	0.908	.57	41.33/32.16	.767
Confidentiality	3	0.985	.76	39.60/38.11	.756
Economic consequences and social concerns	4	0.685	.22	58.36/26.81	.746

Note. Ribeirão Preto, SP (2020).
[a] Possible range for all scales: 0–2, with higher levels indicating more barriers.
[b] Percentage of ratings on the lowest/highest possible score.

corroborating the factor structure found in the EFA. Thus, it was found that the model presented was plausible.

As for the factors, despite the addition of an item to Factor 1, which was named, coincidingly with the original version, personal consequences, it continues to refer to barriers inherent to consequences for the individual's own life. Barriers, named as personal, reflect anticipated difficulties with HIV testing, such as fear of becoming ill, fear of negative consequences for sexual and social life, concerns about legal consequences, and fear of losing family (Wiklander et al., 2015).

Among the barriers, compared with other studies, fear of getting sick was also present among Hispanic/Latino MSM residing in the United States. The authors who identified this difficulty recommended that strategies that include the elaboration of a message with an approach to fear can help reduce obstacles to testing (Joseph et al., 2014). Furthermore, the promotion of interventions at the individual level that are capable of inducing change can add positive results in attracting test candidates because one of the pillars of control of the HIV epidemic is the self-surveillance of serological status (Mora et al., 2018).

Personal barriers were also present among Malaysian MSM, and family rejection was identified as an important barrier to HIV testing (Lim et al., 2019). Corroborating this discussion, recent research on barriers to HIV testing, using the Barriers to HIV testing scale-Karolinska version, identified that personal barriers were the most reported by participants (George-Svahn et al., 2021). The fear of negative consequences for sexual and social life, an element present in factor one, is close to stigma, and the perception of this has been shown to be a relevant barrier among MSM in adherence to HIV testing (Andrinopoulos et al., 2015; Lorenc et al., 2011). Although the treatment and prevention of HIV infection has evolved considerably and positively, the stigma related to the health condition and people who regularly seek HIV testing seems to remain an influence. A survey conducted in the Northern Region of Piauí, Brazil concluded that people living with HIV still face stigmatizing situations (Fonseca et al., 2020). The barriers included in Factor 1 appear in the international literature as relevant difficulties that interfere with adherence to the test.

Factor 2 was called structural barriers, coinciding with the original version of the scale. However, the number of items that composed it was different. For the adapted scale, factor 2 was represented by four items on difficulties in moving to the test location, lack of knowledge about test locations, time to perform the test, and distance from the test location. Thus, the four items translate structural barriers that make it difficult to carry out the test.

There is evidence that structural barriers interfere with adherence to HIV testing. A North American survey showed that one quarter of participants, among those who had never tested themselves, reported not knowing where to take the test (Margolis et al., 2012), and uncertainty about the testing site was identified in a systematic review of barriers to HIV testing in Europe (Deblonde et al., 2010). The Unified Health System in Brazil has an organized testing network, the "Testing and Counseling Centers (TCC)", as part of the National STI and AIDS Program. The objective of these centers is to promote prevention, testing, and treatment of HIV and other STIs (Brasil, Ministério da Saúde, 2008). However, despite being an organized service with national distribution, there are reports of barriers to accessing services, such as the limited number of tests (Araújo et al., 2010) and the delay in

Table 5. Sociodemographic Characterization of CFA Stage Participants (n = 641)

Variables	*N* (%)
Gender identity	
Cisgender man	578 (90.2)
Transgender man	5 (0.8)
Intergender	3 (0.5)
Other	55 (8.6)
Sexual orientation	
Gay	539 (84.1)
Heterosexual	7 (1.1)
Bissexual	72 (11.2)
Pansexual	17 (2.7)
Asexual	2 (0.3)
Other	4 (0.6)
Age (full years)	
18–29	438 (68.3)
30–39	167 (26.1)
40–49	27 (4.2)
50–59	7 (1.1)
60 years and more	2 (0.3)
Country region	
Northeast	268 (41.80)
Southeast	233 (36.34)
South	61 (9.51)
Midwest	56 (8.7)
North	23 (3.58)
Skin color	
White	284 (44.3)
Black	76 (11.9)
Brown	265 (41.3)
Yellow	4 (0.6)
Not declared	9 (1.4)
Other	3 (0.5)
Education	
No education or <1 year of study	1 (0.2)
Incomplete elementary school	2 (0.3)
Complete primary education	5 (0.8)
Incomplete high school	17 (2.7)
Complete high school	87 (13.6)
University education incomplete	198 (30.9)
Complete higher education	160 (25.0)
Specialization	112 (17.5)
Master's degree	51 (8.0)
Doctorate degree	8 (1.2)
Job	
Formal work	309 (48.2)
Informal work	92 (14.4)
Unemployed	97 (15.1)
Retired/pensioner	143 (22.3)
Family income[a]	
Less than 1 minimum wage	67 (10.5)
Between 1 and 2 minimum wages	193 (30.1)
Between 3 and 4 minimum wages	151 (23.6)
Between 5 and 6 minimum wages	89 (13.9)
7 or more minimum wages	112 (17.5)
No income	29 (4.5)
Marital status	
Not married	524 (81.7)
Married	28 (4.4)
Stable union	84 (13.1)
Divorced	5 (0.8)

Note. Ribeirão Preto, SP (2020). CFA = confirmatory factor analysis.
[a] Minimum wage in Brazil at the time of collection: R$1,035.00.

delivering results (Soares & Brandão, 2013). However, it is important to emphasize that the representativeness of each barrier present in factor 2 may depend on aspects related to the participants' social and demographic characteristics. For example, the lack of knowledge about the location of the test may be more relevant for immigrants (Deblonde et al., 2010).

Viable alternatives for promoting HIV testing among MSM are available in the literature. For example, propose to provide testing and recruitment of participants through meeting apps and community-based organizations (Ren

Table 6. Analysis of Normality

Variable	Minimum	Maximum	Skew	c.r.	Kurtosis	c.r
E11	0	2.000	0.952	9.840	−0.772	−3.989
E10	0	2.000	0.786	8.120	−1.090	−5.632
E9	0	2.000	0.562	5.811	−1.416	−7.317
E8	0	2.000	0.931	9.618	−0.963	−4.975
E7	0	2.000	−0.060	−0.617	−1.638	−8.463
E6	0	2.000	−0.614	−6.344	−1.281	−6.621
E5	0	2.000	1.011	10.446	−0.480	−2.483
E1	0	2.000	0.959	9.913	−0.588	−3.038
E2	0	2.000	−0.212	−2.188	−1.699	−8.782
E3	0	2.000	0.166	1.714	−1.402	−7.246
E4	0	2.000	0.238	2.464	−1.455	−7.521
E12	0	2.000	0.393	4.063	−1.551	−8.018
E13	0	2.000	0.230	2.379	−1.685	−8.707
E14	0	2.000	0.215	2.218	−1.690	−8.735
E15	0	2.000	−0.410	−4.242	−1.473	−7.615
E16	0	2.000	−1.027	−10.619	−0.663	−3.425
E17	0	2.000	0.393	4.061	−1.508	−7.796
E18	0	2.000	−0.431	−4.457	−1.551	−8.014

Note. Ribeirão Preto, SP (2020).

et al., 2020). The approximation between patients and the health service seems to generate positive results by reducing geographic barriers, bringing people closer to the services. Thus, authors emphasize that testing services with easy access should be available for MSM (Persson et al., 2016).

Factor 3 was called "confidentiality" and concerns the barriers related to the confidentiality of the test and the relationship with people at the test site. Confidentiality for HIV testing seems to be a central issue regarding the relationship between secrecy and privacy, which may reflect stigma. When it comes to diagnosis in Brazil, confidentiality is guaranteed by law in the following areas: health services; educational establishments; work places; public administration; public security; court lawsuits; and written and audiovisual media (Brasil, Senado Federal, 2022). Confidentiality in relation to the testing procedure and professional ethics must prevail to promote user safety. It is necessary that MSM are welcomed with humanized care, and health professionals must create bonds so that the bonds of trust can grow. Researchers emphasized that the act of welcoming the user facilitates access and the bond between the professional and patient binomial approximates and promotes trust (Campos, 1994).

In addition, Swedish researchers highlighted that in addition to guaranteeing confidentiality, health services should bring together professionals who are able to address the sexual health needs of MSM (Persson et al., 2016). International evidence indicates that test confidentiality is an important barrier that hinders MSM adherence (Hoyos et al., 2013; Joseph et al., 2014). In a survey of 285 people newly diagnosed with HIV, 39% of them reported barriers related to confidentiality (George-Svahn et al., 2021).

Confidentiality barriers influence the decision to adhere to the HIV test because the fear of being recognized at the test site can generate uncertainty about the confidentiality of the procedure. An alternative to overcome these barriers is the provision of a self-test, so that the patient can perform it in their own home. British MSM have shown interest in participating in HIV self-testing for convenience and confidentiality (Witzel et al., 2016).

Table 7. Results of the Fit Measures in the Initial Model

Adjustment Measures	Results
Absolute	
Chi-square (χ^2)	679.755
Degrees of freedom (DF)	129
(χ^2)/DF	5.269
Statistical significance level (*p* value)	.000
GFI	0.885
RMSEA	0.082 [90% CI = 0.076–0.088]
Incremental	
TLI	0.862
NFI	0.861
IFI	0.884
CFI	0.883
Parsimonious	
PNFI	0.726
PGFI	0.745

Note. Ribeirão Preto, SP (2020). CFI = Comparative Fit Index; GFI = Goodness of Fit Index; IFI = Incremental Fit Index; NFI = Normed Fit Index; PGFI = parsimonious goodness of fit index; PNFI = parcimonious normed fit index; RMSEA = root-mean-square error of approximation; TLI = Tucker–Lewis Index.

In Brazil, there are several alternatives for its realization. The Unified Health System started to provide HIV self-tests after carrying out a pilot test in 14 Brazilian cities. Currently, the focus of distribution is aimed at populations that have various difficulties in accessing health services, especially those most vulnerable to HIV (Brasil, Ministério da Saúde, 2020). Other options are available from pharmacies and research groups that aim to test the acceptability of the self-test among key populations. In different social and cultural realities, the tool seems to be a viable option for overcoming barriers such as confidentiality.

Factor 4 was called "economic consequences and individual concerns," consisting of four items. The construction of factor four involves two barriers that add harm to future treatment, in case of a positive result. The first one is about the nonexistence of need to perform the test because there is no cure, and the second is about not wanting to know the result. These barriers reflect both future difficulties in adherence to treatment and in combined prevention and risk reduction.

In addition, testing is a type of behavioral intervention that contributes to the combined prevention strategy, which uses different approaches to respond to the HIV epidemic, and is one of the important steps in the composition of a larger prevention plan. Adherence to testing demonstrates greater risk perception and can contribute to behavior change (Brasil, Ministério da Saúde, 2020). Strategies in different countries to increase HIV testing among MSM have had positive results, such as use of social media in China (Wang et al., 2019) and internet-based self-testing in Brazil (Boni et al., 2019). Despite coming from different environments, MSM in the two countries have better accepted internet-based strategies for providing the test with a corresponding increase in testing rates.

Despite the different barriers present in the daily lives of MSM, a systematic review showed that HIV testing among the group has increased in African countries (Stannah et al., 2019). However, more efforts and different strategies are needed to reach testing rates that meet the 90-90-90 goal. One facet of expanding testing in the population in question is the implementation of

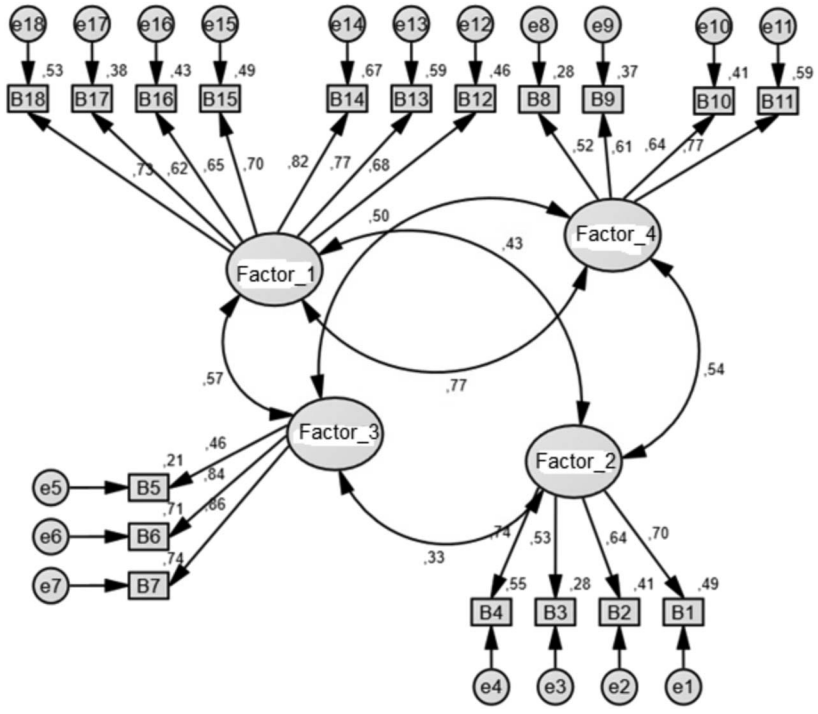

Figure 2. Initial confirmatory factor analysis model. This figure is available in color online www.janacnet.org.

strategies capable of causing behavioral changes. Relatedly, a systematic review indicated that e-Health interventions can generate behavioral changes among MSM (Nguyen et al., 2019). Different strategies that include internet recruitment, provision of self-tests, and awareness of risk perception seem to be feasible to reach the common goals of prevention and control of HIV among MSM.

As for the economic consequences contemplated in factor 4, barriers related to job loss and health insurance problems are addressed. In this context, disclosure of the diagnosis in work environments is a difficulty encountered by people living with HIV. A study in Mozambique showed that participants' concerns were focused on the fear of losing their job due to disclosure of their HIV status (Steenberg, 2020). Thus, it is believed that barriers related to economic consequences may play an important role in late diagnosis rates among MSM. In Brazil, the confidentiality of diagnosis in the workplace is guaranteed by law (Brasil, Senado Federal, 2022).

As for the floor effect, the scores for the four factors were above 15%, which may be due to the few response options of the Likert scale, which had three choices, and the attribution of lesser or greater importance to barriers to HIV testing presented on the scale. It is noteworthy that in factor 1, the results were greater than 40%. In this context, the floor and ceiling effects, when they exceed 15%, are considered problematic because they interfere with the responsiveness of the scale, which is the ability to identify changes (McHorney & Tarlov, 1995). However, for the present research, the scores may reflect the relevance of the barriers presented in the scale for the investigated population, with similar results being found in the original study of instrument development (Wiklander et al., 2015).

The authors of the Karolinska version emphasize that there are two possible interpretations for the accumulated scores in the floor effect; the first is that the investigated group considers that barriers are not important in everyday life, and the second is that the group may have a low perception of risk (Wiklander et al., 2015). This second interpretation, if confirmed in future studies, is noteworthy because the perception of low risk of HIV infection brings negative consequences both in relation to testing and adherence to prevention methods (Brasil, Ministério da Saúde, 2008). In a survey of North American MSM, those with a higher perception of risk were more likely to have tested for HIV in the last year (Kahle et al., 2018). Thus, it is understood that results concentrated in the minimum range of the scale may contain evidence of low-risk perception and serve as a warning to health professionals about the awareness of the risk of exposure to HIV for MSM.

As for the ceiling effect, similar to the floor effect, the scores for the four factors were above 15%, with an emphasis on factor 4, which presented results above

Table 8. Results of the Fit Measures in the Final Model

Adjustment Measures	Results
Absolute	
Chi-square (χ^2)	314.331
Degrees of freedom (DF)	116
(χ^2)/DF	2.710
Statistical significance level (*p* value)	0.000
GFI	0.948
RMSEA	0.052 [90% CI = 0.045–0.059]
Incremental	
TLI	0.945
NFI	0.936
IFI	0.958
CFI	0.958
Parsimonious	
PNFI	0.709
PGFI	0.726

Note. Ribeirão Preto, SP (2020). CFI = Comparative Fit Index; GFI = Goodness of Fit Index; IFI = Incremental Fit Index; NFI = Normed Fit Index; PGFI = parsimonious goodness of fit index; PNFI = parcimonious normed fit index; RMSEA = root-mean-square error of approximation; TLI = Tucker–Lewis Index.

58%. From these results, it can be understood that participants reported high perceptions of relevance to barriers related to economic consequences and individual concerns. Negative economic consequences related to HIV testing results were reported in an African country survey (Steenberg, 2020). Barriers related to job loss are closely linked to the stigma present in HIV infection (UNAIDS, 2014).

As for the confirmation of the factor structure of the adapted version of the scale through CFA, it was observed that some adjustment indices had good results and others did not. After inserting the item error covariances, the fit indices improved, and an acceptable model was reached that fit the data, corroborating the factor structure found in the EFA. Thus, it was found that the model presented is plausible.

Based on our findings, we suggest that health managers and public policy makers include validated scales that assess barriers to accessing HIV testing in specialized outpatient services and other health services. The identification of barriers can contribute to the acceptance of the patient by the nurse and other health professionals because once the barriers to access to the HIV test are identified, patient care can be directed toward counseling with a focus on the difficulties of adherence to the HIV test.

Study Limitations

The limitations of the study reflect the nature of the recruitment of participants, which limited the sampling frame to social networks, mainly on Instagram profiles that produced content aimed at the general LGBTQI+ audience, which represents in excess those men who identified themselves as gay, so that the sample may have overestimated a particular group that has very similar characteristics.

Conclusion

The methodological process to which the Barriers to HIV testing scale-Karolinska version was submitted resulted in a Brazilian Portuguese version culturally adapted for Brazilian MSM with respective semantic, idiomatic,

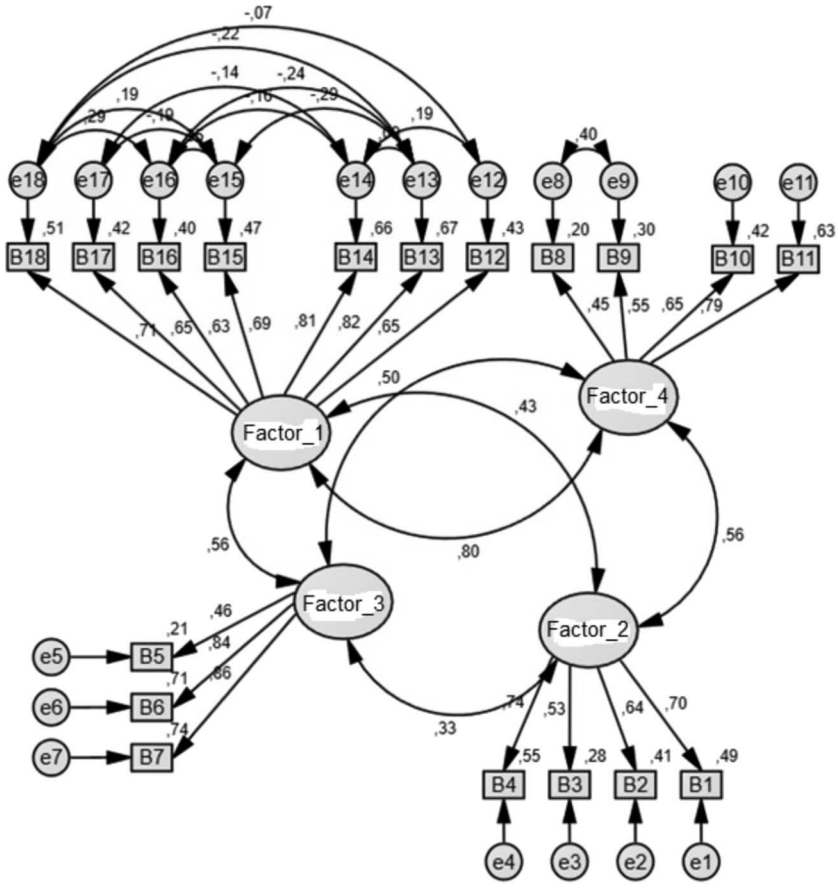

Figure 3. Final model adjusted for confirmatory factor analysis. This figure is available in color online www.janacnet.org.

cultural, and conceptual equivalences between the two versions. It appears that the final version of the scale, Brazilian Portuguese Version, is a valid tool to assess barriers to accessing HIV testing among Brazilian MSM and that it would be beneficial to encourage its use both by researchers and by health professionals working in testing services.

The adapted version of the scale showed satisfactory reliability and validity to assess barriers to HIV testing among MSM and, therefore, its application in future research and in health care service environments that provide HIV testing for compliance checks is recommended. However, because this is the first study that performed the cultural adaptation and validation of the Barriers to HIV testing scale-Karolinska version, it is recommended that its psychometric properties be tested in a more varied sample to overcome the study limitations identified above and in different cultural contexts so that more evidence about its validity and stability can be gathered.

Table 9. Convergent and Discriminant Validity

	Convergent Validity	Discriminant Validity (HTMT)			
	CC	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	.877				
Factor 2	.750	.448			
Factor 3	.779	.616	.432		
Factor 4	.735	.748	.525	.540	

Note. Ribeirão Preto, SP (2020). CC = composite reliability; HTMT = heterotrait–monotrait ratio of correlations.

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Availability of Data and Material

The data will be preserved for five years in the Scientific Data Repository of the University of São Paulo (https://uspdigital.usp.br/repositorio/) under the ethical and legal responsibility of the author R. K. Reis. Data may be provided by means of a request to the corresponding author.

Author Contributions

All authors on this paper meet the four criteria for authorship as identified by the International Committee of Medical Journal Editors (ICMJE); all authors have contributed to the conception and design of the study, drafted, or have been involved in revising this manuscript, reviewed the final version of this manuscript before submission, and agree to be accountable for all aspects of the work. The specific contributions of each author is as follows: Conceptualization & Methodology: L. R. M. Sousa, R. F. de Mesquita, M. Wiklander, L. E. Eriksson; R. K. Reis, E. Gir; Formal Analysis: L. R. M Sousa, R. F de Mesquita; Project administration: L. R. M. Sousa, R. K. Reis; Supervision: R. K. Reis; Validation: L. R. M. Sousa, R. F. de Mesquita, M. Wiklander, L. E. Eriksson; R. K. Reis, E. Gir; Writing—original draft: L. R. M. Sousa, R. F. de Mesquita, M. Wiklander, L. E. Eriksson; R. K. Reis, E. Gir; Writing/Revising: L. R. M. Sousa, R. F. de Mesquita, M. Wiklander, L. E. Eriksson; R. K. Reis, E. Gir.

Key Considerations

- ❍ Barriers, named as personal, reflect the difficulties faced in carrying out the HIV test, such as fear of becoming ill and negative consequences for sexual and social life.
- ❍ Structural barriers make it challenging to perform the HIV test (difficulty accessing the test site, lack of knowledge about test sites, test time, and distance from the test site).
- ❍ Confidentiality about the result is a central issue in the decision to perform an HIV test.

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