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ORIGINAL ARTICLE

Psychometric validation of the Brazilian Portuguese version of the Body Image Scale – HIV for people living with HIV/AIDS

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Abstract

Introduction: Body Image can be defined as the mental representation of body identity. The surroundings, the gaze of the other, they emotions, they integrity, and our own fragility are elements of this representation. The social stigma caused by body changes in people living with HIV / AIDS may be more intense than the fear of death itself, being important to assess the impact of these changes in the course of treatment.

Objective: To perform the psychometric validation of the Brazilian Portuguese version of the Body Image Scale - HIV for a sample of Brazilians, of both sexes, living with HIV / AIDS.

Methods: The total of 450 patients were recruited from the São Bernardo do Campo HIV/AIDS program, aged between 18 and 78 years. Confirmatory factor analysis using the Unweighted Least Square and listwise deletion was used to determine the adherence of the data to the models tested.

Results: Adequate coefficients of internal reliability and evidence of construct validity were established for the Brazilian version of BIS-HIV in the unifactorial model.

Conclusion: This scale, with evidenced psychometric qualities, provides a useful tool for quantitative investigations of body image in people with HIV/AIDS in the Brazilian context and extends the possibility of future cross-cultural research.

Keywords: body image, appearance, HIV/AIDS, psychometrics.

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Authors' summary

Why was this study done?
Lipodystrophy is a chronic condition that both causes psychological distress and makes it difficult to adhere to treatment. Thus, monitoring changes in body image and quality of life during the course of clinical treatment is a valid clinical strategy. However, until the present moment, there were no valid and reliable instruments available in Brazil to carry out this evaluation. The study was carried out to fill this methodological gap and enable better clinical follow-up of people living with HIV/AIDS.

What researchers did and found?
After selecting the instrument that assesses the construct of interest – body image (*Body Image Scale – HIV*), the researchers contacted the original authors and asked for permission to culturally adapt and validate the instrument in Brazil. Thus, the process of cultural adaptation was carried out in 5 steps:
(1) Two translations;
(2) Consensus synthesis of the two translations;
(3) Two back-translations of the synthesis;
(4) Meeting of a committee of expert experts to verify semantic, cultural, idiomatic and conceptual equivalence;
(5) Pre-test with the target population to verify the adequacy of the layout, understanding and clarity of the items.
Next, they proceeded with the verification of the psychometric evidence (factor structure; construct validity; internal reliability; invariance) of the instrument in a sample of the population of interest, through confirmatory factor analysis with the Unweigthed Least Square estimator. After eliminating some items, the original factor structure of the *Body Image Scale – HIV* was confirmed, with the generation of evidence of construct validity and internal reliability and proof of metric non-invariance.

What do these findings mean?
The findings indicate that the instrument in question can be used validly and reliably, both by researchers and in the clinical practice, to assess the body image of people living with HIV/AIDS in Brazil.

INTRODUCTION

Body image can be defined as the mental representation of the body, the mental image of the body formed in the mind, which encompasses self-perceptions and attitudes in relation to bodily appearance and function[1]. It is linked to an integrated brain organization, influenced by sensory factors, developmental process and psychodynamic aspects, but it is not just a functioning brain organization.

Body image includes conscious and unconscious aspects that are interrelated with the external world at all times, and can be considered both a structure and a process, as it is deconstructed and reconstructed under the stable core of identity, which gives the subject primordial references of itself. This dynamism is related to the development of body image. It allows the subject to re-signify elements of his life and incorporate them, in a new meaning, to his identity[1,2].

Although dependent on a circumscribed organic structure, the body image must be understood as a singular phenomenon, structured in the context of each human being's body experience, in a universe of interrelationships between body images. Social, physiological and psychological variables are also integrated into the perception of the body as a whole[1]. As pointed out by Cash (2000)[3], function and appearance shape our lives. This is because these two aspects profoundly interfere in the way that others react to our body, how we interact with our social world and, as individuals, we perceive and relate to our own body. The maintenance and management of our bodies was framed as an individual responsibility in neoliberal times with strong social imperatives to present an attractive, "normal" and healthy image[4,5]. When the body changes as a result of illness and no longer appears healthy, self-definition can be severely challenged[4]. Thus, the body image of people with disabilities, chronic diseases or changes in appearance is shaped by perceptions that emerge from this special social context, as they arouse extraordinary reactions in social relationships and in the concept of self[2,3,6].

Changes in the body image of people living with HIV/AIDS (PVHA) vary greatly over time[7,8]. At the time of diagnosis, there is a great impact on the concept of self, which becomes someone invaded by the virus and now with a chronic condition, which often becomes hypervigilant[7]. PVHA report feeling "dirty" or "contaminated", and the act of taking the medication refers to a daily memory of the infection[9].

There are other changes that can occur as the infection progresses. Changes caused by the virus and/or by the side effects caused by some antiretroviral drugs, which lead to the need for constant monitoring and which maintains hypervigilance; changes due to interaction with the clinical team and other social relationships, or by assuming this new identity condition of a chronic patient[8]. Lipodystrophic Syndrome is an especially important comorbidity in this process, as it causes lipodystrophy that leads to a great psychosocial impact, due to the changes it causes in body shapes, essentially causing loss of fat tissue in the extremities (face and limbs) and accumulation in the central region . In addition to the alteration in the distribution of lipid tissue, metabolic abnormalities are present in Lipodystrophic Syndrome, including hypercholesterolemia, hypertriglyceridemia, hyperinsulinism and hyperglycemia[10]. Lipodystrophy reveals HIV seroreactivity and the diagnosis of AIDS, making it difficult to socially deny HIV, exposing the person to the judgment of the other[11].

Despite not being related to the mortality and morbidity of HIV/AIDS, PVHA report that dealing with lipodystrophy can be more difficult than with HIV itself, since the subjective experience with appearance can be more challenging than the objective reality in terms of self[12]. As the signs of lipodystrophy begin to appear, the expectation of the reaction of others often causes social withdrawal, shame and guilt[13].

Regarding body image, it has already been identified that lipodystrophy is associated with greater dissatisfaction with the body[11,14,15], feeling of disfigurement[13,16], feeling of

loss of oneself[15], dysphoria when seeing one's own body[17], in addition to behaviors that are the core of negative body image: body avoidance and checking[16-19].

Facial lipodystrophy is associated with depressive states and low self-confidence[20,21], feelings of lack of control over the body[21], the impossibility of denying HIV/AIDS[22], body avoidance behavior[23] with an impact on financial life, social relationships and love relationships[13].

The emotional and social impact caused by lipodystrophy lies in the impossibility of socially denying or hiding the infection, exposing PVHA to the judgment of others[24]. The internalization of the stigma of being seropositive for HIV is associated with guilt and shame, states of depression, anxiety, helplessness, stress, social isolation, in addition to affecting physical health and well-being[25-30].

In short, lipodystrophy can be considered a threat to the identity of PVHA. These negative feelings and sensations associated with the stigma of the "image of AIDS" exposed on the person's body have direct impacts on body image[31,32]. Thus, it is important to monitor the changes that occur in the body image of these patients during the course of treatment.

The Body Image Scale - HIV (BIS-HIV) focuses on obtaining traces of the affective dimension of the Body Image of PVHA. It is a self-administered 12-item scale, with responses ranging from 1 to 5 on a semantic differential-type scale. The BIS-HIV has 5 dimensions: (1) Comfort (which assesses feelings about energy, availability for sex); (2) Competence (which assesses feelings about libido, health in general); (3) Appearance (which assesses feelings regarding the visibility of the disease, attractiveness, being desirable); (4) predictability (which assesses feelings in relation to the disposition towards illness, if the body functions as before) and (5) existential "Self" (which assesses feelings in relation to guilt, innocence, contamination)[33].

One of the advantages of BIS-HIV in clinical use is the possibility of evaluating body image changes in three moments: "before" the diagnosis of HIV/AIDS; "now" living with HIV/AIDS and also, the perception of the social image in the evaluation of what the respondent thinks the "others" think of him now that he lives with HIV/AIDS. This is made possible by the three distinct response protocols created for the scale: before HIV; at that moment, after the diagnosis and how the subject thinks others see him[33].

The treatment system created by the Brazilian government for PVHA is cited as exemplary among developing countries[34]. Brazil is the country that most distributes condoms in the world, performs pre- and post-exposure prophylaxis and since 2013 has provided more effective antiretroviral therapy (ART) with fewer side effects (example: Dolutegravir) to all people living with HIV/AIDS, regardless of the stage of infection. Treatment is decentralized and carried out by a network of specialists, in order to provide quality care to those living with HIV/AIDS, with more than 700 places of care in the country, a structure that is expanding[35-37]. In Brazil, there is still no instrument available to assess the body image of PVHA. Faced with this reality, the availability of a specific instrument for assessing body image will be useful, not only for Brazilian researchers, but also for those from other countries in cross-cultural approaches, and therefore this research is justified.

The objective of this research was to carry out the psychometric validation of the Brazilian Portuguese version of the Body Image Scale – HIV for a sample of Brazilians, of both sexes, living with HIV/AIDS.

METHODS

Study design and sample size

This is a methodological study with non-probabilistic sampling. The sample size was calculated according to the recommendations of Hair, Anderson, Tatham and Black (2009)[38]. These authors recommend that the sample size should be 5 – 10 (k) participants per parameter evaluated. Considering that the BIS-HIV has 25 parameters (12 observable variables; 12 errors; a first-order latent variable) and k = 6, the sample number for this research was at least 150 participants.

Table 1: Characteristics of the samples used

Categorical variables		Sample 1 (n = 300)		Sample2 (n = 300)		Sample 3 (n = 300)		Sample 4 (n = 150)	
		n	%	n	%	n	%	n	%
Sex	male	195	65	200	66,7	179	59,7	108	72
	female	105	35	100	33,3	121	40,3	42	28
Gênder	male	192	64	195	65	175	58,3	106	70,7
	female	108	36	105	35	125	41,7	44	29,3
marital status	single	160	53,3	157	52,3	149	49,7	84	56
	Married	91	30,3	100	33,3	101	33,7	45	30
	Divorced	29	9,7	24	8	25	8,3	14	9,3
	widower	20	6,7	19	6,4	25	3,3	7	4,7
Education	1st cycle elementary school	60	20	71	23,7	73	24,3	29	19,3
	2nd cycle of Elementary Education	64	21,3	63	21	67	22,3	30	20
	High school	106	35,3	105	35	99	33	56	37,3

Continuation - Table 1: Characteristics of the samples used

Categorical variables		Sample 1 (n = 300)		Sample2 (n = 300)		Sample 3 (n = 300)		Sample 4 (n = 150)	
	University education	70	23,3	61	20,3	61	20,3	35	23,3
Safety	very insecure	43	14,3	36	12	41	13,7	19	12,6
financial	insecure	106	35,3	118	39,3	114	38	55	36,7
	Safe	136	45,3	136	45,4	132	44	70	46,7
	Very safe	15	5	10	3,3	13	4,3	6	4

The sample consisted of 450 participants, who participated in three independent rounds of data collection, organized into four samples.

The sample consisted of 1050 participants divided into four samples (table 1).

Sample one (n = 300, 150 participants from round 1 and 150 from round 3) was used to evaluate the version of the BIS-HIV in which the participant responds considering how he was before being diagnosed with HIV/AIDS (BIS-HIV). "before"). Sample two (n = 300, 150 participants from round 2 and 150 from round 3) was used to evaluate the version of BIS-HIV in which the participant responds considering that he now has the diagnosis of HIV/AIDS (BIS-HIV "now"). Sample three n=300, 150 participants from round 1 and 150 from round 2) was used to evaluate the BIS-HIV version in which the participant responds considering what he thinks of how other people see people living with HIV/AIDS (BIS-HIV "others"). Sample four (n = 150) was used for non-invariance analyzes and additional tests, composed of participants who responded to the three versions of the BIS-HIV: BIS "before", BIS "now" and BIS "others", collected in the third round.

Instruments

Body Image Scale – HIV (BIS-HIV)[33]; The BIS-HIV was based on the original BIS scale for cancer patients. It was modified and expanded to adapt to the reality of PVHA, contemplating content regarding comfort (energy, availability for sex); competence (libido, health in general); appearance (disease visibility, attractiveness, desirableness); predictability (disposition to illness, if the body functions as before) and existential self (guilt, innocence, contamination). The BIS-HIV is a self-administered twelve (12) item scale, with responses ranging from one (1) to five. (5) on a semantic differential scale. Only item nine (9) is reversed. The maximum score is 60 points, the average is 36 and the minimum is 12. It can be answered according to three different guidelines: "how do you feel about yourself now that you know you are living with HIV" (BIS -HIV "now" - This is the participant's response about his feelings about himself in relation to the assessment of his body image "now" that he knows he is living with HIV); "how did you feel about yourself before finding out you were living with HIV" (BIS-HIV "before" - This is the participant's response about their feelings in relation to the assessment of body image "before" knowing who was living with HIV); "how they think others see people living with HIV in general" (BIS-HIV "others" - This is the participant's response about his feelings about how he thinks other people view those living with HIV in general). The reliability for each of the protocols – now, before and the others – revealed a high degree of internal consistency with the following values of Crombach's Alpha: $\alpha = 0.90$; 0.95 and 0.90 respectively.

Demographic questionnaire

Specially designed for this research, in the demographic questionnaire, participants self-reported their age, sex, gender, education, marital status and perception of financial security.

Cultural adaptation of the Body Image Scale - HIV (BIS-HIV)[33] to Brazilian Portuguese

Before carrying out the psychometric validation of the Brazilian Portuguese version of the Body Image Scale – HIV for people living with HIV/AIDS, it was necessary to carry out the cultural adaptation of the BIS-HIV.

The Brazilian Portuguese version of the Body Image Scale - HIV (BIS-HIV)[33] was prepared following the guidelines of Beaton, Bombardier, Guillemin and Ferraz (2002)[39]. Initially, the scale was independently translated into Brazilian Portuguese by two native Portuguese speakers, and two different translations (T1 and T2) were created. Second, a summary version (T12) was prepared by the two translators and a neutral judge. Third, from the synthesis of the two translations, two back-translations (RT1 and RT2) were created by two native English-speaking translators with proficiency in Brazilian Portuguese and who were unaware of the original instruments. Fourth, all versions (T1, T2, T12, RT1, RT2) were sent to an expert committee, composed of the two translators, the two back-translators, the synthesis judge, a speech therapist who works with this researched population, two professionals doctors, a methodologist and a linguist. This committee examined, discussed the items and instructions to ensure a clear version for carrying out the pre-test, equivalent to the original in terms of semantics, language, culture and concept[40].

For the pre-test, a sample of five participants was recruited from an HIV/AIDS clinic in São Bernardo do Campo, São Paulo, Brazil. Each application took place individually, in a room provided by the outpatient clinic. After completing the instrument, each participant was interviewed by the main researcher about the difficulties they might have encountered in filling out the items in terms of clarity of items, adequacy of the items to what is being evaluated in the instrument, and adequacy of the items to the population of interest. Only one pre-test session was needed, as the Brazilian version of the BIS-HIV was considered clear, adequate and understandable.

Ethical Procedures and Aspects

This study was approved by the Research Ethics Committee of Faculdade de Medicina do ABC and is registered under protocol number 944643 of 01/20/2015.

Prospective participants were PLWHA from the HIV/AIDS clinic in São Bernardo do Campo, São Paulo, Brazil. They were invited to participate in the research by the nursing staff of the outpatient clinic who they already knew, orally, individually on the days of their consultation with the infectious disease specialist. Those who agreed to participate received the package of questionnaires with the Free and Informed Consent Term (ICF). They were filled out in the waiting room, in individual chairs, before the medical appointment. Participants completed the instruments individually, taking about five minutes to complete.

Investigated models

In addition to the initial psychometric development and investigation study[33], there has not been any other psychometric validation study of BIS-HIV[41]. The original one-factor solution was generated by exploratory factor analysis (EFA), in which an alternative two-factor solution for the BIS-HIV version filled in when considering the attitude of others towards the participant is also highlighted. However, the second factor is loaded with only two items, which violates the 3-item rule[38]. Thus, in the present study, we investigated the adequacy of the sample data to the one-dimensional factor structure of the BIS-HIV for the three instructional protocols.

Statistical analysis

To prepare the data for Confirmatory Factor Analysis (CFA), the PRELISM[2] module of the LISREL® system was used, adopting the listwise deletion criterion for missing data[42]. After the generation of the PRELIS file, the SIMPLIS model was used, which is a codification of the LISREL® system. The CFA was then generated, enabling the estimation of the parameters of the measurement model of the constructs. Due to the fact that the data distribution did not adhere to the multivariate normal distribution, the "Unweighted Least Square" extraction method was used because it is not sensitive to this violation[43].

Due to the fact that the weighted chi-square (X^2/gl) is inflated by large samples[44], the following adjustment indices were also considered: Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Normed Fit Index (NFI), Non-normed Fit Index (NNFI), and Comparative Fit Index (CFI). It was also considered the Root Mean Square Error of Approximation (RMSEA). The model was considered acceptable when $\chi 2/gl \leq 5.00$; RMSEA ≤ 0.08; CFI, NFI, NNFI, GFI and AGFI ≥ 0.95[38].

For models with unsatisfactory initial fit, factor loadings, residuals and the LISREL® system modification indices were used for fitting.

In the analysis of the measurement model, construct validity (discriminant, convergent) and internal consistency were considered. To establish the latter, Cronbach's Alpha (α) and Composite Reliability (CC) were calculated, with values above 0.70[45] being considered acceptable. CC is given by the formula: (square of the sum of factor loadings) / (square of the sum of factor loadings) + (sum of errors of observable indicators). To establish convergent validity, factor loadings and the Average Variance Extracted (AVE) were considered. The AVE is given by the formula: (sum of squared factor loadings) / (sum of squared factor loadings) + (sum of errors of observable indicators). Values above 0.50 are considered acceptable[38] and factor loadings (λ) above 0.50 are preferable and above 0.40 are acceptable[38].

Nomological validity was estimated by verifying the difference in scores of each of the 3 versions of the scale (BIS-HIV "before"; BIS-HIV "now" and BIS-HIV "others") in relation to biological sex, gender, marital status and perceived financial security.

The Maximum Likelihood (ML) method was used to verify the non-invariance of the "how I see myself now" and "how I was before" models, as both assess personal dimensions of the experience with HIV and allow the monitoring of post-infection changes.

The invariance test was performed by multigroup analysis using the chi-square difference ($\Delta\chi 2$) between the invariance levels. For these analyses, data from sample 4 were used. The test was performed considering the analysis of factor loadings (λ), intercepts (I) and variance/covariance residuals[46]. Following the recommendations of Jöreskog and Soborn (1999)[47] and Brown (2015)[48], we followed the following steps: (1) we adjusted the model separately for samples one, two and three; (2) we check the configural invariance (shape); (3) we check the metric invariance (4) we check the scalar variance and (5) we check the strict invariance.

Metric invariance was supported if $p\Delta\chi 2\lambda > 0.05$. Metric and scalar invariance were supported if $p\Delta\chi 2\lambda$ and $p\Delta\chi 2I > 0.05$. Finally, strict invariance was confirmed if $p\Delta\chi 2\lambda$, $p\Delta\chi 2I$, and $p\Delta\chi 2cov/res > 0.05$[49,50].

Additional analyzes were performed on sample four in order to verify the variability of scale scores in the sample in the 3 possible item assessments (BIS-HIV "before"; BIS-HIV "now" and BIS-HIV "other") in a same sample, to verify if the expectation of variability of the original study is confirmed in the used reference sample.

RESULTS

Factor structure

BIS-HIV "before" I knew I was living with HIV"

The first estimation of the model with sample one showed some indices with poor fit, $\chi 2/gl = 7.15$, RMSEA= 0.143, CFI = 0.97, NFI = 0.95, NNFI =0.96, GFI = 0.97, AGFI = 0.95. For a better fit of the model, the following changes were made at each new estimation: removal of item 9 - due to low factor loading ($\lambda = 0.23$); acceptance of covariance between items 6 and 4, 7 and 4, 7 and 6, 11 and 10; removal of item 12 due to high associated residues. The final model achieved a satisfactory fit, $\chi 2/gl = 1.81$, RMSEA= 0.052, CFI = 1, NFI = 0.99, NNFI= 1, GFI = 0.99, AGFI = 0.99 (figure 1A, table 2).

BIS-HIV "now that you know you are living with HIV"

For sample two, which filled out the questionnaires with the guidance of considering each item from the moment they started living with HIV/AIDS, the first

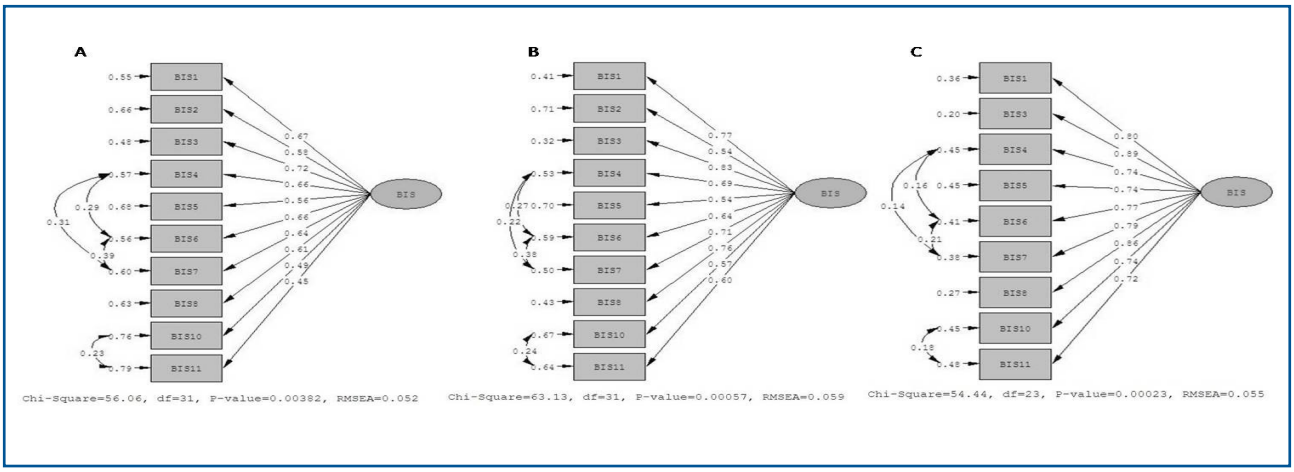

Figure 1: Adjusted BIS models for sample 1, "Before" (A), sample 2, "Now" (B) and sample 3, "Others" (C)

Table 2: Fit indices of the measurement and measurement model for BIS in the three samples

Sample	Model	n	>λ	<λ	χ2/gl	CFI	NFI	GFI	RMSEA	α	CC	AVE
1	Initial	300	0.23	0.77	7.15	0.97	0.95	0.97	0.143	0.83	0.86	0.40
	Adjusted		0.45	0.72	1.81	1	0.99	0.97	0.052	0.86	0.85	0.37
2	Initial	300	0.14	0.79	9.57	0.97	0.96	0.97	0.169	0.87	0.87	0.37
	Adjusted		0.54	0.82	2.03	1	0.99	1	0.059	0.90	0.89	0.45
3	Initial	300	0.12	0.87	9.45	0.98	0.99	0.99	0.137	0.91	0.92	0.48
	Adjusted		0.71	0.89	2.36	1	1	1	0.055	0.94	0.94	0.61

Note: λ = factor loadings, χ2/gl = normed chi-square, CFI = comparative fit index, NFI = Normed fit Index,; RMSEA = root mean square error of approximation, α = Cronbach's alpha; CC = construct reliability; AVE = extracted mean variance; R2 = shared variance.

estimation of the model was equally poor in some indices, χ2/gl= 9.57, RMSEA = 0.169, CFI = 0.97, NFI = 0.96, NNFI = 0.97, GFI = 0.97, AGFI = 0.96. on inspection from the adjustment parameters, we verified the need to exclude item 9 due to its low factor loading (λ = 0.15) and to exclude item 12 due to its high associated residuals in the model. The modification indices of the LISREL system suggested the covariance of errors in items 6 and 4, 7 and 4, 7 and 6, 11 and 10 that were accepted, due to conceptual coherence. Each modification performed was made in a new estimation. The final model, obtained after these changes, had a satisfactory fit, χ2/gl= 2.03, RMSEA= 0.059, CFI = 1, NFI = 0.99, NNFI = 1, GFI = 1, AGFI =0.99 (figure 1B, table 2).

BIS-HIV "what others think of me now that I have HIV"

Regarding the version of the BIS-HIV, which was filled in to assess what others were thinking about the participant, again inadequate values were obtained in the RMSEA and in the normal chi-square, χ2/gl= 9.45, RMSEA= 0.137 , CFI = 0.98, NFI= 0.99, NNFI = 0.99, GFI = 0.99, AGFI = 0.99. The analysis LISREL output for model adjustment followed the same criteria and procedures adopted for the two previous models. In this model, items 2 (λ =0.25) and 9 (λ =0.13) presented low factor loadings. Item 12 was associated with a lot of waste. These items were removed, in that order, in three different estimations. After analyzing the LISREL modification indices, correlations between items 6 and 7 were accepted; 10 and 11; one for each new estimate. After these changes, the scale had a satisfactory adjustment, χ2/gl= 2.36, RMSEA= 0.055, CFI= 1, NFI = 1, NNFI = 1, GFI = 1, AGFI = 1 (figure 1C, table 2).

Adjustment of the measurement model

Regarding convergent validity, considering the AVE, it can be strongly evidenced only in the BIS "others" (AVE = 0.61). For the BIS "now" there is an indication of validity (AVE = 0.45) but for the BIS "before" the construct validity of the scale could not be evidenced (AVE = 0.37; Table 2). We only emphasize that, in this last model, items 10 and 11 had a factor loading below the preferable value (λ = 0.49 and λ=0.45). However, all other values were above the acceptable and the decision was to keep these items in the model to preserve the theoretical validity of the instrument.

The internal reliability values - composite reliability and Cronbach's Alpha - were above 0.70, both in the "before" BIS (CC = 0.85; α = 0.86) and in the "now" BIS (CC = 0 .89; α = 0.90) and Bis "others" (CC = 0.93; α = 0.94).

Nomological validity

In the three BIS-HIV protocols, there were no significant differences in relation to biological sex, gender or marital status. There are significant differences between those who have a perception of security and financial insecurity in the BIS-HIV "before" and BIS-HIV "now" protocols, in both cases those who feel secure have higher scores (a more positive assessment of themselves) (table 3).

Invariance of models

The test of invariance between BIS-HIV "before" and BIS-HIV "now" was supported in metric non-invariance, $\Delta\chi2\lambda(12) = 17.73$, $p= 0.12$; but not in the scalar $\Delta\chi2I(19)= 106.01$, $p<0.001$; and strict $\Delta\chi2cov/res(1) = 14.61$, $p = 0.01$ (table 4).

Additional analysis

There is a moderate correlation between the BIS-HIV score "now" and BIS-HIV "before", $rs=0.36$, $p<0.001$. There is also a moderate and positive correlation between BIS-HIV "now", $rs= 0.33$, $p <0.001$ and BIS-HIV "others"

There is a significant difference, $\chi2 = 179.49$, $p <0.001$, between the scores of the BIS-HIV protocols completed by sample 4. Dunn's post hoc test indicated that there were differences between BIS-HIV "now" (Md = 37) and BIS-HIV "before" (Md = 43), $Z = 5.26$, $p<0.05$, with the second having the highest score.

Table 3: Nomological validity

Categorical variables		BIS-HIV "before" (n = 300)			BIS-HIV "now" (n = 300)			BIS-HIV "others" (n = 300)		
		n	Med	p	n	Med	p	n	Med	p
Sex	Male	195	43	0.98	200	39	0.05	179	40	0.13
	Female	105	43		100	36		121	43	
Genre	Male	192	43	0.88	195	39	0.10	175	40	0.17
	Female	36	43.5		105	36		125	43	
Marital status	single	160	43	0.24	157	38	0.81	149	40	0.22
	Married	91	44.5		100	38		101	43	
Financial Sex	insecure	106	42.5	0.03	118	36.5	0.004	114	20	0.38
	Safe	136	44.5		136	40		132	26.5	

Note: n= sample number, MED = median

Table 4. Measurement invariance test between BIS-HIV "before" and BIS-HIV "Now"

MI	gl	χ2	RMSEA	CFI	NFI	Δ χ2	Δgl	pΔ χ2
BIS-HIV "Before"	31	48.37	0.061	1	0.97	N/A	N/A	N/A
BIS-HIV "Now"	31	63.89	0.084	0.99	0.97	N/A	N/A	N/A
configurable	73	148.52	0.083	0.95	0.90	N/A	N/A	N/A
Metric	85	166.25	0.080	0.94	0.89	17.73	12	0.12
Climb	104	272.26	0.104	0.89	0.82	106.01	19	<0.001
strict	105	286.87	0.108	0.90	0.82	14.61	1	0.01

Note: MI = measure of invariance, gl = degrees of freedom, χ2 =chi-square;RMSEA = root mean square error of approximation CFI = comparative fit index, NFI = Normed fit Index, Δχ2 =delta chi-square Satorra-Bentler ; Δgl = delta degrees of freedom; pΔ χ2 significance level of the P value for the Satorra-Bentler chi-square difference test.

Between BIS-HIV "before" (Md= 43) and BIS-HIV "others" (Md= 23.5), $Z = 12.86$, $p<0.05$, the former had a higher score. Finally, between BIS-HIV "now" (Md= 37) and BIS-HIV "others" (Md= 23.5), $Z = 5.26$, $p<0.05$, the

first scored higher again. It is noteworthy that higher scores are associated with a more positive assessment of body image.

DISCUSSION

TThe objective of this research was to carry out the methodological study, investigating the factor structure, the construct validity, the internal reliability, the non-invariance of the Brazilian Portuguese version of the BIS-HIV for a reference sample of PVHA.

The one-factor model tested showed a satisfactory fit for the three BIS-HIV instruction protocols, with all goodness-of-fit indices having been achieved. The instrument was refined, with the elimination of items 9 and 12 in the BIS-HIV "Before" and BIS-HIV "Now" protocols. For the protocol with the instruction "how others see me", item 2 was additionally eliminated. The adequacy of the adjustment index evidences adherence of the data generated by the instrument to the theory underlying it, which is a fundamental aspect in the psychometric evaluation of the instrument[38,50].

The structural difference of the "others" protocol in relation to the others made it impossible to verify the non-invariance, since the configurational non-invariance was no longer supported. Furthermore, this protocol assesses more a social view of the respondent than body image per se, so some difference is expected in relation to the "before" and "now" protocols. Thus, the non-invariance of BIS-HIV was verified between the instructional protocols and it could only be verified between "before" and "now", which can only be supported in relation to metric non-invariance. This tells us that the researcher can reliably interpret the averages between these two versions of BIS-HIV.

The internal reliability assessed by Cronbach's Alpha test and the Composite Reliability reached satisfactory values in the three tested versions of the Brazilian version of the BIS-HIV. Regarding construct validity, convergent validity can be partially evidenced

for the "before" and "now" protocols, since only the adequacy of factor loadings was confirmed. The average variance extracted from these two protocols was lower than expected. The decision to accept the covariances of errors in the model leads to a decrease in the factor loading of the items[38], which mathematically explains this low value found. The researchers' decision was to keep the instrument's items as much as possible – since it is brief – to preserve its content validity. Although the average variance extracted was outside the citation limit, the factor loadings were adequate, indicating that the items inserted in the single factor were coherent with each other[50].

It is then worth commenting on the decision to accept the covariances of errors. Common causes for its occurrence include the redundancy of items (caused by similar content or social desire) and/or the omission of an exogenous factor[51]. Acceptance of the error of covariance must have theoretical support, rather than a purely statistical reason[52]. Having this criterion clear helps to avoid creating model caricatures and ignoring the theoretical confirmation logic that confirmatory factor analysis generates. It is unlikely that social desirability is a factor for error covariance, as we guarantee conditions for data collection to reduce this bias (voluntary and anonymous participation). It is also unlikely that an ignored latent variable (factor) is absent in BIS-HIV, as its cross-loads identified in the initial study[33] lead to the rejection of another model that is not unifactorial. It was the content analysis of the paired items that led us to consider that the existence of error covariance was due to similar content between items.

It should be noted the elimination of items 2, 9 and 12 in the BIS-HIV refinement process. The cultural adaptation of the scale to Brazilian Portuguese was carried out rigorously following the recommendation of Beaton, Bombardier, Guillemin and Ferraz (2002)[53]. Thus, the elimination seems not to be caused by item bias, originating from content deviation or lack of clarity of the items[54]. It may be a reflection of cultural differences between the origin and destination samples, indicating that, in Brazil, the experience of living with HIV/AIDS is different from the United States. This may also be a reflection of differences in the treatment of HIV/AIDS, which generate situations and experiences that have a distinct impact on body image.

The nomological approach points to the validity discriminant of the measure, since they indicated differences between the different perceptions of financial security. The financial security of people living with HIV/AIDS can play a central role in treatment adherence and emotional balance[55-58]. In Brazil, the universal provision of antiretroviral therapy (ART) has been guaranteed free of charge to HIV-eligible patients since 1996[59]. However, HIV/AIDS prevention and treatment actions are still vulnerable, as they depend on political will and economic availability being , however, even exemplary among low- and middle-income countries[60]. The differences between the level of financial security found here could be explained by the vulnerability of the Program, since Brazilian patients are always faced with the possibility of lack of medication and free medical care, making the process of identity integrity during the course of treatment more challenging for those who are financially insecure.

Additional analyses, comparing the scores of the three BIS-HIV instruction protocols in a paired sample, point to an expected pattern: the "before" body image was more positive than the "now" body image and also that the image that the "others" see those living with HIV/AIDS. Further investigation of body image changes and their interpretation is an aspect that should be explored in future research.

Despite the contributions that the present study presents - either for the improvement of BIS-HIV, or for the possibility of new cross-cultural studies and on the body image of PLWHA - a series of other limitations of the present study must be considered. We validated these scales for a specific clinical group of Brazilians – people living with HIV/AIDS who were seen at the HIV/AIDS clinic in São Bernardo do Campo, São Paulo, Brazil. It would be interesting to have a more representative sample of Brazilian patients, with more data collection centers for future psychometric analysis. We did not verify the associations or determine the relationships of the BIS-HIV score with other measures of constructs that are concomitantly altered by bodily transformations – such as depression, social anxiety and self-esteem. Future studies could also do this.

Despite the limitations, the present study provides positive evidence for the psychometric properties of the Brazilian Portuguese versions of the BIS-HIV, in its three instructional protocols. We emphasize that research on body image in PLWHA has grown, focusing especially on body dissatisfaction, but there is still a need and space for further studies[8].

Concerns about appearance cannot be considered "purely aesthetic". Rather, they should be carefully examined by the infectologist, since these changes may have implications for treatment adherence[61]. Considering the relatively poor state of quantitative research on body image in people living with HIV/AIDS in the Brazilian context[62], we hope that the availability of this instrument will allow for more systematic investigations in Brazil and across cultures.

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BODY IMAGE SCALE – HIV (BIS-HIV)

Full of energy / Willing	5☐	4☐	3☐	2☐	1☐	No energy/tired
**I like sex	5☐	4☐	3☐	2☐	1☐	I don't like sex
I feel healthy	5☐	4☐	3☐	2☐	1☐	I feel unhealthy
I feel sexy	5☐	4☐	3☐	2☐	1☐	I don't feel sexy
No visible signs of illness	5☐	4☐	3☐	2☐	1☐	With visible signs of illness
Attractive	5☐	4☐	3☐	2☐	1☐	not attractive
Desirable	5☐	4☐	3☐	2☐	1☐	not desirable
My body works as usual	5☐	4☐	3☐	2☐	1☐	My body doesn't work as usual
*I get sick easily	5☐	4☐	3☐	2☐	1☐	I don't get sick easily
I feel clean	5☐	4☐	3☐	2☐	1☐	I feel dirty
I don't feel contaminated	5☐	4☐	3☐	2☐	1☐	I feel contaminated
*I don't feel guilty	5☐	4☐	3☐	2☐	1☐	I feel guilty

Sample one: Instructions: Place an “X” on the option that best reflects your feelings about how you felt BEFORE you knew you were living with HIV:
Sample two: Instructions: Place an “X” on the option that best reflects your feelings about yourself (a) NOW, knowing that you are living with HIV:
Sample three: Instructions: Place an “X” on the option that best reflects your feelings about how you think other people view people living with HIV, in general:
*items taken from samples one, two and three
** item taken from sample three

Resumo

Introdução: a Imagem Corporal pode ser definida como a representação mental da identidade corporal. O meio que cerca o sujeito, o olhar do outro, suas emoções, a integridade e a própria fragilidade do corpo são elementos próprios desta representação. O estigma social provocado pelas alterações corporais nas pessoas que vivem com HIV/AIDS pode ser mais intenso que o próprio medo da morte, sendo importante acompanhar o impacto dessas alterações do decurso do tratamento.

Objetivo: realizar a validação psicométrica da versão em português brasileiro da Body Image Scale – HIV para uma amostra de brasileiros, de ambos os sexos, vivendo com HIV/AIDS.

Método: foram recrutados 450 pacientes de um ambulatório de HIV/AIDS de São Bernardo do Campo, São Paulo, Brasil, com idades entre 18 e 78 anos. A análise fatorial confirmatória, utilizando o Unweighted Least Square e deleção listwise, foi usada para determinar a aderência dos dados aos modelos testados.

Resultados: coeficientes adequados de confiabilidade interna e evidência de validade de construto foram estabelecidos para a versão brasileira da BIS-HIV no modelo unifatorial.

Conclusão: A escala foi validada e com suas qualidades psicométricas evidenciadas, fornece uma ferramenta útil para investigações quantitativas da imagem corporal em pessoas com HIV/AIDS no contexto brasileiro e amplia a possibilidade de futuras pesquisas transculturais.

Palavras-chave: imagem corporal, aparência, HIV/AIDS, psicometria.