Title: HIV-Risk Index: development and validation of a brief risk index for Hispanic Young people.

Running head: Development of the HIV-Risk Index in Spanish Young people.

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Abstract

The prevalence of HIV risk behaviors among young people facilitates the spread of HIV, in particular regarding unsafe sex behavior, although this trend is different within this population. For this reason, identifying the riskier young population is required to prevent HIV infection. The main purpose of this study was to develop and validate a Risk Index to assess the different sexual HIV risk exposure among Hispanic Young people. For this purpose, 9861 Spanish young people were randomly distributed into two groups (derivation and validation group). According to the results, the factor analyses grouped the nine items of the HIV- Risk Index into two factors (factor 1, direct sexual risk indicators and factor 2, indirect sexual risk indicators) with an equal structure for men and women by a Multi-group Confirmatory Factor Analysis. The variance explained was 54.26%. Moreover, the Cronbach's alpha coefficient revealed high internal reliability (α=.79) and the Convergent validity supported its evidence based on different HIV risk indexes. Therefore, the HIV-Risk Index seem to be a rigorous and valid measure to estimate HIV risk exposure among young people.

Keywords: HIV, Risk Index, validation, Hispanics, young people.

INTRODUCTION

Nowadays, the HIV-AIDS epidemic remains a public health concern (1). In this context, sexual risk behavior is one of the most prevalent causes for new infections. In Europe, the impact of the epidemic prevails in countries like Spain (2) where the eighty percent of new diagnosis is due to the sexual transmission. In particular, this prevalence shows a rising tendency for Spanish young people (3).

As some models have revealed, such as the Theory of Planned Behavior (4), the Social learning theory (5) or the Information-Motivation-Behavioral Skills model (6), several variables facilitate sexual HIV transmission. According to them, Spanish young people still exhibit risk indicators for sexual risk behaviors, such as inconsistent condom use or lower risk perception (7,8). Moreover, the newer Spanish generations maintain this type of risk indicators for HIV infection contributing to the epidemic spread (9).

In order to improve this situation, an accurate evaluation of risk indicators among young people is essential. Indeed, this is the first stage to develop HIV prevention interventions effectively (10). Despite some efforts to evaluate sexual risk behavior, previous studies have demonstrated important weaknesses in outcomes measures. For example, the poor comprehension and the ambiguity of some survey questions have made difficult considering past findings (10,11). As well as, the lack of control of social desirability (12), the inappropriateness of some metric scales and the disconnection between some measures and the risk indicators of HIV infection (13,14) that have compromised the accuracy of different results. In addition, most of the risk indicators have focused on specific populations such as men who have sex with men (15,16) or male sex workers (17,18) excluding other high-risk populations such as young people (1).

Among Spanish young people, few authors have developed measures to assess HIV risk indicators (9,19–21). Furthermore, past studies have exposed deficiencies to develop a

comprehensive and accurate evaluation among this population (22). In particular, some instruments have only focused on one variable such as information (9) or attitudes (20,23). In other cases, authors have emphasized the lack of adjusted metric scales to consider some results (24) or the limitations of the instrument to cover risk indicators (25). Moreover, most of them addressed to adolescent people without considering the characteristics of young people (26–28). In line with this, there would not be an accurate instrument to evaluate comprehensively sexual risk among Spanish young people.

However, if both the high prevalence of sexual risk in new HIV infections and the relevance of evaluation to improve preventive strategies are considered, the need of a rigorous and adequate instrument to asses sexual risk indicator among Spanish young is evident. In this context, a HIV Risk Index (HIV-RI) could allow to estimate the HIV exposure of young people based on risk indicators that have demonstrate their influence on HIV infection (16,29). For this reason, this study develops and evaluates the psychometric properties of the HIV Risk Indicator, a brief instrument to assess the sexual HIV risk exposure among Hispanic Young people.

METHOD

Participants

Nine thousand eight hundred and sixty-one young people were involved into two studies. The first study (derivation group) included 9477 participants (3553 males and 5924 females). Their age was ranging between 18 and 30 (M= 21.17; SD = 4.051) years old. The second study (validation group) included 384 participants (187 males and 197 females) and aged between 18 and 27 (M= 20.84; SD = 2.149) years old. Regarding country of origin, all of them were Spanish young people. Table 1 shows participants' characteristics for each group. Differences between derivation and validation groups were inexistent, except for the lifetime number of sex partners.

INSERT TABLE 1

Measures

Derivation and validation groups:

Demographics. Demographic variables were assessed by different items developed adhoc that included sex, age, sexual orientation, and relationship status (single/steady partner).

HIV Risk Index development. A comprehensive revision of the main risk variables related to HIV transmission, emphasized the relevance of six variables directly related to condom use during different sexual situations. Items contained short phrases prefaced by "*How often do you use condoms*…" and followed by: 1) …*during vaginal intercourse*?; 2) …*during oral sex?*; 3) …*during anal intercourse?*; 4)…*during sexual intercourse with a steady partner?*; 5) …*when you have drunk or used drugs?*; and 6) …*during sexual intercourse with a sporadic partner*? Participants answered to each question on a 4 point Likert scale ranging from 1 (*Never*) to 4 (*Always*). According to previous studies (30,31), answers were dichotomized as 0 (no risk) or 1 (risk) depending on whether they always use or not condoms (0=no HIV risk due to consistent condom use and 1=HIV risk due to inconsistent condom use). We added 3 extra HIV risk indicators supported by literature (32–35): 7) *had you ever been unfaithful to a steady partner?* 8) *Do you intend to continue using the condom in future sexual intercourses?* and 9) *Ever knowingly had an HIV test?* Participants answered each question on a dichotomous scale (True/false). An affirmative answer to question 7 was codified as 1 (risk) whereas an affirmative answer to question 8 and 9 was codified as 0 (no risk).

In order to weight the HIV risk for the above indicators, we added 2 additional questions. Firstly, participants were asked about their current sexual frequency on a 7 point Likert scale that ranged from 1 (*less than 6 times per year*) to 7 (*more than 3 times per week*). Those who reported >1 sexual intercourse per week received a score of 1.225 (additional HIV risk) whereas the rest received a score of 1 (no additional HIV risk). Secondly, we asked about the number of lifetime sexual partners and the age of their first sexual intercourse. Those who reported ≥1

sexual partner per sexually active year received a score of 1.225 (additional HIV risk) in other case they received a score of 1 (no additional HIV risk). The election of these cutoff values was based on statistical criteria: only 36.8% and 15.9% of the sample reported >1 sexual intercourse per week and ≥1 sexual partner per sexually active year respectively.

The following simple linear function was applied in order to estimate HIV risk for each indicator: Risk score= indicator (0 [no risk] or 1 [risk]) x sexual frequency (1 [≤1 sexual intercourse per week] or 1.225 [>1 sexual intercourse per week]) x lifetime sexual partners (1 [<1 sexual partner per sexually active year] or 1.225 [≥1 sexual partner per sexually active year]). The result of the risk score for each indicator was rounded, obtaining a scale with 4 values: 0 (no risk), 1 (medium risk), 1.25 (medium-high risk), and 1.5 (high risk). With this multiplicative function, sexual frequency and lifetime sexual partners only add risk when the primary risk behavior (indicators) exists. Risk scores on each indicator were added to get a total risk index (The HIV-RI).

As a final step, an administration format of the HIV-RI was developed to simplify its use in community setting (table 2).

INSER TABLE 2

HIV severity perception. A brief scale was developed through 4 items with a dichotomous answer scale (Yes/no), such as "*There is still no known treatment for Aids*". Internal consistency was .63.

Self-efficacy in condom use. An 8-item measure was developed to assess individual's capability to deal with barriers in condom use, based on Teng and Mak (36). The scale included three types of situations: 1) condoms accessibility (i.e., *I feel comfortable buying condoms*); 2) assertiveness and negotiation (i.e., *I feel comfortable suggesting the use of condoms to a new partner*); and 3) self-control (i.e., *I use condoms even if I feel very horny*). Items were a four-

point Likert scale (strongly disagree, disagree, agree, and strongly agree). Cronbach's alpha for this measure was .65.

Validation group:

Personality. The Spanish version of the Revised NEO Personality Inventory (NEO PI-R, 37) was used in order to assess the main domains of the personality structure. This questionnaire includes 240 items to assess the five domains of the Five Factor Model of personality: Neuroticism (N), Extraversion (E), Openness to experience (O), Agreeableness (A), and Conscientiousness (C). Items include a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*. Internal consistency for the Spanish version ranged from .83 to .92 (37). Internal consistency in the current study was between .72 and .86.

Sexual Sensation Seeking. The Spanish adaptation of the Sexual Sensation Seeking Scale by Kalichman & Rompa (38) assesses "the propensity to attain optimal levels of sexual excitement and to engage in novel sexual experiences". It is an 11-item scale on a 4 point Likert scale that ranges from 1 (*Not at all like me*) to 4 (*Very much like me*). Internal consistency in our study was 0.81.

Sexual addiction and Compulsivity. Two scales were used to provide an overview of sexual compulsivity and general symptoms associated with hypersexuality: the Spanish adaptation of the Sexual Compulsivity Scale (SCS, 39) and the Hypersexual Behavior Inventory (HBI, 40). The SCS contains 10 items answered on a 4 point Likert scale (1=*not at all like me* to 4=*Very much like me*). The HBI is a 19-item self-report scored on a 5-point Likert scale that ranges from 1 (*Never*) to 5 (*Very often*). Cronbach's alpha for the SCS and the HBI was .84 and .91 respectively.

Consequences of the sexual behavior. Participants completed a 16 item subscale from the Cognitive and Behavioral Outcomes of Sexual Behavior Scale (CBOSBS, 41). The subscale, named Behavioral Outcomes (CBOSBS-B), measured whether participants had

experienced specific outcomes (i.e., "*I contracted a sexually transmitted infection*" or "I or my sexual partner(s) became pregnant") caused by their sexual behavior over the past year. Participants answered each question on a dichotomous (True/false) scale and total score ranged from 0 to 16. Cronbach's alpha in the present study was .79.

Cybersex addiction. The Spanish adaptation of the Internet Sex Screening Test (ISST, 42) evaluates the degree to which the online sexual behavior of a person is, or is not, problematic. Twenty-five items on a dichotomous (True/false) scale provide a total score (ISST-total) ranging from 0 to 25. Ballester-Arnal et al. (42) reported good internal consistency (α=0.88) and test-retest stability (r=.82). In our study, internal consistency was 0.82.

Procedure

The data collection for this research, that involves two studies (derivation and validation groups), was included in a comprehensive project focused on evaluating the HIV risk profile of young people. For this purpose, participants for both groups were recruited, at the same time, in different educational centers from Castellon and Valencia (Spain). After obtaining authorization by educational institutions and the University Ethical Committee, the participants of both groups received the same information by different channels (email, a website, social networks and outreach activities). Once participants gave their informed consent, they were randomly assigned to one of both studies: derivation and validation groups. In case of validation group the number of participants was restricted because its limited purpose (convergent validity). Once assigned, participants completed the questionnaires in classrooms and other locations of educational centers that guaranteed their confidentiality. In addition, participants were separated enough to have privacy. The participants of derivation group only completed the HIV-RI in 5 minutes. The participants of validation group completed the HIV-RI, as well as other questionnaires, in 30-40 minutes. Both groups of participants completed the questionnaires individually, anonymously and voluntarily. In order to ensure data accuracy and

solve any possible doubts, trained psychologists provided appropriate instructions and were present during this process.

Data Analysis

Derivation group was used to develop the risk index, and validation group for validation analyses. Descriptive analyses were first conducted to characterize participants in terms of demographics and sexual behavior variables using SPSS statistic package (version 23). *t* test (continuous variables) and chi-square (categorical variables) were calculated to assess the comparability of both groups. Effect size measures for continuous variables were expressed as the standardized mean difference between groups (Cohen's *d*) and for categorical variables as Cramer´s V. For Cohen's *d*, effect sizes of .2 to .49 were considered small, those between .5 and .79 were considered medium, and those greater than .8 were considered large (43). For Cramer´s V, this corresponds to .10, .30, and .50 respectively (44).

In order to identify the internal structure of the HIV Sexual Risk Index (HIV-RI), an Exploratory Factor Analysis (EFA) was performed on the derivation group Following Gaskin and Happell (45) recommendations, we used principal axes analysis with oblimin rotation. Reliability was assessed by Cronbach's alpha coefficients, Item-scale, and Item-test correlations.

Then, we conducted a Confirmatory Factor Analysis (CFA) on the validation group to compare the adequacy of different factor models. Multi-group CFA was performed in order to test configurational and metric invariance. EQS (Version 6.2) software was used to perform the CFA and the Multi-group CFA. Due to the non-normality in the data, Robust Methods were used. Within the CFA, we examined standard indicators of model fit, which included: the Satorra-Bentler chi-squared ($_{S.B.}\chi^2$), the general model significance (p), the normed chi-square (χ^2/df), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the incremental fit index (IFI). For the CFA, as well as for the Multi-group CFA, a good fit

is obtained when the $_{S.B.}\chi^2$ is nonsignificant (p>.05), the χ^2/df is between 1 and 2, the CFI and the IFI are 0.95 or higher, and the RMSEA is 0.05 or lower (46). CFI and IFI values between .90 and .95 as well as RMSEA lower than .08 are also indicative of an acceptable model fit. Convergent validity between HIV-RI and other theoretically related variables was assessed by Pearson correlation coefficient.

Receiver Operating Characteristics (ROC) analyses were finally performed on the whole sample to establish a cutoff point for the HIV-RI. The HIV-RI cutoff point was assessed by computing sensitivity, specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) with three different criteria variables.

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the Jaume I University approved the study. All subjects were informed about the study and all provided informed consent.

RESULTS

Analyses performed on the derivation groups

Kaiser-Meyer-Olkin (KMO=0.822) and Bartlett's test (χ^2 (36)= 29434.93, p<0.001) indicated that data met the requirements to perform an Exploratory Factor Analyses (EFA). Thus, a maximum likelihood factor analysis was conducted with oblique rotation, revealing a 2-factor solution that accounted for 54.26% of total variance. Factor 1 was named "direct sexual risk indicators" and grouped together 5 HIV transmission indicators. Factor 2 was named "indirect sexual risk indicators" and included 3 situations that increase the risk of contracting HIV. Direct and Indirect Sexual Risk Indicators accounted for 41.38% and 12.88% of the variance respectively. Factor loadings ranged from .55 to .86 on the first factor and from .31 to .80 on the second factor. With the exception of item 6 (loaded above .50 on both factors), indicators were clearly assigned to one or another factor (table 3).

INSERT TABLE 3

Mean values near to 0 indicate a non-existent or lower risk whereas values greater than or equal to 1 indicate a medium to high HIV transmission risk. As can be seen in table 3, indicator 9 had the highest mean value (0.88), with 82.5% of participants with a risk score greater than or equal to 1 due to having an HIV test. The proportion of participants with risk scores on the remaining 8 risk indicators was lower, with 39.7% with a risk score as a result of inconsistent condom use during oral sex, 24.7% as a result of inconsistent condom use during sexual intercourse with a steady partner, and 21% due to inconsistent condom use during vaginal intercourse. Indicator 7 displayed the lowest risk ratio, with only 3.6% of participants showing inconsistent condom use during sexual intercourses with a sporadic partner.

The sum of the scores on the 9 HIV sexual risk indicators (HIV-RI) turn out in a scale that ranges from 0 to 13.5. The average score for this scale was 2.51 (*SD*=2.41). HIV-RI score was right skewed, reflecting the presence of a large proportion of participants at lower values of the distribution and proportion that gradually decreases in higher values of the distribution.

Reliability analysis of the scale, calculated using Cronbach's alpha coefficient, found high internal reliability for the overall scale (α=.79) and for the factor 1 (α=.84). Cronbach's alpha for the factor 2 (α=.51) was lower than those previously reported, foreseeable taking into account that the factor contained only three items. Therefore, the use of that subscale is recommended only inside the context of the HIV-RI. Item-scale correlations were acceptable, with values ranging from .46 to .71 in case of factor 1 and between 33 and .55 in case of factor 2. Item-test correlations were also good except for indicator 9 where item-test correlation was below .30.

Analyses performed on the validation group

INSERT TABLE 4

In order to verify the factorial structure of the HIV sexual risk index and decide whether indicator 6 better fit into factor 1 or 2, a Confirmatory Factor Analyses (CFA) was performed in the validation group. Goodness of fit of two possible models was tested: a model where item 6 was allocated to factor 1 (M1) and a model where this item was allocated to factor 2 (M2). For both models, a correlation between factor 1 and 2 was proposed. As can be seen in table 4, both M1 and M2 demonstrated good model fit. However, in comparison with M2, M1 showed better fit indices, especially for the general model significance, the normed chi-square, and the RMSEA. CFI and IFI values in M1 were above .95, indicating once again a perfect model fit. Hence indicator 6 was finally assigned to factor 1. M1 is illustrated in figure 1. The standardized factor loading were all statistically significant ($p<.001$), with values ranging from .46 to .83 in case of factor 1 and between .40 and .70 in case of factor 2.

INSERT FIGURE 1

Multi-group CFA was performed in order to test whether factorial structure was equal for males and females. Validation group was employed to test configurational invariance (Invariance_1) and metric invariance (Invariance_2). To test configurational invariance, no constraint was applied. Factorial loads and correlations were constrained to be equal to test metric invariance hypothesis. As can be seen in table 4, Invariance_1 model had an excellent fit to the data, supporting a configurational invariance. However, there is some significant worsening of model fit when factorial loads and correlations were constrained to be equal (Invariance_2), suggesting some differences in terms of factorial weights between males and females. In this regard, it seems that whereas the distribution of the HIV-RI items between the two factors is equivalent for males and females, the strong of the relationship between items and factors (as well as the correlation between factor 1 and 2) differs.

INSERT TABLE 5

To assess convergent validity, we correlated the HIV-RI and their subscales with measures of perceived severity of HIV, self-efficacy in condom use, sexual addiction and compulsivity, sexual sensation seeking, consequences of sexual behavior, and personality. Table 5 presents the results. As we expected, we found positive and significant correlation between the HIV-RI and scores for the sexual compulsivity scale and the hypersexual behavior inventory (.202 and .222 respectively), the Internet Sex Screening Test (.133), and the sexual sensation seeking scale (.421). On the contrary, negative and significant correlations were found between the HIV-RI and perceived severity of HIV (-.070) and between the HIV-RI and 2 personality domains of the NEO PI-R, agreeableness (-.164) and Conscientiousness (-.107). Self-efficacy in condom use and behavioral outcomes of sexual behavior did not significantly correlated with the HIV-RI, but they correlated with factor 1 and 2. In case of self-efficacy in condom use, it was negative correlated with both factor 1 and 2, whereas in case of the CBOSB-B, the correlations were positive. Correlations between the HIV-RI and some of the variables previously mentioned (in particular, HIV-severity perception) were significant but with values below .10, possibly due to the large sample size of this particular analyses. Thus, it is very likely that the same analyses on a smaller sample would not result significant.

Analyses performed on the whole sample

ROC curve analyses were applied in order to establish a cutoff point that accurately identifies those individuals at higher risk of HIV (as well as other STI) transmission. Criterion variables to identify this cutoff point were: (1) having had inconsistent condom use during anal intercourse, (2) having had inconsistent condom use during vaginal intercourse, and (3) having contracted a STI. Roc curve analyses found AUC's of .921 (95% CI .915-.927) for inconsistent condom use during anal intercourse, .969 (95% CI .966-.972) for inconsistent condom use during vaginal intercourse, and .631 (95% CI .500-.763) for having contracted a STI.

INSERT TABLE 6

Sensitivities and specificities are depicted in table 6. We selected a cutoff point of 4 to identify those individuals at higher risk of HIV transmission. 79% of participants scored below this value. This cutoff was associated with a sensitivity of 80.4% to identify those individuals who have reported inconsistent condom use during anal intercourse (i.e., among those who reported inconsistent condom use during anal intercourse, 80.4% scored 4 or more), 84.2% to identify those individuals who have reported inconsistent condom use during vaginal intercourse, and 81.3% to identify those individuals who have contracted an STI. Specificity at a cutoff of 4 was 85.5% (i.e., among those who did not report inconsistent condom use during anal intercourse, 85.5% scored <4), 95.6%, and 39.1% respectively. Positive Predictive Value (PPV) for having contracted an STI was 11.2% (i.e., among those with a HIV-RI >4, 11.2% had contracted an STI) and Negative Predictive Value (NPV) was 95.6% (i.e., among those with a HIV-RI <4, 95.6% had not contracted an STI). PPV for inconsistent condom use during anal and vaginal intercourse was 53.8% and 82.6% respectively, whereas NPV was 94.6% and 97.2%.

DISCUSSION

The main purpose of this study was to develop and evaluate the psychometric properties of the HIV Risk Indicator, a brief instrument to assess the sexual HIV risk exposure among Hispanic Young people in preventive and clinical interventions. In this context, our findings show that the HIV Risk Indicator is a reliable and rigorous instrument to estimate different levels of HIV risk. In particular, the HIV-RI provides the possibility of establishing a risk range among young population (between 0 and 13.5 points), including a risk cutoff with similar sensitivity and more specificity than previous risk indicators in other populations, such as men who have sex with men (16). According to the HIV-RI, young people who score more than 4 points should be included in a comprehensive assessment of their HIV risk sexual behavior. However, a basic risk-reduction intervention should be appropriate for young people who score

less than 4 points. In this sense, the HIV-RI contributes to one of the most important aims for HIV prevention, improving the identification of high risk-populations and adjusting clinical and preventive interventions (47).

The factor analyses grouped the items into two factors explaining 54.26% of total variance. Both of them explore relevant indicators that have demonstrated facilitating HIV risk exposure (29). In addition, attending to the relevance of gendered approach to HIV (48), the results have shown an equal structure for men and women. Therefore, this index is gender sensitive and appropriate for young men and women, an important aspect for HIV assessment (19,49). **In this sense, the index improves past measures that did not consider the gender perspective. This made difficult an adequate analysis of women's needs and, consequently, an adjusted development of intervention strategies (50). Moreover, this instrument is one of the most comprehensive addressed to Hispanic young people who have been excluded in most of risk indicators (15,16).**

The first factor "direct sexual risk indicators" includes the most important variable that has been related to sexual transmission of HIV, that is, unprotected sex (3). In particular, this factor explores risk situations supported by past literature such as a diversity of sexual practices (51,52), having sex after drugs consumption (53) and partners (54). This comprehensive approach improves past instruments focused on a specific sexual practice (for example, vaginal sex) that ignored the other sexual transmission routes (55,56). The second factor "indirect sexual risk indicators" includes three items that have already demonstrated their relation to HIV infection: intention of no condom use (35), having HIV testing (32) and being unfaithful (33). In general, the coefficients of reliability for both factors are adequate. Therefore, according to past studies, direct risk indicators as having unprotected sex become the greatest weight of variance (3), while other indicators as sexual frequency and lifetime sexual partners become lower relevant and, basically, modulate a score. **Therefore, a young man who uses condom**

in all his sexual activities will obtain a no-risk result even if he has several sexual practices per week or he has different sexual partners. However, a young woman, who does not use condom in vaginal sex, will have a medium risk having several sexual intercourses per week even if these are with the same partner.

Moreover, the convergent validity **would support** the evidence of this index. As past studies have revealed, more HIV risk exposure (based on HIV-RI) has been associated with higher scores on sexual compulsivity, sexual sensation seeking (57) and cybersex behavior (58). In addition, perceived severity of HIV (59), and some personality traits (agreeableness and conscientiousness) (60) have been related to lower scores of HIV-RI, that is, lower HIV risk exposure. In this context, self-efficacy in condom use and some sexual consequences such as having STI have also revealed association with both factors (61,62).

Thus, this Index explores the unprotected sexual behavior distinguishing the most important sexual transmission routes (vaginal sex, anal sex and oral sex) (53,63,64). In this sense, the HIV-RI improves past measures focused on a specific practice that ignored an important percentage of risk (55,56). **In fact, young people who have had safe sex in vaginal practices have reported unsafe sex in oral or anal sexual practices (19).**

In addition, the HIV-RI is also based on important variables included in socio-cognitive models of HIV transmission (4,6) such as behavioral intention (35) and risk perception of HIV, illustrated as lack of awareness of HIV serological status (34,65). These variables are mediated by two relevant HIV risk conditions, such as sexual frequency and the number of partners that increase the HIV exposure among people (66).

There are limitations to the analysis used to develop HIV-RI. Firstly, diversity of sexual orientation has not been included among participants equally. In this sense, future studies should include more participants self-identified as homosexual and bisexual. In addition, participants are located only in Spain. Therefore, the HIV-RI should test in other Hispanic

countries to confirm its accuracy among Spanish speakers. **In addition, despite some correlations were statistically significant their lower values require more studies to confirm securely their convergent validity with certain questionnaires.** Concerning factors' analyses, the limited Cronbach's alpha of the factor 2 recommends its use inside the context of the HIV-RI.

Despite these limitations, the HIV-RI has been revealed as a new instrument to assess HIV exposure among Hispanic young people (men and women) in the most prevalent transmission route (unprotected sex). Its psychometrical properties have supported reliability, validity and accuracy. Even more, this instrument allows estimating a risk-range for HIV transmission, which is usually consider for other populations but not for young people. Moreover, its shortness and easy administration facilitate a quickly evaluation of HIV exposure among young people in different contexts. Therefore, this is an advantageous instrument to asses HIV risk among young people who are mainly affected by the HIV-AIDS epidemic.

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Table 1. Sample characteristic for each group

	Derivation group % or *M* (*SD*)	Validation group % or *M* (*SD*)	Size effect
Demographics			
Sex (male)	37.5%	48.7%	*V*=0.04
Sex (female)	62.5%	51.3%	*V*=0.04
Age	21.17 (4.05)	20.84 (2.14)	*d*=0.082
Steady Partner (Yes)	63.8%	63.2%	*V*=0.003
Sexual orientation (heterosexual)	94.5%	86.7%	*V*=0.052
Sexual orientation (bisexual)	3.7%	5%	*V*=0.014
Sexual orientation (homosexual)	1.9%	8.4%	*V*=0.087
Sexual behavior			
Sexual intercourse during the last 3 months (yes)	79.5%	86.7%	*V*=0.035
Same sex intercourse (yes)	4.3%	14.7%	*V*=0.095
Lifetime number of sex partners	3.82 (5.65)	8 (20.79)	*d*=0.563
Masturbation	57.3%	86.9%	*V*=0.118
Mutual masturbation	66.9%	89.8%	*V*=0.096
Oral sex	67.4%	90.3%	*V*=0.097
Vaginal intercourse	87.3%	90.9%	*V*=0.021
Anal intercourse	17.5%	36.5%	*V*=0.095

*p<0,05; **p<0,01; ***p<0,001

Table 2. HIV-RI: Administration and Scoring format

Item	Answer	Score
1. How often do you use condoms during vaginal intercourse?	Never Sometimes Often	Score 1
	Always	Score 0
2. How often do you use condoms during oral sex?	Never Sometimes Often	Score 1
	Always	Score 0
3. How often do you use condoms during anal intercourse?	Never Sometimes Often	Score 1
	Always	Score 0
4. How often do you use condoms during sexual intercourse with a steady partner?	Never Sometimes Often	Score 1
	Always	Score 0
5. How often do you use condoms when you have drunk or used drugs?	Never Sometimes Often	Score 1
	Always	Score 0
6. How often do you use condoms during sexual intercourse with a sporadic partner?	Never Sometimes Often	Score 1
	Always	Score 0
7. Had you ever been unfaithful to a steady partner?	Yes	Score 1
	No	Score 0
8. Do you intend to continue using the condom in future sexual intercourses?	Yes	Score 0
	No	Score 1
9. Ever knowingly, had an HIV test?	Yes	Score 0
	No	Score 1
Additional 1. How often do you have sexual intercourse per week?	≤ 1 per week	Score 0
	>1 per week	Score 0.25*
Additional 2. How many sexual partners have you had in the last 12 months?	1 partner	Score 0
	More than 1	Score 0.25*
Add down entries in right column to calculate total score		Total Score

*This adds a 0.25 additional risk for each primary risk indicator with a score of 1. This does not add additional risk score when there is not present a risk answer in any of the primary indicators.

Table 3. Exploratory Factor Loadings, descriptives, and reliability coefficients for indicators, factors and HIV Risk Index

HIV Risk due to…	Factor Loadings		Range	*M* (*SD*)	Risk % [a]	Skewness	Kurtosis	Reliability coefficients		
	Factor 1	Factor 2						α	I-S *r*	I-T *r*
Indicator 1. …inconsistent condom use during vaginal intercourse	.833		0-1.5	0.25 (0.50)	21%	1.48	0.31	NA	.712	.792
Indicator 2. …inconsistent condom use during oral sex	.786		0-1.5	0.48 (0.60)	39.7%	0.49	-1.66	NA	.598	.720
Indicator 3. … inconsistent condom use during anal intercourse	.553		0-1.5	0.11 (0.37)	9.5%	2.83	6.24	NA	.452	.559
Indicator 4. …inconsistent condom use during sexual intercourse with a steady partner	.863		0-1.5	0.30 (0.53)	24.7%	1.23	-0.38	NA	.724	.799
Indicator 5. … inconsistent condom use after drugs or alcohol consumption	.701		0-1.5	0.23 (0.49)	19.2%	1.63	0.79	NA	.661	.652
Indicator 6. …inconsistent condom use during sexual intercourse with a sporadic partner	.507	.551	0-1.5	0.11 (0.36)	9.2%	2.92	6.77	NA	.462	.762
Indicator 7. …the fact that I have been unfaithful to my steady partner		.797	0-1.5	0.04 (0.24)	3.6%	5.11	24.56	NA	.43	.521
Indicator 8. …the intention of not using condoms in future intercourses		.530	0-1.5	0.06 (0.27)	5%	4.24	16.38	NA	.55	.459
Indicator 9. … not to be tested of HIV		.306	0-1.5	0.88 (0.42)	82.5%	-1.37	0.53	NA	.33	.29
Factor 1. Direct sexual risk indicators	NA	NA	0-9	1.52 (2.15)	NA	1.34	0.80	0.84	NA	.971
Factor 2. Indirect sexual risk indicators	NA	NA	0-4.5	0.99 (0.60)	NA	1.29	6.40	.51	NA	.531
HIV Risk Index (HIV-RI)	NA	NA	0-13.5	2.51 (2.41)	NA	1.55	2.06	.79	NA	NA

*p<0,05; **p<0,01; ***p<0,001

Note: NA= Not applicable; [a]=This percentage includes scores greater than or equal to 1 (that is, participants with medium, medium-high and high risk); I-S *r*= Corrected item-scale correlation; I- T *r*= Corrected item-test correlation.

Table 4. Goodness of fit indices for the CFA and the multi-group CFA

		$_{S.B.}\chi^2$	df	p	χ^2/df.	RMSEA	CFI	IFI
CFA	M1	26.52	24	.32	1.10	.003	0.96	.97
	M2	34.72	24	.04	1.44	.008	0.90	0.92
Multi-group CFA	Invariance_1	46.90	48	.51	0.97	.009	0.92	.92
	Invariance_2	159.55	58	.02	2.75	.04	.86	.87

Note: $_{S.B.}\chi^2$= Satorra-Bentler chi-square; df= degrees of freedom; p=general model significance; χ^2/df= normed chi-square; RMSEA= Root Mean Square Error of Aproximation; CFI= Comparative Fit Index; IFI= Incremental Fit Index.

Table 5. Correlations between HIV-RI and theoretically related measures

		HIV-RI	Factor 1	Factor 2
HIV-severity perception [a]		-.070***	-.086***	.023
Self-efficacy in condom use [a]		.024	-.042**	-.046***
SCS [b]		.202***	.198***	.126***
HBI [b]		.222***	.222***	.127***
SSS [b]		.421***	.431***	.211***
ISST [b]		.133**	.157**	.020
CBOSB-B [b]		.076	.168*	.169*
NEO PI-R	Neuroticism [b]	.067	.048	.084
	Extraversion [b]	.059	.057	.038
	Openness to experience [b]	-.020	.005	-.068
	Agreeableness [b]	-.164***	-.177***	-.064
	Conscientiousness [b]	-.107*	-.105*	-.067

*p<0,05; **p<0,01; ***p<0,001

Note: [a]=Correlations performed on the whole sample (*N*=9861); [b]=Correlations performed on the validation sample (*N*=384); SCS= Sexual Compulsivity Scale; HBI= Hypersexual Behavior Inventory; SSS=Sexual Sensation Seeking; ISST= Internet Sex Screening Test; CBOSB-B=Behavioral Outcomes of Sexual Behavior Scale.

Table 6. Sensitivity and Specificity of HIV-RI cutoff scores

HIV-RI cutoff score	Percentile	Risk anal intercourse		Risk vaginal intercourse		Contracted STI	
		Sensitivity	Specificity	Sensitivity	Specificity	Sensitivity	Specificity
1	50	100%	56%	100%	64.1%	100%	3%
2	57	98.8%	67.4%	98.7%	76.9%	100%	15.4%
3	70	91.7%	79.2%	93.9%	90%	93.8%	23.1%
4	79	80.4%	85.8%	84.2%	95.6%	81.3%	39.1%
5	82	63.4%	91.8%	56.5%	98%	75%	52.1%
6	87	53.9%	93.8%	46.2%	98.7%	62.5%	56.2%
7	93	41.9%	96.7%	30.7%	99.3%	56.3%	67.5%
8	96	26.6%	98.5%	17.3%	99.7%	31.3%	82.2%
9	98	13.8%	99.3%	8.8%	99.9%	25%	89.3%
10	99	8.6%	99.6%	5.4%	99.9%	12.5%	90.5%
11	99	6.1%	99.8%	3.4%	100%	0%	94.1%
12	99	1.3%	99.9%	0.6%	100%	0%	98.8%
13	99	1%	100%	0.4%	100%	0%	99.8%

Figure 1. Confirmatory Factor Analyses for the HIV risk index (M1). R^2 is expressed as a percentage outside the main endogenous variables boxes. Coefficients are reported in standardized format. All parameters were significant at p<.001. Error terms are not included in order to facilitate its interpretation.