Validation of a brief questionnaire for assessing psychological variables and medication-adherence behaviors among HIV-positive persons from Venezuela

Erika Mariana Álvarez Arenas

Ronald Daniel González Mendoza

Licenciatura en Psicología, Universidad Centroccidental "Lisandro Alvarado"

Barquisimeto (Lara), Venezuela

Melina Miaja Ávila

Instituto de Bienestar Integral. Hospital Zambrano Hellion.

Instituto Tecnológico de Monterrey, México

Julio Alfonso Piña López

Programa de Salud Institucional
Universidad de Sonora, México

Luis Enrique Fierros Dávila

Departamento de Psicología y Ciencias de la Comunicación

Universidad de Sonora, México

Correspondence: Julio Alfonso Piña López. Guillermo Prieto No. 18. Colonia Constitución. Hermosillo, Sonora, C.P. 83150, México. Tel.: +52-662-2592151. Email: pina.lopez.julio@gmail.com

Abstract

The objective of this cross-sectional study was to validate a brief version of a questionnaire for assessing psychological variables and adherence behaviors (VPAD-24) among 124 HIV-positive Venezuelan persons under different treatment regimens of antiretroviral medication. For data analyses SPSS for Windows (v. 19.0) and AMOS package (v. 18.0) were used. The brief version of the VPAD extracted three factors (past competencies, motives, and current competencies) accounting for 52.3% of the variance, showing an adequacy fit of data to the theoretical model: χ^2 [65, $N = 124$] = 105.30, p < 0.01; DF= 0.33 [DF_{MI} = 2.70]; NCPP = 0.86 [$NCPP_{MI}$ = 3.33]; GFI = 0.89, AGFI = 0.84, CFI = 0.88; RMSEA = 0.07. The VPAD Venezuelan version resulted to be adequate and provides guidance for further research on the relationship between the psychological variables of a theoretical model and adherence behaviors in HIV-positive persons under different treatment regimens of antiretroviral medication.

Keywords: Validation, Psychological Variables, Adherence Behaviors, HIV-Positive Persons, Venezuela.

Validación de un cuestionario breve que mide variables psicológicas y conductas de adhesión a los medicamentos en personas VIH-positivas de Venezuela

Resumen

El objetivo de este estudio transversal fue evaluar la versión breve de un cuestionario que mide variables psicológicas y conductas de adhesión (VPAD-24) en una muestra de 124 venezolanos VIH-positivos expuestos a diferentes regímenes de tratamiento con medicamentos antirretrovirales. Para el análisis de los datos se utilizaron el paquete SPSS para Windows (v. 19.0) y el paquete AMOS (v. 18.0). El cuestionario arrojó una estructura de tres factores (competencias pasadas, motivos y competencias presentes) que explican 52.3% de la varianza, mostrando un buen ajuste de los datos al modelo teórico: χ^2 [65, $N =$ 124] = 105.30, p < 0.01; DF= 0.33 [DF$_{MI}$ = 2.70]; NCPP = 0.86 [NCPP$_{MI}$ = 3.33]; GFI = 0.89, AGFI = 0.84, CFI = 0.88; RMSEA = 0.07. La versión venezolana del VPAD resultó ser adecuada y provee lineamientos para futuras investigaciones sobre la relación entre las variables psicológicas de un modelo teórico y las conductas de adhesión en personas VIH-positivas expuestas a distintos regímenes de tratamiento con medicamentos antirretrovirales.

Palabras Clave: Validación, Variables Psicológicas, Conductas de Adhesión, Personas VIH-Positivas, Venezuela.

Introduction

Acquired immunodeficiency syndrome (AIDS) is a global health problem affecting more than 35 million people around the world (UNAIDS, 2014). Despite the evidence that antiretroviral therapy (ART) has led a significant decline of both AIDS-related morbidity and mortality, medication-adherence behaviors among HIV-positive persons living in resource-limited settings —e.g., Latin-America and the Caribbean countries— remains a great concern for health authorities (Cohn & Baker, 2010; Wools-Kaloustian & Kimaiyo, 2006). In fact, in some of these countries few research reports have documented how many HIV-positive persons are under an ART regimen, but overall, few have documented which are the psychological and/or social variables facilitating or not the practice of those behaviors (*e.g.,* Arrivillaga, Ross, Useche, Alzate, & Correa, 2009; Jones, Cook, Cecchini, Sued, Bofill, Weiss *et al.,* 2015; Varela & Galdames, 2014).

In Venezuela, for example, people aged 15 or more with HIV amounted close to 100,000 by the end of 2013, and less than a half of them have been under an ART regimen (WHO, 2013). Nevertheless, the lack of specific information about the number of HIV-positive persons that consistently and efficiently are practicing medication-adherence behaviors is very concerning. In a search on the Internet of both national and international databases led to only two works specifically addressing the issue of adherence to treatment among HIV-positive persons undergoing one of the different ART regimens. On the first one, medication-adherence behaviors were assessed among 46 HIV-positive persons, 69.7% of who took their antiretroviral medications ≥ 95% (Bastardo, Castro, Suárez, Torres, Comenga, & Dumas, 2013). On the second one, which included 82 HIV-positive persons,

71.2% reported a good adherence in the last four days, even though 62.2% of them informed they continued drinking alcohol and 23.2% in an excessive way (Bastardo, 2014). Taken into account the above scenario and the importance of the issue of medication-adherence behaviors in HIV-positive persons from Venezuela, this study was justified in a psychological model to assess psychological variables and adherence behaviors in persons with HIV, e.g., medication consumption, laboratory testing, diet and exercise (Piña & Sánchez-Sosa, 2007). Such a model attempts to articulate the interaction between psychological and biological variables in four phases (Figure 1). The first phase involves three psychological process variables: stress-related situations (personality) dealing with decision-making and tolerance to both ambiguity and frustration; the motives underlying adherence behaviors; and the performance of past and current behavioral competencies. Phase two entails HIV infection and latter development of other co-morbidities (e.g., opportunistic infections). Phase three includes two different behaviors: adherence behaviors and disease-related behaviors (e.g., stress, depression, irritability, etc). Finally, phase four comprises conventional biological markers (e.g., CD4 cell-count and levels of viral load) and other health results.

So, based on the aforementioned theoretical model, this work is aimed to validate the simplified version of a questionnaire to assess psychological variables and adherence behavior, which was originally designed and validated in Mexico (Piña, Corrales, Mungaray, & Valencia, 2006).
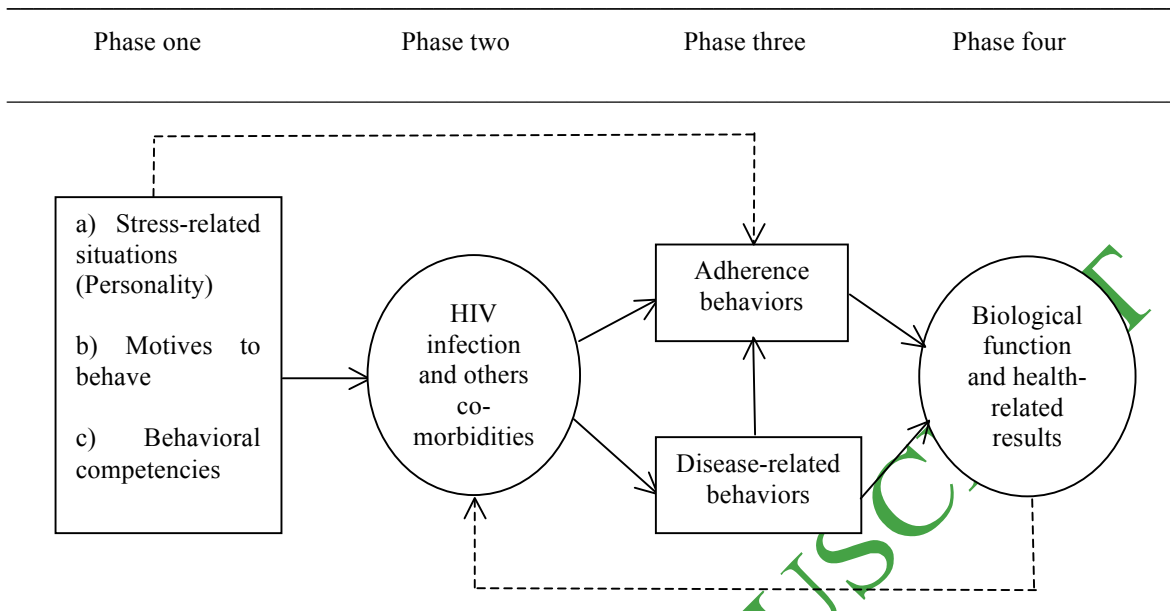
| Phase one | Phase two | Phase three | Phase four |

Figure 1. Psychological model for the research of adherence behaviors (PMAB).

Method

Participants

This cross-sectional study was based on a purposive sampling. From January-February 2015, HIV-positive men and women were seen in routine clinic appointments, as part of the activities of the National Program on AIDS (PRONASIDA) in the State of Lara, Venezuela. The HIV/AIDS Center attends men and women under current ART regimen with antiretroviral medication, and also provides psychological and social support. Participants between 18 and 64 years of age under ART regimen were eligible for inclusion. A total of 124 HIV-positive persons completed the simplified version of the VPAD, aged 18-64 (M = 40; SD = 11.2). Ninety-one (73.4%) participants were male, ninety-seven (78.2%) were single, sixty-four (51.6%) had earned some/complete university degree, and eighty-six (69.4%) were currently employed. Length of infection (months since

HIV diagnosis) was 72.2 (SD = 71.7). Additionally, having no psychological problems and/or cognitive deficit limiting the understanding of directions or items was considered as well. The participant's characteristics are summarized in Table 1.

Table 1
Demographic and clinical variables among 124 HIV-positive persons.

Characteristics	M	SD	Range	N	%
Age (years)	40	11.2	18-64		
Gender					
Male				91	73.4
Female				33	26.6
Marital status					
Single				97	78.2
Married				23	18.5
Divorced/separated				2	1.6
Widowed				2	1.6
Education					
No formal education				5	4.1
Primary education				7	5.6
Secondary education				48	38.7
Some/complete university education				64	51.6
Employment					
Currently employed				86	69.4
Currently unemployed				19	15.3
Home				11	8.9
Student				6	4.8
Other				2	1.6
Time (months) since HIV diagnosis	77.2	71.7	1-432		

Procedure

According with recent recommendations (Stirratt, Dunbar-Jacob, Crane, Simoni, Czajowski, Hilliard et al., 2015), self-report measures of medication-adherence behaviors, originally designed and validated in other countries, needs to accomplishment with several steps. In order to avoid the sources of error, one of them included the administration of the

simplified version of the VPAD by the two first authors (both from Venezuela), with the main purpose to review the clarity and comprehensibility of the items. Before this step, eligible participants voluntarily signed the informed consents prior to participation in this study, and over a two months period were seen using face-to-face interviews. Each participant received the same instructions about the content of the VPAD and the way to respond to the items; after completing the questionnaire, each one was putted in an individual envelope. Participants were not reimbursed for completing the survey. The study was approved by the Research Department of the Psychology Program in the *Universidad Centroccidental "Lisandro Alvarado"* and by the Research Area of the National Program on AIDS (PRONASIDA), both in the State of Lara, Venezuela.

Self-administered questionnaire

HIV-positive persons responded to the VPAD questionnaire, designed and validated in Mexico (Piña et al., 2006). The original version of the VPAD-24 yielded a four-factor structure with the factorial analysis in varimax rotation: 1) Current adherence behavior and treatment; 2) Motives underlying medication-adherence behaviors; 3) Current behavioral competencies; 4) Past behavioral competencies, with values above 1 explaining 65.5% of the total variance. An overall Cronbach's alpha coefficient of 0.85 was obtained with the test of reliability. The simplified version used here consists of 18 items in Spanish language. Item number six measures medication-adherence behaviors (e.g., in the last month, did you take all the medication as prescribed by your physician?), while the other 17 items were originally focused on three factors regarding adherence to treatment: past

behavioral competencies (five items), motives (four items) and current behavioral competencies (eight items).

Data collection and analyses

The internal consistency was estimated by means of Cronbach's alpha coefficient (α). Three values were taken into account: high ≥ 0.70, adequate ≥ 0.60 and low < 0.60 (Cronbah & Shavelson, 2004). The adjustment of the distribution to a normal curve was contrasted with a Kolmogorov-Smirnov (ZK-S) test. The dimensional structure was first drawn by means of an exploratory factor analysis (EFA), with the method of extraction of the main components and varimax rotation; the number of factors was set by the expectation. Those items with factorial loads below 0.40 were eliminated. Secondly, the structure was contrasted with a confirmatory factor analysis (CFA). The models were calculated by high verisimilitude, and estimated parameters were standardized. Seven indexes for interpreting data adjustment were considered according to recommendations:

- Two basic: the discrepancy function (DF) and the chi-squared test (χ^2).
- Two no centrality: the no centrality-based population parameter (NCPP) and the Root Mean Square Error of Approximation (RMSEA) of Steiger-Lind.
- Three comparative: goodness-of-fit index (GFI) of Jöreskog and Sörbom, the GFI adjusted for degrees of freedom (AGFI), and the comparative fit index (CFI) (Jöreskog & Sörbom, 1986; Klem, 2010).

Good fit values for the indexes were as follows: p of $\chi^2 > 0.05$; DF and NCPP $\leq 1/4$ of the respective value to the independent model; GFI ≥ 0.95; AGFI and CFI ≥ 0.90; RMSEA < 0.05. The adequate values indexes were as follows: p of $\chi^2 > 0.01$; DF and NCPP $\leq 1/3$ of the respective value to the independent model; GFI ≥ 0.85, AGFI and CFI ≥ 0.80; RMSEA < 0.08 (Ruiz, Pardo & San Martín, 2010). Calculation was done with SPSS package for Windows 19.0 and the AMOS package version 18.0.

Results

Factor structure of the PVAB and internal consistency

Three factors were drawn by means of the exploratory factor analysis (EFA) as expected. Out of the 17 questions, four were eliminated after resulting in loads below 0.40 (items 1, 8, 9, and 10). As to the other 13 items, a three-factor structure was created, explaining 52.3% of the total variance (see Table 2): the first factor included four out of the five indicators related to past behavioral competencies factor (items 2-5), which explains 20.2% of the variance; the second factor included five out of eight indicators related to current behavioral competencies factor (items 11-15), which explains 17.7% of variance; the third factor consisted of the four indicators related to the motives factor (items 7.1, 7.2, 7.3 and 7.4), which explains the 14.3% of variance. The internal consistency value for past competencies, current competencies, and motives were 0.80, 0.70, and 0.53, respectively.

Table 2
Factor loadings of the VPAD items on their factors.

Items	Factors		
	1	**2**	**3**
Before receiving an HIV-positive diagnosis (Past competencies):			
2. Did you take your medications as indicated by your physician?	0.76		
3. Did you follow your physician's recommendations in regards of staying in bed?	0.86		
4. Did you follow your physician's indications in regards of avoiding certain foods and beverages?	0.86		
5. Did you follow your physician's indications in regards of necessary laboratory testing?	0.72		
If you took your medication, what motives moved you to do so? (Motives):			
7.1. I've experienced its benefits		0.71	
7.2. Because my physician asked me to		0.70	
7.3. I did it because of persons close to me		0.56	
7.4. Because I want to maintain healthy as long as possible		0.65	
How frequently do you practice the following behaviors? (Current competencies):			
11. You follow the recommendations that the hospital staff share with you			0.65
12. You avoid situations that have a tendency to depress you			0.69
13. That allow you to remain relaxed and/or in peace			0.49
14. That allow you to establish relationships with unknown persons			0.77
15. That allow you to enforce your social relationship with family or close persons			0.76

Note: Item No. 6 corresponds to *medication-adherence behavior*.

The three-factor model reproduced with the EFA was immediately contrasted with the CFA. Data adjustment mostly resulted adequate within its 13 items. From the data observed, the null hypotheses for a goodness of fit was not sustained by the chi-square statistic (χ^2 [65, N = 124] = 105.30, p < 0.01). Good fit was found in DF= 0.33 [DF_{MI} = 2.70]), meanwhile five showed an adequate fit (NCPP = 0.86 [$NCPP_{MI}$ = 3.33]; GFI = 0.89, AGFI = 0.84, CFI = 0.88, and RMSEA = 0.07). As can see in Figure 2, all parameters were significant.
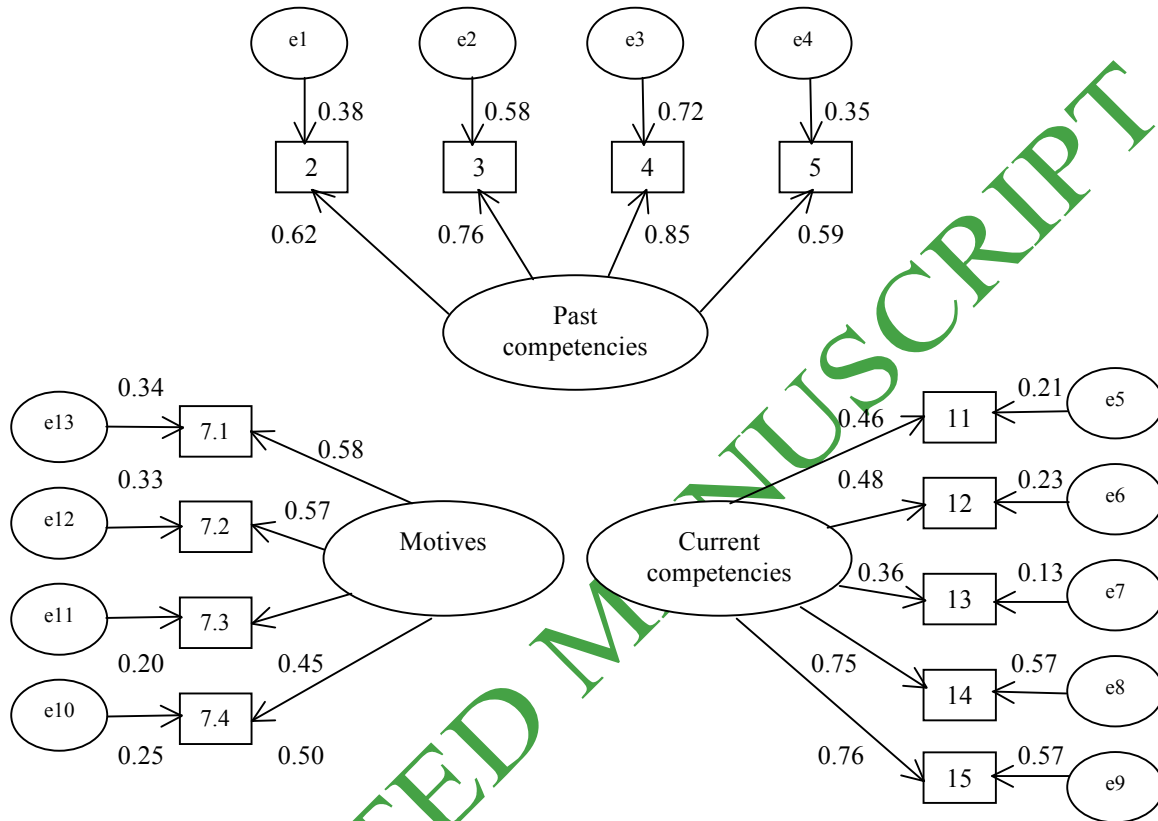
Figure 2. Standardized parameter estimates of the final model. Model fit statistics were as follow: χ^2 [65, N = 124] = 105.30, p < 0.01; DF = 0.33 [DF_{MI} = 2.70]; NCPP = 0.86 [$NCPP_{MI}$ = 3.33]; GFI = 0.89, AGFI = 0.84, CFI = 0.88; RMSEA = 0.07.

Distribution of the VPAD-13 scale

Distribution of the past behavioral competencies, motives and current behavioral competencies factors was not adjusted to a normal curve. The mean of the question regarding medication-adherence behaviors showed high frequency. The average of the past and current behavioral competencies and motives was divided into the number of items,

therefore obtaining a value close to 4. For the past and current behavioral competencies factors, the range of response moved from 1-5; therefore, the average of the two behavioral competencies was the answer "*Most of the time*". As for the motives factor, the range of response varied from 1-4, and the average response resulted in "*The motive was quite determining*" (*see* Table 3).

Table 3
Descriptive statistics and factors distribution.

Adherence behaviors and factors	Descriptive statistics				Normality	
	X	SD	Minimums	Maximus	KS	*p*
Medication-adherence behaviors	4.97	0.22	3	5	0.53	< 0.01
Past competencies	17.13	3.53	4	20	0.21	< 0.01
Current competencies	22.14	3.30	9	25	0.22	< 0.01
Motives	14.60	1.97	5	16	0.29	< 0.01

SD: Standard deviation; KS: Kolmogorov-Smirnov statistic.

Discussion

The results obtained in this study confirm reliability and validity of the simplified version of VPAD in a sample of HIV-positive persons in the State of Lara, Venezuela. The three factors that were formed based on the CFA, particularly those relative to motives and past behavioral competencies, significantly match the results drawn from the study of original validation (Piña et al., 2006). According to the logic of the psychological model for the research on adherence behaviors, the issue it is not only about measuring whether persons with HIV are practicing medication-adherence behaviors, in both consistently and efficiently ways (Piña & Sánchez-Sosa, 2007; Ribes, 1990), but it is also about to understand, from a theoretical perspective, which psychological variables of process, state or result will allow its prediction systematically. Three key psychological variables for such purpose are personality (decision-making, tolerance to ambiguity and tolerance to

frustration), motives, and behavioral competencies. The last two are critical in our theoretical model. As variables that together have showed high percentages of prediction of medication-adherence behaviors in HIV-positive persons; they include the results of cross-section and longitudinal studies, taking into consideration the comparison between 100% adherents *vs.* non-adherents patients (Piña, García-Cadena, Ybarra, & Fierros, 2012; Sánchez-Sosa, Fierros, Cázares, & Piña, 2011)

Different authors have pointed out the pros and cons of self-administered instruments, such as self-reports in measuring medication-adherence behaviors (Berg & Arnsten, 2006; Wilson, Carter, & Berg, 2009; Varela, Salazar, & Correa, 2008). Although some others have noted their potential usefulness —especially in countries where health institutions rely on limited resources— to both the availability of antiretroviral drugs and the interdisciplinary programs oriented to provide health care to persons with HIV (Simoni, Huh, Wang, Wilson, Reynolds, Remien et al., 2014; Simoni, Kurth, Pearson, Pantalone, Merrill, & Frick, 2006). Having recognized the potential usefulness of self-administered instruments such as self-reports, validation of the simplified version of the VPAD in a sample of HIV-positive persons from Venezuela was proposed in this study.

Two results are worth noting. First, in both analysis (EFA and CFA), a three-factor structure was created. It corresponds to the theoretical logic of the psychological model for research on adherence behaviors, whose indicators of goodness of fit were optimal in general. Second, the asymmetric distribution of the item of medication-adherence behaviors and the three factors showed that most patients reported high adherence, more past and current behavioral competencies, and high motivation to practice those behaviors, all of

which may be a signal of social desirability (Bangsberg, 2006). Hence, we may assert that the simplified version of the VPAD in this sample represents a valid indicator to single out psychological variables that are pertinent in predicting treatment adherence behaviors in HIV-positive persons. Certainly, the fact that the total number of participants in this sample answered ($X = 4.97$ in a range of 1-5) that they took their medications during the last month prior to the study may suggest an overestimation of the answer, which obviously demands systematic assessment in different occasions.

Thus, there are limitations that need to be taken into account for future studies. First, we cannot ignore that considering that this is a study conducted in one Venezuelan state, caution is needed when pretending to generalize the results to all people with HIV in the country who are also exposed to one of the various treatment regimens with antiretroviral medication. Second, it is important to mention that, in the case of the motives factor, the Cronbach's alpha was moderate (0.53), compared with the original version of the VPAD (Piña et al., 2006), as well as their adaptation and validation among women with breast cancer from Peru (Mejía, Méndez, Piña, & Laborín, 2013). A possible explanation regarding these data could be that the majority of the participants in this study reported a high frequency of medication-adherence behaviors, as a consequence of highly levels of past and current behavioral competencies; in this sense, it is reasonable to think that the participants do not considered important the motives underlying medication adherence behaviors, but this one in self and what has been done regarding other disease and the HIV as well. Finally, it is critical to underline that due to financial issues, it was not possible to rely on the results of the lab tests to determine the CD4 cell counts and the levels of viral

load, which could have perfectly help to confirm the effects of the competential practice of medication-adherence behaviors on the condition of the participants (Ironson, O'Cleirigh, Fletcher, Laurenceau, Balbin, Limas, Schneiderman et al., 2005; Langebeek, Gisolf, Reiss, Vervoot, Hafsteinsdóttir, Ritcher et al., 2014).

In order to offset such limitations, it would be necessary to work in the drafting of a more ambitious research project where: a) To include a representative sample of HIV-positive persons from other regions of the country; b) To consider the totality of variables of the theoretical model, especially both the variable personality and the disease-related behaviors —e.g., stress, depression, irritability, etc., and c) The usage, along with the measure of auto-reporting of the adherence behaviors, of other direct and indirect measures that will allow us to compare the reliability and validity of the first, in regards of the counting of pills, pharmaceutical records and conventional biological markers, e.g. viral load levels and lymphocyte count CD4+ (Friedman, Stall, Silvestre, Wei, Shoptaw, Herrick et al., 2015; Thompson, Bidgood, Petróczi, Denhol-Price, & Fielder, 2009).

 It is necessary, based on the results obtained, to collaborate with the health authorities of the different institutions in designing, implementing, and assessing interdisciplinary intervention programs to improve the practice of adherence behaviors, as well as those behaviors related to psychological and social adjustments to both disease and treatments (García-Cedillo & Rodríguez, 2014; Guevara & Galán, 2010; Navarro, Pérez, Curran, Burgos, Feijoo, Torella et al., 2014; Sánchez-Sosa, Ybarra, & Piña, 2012). In conclusion, the simplified version of the VPAD questionnaire should be downsized to 14 items, including the 13 items making up the three dimensions influencing adherence behaviors.

The structure consisted of three factors and data was adequately fit. The three-factor structure matches the results obtained in the original validation study (Piña et al., 2006)

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