Self-Reported Adherence to Antiretroviral Therapy in HIV+ Colombian Population

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Abstract
The purpose of this study was to assess psychometric properties of the CEAT-VIH (“Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral en Personas con Infección por VIH y Sida” in the original) questionnaire applied to 652 HIV+ adult Colombian population and identify perceived psychological barriers to self-reported adherence. Questionnaire items analysis showed that most items were expectedly skewed toward reporting adherence. Corrected homogeneity index for the 20 items varied between 0.08 and 0.70. However, none of the items would considerably improve the reliability if deleted. Total score on CEAT-VIH ranged from 42 to 89 (median 83, mean 80.5, SD 8.1). Mean adherence scores varied across cities. No floor (0%) or ceiling (0.8%) effects was observed for the CEAT-VIH adherence score, and 85% of respondents scored 87 or below (cutoff score \( \geq 87 \) = strict adherence). The instrument showed good reliability (Cronbach’s \( \alpha = .86 \)) and evidences of criterion-related validity. Adherence behaviors seemed to be particularly at risk when the patients felt physically better or worse or emotionally distressed, if they perceived adherence as difficult and requiring time and effort, if they had less confidence in their ability to comply with medications, if they felt less satisfied with their treatment and consultant, if they had low information about the treatment and if they experienced burden side effects. The application of the CEAT-VIH to Colombian HIV+ adult population shows to be useful, reliable, and valid, and it allows recommending the instrument for research and clinical practice assessment in this population.

Keywords
adherence, HIV, AIDS, adults, CEAT-VIH

Introduction
Nowadays the pool of options available as medical treatment to control HIV infection and disease progression is enormous and increasing. Thus, progresses toward universal access to treatment have been made (WHO/UNAIDS/UNICEF, 2011). Perceptions regarding HIV infection are starting to change in social representations, from a life-threatening condition to a chronic or controllable condition. However, several sources of evidence describe that the benefits from HIV antiretroviral (ARV) therapy and virus control are directly linked to the degree of adherence to ARV treatment (Conway, 2007), that is, strictly take medications as prescribed. Also ARV treatment is being considered the source of prevention against HIV spread (Cohen et al., 2011; Flash, Krakower, & Mayer, 2012) as the ARV therapy reduced rates of sexual transmission of HIV. For that reason, the assessment and measurement of adherence became a crucial aspect to take into account in the HIV patient’s management in health care settings. The assessment of indicators related to the adherence behavior is important to the individual level (patient) and collective level (health community programs offering access to treatment). Availability of tools to measure feasibly the adherence behavior may help, on one hand, to detect patient difficulties to comply with treatment prescription and, on the other hand, assess the efficacy of interventions (or counseling) focusing in empowerment of patients following HIV treatment.

There are different ways to assess adherence to medical regimens, direct methods (e.g., biological assays of active drug in blood) versus indirect methods (e.g., clinician assessment, clinic attendance, behavioral observation, pill count, pharmacy refill records, electronic drug monitoring, and self-reports). Scientific literature review has shown that both methods are acceptable and equally reliable (Simoni et al., 2006; Thirumurthy et al., 2012), with the difference that the
indirect methods are low cost, quicker, and less invasive. In the case of self-reports, additional advantages consist in easy
to use in a resource-limited setting (Thirumurthy et al.,
2012), flexibility in terms of mode of administration and
periods of assessment (Simoni et al., 2006), and may incor-
porate more comprehensive aspects related to the adherence
behavior.

However, not any self-report is acceptable to use for that
objective. To be eligible to use, a self-report should show
proper characteristics as be feasible, reliable, sensible, and
valid.

Currently, several self-report instruments have been pro-
posed to assess adherence in patients receiving HIV therapy,
and there is no agreement on the best strategy or measure for
assessing ARV adherence (Simoni et al., 2006). For this rea-
son, assessing measurement properties of the available tools
is relevant, to provide elements for researchers and practitio-
ners make decisions when choosing for potential measures.
One of the instruments available to measure adherence
behavior for ARV therapy is the CEAT-VIH (“Cuestionario
para la Evaluación de la Adhesión al Tratamiento Antirretrovi-
ral en Personas con Infección por VIH y Sida” in the
original) developed by the author during 1999 to 2001
(Remor, 2001) and first published in 2002 (Remor, 2002).
The instrument is a brief Patient-Reported Outcomes (PRO)
measure, and since its initial diffusion in Spain and after
inclusion in the BiblioPRO: PRO Web Database (Barcelona,
Spain), several investigators have decided to integrate the
tool in their patient’s assessment protocol. Currently, the
instrument is available in six language versions with a biling-
ual user’s manual (Spanish/English), and published psy-
chometric information is available for several countries as
Brazil, Chile, Colombia, Mexico, Panama, Peru, Portugal,
Puerto Rico, Romania, and Spain (Remor, 2013). Thus, the
questionnaire has been used as a measure of adherence in
other several studies (e.g., Lorschieder, Geronimo, &
Colacite, 2012; Reis, Lencastre, Guerra, & Remor, 2010;
Remor, Penedo, Shen, & Schneiderman, 2007).

The PRO measure CEAT-VIH is a multidimensional
instrument including items targeting behavioral indicators of
adherence (i.e., during the past week, from the beginning of
treatment, in relation to the medication schedule, global self-
evaluation, and accuracy of remembering current medica-
tion), and also focus on determinants of adherence: antecedents of nonadherence behaviors (i.e., feeling physically
better, feeling worse, feeling sad or depressed), doctor–
patient interaction (i.e., frequency of doctor’s reinforcement
of adherence behaviors, global assessment of the quality of
the relationship), patient’s beliefs regarding the adherence-
related effort, time, degree of difficulty, self-efficacy, and
outcome expectations, patient’s perception of side-effects
intensity, level of personal knowledge regarding medication,
satisfaction with treatment, improvements in health attrib-
uted to treatment (Remor, 2002).

As very little research has been conducted so far on adher-
ence to HIV medication in Colombia (e.g., Arrivillaga, 2012;
Machado-Alba & Vidal, 2012; Villa-González, 2005), and
only preliminary information about the usefulness of CEAT-
VIH in Colombia is available, a new study including a broad
sample of people with HIV from the six main cities in
Colombia was conducted. The main aim of the present work
was to assess psychometric properties of the questionnaire
and identify psychological perceived barriers to self-reported
adherence that may be useful for future approach in interven-
tion to foster adherence to ARV.

Method

Participants

A nonrandom national sample of 652 patients followed in
the Multicentre Clinic of Psychosocial Counselling and
Medical Care in six main cities of Colombia (i.e., Bogotá
131, Barranquilla 70, Bucaramanga 179, Valledupar 54,
Manizales 25, and Cucuta 193) were assessed for the pres-
ent study. Patients were invited according to study inclusion
criteria: aged more than 18 years, receiving ARV therapy for
at least 3 months, and the ability to read and speak Spanish.
All participants received information detailing the study’s
purpose and the related ethical issues. The patients that gave
written informed consent then underwent study procedures.
The patients were assessed during their regular visit to the
clinic.

Variables and Instruments

Adherence to treatment. To assess the adherence to ARV
treatment, a 20-item multidimensional self-report measure of
adherence to HIV medication called CEAT-VIH was used
(Remor, 2002, 2013). For information on, or permission to
use the questionnaire please contact ceat.vih@gmail.com

ARV treatment. Information related to the ARV treatment
were collected from the clinical files and included: treatment
prescribed by the specialist, number of pills a day, frequency
and doses of prescribed treatment.

HIV/AIDS clinical indicators. Information related to the
patient’s clinical status was collected from the clinical files
and included: Time since HIV diagnosis, TCD4+ count, viral
load count, psychiatric treatment prescription, route of HIV
infection.

Sociodemographical characteristics. Information related to the
patient’s characteristics were collected from the clinical files
and included: city of residence, sex, education level, socio-
economic status (SES), work status, sexual orientation, and
who live with.
Procedures

After agreement between the author and professionals from the Department of Psychology at the clinic (M.L.V.R., C.V.B.) the CEAT-VIH and manual with application and scoring instructions were sent to the center to be included along with their usual assessment protocol. Research approval was also obtained from the respective committees of Milagroz Corporation (Colombia) and Autonomous University of Madrid (Spain). The procedure for data collection in the center started with inviting patients that match inclusion criteria to participate, obtaining informed consent from the patient, followed by the completion of adherence self-report measure. The information regarding sociodemographics, HIV/AIDS-related markers, and treatment were collected from patient files in the clinic. Data collection was developed between August 2008 and March 2010. After this date, the database incorporating the information that was used to develop the present manuscript was sent to the author for statistical analysis and manuscript development.

Data Preparation and Statistical Analyses

Data were first examined for input accuracy and missing values (identified missing values was reported in Table 1). Data analysis was performed using SPSS/PC. Item analyses were performed to identify potential areas of questionnaire improvement. Psychometric properties were examined within classical test theory (reliability and criterion-related validity). Additional associations of adherence report with sociodemographic (sex, education level) and illness-related variables (time since HIV diagnosis) were also examined. Finally, correlations between determinants of adherence (psychological barriers) and self-reported compliance behavior were computed to identify the barriers to adherence most relevant for the current cohort at a group level. Significance tests were set at .05 level.

Results

Sample Characteristics

From the 652 adult participants aged 18 to 75 years, 65.8% were male, 41% were unemployed, 45.1% had a primary school education level, 45.7% had a low socioeconomic status, and 58.1% live with their families. The majority self-identified themselves as heterosexual (77.9%), and the main HIV infection route was sexual intercourse (75.3%). Mean months since HIV diagnosis was 56.2, current number of pills taken daily ranged from 2 to 14 (mean 4.8). Patients received combination of 2, 3, or 4 medicines within an option of 15 ARV medication (i.e., Abacavir, Atazanavir, Duranavir, Didanosina, Efavirenz, Enfurvitida, Estavudina, Fosamprenavir Calcico, Indinavir, Lamivudina, Lopinavir, Nelfinavir, Nevirapina, Ritonavir, Zidovudina). The most frequent combination regimen was Zidovudina + Lamivudina + Efavirenz (44.8%). Of the participants, 19.6% showed viral load below 400 copies/ml. Sample characteristics are detailed in Table 1.

Psychometric Analysis of the CEAT-VIH

Item analysis. Statistics for individual items showed that most items were expectedly skewed toward reporting adherence. Corrected homogeneity index (CHI) for the 20 items varied between 0.08 and 0.70. Three items showed a CHI below 0.30 (Items 5, 8, and 20). However, none of the items would considerably improve the reliability if deleted.

Examination of the qualitative responses to item 20 revealed that the most frequently used strategy to remember taking pills was using clock or mobile phones alarms (n = 27), followed by placing medication in a visible location (n = 3), associating medication with food intake (n = 1), and use of pillbox (n = 1).

Reliability and evidences for criterion-related validity. Total scores on CEAT-VIH ranged from 42 to 89 (out of a possible range of 17-89), showing an expectedly skewed distribution (median 83, mean 80.5, SD 8.1). No floor (0%) or ceiling (0.8%) effects were observed for the CEAT-VIH adherence score. In our sample, 85% of respondents scored 87 or below; thus a score ≥87 could be interpreted as strict adherence in Colombian population (percentiles and correspondent CEAT-VIH cutoff score: 50 = 83, 75 = 86, 85 = 87, 95 = 88). Mean adherence scores varied across cities (Bogotá 79.4, Barranquilla 83.8, Bucaramanga 81.2, Valledupar 70.1, Manizales 78.3, and Cucuta 82.5). The instrument showed good reliability (Cronbach’s α = .86). Evidences of criterion-related validity (i.e., number of pills taken daily, viral load, CD4+, and SES) were presented in Table 2. CEAT-VIH scores were not related to sex, education level, and time since HIV was diagnosed (all ps >.05).

Psychological Barriers to Adherence to ARV Therapy

We examined the associations (Table 3) between 14 CEAT-VIH items targeting adherence determinants and self-reported compliance behavior. Following previous work (Dima et al., 2013), the compliance was computed by summing four CEAT-VIH items (1, 12, 17, and 19) measuring adherence behaviors (Cronbach’s α = .50). The table shows that the majority of items were significantly associated with self-reported compliance.

Thus, adherence behaviors seemed to be particularly at risk when the patients felt physically better or worse or emotionally distressed, if they perceived adherence as difficult and requiring time and effort, if they had less confidence in their ability to comply with prescribed medications, if they
Table 1. Sample Characteristics: Sociodemographics and HIV-Related Markers (Colombia, $n = 652$).

| Cities in Colombia          | $n$  | %   | $M$  | SD  |
|-----------------------------|------|-----|------|-----|
| Bogotá                      | 131  | 20.1|      |     |
| Barranquilla                | 70   | 10.7|      |     |
| Bucaramanga                 | 179  | 27.5|      |     |
| Valledupar                  | 54   | 8.3 |      |     |
| Manizales                   | 25   | 3.8 |      |     |
| Cucuta                      | 193  | 29.6|      |     |
| Sex                         |      |     |      |     |
| Male                        | 429  | 65.8|      |     |
| Female                      | 223  | 34.2|      |     |
| Working status              |      |     |      |     |
| Unemployed                  | 267  | 41  |      |     |
| Working                     | 382  | 58.6|      |     |
| Only studying               | 1    | 0.2 |      |     |
| Retired                     | 2    | 0.3 |      |     |
| Who live (with)             |      |     |      |     |
| Alone                       | 68   | 10.4|      |     |
| Friends                     | 5    | 0.8 |      |     |
| Partner                     | 137  | 21  |      |     |
| Partner and sons            | 63   | 9.7 |      |     |
| Family                      | 379  | 58.1|      |     |
| Socioeconomic status (SES)  |      |     |      |     |
| Low                         | 298  | 45.7|      |     |
| Middle-low                  | 230  | 35.3|      |     |
| Middle-high                 | 110  | 16.9|      |     |
| High                        | 14   | 2.1 |      |     |
| Education level             |      |     |      |     |
| No education                | 44   | 6.7 |      |     |
| Primary school, basic (4 years total) | 294 | 45.1 |      |     |
| Secondary education (9 years total) | 124 | 19  |      |     |
| High school (11 years total) | 97  | 14.9|      |     |
| Technician (not university) | 50   | 7.7 |      |     |
| University                  | 41   | 6.3 |      |     |
| Missing values              | 2    | 0.2 |      |     |
| Self-identified sexual orientation |    |     |      |     |
| Homosexual                  | 115  | 17.6|      |     |
| Heterosexual                | 508  | 77.9|      |     |
| Bisexual                    | 27   | 4.1 |      |     |
| Missing values              | 2    | 0.3 |      |     |
| HIV infection route informed|      |     |      |     |
| Unknown                     | 147  | 22.5|      |     |
| Sexual                      | 491  | 75.3|      |     |
| Injection drug use          | 4    | 0.6 |      |     |
| Blood transfusion           | 7    | 1.1 |      |     |
| Vertical                    | 1    | 0.2 |      |     |
| Occupational                | 1    | 0.2 |      |     |
| Missing values              | 1    | 0.2 |      |     |
| Psychiatric medication      |      |     |      |     |
| Yes                         | 17   | 2.6 |      |     |
| No                          | 635  | 97.4|      |     |
| Months since HIV diagnosis (range 1 to 240) | 56.2 | 39.3 |      |     |
| ARV pills daily (range 2 to 14) | 4.8 | 2.1  |      |     |
| Adherence self-reported score (CEAT-VIH) | 80.5 | 8.1  |      |     |
| CD4+ cell count             |      |     |      |     |
| Missing values              | 58   | 8.9 |      |     |

(continued)
Table 1. (continued)

| HIV viral load (log_{10} transformed) | n  | %  | M   | SD  |
|--------------------------------------|----|----|-----|-----|
| Missing values                       | 333| 51.1| 6.1 | 3.1 |

| Viral load (copies ml.)              |     |     |     |     |
|--------------------------------------|-----|-----|-----|-----|
| <400                                 | 128 | 19.6|     |     |
| 401-30,000                           | 138 | 21.2|     |     |
| >30,000                              | 53  | 8.1 |     |     |
| Missing values                       | 333 | 51.1|     |     |

Note. ARV = antiretroviral; CEAT-VIH = “Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral en Personas con Infección por VIH y Sida” in the original.

Table 2. Distribution of Viral Load Levels and Evidences of Validity Related to External Criteria (Controlled by Place of Data Collection).

| Place of data collection (city) | sc | Bogota | Barranquilla | sc | Bucaramanga | sc | Valledupar | sc | Manizales | sc | Cucuta |
|--------------------------------|----|--------|-------------|----|-------------|----|------------|----|-----------|----|--------|
| Viral load (copies ml.)         |    |        |             |    |             |    |            |    |           |    |        |
| <400                            | 81.6| (12) 21.8% | 83.9| (9) 39.1% | 80.5| (35) 35.4% | 68.8| (42) 77.8% | 85.0| (2) 25% | 83.2| (28) 35% |
| 401-30,000                      | 77.3| (34) 61.8% | 82.7| (10) 43.5% | 81.6| (46) 46.5% | 74.5| (12) 22.2% | 75.8| (6) 75% | 80.3| (30) 37.5% |
| >30,000                         | 72.4| (9) 16.4% | 80.0| (4) 17.4% | 81.5| (18) 18.2% | —  | (0) 0% | —  | (0) 0% | 80.0| (22) 27.5% |
| Missing values                  | 76  | 21.8% | 80.0| (47) 61.8% | 81.5| (46) 46.5% | 74.5| (12) 22.2% | 75.8| (6) 75% | 80.3| (30) 37.5% |

External criteria

| ARV pills daily                  | 0.02 (*) | −0.40 (0.00) | −0.01 (*) | −0.19 (*) | 0.17 (*) | −0.11 (*) |
| Viral load (log_{10} transformed)| −0.29 (0.03) | −0.23 (*) | 0.07 (*) | 0.05 (*) | −0.95 (0.00) | −0.27 (0.01) |
| CD4+                            | 0.18 (0.04) | 0.22 (0.09*) | 0.11 (*) | 0.45 (0.08*) | 0.09 (*) | 0.18 (0.01) |

CEAT-VIH global score, Pearson correlation coefficients (p)

| SES (range 1 to 4) | 0.26 (0.003) | 0.22 (0.09*) | 0.11 (*) | 0.45 (0.08*) | 0.09 (*) | 0.18 (0.01) |

CEAT-VIH global score, Spearman correlation coefficients (p)

Note. sc = mean score CEAT-VIH (Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral en Personas con Infección por VIH y Sida” in the original) questionnaire at group level; SES = Socioeconomic status.

Table 3. Perceived Barriers to Adherence—Correlations With Self-Reported Compliance Behavior.

| Item no. | Abbreviation of CEAT-VIH items                                           | Compliance behavior (Spearman’s r) |
|----------|-------------------------------------------------------------------------|-----------------------------------|
| 2        | Feeling physically better as motive for skipping taking pills           | 0.49***                          |
| 3        | Feeling physically worse as motive for skipping taking pills            | 0.49***                          |
| 4        | Feeling sad or depressed as motive for skipping taking pills            | 0.51***                          |
| 6        | Doctor–patient communication (quality of relationship)                 | 0.29**                           |
| 7        | Perceived difficult to take ARV medication                              | 0.48***                          |
| 8        | Knowledge about ARV medication                                          | 0.12**                           |
| 9        | Perceived benefits from ARV medication                                 | 0.27**                           |
| 10       | Perception of health improvement associated with ARV medications        | 0.27**                           |
| 11       | Self-efficacy to take ARV medication                                    | 0.32**                           |
| 13       | Doctor–patient communication (physicians reinforcement)                | 0.34**                           |
| 14       | Perceived benefits associated with ARV medication                       | 0.38**                           |
| 15       | Perception of side-effects intensity                                   | 0.40**                           |
| 16       | Costs in terms of time taking ARV medication                            | 0.30**                           |
| 18       | Perceived difficult to take the medication                              | 0.51**                           |

Note. CEAT-VIH = “Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral en Personas con Infección por VIH y Sida” in the original; ARV = Antiretroviral treatment.

* * *p < .01.
faced with medication that are being taken), 8 (information about the treatment), and 20 (use of strategies to remember taking pills). This may suggest the need to improve these items (or deleted) in future research, but equally may reflect the lower relevance of these aspects for adherence in the examined group. Similar results have been reported earlier for the Romanian population (Dima et al., 2013).

It was shown that it is important to examine single items for each patient to identify specific difficulties, when delivering intervention to improve adherence, as well as computing a global score.

Past research had described that low SES may be a risk factor to adherence to ARV (Falagas, Zarkadoulia, Platsika, & Panos, 2008). The present results support this evidence; CEAT-VIH scores were associated with SES. However, effect sizes were low and therefore indicated small contributions to variance in self-reported adherence.

Both structural (poverty-related, institutional, social, and cultural; Kagee & Delpo, 2010) and perceived psychological barriers to adherence to ARV treatment need to be taken into account when helping patients deal with medical therapy. As present results show, perceived psychological barriers may also have some contribution to low compliance behavior. Negative mood, perception of side effects, negative expectations or attributions related to treatment, lack of skills to take medication and poor interaction with the health care provider constituted risk factors that were related to difficulties to comply with prescribed therapy. The early detection of these perceived barriers in patients receiving ARV therapy is needed to prevent damage to adherence behavior. Future research could be aimed at developing programs that remove perceived barriers and standardized tools as CEAT-VIH could then be used to measure the effectiveness of such programs. Previous work has pointed out the need for more research in theory-based interventions to increase ARV adherence, especially in resource-limited contexts (Bärnighausen et al., 2011).

Finally, the results of this study should be considered in light of its limitations.

First, the time intervals between measurements—adherence score and viral load—was not well controlled in the present study and may vary considerably, due to logistical and resources restrictions aimed at minimizing interference with standard clinical care. This variation may have led to an underestimation of the associations between adherence scores and viral load due to possible intra-individual fluctuations.

Second, more detailed information regarding current HIV treatment (e.g., reports of adverse drug reaction, and past changes in regimen) were not available, so the role of these variables in relation with nonadherence behavior remain not explored in the Colombian population.

Third, in the current study, adherence was measured only by self-report. Beyond clear usefulness and robust psychometric properties of self-reports, several authors had claimed for a multimethod assessment of adherence to minimize the potential overestimation of adherence observed in self-reports (Mills et al., 2006; Ortega, Huerdo-Medina, Vejo, & Llorca, 2010; Thirumurthy et al., 2012). However, the cost associated with the use of objective measures or electronic monitoring devices may introduce several obstacles for research in limited-resource settings. Moreover, additional difficulties related to the implementation of these methods in clinical settings had been reported (Wendel et al., 2001).

Evidence from research (Thirumurthy et al., 2012) had pointed out that beyond potential overestimation of adherence, information from self-reports is necessary and relevant for clinical monitoring and program evaluation.

In conclusion, according to the evidence described, the CEAT-VIH shows being a precise, reliable, and valid measure to be used in Colombia for HIV treatment adherence assessment in research and clinical settings. Hence, allow to recommend the instrument for the assessment of changes in adherence levels after an intervention or psychoeducational program; for inventorying perceived barriers to comply with HIV medication, and for screening adherence levels in people with HIV receiving ARV treatment.

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