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Evaluating Measures of Pre-ART Adherence Readiness Through Associations with ART Adherence in the Early Months of Treatment

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Abstract

Determining a patient's readiness to adhere well prior to the start of ART provides an opportunity to address adherence barriers before poor pill taking habits form, and ultimately improve clinical outcomes and resource utilization. Three methods of measuring adherence readiness and their comparative utility in predicting early ART adherence were examined in a sample of 176 patients preparing to start ART. Data were analyzed from a randomized controlled trial of a cognitive-behavioral adherence intervention. Three measures of pre-ART adherence readiness (provider estimate, 1 week vitamin practice trials, and self-report [HIV Medication Readiness Scale; Transtheoretical Stages of Change item (TSOC)] were examined in association with measures of (1) ART initiation, (2) ART retention, (3) mean electronic dose-taking adherence, and (4) achievement of optimal (85+ % dose-taking) adherence, over the first 3 months of ART. Of the 176 patients, 166 (94.3%) started ART; 124 (74.7% of those who started ART; 70.5% of whole sample) completed the first 3 months of ART. Among the 124 still on ART at month 3, mean dose-taking adherence was 79.3%, and 62 (35.2% of whole sample) achieved optimal adherence. The provider estimate was the only readiness measure significantly associated with each of the four measures of early ART adherence, and it had the highest concordance statistics (71% PPV and 62.3% NPV) with optimal early ART adherence. Practice trial adherence was only associated with ART initiation and retention. Dose-taking adherence over 3 months was significantly correlated with the provider estimate and the two self-reports. Each method of early treatment adherence has its own utility, but the provider estimate had the best overall performance in predicting early ART adherence.

Keywords

START; ART; Treatment readiness; Adherence; HIV

Introduction

Adherence remains key to the success of HIV antiretroviral therapy (ART), as patients need to take 80–85% of prescribed doses to sustain viral suppression and prevent drug resistance [1]. Many patients struggle to achieve this high level of adherence, even with the newer, simpler, and more forgiving ART regimens [2]. How well a patient adheres at the start of treatment is predictive of how they will adhere over the course of treatment [3]. This is consistent with learning theory principles, which indicate that it is more difficult to break maladaptive behavioral patterns once they have been established [4]. Although current standard of care guidelines call for immediate initiation of ART [5], and no longer emphasize the need to first assess adherence readiness, these issues suggest the importance of evaluating readiness to adhere well prior to treatment initiation and intervening before problems develop. Adherence readiness is generally defined as the patient having the conscious intention and motivation to take the prescribed treatment [6].

Several methods have been used to measure ART adherence readiness, with varying success and limitations. Provider estimates have been found to be a poor predictor of and uncorrelated with individual patient ART adherence in previous studies [3, 7, 8]. Self-report scales or items have been used to measure adherence readiness prior to the start of ART, with some being significantly correlated with early ART adherence [7], while others have been unrelated [9]. Self-report measures that assess stages of adherence readiness based on Prochaska's Transtheoretical Model of Health Behavior Change [10] have been found to be correlated with ART adherence and used to guide intervention strategies to improve adherence [11, 12]. However, it is unclear whether self-reports are sufficiently accurate or reliable to guide provider and patient decisions about ART initiation [13]. Adherence to brief trials of vitamins or inert pills with dosing instructions that mimic ART have been shown to correlate with early ART adherence [9]. However, such practice trials are limited by their inability to simulate the challenges presented by actual medication, such as side effects, though this may be less of a concern with the current, highly tolerable generation of HIV antiretrovirals. Furthermore, the motivation of patients to adhere to a practice trial may not sufficiently match that of actual ART, which could hamper the predictive utility of these trials.

Most research examining the validity of various methods to measuring ART adherence readiness have reported only general associations, such as a correlation coefficient or difference in means between groups. Few studies have reported concordance statistics such as sensitivity and specificity, as well as positive (PPV) and negative predictive values (NPV), for the readiness measure to determine whether a patient is ready to achieve a specified optimal level of adherence. Our research with practice trials revealed a moderate to high concordance (PPV = 75%; NPV = 88%) between good adherence in the practice trial and good adherence in the initial month of ART [9]. Bangsberg et al. [3] found that patient self-report of adherence was more concordant with ART adherence as measured by pill count (PPV = 97%; NPV = 73%), compared to provider estimates of adherence (PPV = 77%, NPV = 53%). Miller et al. [8] reported similar concordance statistics (PPV = 76%, NPV = 60%) between provider estimates of adherence and electronically monitored ART adherence.

This paper examines data from three methods of measuring adherence readiness, including provider estimate, self-report, and vitamin practice trials, and compares their relative utility in predicting early ART adherence in a sample of patients preparing to start ART.

Methods

Study Design

Data for the reported analysis were from the screening and early treatment phase of this ongoing randomized controlled trial of a cognitive-behavioral adherence intervention. The intervention consisted of pre-treatment, early-treatment, and ongoing maintenance adherence counseling provided by a trained study coordinator. The pre-treatment phase included 1 week, vitamin practice trials that mimicked ART dosing instructions to determine readiness for and timing of ART initiation, while the early treatment and maintenance training phases used a performance-based, dose regulation mechanism (i.e., number of adherence counseling sessions determined by recent adherence performance) to tailor the amount and intensity of counseling (see Wagner et al. for further details [14]). Participants were surveyed at baseline and every 6 months for 2 years following ART initiation, using a computer-based survey that was administered by the study coordinator. The study was conducted in several sites in and near Los Angeles, but 90% of the participants were enrolled at one of two HIV clinics, the CARE Clinic in Long Beach and To Help Everyone (T.H.E.) Wellness Center in Los Angeles. Standard of care at each of the study sites follow the national guidelines [5], which typically involves starting ART immediately after HIV diagnosis or the client entering HIV care. The study protocol is registered at [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT02329782) with an identifier of [NCT02329782](https://clinicaltrials.gov/ct2/show/study/NCT02329782). Ethics review and approval was provided by the UCLA Institutional Review Board.

Study Participants

Participants were enrolled between April 2016 and March 2018. Patients were eligible if their primary care provider viewed the patient as medically appropriate to begin (ART naïve) or restart ART (had been off ART for at least 2 months), and either (a) planned to start the patient on ART, or (b) wanted to start the patient on ART but the provider and/or patient was uncertain about the patient's readiness to adhere well. Other criteria included: (1) stable health status; (2) no current acute opportunistic infections or medical condition that called for immediate ART, as determined by the patient's provider; (3) most recent HIV viral load was detectable; (4) if most recent CD4 count was less than 200 cells/cu.mm., the patient was on or would be prescribed prophylactic medication; (5) age 18 years or older; (6) able and willing to give written informed consent; and (7) English or Spanish (at T.H.E. Wellness Center only) speaking. Patients were excluded when they had just tested HIV-positive and their provider suspected the patient may be acutely or recently infected (within past 6 months) and thus should start ART without the possible 1- to 4-week delay caused by the intervention. Providers informed eligible patients of the study and those who expressed interest were referred to the study coordinator for consent procedures. All participants provided written informed consent.

Measures

Dose-Taking Adherence (Percentage of Prescribed Doses Taken)—Dose-taking adherence, for both the vitamin practice trials and ART, was measured using electronic monitoring caps. This methodology, housed in bottle caps, utilizes micro-electronic technology to record the date and time of each medication bottle opening, which is assumed to be when the person ingests a single dose. We used the eDEM (electronic Drug Exposure Monitor) cap manufactured by AARDEX, Inc. (Zurich, Switzerland). Data from these devices are downloaded into computer software that calculates adherence summary scores including percentage of prescribed doses taken. To maximize the validity of electronic monitoring as a measure of adherence, participants were asked not to “pocket” doses of the monitored medication (i.e., remove more than one dose at a time, at least one of which is ‘pocketed’ for taking later), or open the bottle without removing a dose. To reduce the measurement error associated with improper use of the electronic cap, participants were asked to report the number of occasions that they were unable to follow the cap instructions (e.g., removing multiple doses at once; opening the bottle without removing a dose); these data were then used to adjust the adherence summary scores. This strategy has been previously used in attempts to account for pocket dosing and shown to strengthen the relationship between electronically monitored adherence and virologic treatment outcomes [15].

Adherence Readiness—Prior to participants starting ART, three measures were collected to assess adherence readiness. The following readiness measures were assessed with the entire sample: (1) Once a participant enrolled in the study and prior to the start of the intervention, their primary care provider was asked to estimate what the patient’s ART dose-taking adherence would be over the course of their participation in the study on a continuous scale of 0–100%; and two self-report measures: (2) the 10-item HIV Medication Readiness Scale developed by Balfour et al. [16], which asks respondents to rate how ready they are to make certain changes to their daily life (e.g., make necessary changes in their diet; change your work, school or home schedule; have a regular bed time or wake up time) if they were to start ART today, with possible responses ranging from 0 ‘not at all ready’ to 5 ‘extremely ready’; responses were summed and total score reflects level of readiness to adhere well to ART; and (3) a single item based on the Transtheoretical Stages Of Change model (TSOC; [17]), which asked respondents to select the statement that best reflects how they would feel about taking their HIV medication if they had already been prescribed ART: 1 ‘I do not take my HIV medication as directed, and I am not considering taking my HIV medications as directed’, 2 ‘I do not take my HIV medication as directed, but I am considering taking my HIV medications as directed’, 3 ‘I do not take my HIV medication as directed, but I am planning to start taking my HIV medications as directed’, 4 ‘I consistently take my HIV medication as directed’.

For patients in the intervention arm, additional readiness measures included: (4) dose-taking adherence (% of prescribed doses taken) in the first 1 week, vitamin practice trial, which was assessed with electronic monitoring and prior to any counseling aimed at improving adherence by addressing adherence barriers. The practice trial used the same dosing instruction as the ART regimen that was planned for the patient by their primary care

provider. Dose-taking adherence of at least 85% adherence during a single practice trial was defined as demonstrating sufficient readiness to adhere well and start ART; this level of adherence was chosen because it is consistent with the level of adherence needed to sustain undetectable viral load with the current, potent ART regimens [1], and it allows the patient to miss one dose and still demonstrate readiness. Adherence less than this resulted in the patient receiving counseling and needing to do another 1 week practice trial (up to a maximum of four), until the readiness threshold was achieved. Primary care providers were informed of the practice trial results and providers had the ability to start the patient on ART whenever they wanted, regardless of the practice trial results. Other readiness variables related to the practice trials included: (5) whether or not only one practice trial was needed to achieve the adherence readiness; and (6) whether or not readiness was achieved at all in the practice trials.

Early ART Adherence—To assess the validity of the readiness measures, we assessed how the above described measures were associated with the following measures of early ART adherence (first 3 months of ART): (1) whether or not ART was started; (2) whether or not the patient was still in care and on ART at month 3; (3) whether or not optimal early ART adherence (greater than or equal to 85% adherence during first 3 months of ART) was achieved; and (4) mean dose-taking adherence over the first 3 months of ART, as measured by electronic monitoring, among those who completed 3 months of ART.

Sociodemographic and Medical Characteristics—We assessed age, gender, relationship status, sexual orientation, current employment and highest level of formal education. Latest CD4 count at baseline and date of HIV diagnosis were abstracted from the client's medical chart. Respondents were asked to indicate whether or not they had medical insurance.

Statistical Analyses

We performed descriptive statistics and analysis of associations between measures of adherence readiness and measures of early ART adherence. Depending on variable type, chi square tests were used in the case of both variables being categorical, 2-tailed independent t-tests were used when one variable was categorical and the other continuous, and Pearson correlations were performed when both variables were continuous. For calculating concordance statistics (specificity, sensitivity, positive predictive value, negative predictive value), binary measures of adherence readiness measures were calculated (greater than 85% adherence in first practice trial, demonstrated readiness in pre-ART practice trial phase, greater than 85% provider estimate of ART adherence, greater than or equal to 30 on the HIV Medication Readiness Scale, TSOC = 4) and compared to whether or not optimal early ART adherence was achieved. This analysis included all participants; those who did not start ART or did not complete 3 months of ART were assigned a value of zero on the optimal early ART adherence variable. All analyses were performed with IBM SPSS version 20 software.

Results

Of the 176 participants who enrolled in the study, 83 were in the intervention arm and 93 were in the usual care control arm. Table 1 shows the sociodemographic sample characteristics for the intervention group and the total sample. Majority of participants were college educated, of racial or ethnic minority status, and self-identified as gay or bisexual. Most were not in a relationship and just over half were employed. The average age was 36.5 years, and most had been diagnosed with HIV over 5 years ago. There were no statistically significant differences in sociodemographic and medical characteristics between the intervention and control groups.

Measures of Pre-ART Adherence Readiness

Among measures administered to all study participants, provider estimation (0–100%) of ART adherence ranged from 25 to 100% with a mean of 83.4% (SD = 11.3); 49.4% (n = 87) were estimated to be ready to adhere at a minimum of 85% by their provider. The HIV Medication Readiness scale showed a mean item score of 26.6 (SD = 10.0), with 41.7% scoring at least 30, which represents an average item response of being at least “quite ready” to adhere well. The TSOC had a sample mean of 3.4 (SD = 0.9), with 59.4% stating they were ready to consistently take their ART medication as directed.

Among those in the intervention arm, the first practice trial was completed by 73 of the 83 patients and the mean adherence rate (% of prescribed doses taken) was 92.5% (SD = 15.9%). Of these 73, 64 (87.7%) were able to demonstrate readiness to adhere well to and start ART (defined as 85% adherence or higher in the practice trial) in their first practice trial; the other 9 were asked to complete additional trials, of whom 7 achieved readiness after either the second or third trial, while the remaining two did not achieve the 85% threshold for readiness but were still initiated on ART by their providers. A total of 71 (85.5%) of the 83 intervention patients demonstrated adherence readiness in the practice trials.

Measures of Early ART Adherence

Of the 176, 166 (94.3%) went on to start ART, of whom 124 (74.7% of those starting ART and 70.5% of whole sample) remained in care and on ART at month 3; the remaining 42 participants had dropped out of care by month 3. Of those on ART at month 3, mean dose-taking adherence was 79.3% (SD = 21.9), and 62 (50% of those on ART at month 3; 35.2% of whole sample) demonstrated at least 85% dose-taking adherence as measured by the electronic monitoring caps, while the other 62 either had less than 85% adherence or didn't use or didn't return the MEMS cap for reading.

Comparative Analysis of the Readiness Measures in Predicting Early ART Adherence

Table 2 shows the associations of the various readiness measures with (1) whether or not ART was started, (2) whether or not the patient remained on ART after 3 months of treatment; and (3) achievement of optimal early ART adherence. In the intervention group, adherence in the first practice trial, only needing one practice trial to demonstrate readiness, and demonstrated readiness in the pre-ART practice trial phase were all significantly associated with both starting ART and the patient remaining on ART after 3 months, but

only demonstration of readiness was associated with achieving optimal early ART adherence. In the total sample, provider estimate of ART adherence was significantly associated with starting and remaining on ART at 3 months, and achievement of optimal early ART adherence, whereas neither self-report measures of readiness were associated with either starting or remaining on ART, but the TSOC measure was associated with optimal early ART adherence, while the HIV Medication Readiness Scale was marginally associated with optimal early ART adherence.

Among those who were on ART at month 3, electronically monitored ART adherence was significantly correlated with the provider estimate of ART adherence ($r = 0.476$; $p = 0.000$), the HIV Medication Readiness Scale ($r = 0.203$; $p = 0.037$), and the TSOC ($r = 0.534$; $p = 0.000$). However, it was not correlated with adherence to the first practice trial among those in the intervention arm ($r = -0.059$; $p = 0.69$). We did not examine the association of other practice trial parameters of readiness (i.e., whether readiness was achieved in a single practice trial, or whether readiness was achieved at all during the practice trials) with 3-month ART adherence, because only 1 of the 12 who did not achieve readiness or needed more than one trial to achieve readiness went on to complete 3 months of ART and have data on this measure of early ART adherence.

Table 3 shows the positive and negative predictive values, sensitivity, and specificity of measures of ART adherence readiness when examining their concordance with achievement of optimal early ART adherence. Only the provider estimate had a positive predictive values (PPV) above .50 and even it was relatively low. All five readiness measures displayed relatively high negative predictive values (NPV) (above 0.65), with the provider estimate and TSOC item have values near .80. The TSOC demonstrated particularly low specificity ($< .50$), but the other four measures had moderate specificity (.60 to .70 range). For the three measures collected from the whole sample (provider estimate, TSOC, HIV Medication Readiness Scale), we examined the concordance statistics for those in the intervention and control arms, separately; the results did not differ significantly between the two arms (data not shown).

Discussion

The major finding of the study is that among the measures evaluated, provider estimates outperformed the other methods in its association with measures of early ART adherence. However, each of the methods, including vitamin practice trials and self-report measures demonstrated utility in predicting various aspects of early ART initiation, retention and dose-taking adherence.

Our findings regarding the strength of the provider estimate as a measure of adherence readiness contrasts with findings from previous studies that found provider estimates to be no better than chance in predicting early ART adherence [7, 8]; however, one of these studies found that provider estimates had moderate levels of negative and positive predictive values for concordance with early ART adherence [8], much like our data. There are several plausible reasons for why provider estimates fared better in our study. Other studies were done close to two decades ago when ART regimens were more complex (i.e., number of

daily doses and pills, and food requirements) and toxic (i.e., more side effects), in contrast to current treatment regimens that are much simpler (i.e., typically 1 pill per day) and much better tolerated. These regimen differences may make it easier for providers to accurately estimate a patient's adherence readiness. Another difference is that decades ago decisions to initiate ART were often linked to CD4 count thresholds, whereas today ART is recommended as soon as someone tests HIV-positive; however, this should make the population on ART more heterogeneous and thus more difficult for providers to predict adherence readiness. Perhaps providers have gotten better over time at estimating early treatment adherence among their patients, or patients are feeling more comfortable being candid about potential barriers to adherence, which serves to improve provider estimates.

In this study, practice trials appeared to be the best method for gauging the propensity to start ART, and whether or not ART will be sustained for at least 3 months. It is in this context that practice trials seem most viable, even though they call for a small delay in ART initiation. While current guidelines call for same-day initiation of ART [5], there remains some patients who decline to start ART right away, or who do not return to the clinic after being prescribed ART, or who do not remain on treatment for long before dropping out. Practice trials could help identify such patients and the barriers they need to work through before successfully starting ART. This is supported by our data that showed that poor performance during the practice trial phase was strongly predictive of failure to start or remain on ART.

Similar to research on self-reported measures of adherence [7], demonstration of poor adherence in a practice trial (i.e., low adherence in the first practice trial, not achieving readiness in the practice trial phase, and not being able to demonstrate good adherence in the first practice trial) appears to be a reliable indicator of poor readiness to adhere well in the initial months of ART, as highlighted by the very high negative predictive values and sensitivity ratings of the two practice trial-related adherence measures; conversely, demonstrations of good adherence to the practice trials had minimal predictive value. In fact, all our measures of adherence readiness had superior negative predictive values in predicting achievement of optimal early ART adherence compared to positive predictive values. This suggests that these measures are most useful in identifying patients who are not going to adhere well to ART during the initial months of ART, and less useful in identifying those who will adhere well.

Consistent with prior research involving these measures [11, 16], both self-report measures of readiness, the TSOC and HIV Medication Readiness Scale, were significantly correlated with electronically monitored dose-taking adherence, our most precise measure of early ART adherence. There were signs of superiority for the TSOC as the magnitude of its correlation with dose-taking adherence was much higher than that of the HIV Medication Readiness Scale, and the TSOC was also associated with achievement of optimal early ART adherence (although the group difference was small and the clinical meaningfulness uncertain), whereas the HIV Medication Readiness Scale was not associated with any of the other early ART adherence measures. Other research with the TSOC and another related measure, decisional balance (i.e., how a person weighs the pros and cons of good adherence versus not taking the medication), found these measures to be predictive of HIV viral load

[18], providing further support to utility of the TSOC for identifying clients in need of support to adhere well and to recognize the benefits of adherence. The TSOC performed this well in the study despite some participants being antiretroviral naïve and thus having to project into the future and assess their ability and motivation to adhere to ART in order to respond to the question.

In summary, our findings suggest that each method of adherence readiness has its own advantages or context for utility in predicting early ART adherence. Provider estimates had the best overall performance as it was the only readiness measure associated with each of the four measures of early ART adherence, and it had high concordance statistics in predicting optimal early ART adherence. However, the other methods also have utility as measures of adherence readiness. Practice trials may be useful in identifying those who are ready and motivated to start ART and remain on treatment, at least in the short-term, and the self-report measures were predictive of dose-taking adherence over the first 3 months of ART, our most precise measure of early ART adherence. Depending on specific needs, context and available resources, these methods offer clinicians and researchers an array of options for measuring ART adherence readiness, and in turn improving ART adherence and HIV care outcomes.

References

1. Kobin AB, Sheth NU. Levels of adherence required for virologic suppression among newer antiretroviral medications. *Ann Pharmacother*. 2011;45(3):372–9. [PubMed: 21386024]
2. Pasternak AO, de Bruin M, Jurriaans S, Bakker M, Berkhout B, Prins JM, et al. Modest nonadherence to antiretroviral therapy promotes residual HIV-1 replication in the absence of virological rebound in plasma. *J Infect Dis*. 2012;206(9):1443–52. [PubMed: 22927449]
3. Bangsberg DR, Hecht FM, Clague H, Charlebois ED, Ciccarone D, Chesney M, et al. Provider assessment of adherence to HIV antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2001;26(5):435–42. [PubMed: 11391162]
4. Bouton ME. A learning theory perspective on lapse, relapse, and the maintenance of behavior change. *Health Psychol*. 2000;19(1S):57. [PubMed: 10709948]
5. AIDInfo. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents Living with HIV. 2019 <https://aidsinfo.nih.gov/guidelines/html/1/adult-and-adolescent-arv/37/whats-new-in-the-guidelines>.
6. Sylvain H, Delmas P. Readiness in HIV treatment adherence: a matter of confidence. An exploratory study. *Open AIDS J*. 2011;5:119. [PubMed: 22253667]
7. Gross R, Bilker WB, Friedman HM, Coyne JC, Strom BL. Provider inaccuracy in assessing adherence and outcomes with newly initiated antiretroviral therapy. *AIDS*. 2002;16(13):1835–7. [PubMed: 12218400]
8. Miller LG, Liu H, Hays RD, Golin CE, Beck CK, Asch SM, et al. How well do clinicians estimate patients' adherence to combination antiretroviral therapy? *J Gen Intern Med*. 2002;17(1):1–11. [PubMed: 11903770]
9. Wagner G. Placebo practice trials: the best predictor of adherence readiness for HAART among drug users? *HIV Clin Trials*. 2003;4(4):269–81. [PubMed: 12916013]
10. Prochaska JO. Assessing how people change. *Cancer*. 1991;67(S3):805–7. [PubMed: 1986849]
11. Willey C, Redding C, Stafford J, Garfield F, Geletko S, Flanigan T, et al. Stages of change for adherence with medication regimens for chronic disease: development and validation of a measure. *Clin Ther*. 2000;22(7):858–71. [PubMed: 10945512]
12. Konkle-Parker DJ. A motivational intervention to improve adherence to treatment of chronic disease. *J Am Acad Nurse Pract*. 2001;13(2):61–8. [PubMed: 11930399]
13. Grimes RM, Grimes DE. Readiness, trust, and adherence: a clinical perspective. *J Int Assoc Provid AIDS Care (JIAPAC)*. 2013;12(3):185–94. [PubMed: 22904207]

14. Wagner GJ, Linnemayr S, Ghosh-Dastidar B, Currier JS, Hoffman R, Schneider S. Supporting treatment adherence readiness through training (START) for patients with HIV on antiretroviral therapy: study protocol for a randomized controlled trial. *Trials*. 2016;17(1):162. [PubMed: 27009061]
15. Bangsberg DR, Hecht FM, Charlebois ED, Zolopa AR, Holodniy M, Sheiner L, et al. Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. *AIDS*. 2000;14(4):357–66. [PubMed: 10770537]
16. Balfour L, Tasca GA, Kowal J, Corace K, Cooper CL, Angel JB, et al. Development and validation of the HIV Medication Readiness Scale. *Assessment*. 2007;14(4):408–16. [PubMed: 17986658]
17. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot*. 1997;12(1):38–48. [PubMed: 10170434]
18. Highstein GR, Willey C, Mundy LM. Development of stage of readiness and decisional balance instruments: tools to enhance clinical decision-making for adherence to antiretroviral therapy. *AIDS Behav*. 2006;10:563–73. [PubMed: 16552624]

Table 1

Socio-demographic characteristics of the sample (n = 176)

	%/Mean (SD)
Age (years)	36.5 (12.1)
Male gender	87.5%
At least some university education	57.3%
Race/ethnicity	
White	20.0%
Black	42.3%
Hispanic	32.6%
Other	5.1%
Heterosexual orientation	26.9%
In a relationship	17.7%
Employed	53.2%
Housing stability: rents or owns own apartment/house	43.4%
Time since HIV diagnosis (years)	5.6 (7.6)
CD4 count (cells/cu.mm)	399 (240)
Has medical insurance	77.7%

Associations between measures of ART adherence readiness and starting ART and remaining on ART for 3 months

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Table 3

Positive predictive value (PPV), negative predictive value (NPV), sensitivity, and specificity of measures of ART adherence readiness, in comparison with achievement of optimal early ART adherence

Pre-ART adherence readiness measure	Concordance statistics with achievement of optimal (85%) early ART adherence			
	PPV	NPV	Sensitivity	Specificity
High (85%) adherence in 1st practice trial (n = 83)	0.413	0.850	0.897	0.315
Demonstrated readiness in pre-ART practice trial phase (n = 83)	0.394	0.917	0.966	0.204
Provider estimate of high 85%) ART adherence (n = 176)	0.506	0.798	0.710	0.623
HIV Medication Readiness Scale score 30 (n = 176)	0.370	0.660	0.435	0.596
Translational model of readiness to change score = 4 (n = 176)	0.442	0.778	0.742	0.491