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Development and Validation of a Brief Computer-Administered HIV-Related Health Literacy Scale (HIV-HL)

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Abstract

Health literacy is related to a number of health status variables and has been associated with medication adherence in persons treated for HIV infection. Currently-available measures of health literacy require lengthy administration or have content or format limitations. In this paper we report the preliminary development and validation of a brief computer-administered health literacy test that includes content focused on medication adherence as well as questions based on a video simulation of an HIV-related clinical encounter. The measure shows significant relations with other measures of health literacy, HIV-related knowledge, and electronically-measured medication adherence. We also present ROC analyses that provide estimates of various scores' sensitivities and specificities so that the HIV-HL can be used as a screening measure.

Keywords

health literacy; adherence; cognition; ROC curve

Introduction

Health literacy is increasingly recognized as an important factor in patients' health status and in health outcomes, and is defined as an individual's ability to obtain health-related information and use it to make healthcare-related decisions [1]. Several extensive reviews have shown that individuals' health literacy is related to their health status, function, and use of health care services [2;3], and has even been related to increased risk of mortality [4]. Levels of health literacy differ across race, ethnicity, and age groups [5;6]. Given these differences, health literacy has been implicated in race- and ethnicity-related health disparities [7–9].

Several studies have investigated the importance of health literacy among individuals treated for HIV infection. Kalichman and Rompa [10], for example, showed that lower level of

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Obtaining the HIV-HL: Information about how to obtain and use the HIV-HL is available from Dr. Ownby (ro71@nova.edu).

health literacy (less than 80% correct on the Test of Functional Health Literacy in Adults, or TOFHLA [11]; see below for description) was related to lower CD4 cell counts, higher viral loads, and more frequent hospitalizations. In another study, Kalichman et al. [12] showed that lower levels of health literacy (again, defined as a score less than 80% on the TOFHLA) were associated with less knowledge about HIV infection and its treatment (understanding the meaning of laboratory measures or the actions of medications used to treat HIV), a finding that was supported in another study [13]. In several studies, low levels of health literacy (either using the TOFHLA or a measure of word recognition for medical terms) have also been related to poorer medication adherence [14;15] although in one study with a small sample size, this relation was not observed [16].

The most commonly used measures of health literacy include the Test of Functional Health Literacy in Adults, or TOFHLA [11] the Rapid Estimate of Adult Literacy in Medicine, or REALM [17], and the Newest Vital Sign [18]. Each measure has strengths and weaknesses in its utility for research and clinical practice. A positive aspect of the TOFHLA is that it assesses both reading comprehension and numeracy skills across a range of difficulties. The reading portion of the TOFHLA assesses reading comprehension for three increasingly difficult passages of medically-relevant text, while the numeracy section includes a set of practical tasks such as interpreting pill bottle labels and medical test scores. A possible limitation of the TOFHLA, however, is that it requires a minimum of 20 minutes to administer and must be individually administered and scored by a trained examiner, with scoring further increasing the total time for administration, scoring, and interpretation. The TOFHLA provides separate scores for the reading and numeracy sections as well as an overall score, and guidelines are provided to use scores on it to classify an individual's performance as proficient, borderline, or inadequate. Persons with inadequate performance are characterized as being unable to understand and use even basic healthcare information.

Perhaps because of its limitations, however, the full length TOFHLA is used less often than the Short-TOFHLA [19]. While the original S-TOFHLA includes four items from the original measure's numeracy scale as well as the two less difficult reading comprehension paragraphs, researchers have sometimes only administered the two reading paragraphs. While shorter, this strategy eliminates many of the performance and numeracy items from the administration and may result in the measure having ceiling effects (that is, a large number of persons achieve perfect or near-perfect scores). While a test with a smaller range of difficulty may be useful in screening for individuals with low ability, it may not be as helpful when examining the relation of health literacy to other healthcare-related behaviors such as medication adherence or outcomes such as hospitalization. The S-TOFHLA must also be individually administered and scored, increasing demands on clinician time for its use.

The REALM requires that the person assessed read aloud a set of medically-relevant words. An advantage of the REALM is that it can be self-administered, but it taps only word recognition skills and does not assess comprehension or numeracy abilities. While many persons may be able to complete the REALM without direct supervision, the measure must be individually scored before its results can be used. The Newest Vital Sign [18] asks the person assessed to interpret a nutrition label. This task is brief and as with the other measures has a narrow range of content as well as a limited relation to real-life healthcare tasks. It also requires clinician time for administration and scoring.

Because of its relation to health outcomes and behaviors, health literacy should be assessed more often in clinical and research work with persons with HIV infection. Consideration of existing measures of health literacy shows that each has significant limitations with respect to content and format that limit their usefulness. Several of the existing measures do not

target content specifically related to medication adherence nor do they tap a wide range of skills that includes quantitative tasks or tasks that are closely related to real-life healthcare problems. All current health literacy measures have limited direct relations to real-life health care problems encountered by persons treated for HIV infection. None, for example, assesses an individual's ability to understand or utilize orally-presented information, a key skill in many healthcare situations [20].

As part of a larger project that focused on the development of a computer-based intervention to improve health literacy in persons treated for HIV infection, we developed a health literacy measure that was designed to address some of these limitations. The new measure includes content specifically relevant to tasks required of persons treated for HIV (e.g., interpreting pill bottle labels) and includes a variety of tasks to broaden the range of item content (e.g., interpreting pill bottle warning labels, calculating time between medications doses, and reading a passage on viral resistance). Consistent with Baker's [20] analysis of health literacy as comprising both written and oral communication, items on the measure assess not only reading but also listening comprehension. To assess listening comprehension, the new measure includes a brief video simulation of a clinical encounter during which a clinician gives a patient directions for taking a new medication. The participant then responds to questions about the content presented in the video (e.g., "What should the patient do if he experiences blurry vision?").

It was also designed to be brief (20 questions) and to be administered on touch screen computers using a familiar multiple-choice format so that demands on researcher or clinician time and demands on patients' computer skills are kept to a minimum. The purpose of this study was thus to evaluate the usefulness of a computer-administered health literacy measure among persons with HIV infection and to assess its validity in relation to measures of health literacy, HIV-related knowledge, and medication adherence.

Method

In this section, we outline the general development of the questions, including the video script, the results of the initial pilot test of the measure, and revision of the measure for use in the current study. The current study within which the new health literacy was administered and the strategy for evaluating its reliability and validity as well as its potential usefulness in clinical practice or research are then presented.

Question Development

Questions were developed to evaluate various skills related to taking medications. In light of the usefulness of medication label questions as used in the TOFHLA, we created similar graphic elements and developed multiple-choice questions evaluating the participant's ability to understand straightforward medication directions ("Take two pills two times a day") as well as more complex questions that required mental arithmetic as well as the ability to read medication labels ("If you take two pills two times a day, how long will this prescription last?"). In light of evidence that some patients may not understand prescription bottle warning labels such as "Take with food" [21], several questions assessed participants' understanding of these warnings.

To assess medication-related listening comprehension, a script of a simulated clinician visit was developed and video recorded for use as a stimulus in the measure. In this simulation, participants view a clinician giving a patient a new medication ("to reduce your viral load") with directions for taking it and dealing with side effects. Participants view the approximately 90-second video on the computer screen, then are asked to respond to

multiple-choice questions about the content presented ("What should the person do if he experiences blurred vision?").

Pilot Study

In a pilot study that drew participants from another study of health literacy, cognition and medication adherence in persons treated for HIV, 11 participants responded to an initial group of questions. Based on their feedback and quantitative analysis of the pilot measure's characteristics (e.g., it showed a strong correlation with the S-TOFHLA), the measure was revised for further use. The final measure reported on here included 20 items assessing general medication taking skills and included several items with content specifically related to HIV infection and its treatment.

Technology

Questions were programmed into an off-the-shelf software program, Captivate® (San Jose: Adobe Corporation). This software allows the creation of multimedia programs that include graphic and video elements and multiple-choice questions to assess participant learning. Its output is a video format (Flash) that plays on most computers. In the pilot study, the measure was administered using standard desktop computer with speakers and required that participants indicate their responses by using a computer mouse to click on elements on the screen.

Current Study

In the study reported here, the new measure was administered using stock touch screen computers (Hewlett-Packard Model Touchsmart 300) with a 20-inch (diagonal) screen that required a minimum of computer skills to use--participants could respond to questions simply by touching the correct answer on the computer screen. The format of questions was similar to that which might have been used in a paper-and-pencil test, with a graphic element, question, and several possible answers. The program included audio presentation of questions to help ensure that participants were assessed on the specific aspect of health literacy assessed, although participants were required to read the key target element being assessed independently. For example, in a question about the meaning of a prescription pill bottle, the question and response alternatives were narrated but participants were required to read and understand the label without assistance in order to answer the question. The measure is designed to be completely self-administered and self-scoring so that demands on clinician or research time are kept to a minimum. The measure provides a final score on the measure on the last screen, allowing the user to rapidly understand the person's performance on the measure without further intervention.

The new measure was administered in the context of a larger study of the acceptability and effectiveness of a computer-administered tailored information intervention that was designed to promote the health literacy of individuals treated for HIV infection.

Participants

Participants were recruited from the local practices of physicians treating persons with HIV infection and through participants' referral of other persons treated for HIV infection in Broward County, Florida, including the city of Fort Lauderdale. One hundred twenty-four participants were enrolled in the study and completed the first visit. Of these, 120 returned for the second visit during which the HIV Health Literacy Scale was administered. Reasons for the four participants not returning for the second visit were withdrawing consent due illness and the time demands of the study (one participant), loss to follow-up in spite of multiple attempts to contact (one), and incarceration (two).

Cognitive Battery

The measures that comprise the assessment battery for this study were selected to assess health literacy using the full-length version of the Test of Functional Health Literacy in Adults or TOFHLA [11], executive function using the Trail Making Test, Parts A and B [22], novel problem solving using the Tower of London [23], psychomotor speed using the Purdue Pegboard [24], memory using the immediate and delayed recall trials of the Logical Memory subtest of the Wechsler Memory Scale, Fourth edition or WMS-IV [25], and crystallized (the Information and Vocabulary subtests) and fluid (the Block Design and Matrix Reasoning subtests) intellectual abilities using the Wechsler Adult Intelligence Scale, Fourth edition or WAIS-IV [26]. Another measure included was LifeWindows IMB scale [27], a self-report measure of participants' understanding of the elements of the Information-Motivation-Behavioral Skills (IMB) model. The battery was included in the larger study of the health literacy intervention to allow for an evaluation of the effects of cognitive skills on medication adherence, but included measures relevant to understanding the performance of the new health literacy measure.

Psychosocial Measures

Other measures included in assessments were the Center for Epidemiological Studies Depression Scale, CES-D [28] and a measure of general health-related self-efficacy developed for another study [29]. Items from this measure have good face validity (e.g., "I am in control of my health care.") and the scale has acceptable internal reliability (Cronbach's $\alpha = 0.77$). Finally, we included the AIDS Clinical Trials Group (ACTG) baseline adherence questionnaire during the first study visit [30] and extracted the short form of the Perceived Stress Scale included in the ACTG questionnaire. All rating scale measures were administered via audio computer-assisted self interview (ACASI) using the Questionnaire Development System (QDS: Bethesda MD: Nova Research).

Medication Adherence

Participants' medication adherence was assessed using the Medication Event Monitoring System (MEMS; Aardex: Sion, Switzerland). The MEMS includes a device that electronically records each time a target medication's pill bottle is opened, serving as a measure of how the participant took his or her medication. The information is read into a computer and a program provides a measure of the extent to which the participant took his or her medication each day during the period observed.

Data Analysis

In data analyses, we focused on finding out how well the new measure actually assessed participants' health literacy as a way of being sure that it would be useful to researchers and clinicians. The first analysis assessed how much the items in the new measure actually measured the same thing. This was done with factor analysis, a technique that can determine how items are related to each other. The relation of scores on the new measure to other measures was also assessed. We did this by calculating the correlation of the measure with other variables that measure something similar. Finally, we assessed how well the new measure could detect whether someone had a low level of health literacy. This was done to demonstrate that, at least with participants from our study, the new scale could tell the difference.

Analyses were completed using SPSS 19 (IBM, Inc.: Armonk, NY) and both exploratory and confirmatory factor analyses, treating participant responses to test items as categorical, were completed using MPlus (Muthén & Muthén: Los Angeles). The analysis of whether

scores on the new measure could tell whether someone had low health literacy was completed using the NCSS statistical package (NCSS Inc.: Kaysville, UT).

Procedure

The new HIV Health Literacy Scale (HIV-HL) was administered as part of a larger project to evaluate a computer-based intervention to improve health literacy related to HIV infection. Participants completed three visits in this study. During the first visit, they completed the cognitive battery as well as psychosocial measures and were oriented to the use of the MEMS pill bottles. They returned after one month for a second visit during which their baseline adherence over the intervening month was recorded. Participants completed the HIV-HL immediately before and after participating in a one-hour computer-based intervention during which they viewed a multimedia presentation that provided them with tailored information on HIV infection and its treatment. Data reported in this paper are based on participants' performance on the HIV-HL scale administered before they participated in the intervention.

Results

Descriptive statistics for the sample of participants who completed the HIV-HL are presented in Tables I (risk factors for infection and education), II (continuous variables describing participants), and III (continuous variables for measures used in the study). Participants had a wide range of educational backgrounds and included both heterosexual and homosexual sex as risk factors for infection as well as substance use and transfusions. They also had a wide range of experiences with treatment, ranging from a few months to several years, and a range of regimen complexities. The measure typically required 10 to 15 minutes for completion, although some participants required 20 to 25 minutes. While participant ratings on the measure's ease of use were not obtained, they were asked to rate the usefulness and ease of use of the computer intervention that was administered in the same format. These data showed that the touch screen computer was judged very positively by participants, with average ratings on a scale that varied from 0 to 6 consistently above 5. Participant's comments on their experience with the computer and its touchscreen suggested they found it very positive, with several spontaneously saying "This was fun."

Internal Reliability

Participants' mean score on the full measure was 16.38 with a standard deviation of 2.46. Scores ranged from 8 to 20. Cronbach's alpha was 0.69 for the 19-item version (see explanation below). As experts suggest that a minimum value of 0.70 is considered adequate, the new measure just misses this conventional cutoff. Factor analysis of the instrument suggested that all but one item measured the same thing. This item was eliminated.

External Validity

The extent to which the HIV-HL measured the same thing as other measured was assessed by calculating the correlations between it and other measures of health literacy and HIV-related knowledge. These correlations are presented in Tables IV and V. Table IV presents correlations of the new measure with cognitive measures, including the LifeWindows IMB self-report measure of HIV-related information, motivation, and behavioral skills. It can be seen that the HIV-HL is significantly correlated with both subtests of the TOFHLA, indicating that it may measure the same ability as does that measure. It was also correlated with the Information subscale of the LifeWindows scale showing that it is related to participants' knowledge of how medications work, how they should be taken, and how to cope with side effects. It is also correlated with both immediate and delayed recall of verbal

information (WMS-IV Logical Memory subtests I and II). This relation was evaluated because the HIV-HL includes video items that require that the person assessed remember what they heard.

Correlations of the HIV-HL with measures of self-efficacy, depression (CES-D), stress (the short form of the Perceived Stress Scale included in the ACTG Adherence Questionnaire), and medication adherence (MEMS) are presented in Table V. The total TOFHLA score is included in this table to illustrate its relation to these measures as well so that its relations with the same measures can be compared to correlations for the HIV-HL. It can be seen that the HIV-HL is positively related to self-efficacy and two of the MEMS indexes of adherence, and inversely related to depression. The HIV-HL was unrelated to stress, and overall showed a pattern of relations with other measures similar to that of the TOFHLA. These findings suggest that what the HIV-HL measures is similar to that of the standard test of health literacy, the TOFHLA.

ROC Analysis

Finally, the usefulness of HIV-HL scores in detecting if someone has low levels of health literacy was assessed using receiver operating characteristic (ROC) curve analysis. This technique allowed us to find out whether specific scores on the HIV-HL could predict if someone had a low level of health literacy on the standard measure of health literacy, the TOFLA. Results showed that the HIV-HL could predict whether someone had low health literacy (area under the curve = 0.77; $z = 2.57$; $p = 0.01$). Results showed that a total score of 15 was the best choice to detect as many people with low health literacy as possible while making as few classification mistakes as possible.

Discussion

The purpose of this study was to evaluate the validity and usefulness of a scale that specifically targets health literacy in people treated for HIV. Results show that the new measure was related to other measures of general health literacy (the TOFHLA) and to HIV-related knowledge (the LifeWindows questionnaire). An analysis of how well the scale predicted whether someone had low health literacy also showed that it could do so, and scores on the measure were correlated with participants' medication adherence.

The HIV-HL has several characteristics that may make it attractive for use in research and clinical settings. It is computer administered and scored so that its use requires minimal time on the part of researchers or clinicians. As part of an assessment battery in a research study or in a busy clinical setting, the HIV-HL might be helpful since it doesn't require individual attention from researchers or clinicians. The measure yields a summary score and the analysis presented here provides a cutoff score for predicting if a patient has low health literacy. In using it in a research setting, we have been able to set up several computer work stations, illustrate the use of the touch screen computer, and allow participants to complete the measure without further staff intervention. In the study from which data reported here were drawn, the large majority of participants had no trouble completing the measure in this fashion. The only problem with touch screen computer use arose in a few participants who had long fingernails that interfered with touching the screen. These participants were allowed to interact with the computer using the eraser end of a wooden pencil. The measure has not yet been tested in a clinical setting, but it appears likely that a similar physical setting would allow its use for clinical purposes. It thus represents an expansion of the content and format of existing health literacy measures in a way that allows for automated administration.

The HIV-HL includes items that assess skills clearly relevant to treatment of HIV infection (such as interpreting medication labels and warnings) and is one of the few measures that evaluates health literacy through listening comprehension. The inclusion of items that evaluate HIV-specific skills may make it more valid as measure of HIV-related health literacy, since the behaviors assessed are closer to the actual skills required of patients. It may, for example, enhance the measure's ability to predict HIV-related outcomes to ask the person assessed to explain how to take their medications or the meaning of laboratory tests used in treating HIV. Since a great deal of clinical care involves oral communication, the new measure's ability to assess this domain may also enhance its validity. These strategies are in contrast to other standard measures like the TOFHLA that assess similar knowledge but in ways that are less directly related to the experience of patients with HIV.

Limitations of the measure should be acknowledged. The fact that the HIV-HL is computer based allows it to be self-administered and scored but limits its use to setting in which a computer with audio capabilities is available. In some resource-limited settings suitable computers may not be available, and another measure administered in paper-and-pencil format, such as the REALM or the Newest Vital Sign, may be preferable. Additional information that may be obtained through observation of behavior during individual administration of a measure would not be available from the HIV-HL, such as understanding an individual's problem solving strategy. The automated format of the HIV-HL thus would decrease the clinical information that can be obtained during assessment of a patient's or research participant's evaluation. The measure was developed using a sample that included both patients who had recently been diagnosed and those with considerable treatment experience. This may have affected our results, although in general developing a new measure on a diverse population is considered a good idea as it may make results more relevant to a range of people.

While we obtained a Cronbach's alpha value for the revised scale that was at the border of the acceptable range, we think the fact that the scale includes different formats, diverse content, and is brief may explain the low value, but this issue should be kept in mind if the scale is used. There are several likely reasons for the low alpha value. The HIV-HL includes diverse content and several different item formats. These are likely to reduce the alpha value. In addition, the new measure is brief. Brief scales are likely to have lower alphas [31;32], and we note that some authorities describe alpha values in the range of 0.65 to 0.70 as minimally acceptable [33]. The measure's single factor properties show that its individual items share common variability and measure the same underlying construct, while the diversity in format and content contribute large item-specific variability that is reflected in the alpha value.

These analyses thus show that the HIV-HL has satisfactory psychometric properties and may be a valid measure of health literacy useful in research and clinical practice. Analyses show that it is significantly related to another measure of health literacy, to a measure of self-reported HIV knowledge, and to self-efficacy, mood, and medication adherence. Further development, currently in progress, will focus on improving the measure's internal reliability and further demonstrating its relation to clinical and research outcomes. A trial of its use in a clinical setting, in which clinicians are provided with information about patients' level of health literacy or in which information is otherwise tailored to the patients' level of health literacy, would be helpful in establishing the usefulness of health literacy assessment in the context of regular clinical care.

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Table I**Description of Sample Risks for Infection, Education, Work and Family Status How participant became infected**

	Men N = 88	Women N = 36	Blacks N = 78	Whites N = 45
Sex with man	47	29	38	38
Sex with woman	37	6 ^b	37	6
Shared needles	16	4	10	10
Transfusion	9	6	12	3
Other	9	2	7	4
Don't Know	21	11	29	3
Totals ^a	139	58	133	64

Education

	Men	Women ^a	Blacks	Whites ^b
11th grade or less	29	17	42	4
HS or GED	30	15	24	21
2 yrs college/AA/Tech	17	1	7	11
College graduate	9	2	3	8
Master degree or greater	2	0	1	1

Work and family status

	Men	Women ^a	Blacks	Whites
Work for pay	64	34	12	11
Have children	21	24	24	21

^aTotals exceed sample size due to several participants indicating multiple risk factors.

^bOf women reporting sex with another woman as a risk factor, only one did not report another risk factor, such as sex with a man or sharing needles.

^aTest of the association of gender and educational status: $\chi^2 = 8.12$ (df = 4) $p = 0.09$.

^bTest of the association of race and educational status: $\chi^2 = 28.31$ (df = 4) $p < 0.001$.

Table II

Descriptive Statistics for Sample

	N	Minimum	Maximum	Mean	Std. Deviation
Age	124	20	67.00	47.10	8.69
CD4	124	62	1734.00	501.23	289.29
Viral Load	124	0 ^a	2321K	23K	21K
Years Since Diagnosis	123	1	27.00	15.54	7.88
Years Since First Treatment	123	.25	24.00	11.60	7.18
HIV Meds Doses Per Day	124	1	8.00	2.83	1.50
Other Meds Doses Per Day	124	0	11.00	2.60	2.54
All Meds Doses	124	1	15.00	5.43	3.32

^aZero for this variable represents a laboratory report of "nondetectable."

Table III

Descriptive Statistics for Cognitive and Psychosocial Measures

Measure ^a	N	Minimum	Maximum	Mean	SD
TOFHLA Numeracy	124	5	50	46.02	7.07
TOFHLA Reading	124	13	50	42.46	8.50
TOFHLA Total Score	124	20	100	88.48	14.16
WAIS-IV Information	124	2	16	7.85	3.01
WAIS-IV Vocabulary	124	2	16	7.63	3.11
WAIS-IV Block Design	124	3	13	7.90	1.94
WAIS-IV Matrix Reasoning	124	4	19	8.48	3.09
WMS-IV Immediate	124	1	15	7.56	3.27
WMS-IV Delayed	124	1	15	7.60	3.05
LifeWindows Information	118	4	36	28.25	6.94
LifeWindows Motivation	116	14	40	28.06	6.91
LifeWindows Behavioral Skills	118	5	52	39.39	8.55
CESD	122	0	51	16.02	11.33
PSS	124	0	33	14.33	6.35
MEMS Doses Taken (%)	118	6.9	116.7 ^b	87.91	19.61
MEMS Correct (%)	118	6.9	100.0	81.46	20.95
MEMS On Schedule (%)	118	0	100.0	69.89	26.59

^aTOFHLA = Test of Functional Health Literacy in Adults; WAIS-IV = Wechsler Adult Intelligence Scale, 4th ed.; LifeWindows = LifeWindows IMB Scale; CESD = Center for Epidemiological Studies Depression Scale; PSS = 10-item Perceived Stress Scale; MEMS = Medication Event Monitoring System.

^bPercent adherence greater than 100 results from multiple openings of the MEMS cap device.

Table IV

Correlations of HIV-HL Scale with Cognitive Measures

	HIV-HL	TOFHLA Numeracy	TOFHLA Reading	TOFHLA Total	LW Info	LW Mot	LW Behav	WMS-IV Immediate	WMS-IV Delayed
HIV HL Scale	1.00	.54**	.53**	.58**	.39**	.13	.15	.37**	.29**
TOFHLA Numeracy ^a		1.00	.65**	.89**	.42**	.10	.18	.40**	.32**
TOFHLA Reading ^a			1.00	.93**	.49**	.15	.31**	.55**	.49**
TOFHLA Total ^a				1.00	.51**	.14	.28**	.53**	.46**
LW Info ^a					1.00	.23*	.45**	.33**	.33**
LW Mot ^a						1.00	.47**	.10	.04
LW Behav ^a							1.00	.21*	.19*
WMS-IV Immediate ^a								1.00	.90
WMS-IV Delayed ^a									1.00

*
p < 0.05;

**
p < 0.01.

^aTOFHLA = Test of Functional Health Literacy in Adults; W-Info, LW-Mot, LW-Behav = LifeWindows IMB Scale Information, Motivation, and Behavioral Skills subtests; WMS-IV = Wechsler Memory Scale, Fourth Edition Logical Memory subtests I (Immediate Recall) and II (Delayed recall).

Table V

Correlations of the HIV-HL with Psychosocial and Behavioral Measures

	HIV-HL Scale	TOFHLA Total	Self- Efficacy	CESD	PSS	MEMS Taken	MEMS Correct	MEMS Scheduled
HIV HL Scale	1.00	.58**	.31*	-.19*	-.15	.25**	.20*	.20*
TOFHLA Total		1.00	.38**	-.17**	-.19*	.32**	.28**	.25*
Self-Efficacy			1.00	-.49**	-.41**	.16	.12	.17
CESD				1.00	0.73**	-0.08	-0.04	-0.08
PSS					1.00	-0.16	-0.14	-0.14
MEMS Taken						1.00	0.90**	0.89**
MEMS Correct							1.00	0.88**
MEMS Scheduled								1.00

* $p < 0.05$;

** $p < 0.01$

^bTOFHLA = Test of Functional Health Literacy in Adults; Self-Efficacy = General healthcare self-efficacy scale (see text); CESD = Center for Epidemiological Studies Depression scale; PSS = 10-item Perceived Stress Scale; MEMS = Medication Event Monitoring Scale adherence indexes.