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Authors

Harvey, Philip D

Strassnig, Anna

Strassnig, Martin

et al.

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Mild Cognitive Impairment, But Not HIV Status, is Related to Reduced Awareness of Level of Cognitive Performance Among Older Adults

Philip D. Harvey, PhD,
Department of Psychiatry and Behavioral Sciences, Miller School of Medicine, University of Miami, Miami, FL

Research Service, Miami VA Healthcare System, Miami, FL

Anna Strassnig,
Don Souffer High School, Aventura, FL

Martin Strassnig, MD,
Department of Psychiatry and Behavioral Sciences, Miller School of Medicine, University of Miami, Miami, FL

Anne Heaton, BA,
Department of Psychiatry, University of California San Diego, San Diego, CA

Kevin Kuehn, PhD,
Department of Medicine, University of California San Diego, San Diego, CA

Peter Torre, PhD,
School of Speech, Language, and Hearing Sciences, San Diego State University, San Diego, CA

Erin E. Sundermann, PhD,
Department of Psychiatry, University of California San Diego, San Diego, CA

Amy Pinkham, PhD,
School of Behavioral and Brain Sciences, The University of Texas at Dallas, Richardson, TX

Colin A. Depp, PhD,
Department of Psychiatry, University of California San Diego, San Diego, CA

VA San Diego Healthcare System, San Diego, CA

Send correspondence and reprint requests to Raeanne C. Moore, PhD, Department of Psychiatry, University of California San Diego, 220 Dickinson St. Suite B, San Diego, CA 92103. r6moore@health.ucsd.edu.

AUTHOR CONTRIBUTIONS

PDH contributed to the conceptualization of this manuscript, conducted statistical analyses, and helped write and edit the manuscript. AS, MS, and AH helped writing the initial draft. AH also helped with data curation. KK, AP, CAD, GB, and WW provided critical review and edits of the manuscript. PT, ESS, DW, and AMA contributed to funding acquisition, methodology, and critical review and edits of the manuscript. RCM contributed to funding acquisition, conceptualization, methodology, project administration, supervision, and writing and editing the manuscript.

DISCLAIMER

The views expressed in the submitted article are the authors' own and not an official position of the institution or funder.

SUPPLEMENTARY MATERIALS

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Gabrielle Black, MS,
Emory University, Atlanta, GA

Whitney Wharton, PhD,
Emory University, Atlanta, GA

Drenna Waldrop, PhD,
Emory University, Atlanta, GA

Albert M. Anderson, MD,
Emory University, Atlanta, GA

Raeanne C. Moore, PhD
Department of Psychiatry, University of California San Diego, San Diego, CA

Abstract

Objective: Self-assessment of cognitive abilities can be an important predictor of clinical outcomes. This study examined impairments in self-assessments of cognitive performance, assessed with traditional neuropsychological assessments and novel virtual reality tests among older persons with and without human immunodeficiency virus (HIV) and mild cognitive impairment (MCI).

Methods: One hundred twenty-two participants (82 persons with HIV; 79 MCI +) completed a traditional neuropsychological battery, DETECT virtual reality cognitive battery, and self-reported their general cognitive complaints, depressive symptoms, and perceptions of DETECT performance. Relationships between DETECT performance and self-assessments of performance were examined as were the correlations between general cognitive complaints and performance. These relations were evaluated across HIV and MCI status, considering the associations of depressive symptoms, performance, and self-assessment.

Results: We found no effect of HIV status on objective performance or self-assessment of DETECT performance. However, MCI+ participants performed worse on DETECT and traditional cognitive tests, while also showing a directional bias towards overestimation of their performance. MCI− participants showed a bias toward underestimation. Cognitive complaints were reduced compared to objective performance in MCI+ participants. Correlations between self-reported depressive symptoms and cognitive performance or self-assessment of performance were nonsignificant.

Conclusions: MCI+ participants underperformed on neuropsychological testing, while overestimating performance. Interestingly, MCI− participants underestimated performance to approximately the same extent as MCI+ participants overestimated. Practical implications include providing support for persons with MCI regarding awareness of limitations and consideration that self-assessments of cognitive performance may be overestimated. Similarly, supporting older persons without MCI to realistically appraise their abilities may have clinical importance.

Keywords

Introspective accuracy; virtual reality; Alzheimer’s disease; digital health; neuropsychological testing

INTRODUCTION

Over 1 million people in the U.S. live with human immunodeficiency virus (HIV) and half are aged 50 and older.[1] Cognitive problems occur in up to 50% of persons with HIV (PWH), and typically present as mild impairments under the classification of HIV-Associated Neurocognitive Disorders (HAND;[2]). However, in addition to the risk for HAND, older PWH are at risk for age-associated, neurodegenerative diseases such as Alzheimer's disease (AD) and its precursor, mild cognitive impairment (MCI;[3,4]). Studies of the interaction between HIV and MCI status are generally absent from the literature.

Impairments in awareness of cognitive challenges, particularly memory deficits, have been reported among individuals with MCI[5,6] and AD,[7,8] and can be a predictor for clinical outcomes such as treatment adherence, caregiver burden, and independent living. Further, there is growing, albeit mixed, evidence that poor self-awareness may be a risk factor for conversion from MCI to AD.[9] Our group has extensively examined the impact of cognitive Introspective Accuracy (IA), the ability to evaluate one's own abilities and performance within multiple different domains, and Introspective Bias (IB), the directionality of introspective inaccuracies (under- versus overestimation). Among persons with serious mental illness (SMI), we have consistently found that impaired IA (both under- and overestimation of abilities) is related to cognitive impairment, impaired self-assessment of mood states, symptoms of psychosis, and functional outcomes.[10–14] Prior work by Chiao et al.[15] found the presence of HAND was associated with overestimation of performance among older PWH. Thus, cognitively impairing disorders, including HAND, MCI, and SMI have all been found to be associated with impairments in IA. To our knowledge, there have not been any studies examining the prevalence and correlates of IA and bias among persons with co-occurring HIV and MCI.

The depressed mood has a complex relationship with self-awareness of cognitive abilities. In people with schizophrenia, reports of no depression are often associated with overestimation of abilities,[16,17] and sadness or mild depression predicts improved accuracy in self-assessment of performance, but not cognitive deficits.[17] Depressive symptoms have also been found to be related to greater accuracy in self-assessment in other populations[18] and unrelated to objective cognitive performance in persons with MCI.[19–21] Among PWH, studies have found the presence and severity of depression are more related to global cognitive complaints than objective performance.[22] However, in longitudinal studies, we found that the cumulative burden of depression was associated with worsening neurocognitive performance over time in PWH.[23] Thus, the influence of depressed mood on the correlation between self-awareness and cognitive performance needs to be considered in both PWH and MCI.

This study examined the extent of impairments in IA and related directional biases in relation to neuropsychological test performance, measured both by traditional neuropsychological assessments and by a novel virtual-reality neuropsychological battery called DETECT (Display Enhanced Testing for Cognitive impairment and Traumatic brain injury) among a sample of older persons with and without HIV and MCI. After completing the DETECT assessment, participants completed standardized self-assessments of their

performance, which were compared to actual test performance. To address more global elements of awareness, we also examined the relationship between global self-reported cognitive complaints and performance on DETECT and a traditional neuropsychological test battery. We hypothesized there would be differences in IA based across diagnostic status (HIV; MCI), expecting cognitively impaired participants (MCI+; more impaired PWH) to have greater IA challenges, indexed by reduced correlations between objective and self-reported impairments. Given associations between depressive symptomatology and self-awareness and cognitive complaints, we also considered the impact of current depression on traditional and DETECT cognitive assessments and self-reports of performance. We anticipated increased depression would be associated with underestimation of performance compared to objective data, across samples, and greater cognitive impairments would be associated with greater overestimation of performance.

METHODS

Participants

One hundred twenty-two participants (82 PWH and 40 persons without HIV) were analyzed at baseline in a longitudinal, observational study of the DETECT device. This multisite study included the University of California San Diego's (UCSD) HIV Neurobehavioral Research Program (HNRP) and Emory University Center for AIDS Research (CFAR) in Atlanta. Between 2020 and 2023, participants completed study visits consisting of a comprehensive neuropsychological evaluation, a neuromedical interview, and the DETECT cognitive assessment. Participants enrolled at UCSD were recruited from the local San Diego community and from studies at the HNRP. Participants enrolled at Emory were recruited through local outreach in the Atlanta metropolitan area which included CFAR-affiliated clinics. The DETECT study included persons with and without HIV, aged greater than or equal to 60 years, fluent in English, and with the ability to provide written informed consent. Persons with HIV were required to be on antiretroviral therapy and manifest evidence of viral suppression (plasma HIV RNA less than 200 copies/mL for at least 6 months). Both HIV status groups included persons with and without a clinical diagnosis of MCI, with these participants coming from UCSD's Alzheimer's Disease Research Center, local recruitment in the San Diego community, and the Emory Brain Health Center. MCI diagnoses were made and/or confirmed by the study team (see below). Exclusion criteria were: diagnosis of HIV-Associated Dementia (HAD), persons in hospice that could not be followed longitudinally, plans to move out of the local area within three years, neurological confounds unrelated to HIV (e.g., stroke, head injury with loss of consciousness greater than 30 minutes and sequelae), SMI (e.g., schizophrenia, bipolar disorder), and significant visual or hearing impairments. All study procedures were approved by the study site's institutional review boards.

Procedures and Measures

DETECT Neuropsychological Evaluation—The DETECT technology was developed at Emory University with collaborators from Georgia Tech Research Institute and was found to be a potentially valid method for identifying cognitive impairment in older individuals at-risk for dementia or with MCI.[24] DETECT was also found to be an accurate screening tool

for HAND.[25] The DETECT program is installed on a smartphone which is then placed in a commercially available virtual reality (VR) headset (the Samsung Gear VR SM-R325, see Fig. 1). The fully-immersive VR environment places participants in a mock doctor's office while they complete a neuropsychological screening battery. Participants were instructed on the use of the VR headset and controller, which had "yes" and "no" response options. The DETECT assessment was designed for self-administration, thus study staff were instructed not to provide feedback during the evaluation. The DETECT neuropsychological screening battery took approximately 15 minutes to complete; individual tests are described below. The instructions for each test appeared on the screen in front of the participant and were presented aloud via prerecorded audio. Instructions for any test could be repeated as many times as desired.

Word Memory: Immediate Recall and Delayed Recall Subtests: Verbal Recognition Memory—Participants were shown 12 target words (displayed one at a time for two seconds each) and asked to remember the list. Participants completed an immediate recognition trial in which they were shown 24 words one at a time for three seconds each. Twelve of the words were from the original word list and 12 randomly selected distractor words came from the same word category. A delayed recognition trial was presented approximately 10 minutes after the immediate recall. Participants were again presented with 24 words, including the 12 target words from the initial word list presentation and 12 different randomly selected distracter words matching the same word category. Responses on the Word Memory test were coded as correct, incorrect, or no response if a participant didn't respond within 10 seconds.

N-Back Faces: 1- and 2-Back Subtests: Working Memory—Participants were shown black-and-white photographs of human faces with either neutral or positive expressions, one at a time for two seconds each. Participants were told to press "yes" if the face shown was the same as the face shown just before (i.e., 1-back), or press "no" if the face was not the same as the face presented just before. Fifteen faces were presented for the 1-Back subtest, resulting in 14 trials (no possible response for the first stimulus face).

In the 2-Back subtest, participants were presented with faces in the same manner as the 1-Back subtest, but this time they were instructed to compare each new face to the one presented two faces ago (i.e., 2-back). Fifteen faces were presented for the 2-Back test, resulting in 13 trials (no possible response for the first two stimulus faces). Participants had two seconds to respond to each image in both the 1-Back and 2-Back tests.

Shape Comparison: Simple and Complex Subtests: Processing Speed—Participants were shown a target shape and then instructed to press "yes" when subsequent shapes exactly matched the target shape and "no" if they did not exactly match. The Simple Shape subtest consisted of 20 trials, in which all shapes were either a gray circle, triangle, square, or diamond.

The protocol for the complex shape subtest was similar to simple shapes; however, in this task, each image had a particular shape, color, and line orientation. Participants were instructed to press "yes" if each image exactly matched the target image in its color, shape,

and line orientation, or “no” if it did not exactly match. Participants had three seconds to respond to each image in the simple and complex shape trials. The complex shape subtest had 24 trials.

Arrow Comparison: Executive Function—Participants were presented with either a red or blue arrow and instructed to press “yes” if the blue arrow was pointing to the right and “no” if the blue arrow was pointing to the left. Conversely, participants were instructed to press “yes” if the red arrow was pointing to the left and “no” if the red arrow was pointing to the right. Participants were given three seconds to respond to each arrow, presented one at a time, for a total of 20 trials.

Self-Assessment of DETECT Performance—After completion of the DETECT assessment, participants were asked the following: “Thinking about your overall performance on the VR cognitive tests, how well do you think you performed on each test?” They rated their performance on each VR test from *1 = Not Very Well* to *10 = Extremely Well*. To simplify the self-assessment tasks in this potentially impaired population, participants were queried as to performance on the “test with the group of words to remember,” “test with the different shapes/figures,” “test with the blue and red arrows,” and “test with the faces to remember.” Thus, there was only one self-assessment rating for Word Memory (combining immediate and delayed recall), one rating for Shape Comparison (simple and complex) and one item for N-Back Face Comparison (1-back and 2-back) yielding four total self-assessment ratings.

Comprehensive Neuropsychological Evaluation—Participants completed the HNRP’s comprehensive neuropsychological test battery, which assesses seven neurocognitive domains (see Table 1[26]). At the HNRP, some tasks were slightly modified to allow for remote administration via video conferencing during the COVID-19 pandemic. For modification details and remote test equivalency to in-person testing, see Kohli et al.[27] At Emory, all testing was completed inperson throughout the pandemic.[28] Raw scores on the neuropsychological battery[26,29,30] are presented as unadjusted scaled scores (SS; M = 10, SD = 3) because there were no demographic corrections available for the DETECT battery.

MCI status was determined using the Jak/Bondi diagnostic criteria for MCI.[31] The criteria were applied to the HNRP battery, and all MCI subtypes were included.

Clinical Scales

Geriatric Depression Scale (GDS)—The GDS is a 30-item “yes/no” self-report measure of depressive symptoms experienced in the past week.[32] Scores ranged from 0 to 30 with some items being reverse scored, generating a single total score with higher scores reflecting greater severity.

Patient Assessment of Own Functioning (PAOFI)—A four-item abbreviated version of the Patient’s Assessment of Own Functioning Inventory (PAOFI) was administered to evaluate subjective cognitive complaints regarding everyday functioning. The abbreviated PAOFI was developed by investigators at the HNRP (unpublished) in order to identify a subset of items to reduce the number of questions on the PAOFI while predicting the full

PAOFI score.[33] Data from the first assessment of 5,906 HIV+ participants was used to create the abbreviated PAOFI. Using regression models to predict the occurrence of significant symptoms on the PAOFI (score equal to or greater than three), two to six- item models were examined. The four-item model was chosen, consisting of forgetting instructions, challenges with verbal instructions, naming deficits, and becoming easily distracted as the best subset. This four-item model yielded a Sensitivity of 90.8%, Specificity of 79%, and partial AUC of 8.33 (0.15). This was then cross-validated using Monte Carlo sampling and demonstrated a Sensitivity of 90.7%, Specificity of 77.5%, and AUC of 8.24 (0.61). Items were rated on a six-point scale from 1 = "*almost always*" to 6 = "*almost never*," with lower scores on the abbreviated PAOFI indicating greater severity of complaints severity and yielding total scores from 1 to 24.

HIV Disease Characteristics

Plasma HIV RNA was confirmed to be less than 200 copies/mL at baseline. CD4+ was measured at baseline. Previous AIDS diagnosis, estimated duration of HIV disease, antiretroviral therapy regimen, and nadir CD4 count were collected via self-report and, if available, a review of the electronic medical record.

Statistical Analyses

We created several composite scores, with plans to conduct follow-up analyses of individual tests if the composites produced significant group differences. These scores included composites for DETECT cognitive performance, self-assessment of DETECT performance, and differences between composite performance and composite self-assessment for the DETECT battery. We used the unadjusted scale score (SS) for the traditional neuropsychological battery scores because DETECT scores were not normed. Composite scores for objective performance and self-assessment scores on the DETECT battery were computed by converting individual test scores to standardized (z) scores in the total sample and then averaging them. For test performance, we examined Immediate and Delayed Recall subtests, total shapes performance (both Shape Comparison subtests), Arrow Comparison test performance, and 1- and 2-Back faces performance. The self-assessment composite was based on the four self-reported scores described above. We created a composite score for the difference between self-assessed performance and objective test performance by subtracting each participant's performance composite from their self-assessment composite, leading to misestimation difference scores that were higher for overestimation of performance to index directional response biases for self-assessed performance compared to objective test performance. Finally, we calculated the absolute value of each participant's composite misestimation score to quantify the extent of bidirectional misestimation.

We examined the effects of HIV and MCI status with a 2 (HIV+, HIV−) × 2 (MCI+, MCI) two-way analysis of variance (ANOVA) for the composite score for the DETECT cognitive module, the unadjusted SS for the comprehensive neuropsychological battery, the PAOFI score, the composite self-assessment of DETECT performance, and the two difference scores (directional and absolute misestimation). We followed-up all significant overall effects with t-tests. Pearson's *r* correlations were calculated between DETECT performance and performance on the comprehensive neuropsychological battery, as well

as self-assessment composite scores, and between performance on each of the DETECT subtests and self-assessment scores. We planned to use depression as a covariate in the 2 × 2 ANOVAs analyses if Pearson correlations suggested it was associated with objective performance or self-assessment. We used Bonferroni correction for group-mean comparisons of composite scores (0.05/5 = p<0.01); significant corrected results on composite scores then led us to perform uncorrected analyses on individual items. We applied the same p<0.01 significance criterion for designating correlations as statistically significant.

RESULTS

Demographic information and clinical characteristics are presented in Table 2. Supplementary Table 1 presents scores for the individual tests from DETECT, self-assessment of DETECT tests, and the absolute values for IA. Internal consistency (alpha) was 0.68 for the composite DETECT performance score and 0.70 for the composite DETECT self-assessment scores. As would be expected with 16 individual subtests, the coefficient alpha was higher for the in-person SS for neuropsychological assessment at 0.87. There were no main effects in two-way ANOVAs of HIV status for the in-person neuropsychological composite (F(df = 1,121) = 2.69, p = 0.10), PAOFI scores, (F(df = 1,121) = 2.67, p = 0.11, the DETECT assessment composite (F(df = 1,121) = 0.06, p = 0.81), the self-assessment composite (F(df = 1,121) = 0.59, p = 0.44), directional bias in misestimation (F(df = 1,121) = 2.74, p = 0.10), or absolute value misestimation (F(df = 1,121) = 2.77, p = 0.11). There were also no statistically significant interactions between HIV status × MCI status.

In contrast, there were significant effects of MCI status for the comprehensive neuropsychological composite (F(df = 1,121) = 65.22, p<0.001) and performance on DETECT (F (df = 1,121) = 8.91, p = 0.003), although directional bias in self-assessment (F (df = 1,121) = 5.23, p = 0.024), did not reach corrected significance. There were no differences by MCI status on PAOFI scores, (F(df = 1,121) = 0.04, p = 0.84), composite self-assessment of DETECT performance (F (df = 1,121) = 0.19, p = 0.66) or for absolute value misestimation (F(df = 1,121) = 0.01, p = 0.92; As a reminder, test by test self-assessment of the comprehensive neuropsychological battery was not performed. Results presented in this section are for (1) test by test self-assessment of DETECT vs. DETECT performance, and (2) global cognitive complaints (i.e., PAOFI scores) vs. DETECT performance as well as performance on the comprehensive neuropsychological battery global scaled score. Thus, there were clear objective cognitive performance decrements associated with MCI status on both DETECT and the standard battery, but the MCI+ participants did not have greater cognitive complaints or rate their performance as worse on DETECT. There were also no differences in absolute misestimation.

As the MCI status difference in DETECT composite performance was significant, Table 3 presents the results of test-by-test performance on DETECT and the composite scores. Because of the significant composite effects, we did not correct for multiple comparisons. MCI+ participants performed worse than MCI− participants on three of the five individual DETECT tests (Word Memory-Delayed Recall: t = 1.99, p = 0.05; Shape Comparison: t

= 2.17, p = 0.03; 2-back Faces: t = 2.90, p < 0.01), on the DETECT composite score (t = 5.14, p<0.001), and the comprehensive neuropsychological battery (F = 9.97, p<0.001). Despite the objective performance differences, self-assessment scores for each DETECT task did not differ by MCI status. We did also not observe any differences in absolute value misestimation or PAOFI scores.

Using our previous strategies for defining directional mis-estimation[13,34] we identified the subgroups of participants who over-estimated, under-estimated, and accurately described their performance. This definition of IB was based on examining the differences in the z-scores for DETECT composite performance and composite self-assessment scores. We calculated under-estimation, accurate, and over-estimation, defined by <−0.5 SD; −0.50 SD to 0.5 SD; and >0.5 SD misestimation. When we identified these IB subgroups, we found that 42% of the full sample were accurate, 29% overestimated, and 29% underestimated.

We used Chi-square tests to compare the rates of these three self-assessment categories (accurate; overestimation; underestimation) by HIV and MCI status, we found no significant differences:

- IB status × HIV status: $X^2(2)=2.56$, $p = 0.28$
- IB status × MCI status: $X^2(2)=2.65$, $p = 0.26$

Table 4 presents correlations between the composite variables in the entire sample, using Bonferroni correction at p<0.01 for significance. Better composite comprehensive neuropsychological test performance was correlated with better performance on DETECT and reduced overall misestimation, and a directional bias toward underestimation of DETECT performance. A similar correlation was found between better performance on DETECT and a tendency toward an underestimation bias. A positive correlation was found between self-assessments of better DETECT cognitive performance and reduced cognitive complaints (i.e., PAOFI score). Overall depression scores were uncorrelated with any performance or self-assessment variables.

On a test-by-test basis, self-assessment of DETECT performance on three of the four domains was correlated with PAOFI scores. However, DETECT performance across all tests was uncorrelated with subjective global cognitive complaints (Table 5).

DISCUSSION

People with MCI performed worse on neuropsychological testing across two assessment strategies and did not report that their performance was impaired. Their judgments of their DETECT performance did not differ from the MCI− group, which outperformed them. Interestingly MCI− people misestimated their performance on DETECT to approximately the same extent as people with MCI. This misestimation of performance occurred at the composite level and was not driven by any individual tests. Worth highlighting is the *amount* of inaccuracy was the same for persons who were MCI+ and MCI−; however, the direction of inaccuracy was opposite in MCI+ compared to MCI− participants, although not meeting corrected criteria for significance. These findings highlight the need to consider both absolute accuracy and directionality of any misestimation to fully evaluate self-assessment

of performance. This same phenomenon was seen for global cognitive complaints, in that the more impaired MCI+ group did not differ in their PAOFI scores from the MCI− group.

In this sample of participants with minimal prior VR experience, an abbreviated assessment with a technology-based strategy yielded scores that shared over 25% of the variance with an extensive traditional assessment. Self-reported depressive symptoms were too modest in severity to influence either performance or self-assessment of performance. There were no relationships between depression and self-reported global cognitive complaints as measured with the abbreviated PAOFI. Reports on the abbreviated PAOFI, however, were related to impairment on the comprehensive neuropsychological battery as well as self-assessments of DETECT performance (but not actual DETECT performance), potentially rendering it a valuable adjunct instrument to index IA for self-assessments of global cognitive functioning. The higher correlations of PAOFI and in-person assessments may be related to much longer or broader personal experience with cognitive challenges, in contrast to the more specific demands of DETECT. It is critical to consider the level of depression reported, which appears to be considerably less than in other studies. It is notable that low levels of self-reported depression have been found to be correlated with overestimation in multiple domains, including cognitive abilities,[35] everyday functioning,[17] and quality of life[16] in studies of other conditions.

Practical implications of these findings include the need for considering support in daily living (e.g., offering to help with shopping, managing finances) for people with MCI. This has several downstream effects including: 1) Awareness of illness: people may believe they do not require treatment despite objective evidence of illness; 2) Medication adherence: people may believe they are more capable of medication self-management than they are; and 3) Living situation: independent living may be less feasible than the person with MCI recognizes. Caregivers, too, may be impacted. With the already high burden of caring for people with cognitive impairment, adding the need to adjust for an MCI+ person poorly gauging their cognitive abilities introduces another layer of complexity, and IA could be an important treatment target.[36] Abbreviated assessments have again been shown useful for the assessment of MCI and technology-based assessment strategies offer opportunities for remote assessment that are not possible with extensive in-person strategies.

There are limitations to this study. PWH in this study had been living with HIV for an average of 29 years, had high levels of ART adherence, and had low HIV viral loads; thus, they could be considered a resilient cohort, which may have impacted the finding of no HIV effects on cognitive performance. Relatedly, participants in this sample had a restricted and modest range of depression scores. Future work should examine these relationships in a sample of persons with MCI with more severe depressive symptoms.

CONCLUSIONS

Overall, this study examined cognitive performance and the accuracy of self-assessments of cognitive performance among a sample of persons with and without HIV and MCI. While no effects of HIV status were found for performance or self-assessment, MCI status was associated with poorer performance on testing and overestimations in self-

assessments. Thus, cognitive challenges can only be validly confirmed with performance-based assessments and exclusive reliance on self-reported cognitive performance, even when the reports are collected systematically and immediately, may lead to biased results across the range of cognitive functioning in older people.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

DISCLOSURES

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DATA STATEMENT

The data has not been previously presented orally or by poster at scientific meetings.

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Highlights

What is the primary question addressed by this study?

How accurate are self-assessments of cognitive performance and do they vary across different cognitive assessment strategies and human immunodeficiency virus and mild cognitive impairment (MCI) status.

What is the main finding of this study?

No effects of human immunodeficiency virus status were found for cognitive performance or self-assessment of performance. MCI status was associated with poorer performance on testing and overestimations in self-assessments.

What is the meaning of the finding?

Both MCI+ and MCI− participants misestimated their performance. Thus, cognitive challenges can only be validly confirmed with performance-based assessments, although comparing performance to self-assessments may identify important individual-level challenges.

FIGURE 1.
SAMSUNG Gear VR with controller, powered by oculus.

TABLE 1.

Neuropsychological Tests by Neurocognitive Domain

Verbal Fluency	**Executive Functioning**
Controlled Oral Word Association Test (FAS)	Wisconsin Card Sorting Test
Category fluency (Animals/Actions)	Trail Making Test (Part B)
Speed of information processing	Stroop Color-Word trial
WAIS-III digit symbol	Learning
WAIS-III symbol search	HVLT-R (Immediate recall)
Trail Making Test (Part A)	BVMT-R (Immediate recall)
Stroop color trial	Memory
Attention/working memory	HVLT-R (Delayed recall)
WAIS-III letter-number sequencing	BVMT-R (Delayed recall)
Paced auditory serial addition task	Motor
	Grooved pegboard

Note. HVLT-R: Hopkins Verbal Learning Test-Revised; BVMT-R: Brief Visuospatial Memory Test-Revised.

TABLE 2.

Demographics and Clinical Characteristics

Characteristic	HIV+/MCI+ (n = 54)[a]	HIV+/MCI− (n = 28)[b]	HIV-/MCI+(n = 25)[c]	HIV-/MCI− (n = 15)[d]	F/X^2 (p)	DF	Differences
Demographics							
Age (years), Mean (SD)	66.35(4.84)	66.75(4.84)	73.64(7.92)	71.80(6.33)	11.57(<.001)	121	a,b<c,d
Male, n (%)	37(69)	22(79)	14(56)	7(47)	.57(.13)	121	
Race					27.88(.14)		
White, n (%)	27(50)	14(50)	21(84)	9(60)			
Black n (%)	25(46)	12(43)	4(16)	5(33)			
Other n (%)	2(4)	2(7)	0(0)	1(7)			
Ethnicity n (%) Latinx	5(9)	3(11)	0(0)	1(6)	2.64(.47)	1	
Education (years), Mean (SD)	14.69(2.97)	13.75(3.15)	17.12(2.51)	14.73(3.58)	6.00(<.001)	121	a,b,d<c
Cognitive functioning							
DETECT total score	−.18(1.02)	0.36(0.86)	−.23(1.14)	0.37(0.91)	3.07(.03)	121	a=b=c=d
Global, Mean SS (SD)	7.25(1.48)	9.24(1.91)	8.63(1.93)	7.80(1.47)	9.97(<.001)	121	a,d<c<b
Clinical scales							
Geriatric Depression Scale (GDS), M(SD)	3.63(4.26)	3.03(3.31)	3.70(4.48)	2.98(2.91)	1.90(.13)	121	
Abbrv. PAOFI, M(SD)	0.62(2.54)	0.53(0.39)	0.67(0.27)	0.73(0.29)	0.75(.44)	121	
HIV **variables**							
Duration of HIV disease (years), M(SD)	26.12(8.04)	26.72(10.50)	—	—	.01(.78)	121	
Current CD4 count, M(SD)	675.30(172.03)	607.54(172.03)	—	—	1.44(.25)	121	
Nadir CD4 count, M(SD)[4]	193.84(200.04)	167.00(145.97)	—	—	.36(.54)	121	
AIDS, n (%)5	33(61)	20(71)	—	—	1.03(.80)	121	

TABLE 3.

Cognitive Performance, Self-Assessments of Performance, and Cognitive Complaints by MCI Status

MCI Status Analyses: DETECT Cognitive Task Performance							
DETECT Cognitive Tests	**MCI−**		**MCI+**				
	M	**SD**	**M**	**SD**	**t**	***p***	**d**
Word memory - Immediate recall	0.89	0.10	0.87	0.11	1.01	.31	.19
Word memory - Delayed recall	0.89	0.12	0.84	0.13	1.99	.048	.38
Shape Comparison - Total	0.77	0.17	0.69	0.21	2.17	.032	.41
Arrow Comparison - Total	0.22	0.14	0.18	0.13	1.78	.077	.34
1-Back Faces Subtest	0.55	0.27	0.51	0.21	0.79	.43	.15
2-Back Faces Subtest	0.58	0.24	0.45	0.23	2.90	.004	.55
DETECT Composite (Z-score)	0.21	0.56	−.12	0.58	3.06	.003	.58
Comprehensive Neuropsychological Battery Unadjusted Scaled Scores	9.04	1.91	7.43	1.49	5.14	<.001	.97
MCI status analyses: Self-assessments of DETECT performance							
Word memory performance	6.19	1.94	6.01	2.24	0.42	.69	.08
Shape Comparison Performance	6.26	2.24	6.03	2.24	0.54	.59	.10
Arrow Comparison Performance	4.23	2.31	4.39	2.36	0.36	.72	.07
Faces performance	5.07	2.28	5.18	2.49	0.23	.82	.04
DETECT Composite Difference Score[a]	−.26	0.85	0.14	1.05	2.17	.032	.41
Absolute Value Misestimation[b]	0.98	0.39	1.00	0.50	0.29	.77	.05
Abbreviated PAOFI[c]	0.60	0.36	0.64	0.37	0.54	.59	.11

Note. Higher DETECT performance scores reflect better cognitive performance; Lower self-assessment scores (1–10 scale) reflect lower estimated performance. DF=121.

[a]This difference score is calculated by subtracting composite scores for self-assessment scores from composite scores for actual performance; lower scores reflect lower self-assessments compared to performance.

[b]This difference score is the absolute value of the composite difference score; higher scores reflect greater mis-estimation.

[c]Patient's Assessment of Own Functioning, z-scores created; range from 0.00 to 1.00; lower scores reflect fewer cognitive complaints.

TABLE 4.

Correlations Between Cognitive Test Performance Self-Assessments of Performance, Cognitive Complaints and Depression

	DETECT Cognitive Module Composite	Self-Assessment of DETECT Performance	Assessment Bias (IB)	Absolute Value Mis-Estimation	Abbrv. PAOFI Total	GDS Total
Comprehensive Neuropsychological Battery composite	0.53[a]	−0.11	−0.27[b]	−0.13	−0.27[b]	−0.22
DETECT cognitive module composite	—	−0.05	—0.54[a]	−0.06	−0.13	−0.15
Self-assessment of DETECT performance	—	—	0.15	−0.17	0.31[b]	0.02
Assessment bias (IB)	—	—	—	0.16	−0.19	−0.03
Absolute value misestimation	—	—	—	—	−0.12	−0.12
Abbrv. PAOFI Total	—	—	—	—	—	0.14

Note: PAOFI = Patient Assessment of Own Functioning; GDS = Geriatric Depression Scale.

[a] p<0.001.

[b] p<0.01; all correlations have 121 DF.

TABLE 5.

Task by Task Correlations with Cognitive Complaints

Correlations between Global Cognitive Complaints and Self-Assessments of DETECT Task x Task Performance Ratings					
	Word Memory Performance Self Assessment	**Shape Comparison Performance Self-Assessment**	**Arrows Comparison Performance Self-Assessment**	**Faces Performance Self-Assessment**	
Abbrv. PAOFI Total Scores	−0.22	−0.29[a]	−0.23[a]	−0.30[a]	
Correlations between global cognitive complaints and DETECT objective performance					
	Word memory - Immediate recall	Word memory - Delayed recall	Shape Comparison - Total	Arrows Comparison - Total	2-Back caces
Abbrv. PAOFI Total Scores	0.00	−0.13	−0.11	−0.02	−0.15

[a] $p<0.01$; all correlations have 121 DF.