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Aging and HIV/AIDS: Neurocognitive Implications for Older HIV-Positive Latina/o Adults

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Abstract

In recent years, HIV/AIDS populations have become older and increasingly more ethnically diverse. Concurrently, the prevalence of HIV-related neurocognitive (NC) impairment remains high. This study examined the effects of age and ethnicity on NC function in HIV-positive adults. The sample ($N = 126$; 84 Latina/o and 42 Non-Hispanic White) completed a comprehensive NC battery. Global NC and domain average demographically-corrected t -scores were generated. There were no significant differences between Younger (<50 years) Latina/os and non-Hispanic Whites on Global NC function or NC domains (all p 's $>.10$), with generally small effect sizes. Older Latina/os (>50 years) were significantly more impaired than Older Non-Hispanic Whites on

processing speed and learning, with trends in Global NC function and memory. Further, effect sizes fell within the medium to large range (Cohen's d s = .49–1.15). This study suggests that older Latina/os are at potentially greater risk for NC impairment, particularly in processing speed and learning, when compared to similarly-aged non-Hispanic whites.

Keywords

aging; AIDS; cognition; health disparities; HAND; Hispanics; HIV; Latina/os; neurocognitive; neuropsychological impairment

Human Immunodeficiency Virus (HIV) is neurotropic, enters the central nervous system (CNS) early in the course of infection, and can result in marked neuropathological, neuroanatomic, and neurocognitive sequelae.^{1,2} The number of older adults (ie, ages 50 years) living with HIV has increased over recent years. This is due both to the longer life expectancies of adults already diagnosed with HIV on combined antiretroviral therapy (cART) and to increased numbers of new diagnoses within older adults.³ In fact, adults over the age of 50 constituted approximately 16% of all new HIV diagnoses in 2010, and the percentage of older persons living with HIV/AIDS (PLWHA) increased from 29% in 2007 to 33% in 2009.^{3,4} Estimates suggest that these trends will continue,⁴ and will contribute to the “graying of HIV.”

Despite advancements in treatment, recent research indicates that the prevalence of HIV-associated neurocognitive disorders (HAND) continue to remain as high as 52%, similar to rates reported in the pre-cART era.⁵ Emerging evidence further suggests that older PLWH may be at even higher risk for developing HAND, although this literature remains somewhat equivocal (Cherner et al., 2004; Valcour, 2004).^{6,7} A number of factors may potentially confer increased risk of neurocognitive decline in older PLWH, including increased risk for cardiovascular and cerebrovascular pathology, immunological changes, and expression of apolipoprotein E4 (APOE4), among others.⁸ However, the potential interactions of aging and HIV disease remain poorly understood.⁸

The risk factors for neurocognitive decline are especially salient for older racial/ethnic minority PLWHA, and this remains an understudied and poorly understood area. Not only has the HIV/AIDS population become older overall, but this population has also become increasingly ethnically diverse. In the US, the Latina/o population is disproportionately impacted by the HIV/AIDS epidemic. Among people 50 years or older in the US, Latina/os are five times as likely as their white counterparts to be living with HIV,³ and once infected, the HIV-seropositive Latina/o population carries greater disease burden compared to non-Hispanic white adults.⁹ For instance, HIV-seropositive Latina/o adults have a higher mortality rate, are more likely to die at significantly younger ages, and demonstrate significantly worse executive functioning (even after accounting for relevant covariates such as reading level which is a proxy for quality of education) compared to their non-Hispanic White counterparts.^{10,11,12,13}

The general US Latina/o population also suffers from myriad other health disparities, including higher rates of stroke, diabetes, obesity, and hypertension.^{10,14,15} Within an aging,

HIV-seropositive, and ethnically diverse urban cohort similar to that of the present study, vascular disease history was found to be greater among Latina/os, and associated with increased white matter hyperintensity severity.¹⁶ Thus, HIV-seropositive Latina/Latino adults may be uniquely at risk for deleterious neuropathological and neurocognitive sequelae within the context of aging. Indeed, data from the Veterans Aging Cohort 3-Site Study suggest that nationally, HIV-seropositive veterans of ethnic minority status have greater burdens of medical comorbidities, poorer health outcomes, and higher mortality rates compared to their non-Hispanic white counterparts.¹¹ Such findings highlight the presence of health disparities among PLWHA, even in the presence of equal health coverage through the VA system, and underscore the need to more fully understand the effects of HIV and aging within populations disproportionately affected by the disease.

The aim of this cross-sectional study was to examine whether Latina/os are at risk for worse neurocognitive outcomes, compared to non-Hispanic whites, within the context of aging and HIV. Given that prior research detailed above suggests that older PLWHA may be at increased risk for neurocognitive impairment *and* that Latina/os suffer higher levels of disease burden (*both* in HIV and other medical comorbidities associated health disparities, including vascular diseases) compared to non-Hispanic whites, we expected that older Latina/os would be at particular risk for HAND. First, we hypothesized that after accounting for relevant covariates (including reading level) among younger HIV-seropositive adults, there would be no significant differences in neurocognitive functioning between Latina/o and non-Hispanic white participants. This hypothesis is based on prior work by Rivera Mindt et al.¹³ which found similar findings with a demographically similar group. Second, we hypothesized that after accounting for relevant covariates (including reading level) among older HIV-seropositive adults, Latina/o participants would demonstrate significantly worse neurocognitive functioning compared to their older non-Hispanic white counterparts. This hypothesis is based on work discussed above regarding potentially greater HAND risk among older PLWHA and greater disease burden among Latina/os (in HIV and other chronic diseases).

Methods

Participants

This study included 126 HIV-seropositive adult participants, including 84 Latina/o and 42 non-Hispanic white (NHW) adults. The sample was drawn from an NIMH-funded medication adherence study (PI: M. Rivera Mindt; K23MH079718) based in the Spanish (East) Harlem neighborhood of New York City. Participants were primarily recruited through community outreach in New York City (particularly Spanish Harlem) and self-referral. Additional recruitment occurred through related studies and clinics at the Icahn School of Medicine at Mount Sinai.

All participants were HIV-positive (confirmed by medical records) and between the ages of 18 and 80. Inclusion criteria included HIV-seropositive status (confirmed by medical records); self-identification as Latina/o (any race) or non-Hispanic White ethnicity; proficiency in English; and stable antiretroviral therapy for at least 12 weeks (taken independently and in pill form). Exclusion criteria included self-reported history of any of

the following conditions that could impact cognition: severe psychiatric disorder (eg, schizophrenia, psychosis, or bipolar disorder) or significant non-HIV-related comorbid medical condition (eg, advanced liver or renal disease, Parkinson's disease, Lupus, Multiple Sclerosis, brain cancer or brain tumor, or chronic obstructive pulmonary disease, epilepsy).

Procedures

Participants completed comprehensive neuropsychological evaluations. They also provided urine and blood samples for toxicology tests and CD4 count cell enumerations and plasma HIV viral load assays, respectively. Estimated HIV duration was based on participants' self-report. All participants provided written informed consent. The study was approved by the Institutional Review Boards (IRB) of both the Icahn School of Medicine at Mount Sinai and Fordham University.

Neuropsychological Evaluation—Table 1 summarizes the neuropsychological test battery that participants completed, which included measures within the following putative neurocognitive (NC) domains: verbal fluency, executive function, processing speed, attention/working memory, learning, memory, and motor functioning. All of the measures in this battery have excellent psychometric characteristics in terms of both reliability and validity indices.¹⁷ Importantly, this test battery has been widely used and well-validated in HIV/AIDS populations.^{5,18} The battery was administered and scored by trained psychometrists using standardized procedures and supervised by a board-certified clinical neuropsychologist (MRM). Consistent with empirically supported methods, raw test data from our battery was transformed into demographically corrected *t*-scores using the best available published normative data (see Table 1). The *t*-scores of the individual tests in each domain were averaged to derive NC domain average *t* scores, and all individual test *t*-scores were averaged to derive the Global NC Average *t* score, which reflects global neurocognitive functioning.¹⁸ Consistent with prior literature, Global NC and Domain Average *t* scores <40 were considered impaired and cut-offs for levels of NC impairment (ie, mild, moderate, etc.) were also based on this prior literature.^{2,5,18}

The Wide Range Achievement Test (WRAT-3) Reading Recognition subtest is a test of single word reading that was administered as a measure of quality of education.^{19,20} The psychometric properties of the WRAT-3 Reading subtest are well-established with adequate reliability coefficients (>.90) and validity indices (including convergent and content validity).¹⁹ Further, there is strong empirical support showing that performance on single word reading tests (such as WRAT-3 Reading subtest) is among the most valid estimates of quality of educational experience among multiethnic samples.²¹

Beck Depression Inventory—Second Edition (BDI-II)—The Beck Depression Inventory—Second Edition (BDI-II)²² was administered to evaluate depressive symptoms over the past two weeks. The BDI-II Fast Screen (BDI-II FS) score (based on 7 items of the BDI) was used in order to minimize the impact of the somatic complaints associated with the medical symptoms of HIV.^{23,24} In an HIV-positive sample, the BDI-FS demonstrated high internal consistency (Cronbach $\alpha = .84$) and cut-off scores of 4 and above yielded a high sensitivity rate (90%) and 74% sensitivity for detecting patients with and without

diagnosed mood disorders.²⁴ BDI-FS total scores have also been found to be either not significantly or minimally correlated with sex, age, ethnicity, and type of medical diagnosis.²⁵

Acculturation—Participants completed the Abbreviated Multidimensional Acculturation Scale (AMAS),²⁶ a self-report acculturation questionnaire. This brief questionnaire assesses both US and Latina/Latino (ie, culture of origin) acculturation levels and is comprised of six subscales (three for each US and Latina/Latino acculturation domain) related to language competence, cultural competency, and cultural identity. From these subscales, two summary measures of acculturation were computed: (1) Total US Acculturation Score and (2) Total Latina/o Acculturation Score (scores ranging from 1 to 4 for each summary score; higher levels represent higher acculturation levels.) The AMSA has Cronbach alpha coefficients ranging from .83 to .97 across AMAS subscales. Further, the AMAS has shown adequate validity and has been used previously with HIV-positive populations.^{26,27} The AMAS Total US Acculturation Score was used in this study's posthoc analyses.

Statistical Analyses

The Statistical Package for the Social Sciences (SPSS) Version 18.0 was used for data analysis. A p level of .05 was used to determine statistical significance. Participants under the age of 50 were considered “younger adults” ($n = 82$), and participants 50 years old or older were considered “older adults” ($n = 44$).

Demographic and clinical characteristics, which were *not* accounted for in the demographically-corrected norms utilized for the neurocognitive data (ie, CD4 count, % Detectable HIV viral load, BDI-II FS, and WRAT-3 Reading subtest), were examined as potential covariates. To be included as a covariate, the variable must have been significantly different between Latino and NHW groups ($p < .05$) and significantly correlated with a NC outcome variable ($p < .05$). As Table 2 illustrates, among the Younger Adult group, there were no significant differences between the NHW and Latino participants on the demographic or clinical characteristics noted above (all $ps > .05$), with the exception of HIV duration (years) in which the NHW group had significantly longer estimated HIV duration compared to the Latina/o group ($t_{(37)} = 2.71$, $p = .01$). However, estimated HIV duration was not significantly associated with any of the NC t scores (all $ps > .10$) and was thus not included as a covariate. Among the Older Adult group, the only significant between-group differences were on age and the WRAT-3 Reading subtest (all $ps < .05$), with the older NHW group being significantly older and performing better on the WRAT-3. Given that the NC t scores demographically correct for age already, age was not included as a covariate. In contrast, the Older Latino participants performed significantly worse than their non-Hispanic white counterparts *and* the WRAT-3 was significantly correlated with all of the NC Average t scores (all $ps < .05$), with the exception of processing speed and motor functioning. Thus, the WRAT-3 was therefore included as a covariate in all relevant comparisons within the Older group.

Results

Table 2 summarizes the demographic and clinical characteristics of the sample. Overall, the sample was 74% male and 66% Latina/Latino with a mean age of 47.04 years ($SD = 8.75$) and a mean education of 13.25 years ($SD = 2.49$). Of the entire sample, 14% was immunosuppressed (ie, CD4 count <200), and 40% of the sample had detectable HIV viral load levels (>49 copies/mL). The WRAT-3 Reading scores suggest low average quality of education for all groups, with the exception of the Older NHW group, which fell in the average range. The sample as a whole had a BDI-II FS total score of 3, which is below the cutoff of 4 points for significant depressive symptomology.²² The vast majority of Latina/o participants were of Caribbean (Puerto Rican or Dominican) origin. In terms of acculturation, Latina/o participants' average AMAS Total US Acculturation scores fell in the high range ($M = 3.44$, $SD = 0.45$; Range = 1–4) suggesting a relatively high level of overall acculturation to US majority culture.

As mentioned above, the Younger Latina/o group had significantly shorter reported estimated HIV duration compared to their NHW counterparts. Further, although there were no other significant between-group differences on other HIV clinical characteristics (eg, CD4 count, % AIDS, % detectable HIV viral load; all $ps > .05$), it is notable that the Younger and Older Latina/o participants appeared more likely to have an AIDS diagnosis (approximately four- and three-times as likely, respectively) and almost twice as likely to have a detectable HIV viral load count compared to their NHW counterparts.

As illustrated in Table 3, the overall sample performed in the low average to average range in terms of Global NC function and across the specific NC domains. Within the Younger group, Global NC and NC domain performance fell generally within normal limits (ie, average NC t scores ≤ 40) for both the NHW and Latina/o participants. The results of a series of ANOVA analyses, solely within the Younger group, revealed no significant differences between Latina/os and NHWs on Global NC or NC domain performance (all $ps > .10$). Small effect sizes were observed for all of the NC variables, with the exception of Executive Function, for which a medium effect size was observed (Cohen's $d = .52$).

As Table 3 further demonstrates, within the Older group, on average Latina/o participants demonstrated mild impairment in learning and mild-to-moderate impairment in memory, whereas no such impairments were observed in the NHW group in these domains. The results of a series of ANOVA and ANCOVA (controlling for WRAT-3 where appropriate) analyses, solely within the Older group, revealed that Latina/os performed significantly worse than NHWs in the areas of processing speed ($p = .049$) and learning ($p = .04$), as well as trend-level differences in Global NC function ($p = .054$) and memory ($p = .057$). These effect sizes ranged from medium to large for all NC variables (Cohen's $ds = .49$ [attention/working memory] – 1.15 [memory]), with exception of motor functioning, which fell in the small range (Cohen's $d = .05$). In addition, posthoc Pearson correlational analyses were computed to examine whether the AMAS Total US acculturation score was associated with NC functioning within this group. The results revealed no significant associations between acculturation with Global NC or NC domain performance ($rs = .09$ [memory] – $.21$ [verbal]; all $ps > .40$).

Lastly, posthoc analyses were conducted to examine whether certain HIV clinical characteristics (ie, estimated HIV duration, CD4 count, % AIDS diagnosis, and % detectable viral load) were related to NC functioning. Within the Younger group, the results revealed no significant associations, with the exception of higher % detectable viral load being significantly related to worse memory performance ($t_{(41)} = 2.45, p = .02$). Within the Older group, the results revealed no significant associations with HIV clinical characteristics and NC functioning (all $ps > .10$).

Discussion

The HIV/AIDS epidemic has evolved from a fatal disease to a chronic illness, but the prevalence of HIV-associated neurocognitive disorders (HAND) remains high and older PLWHA may be at increased risk for hand. At the same time, the US Latina/o population is disproportionately impacted by both this epidemic and significant health disparities. Therefore, it is critical to understand neurocognitive outcomes of Latina/os on within the context of aging and HIV in order to inform treatment and improve health outcomes within this growing population. The results of this study revealed no significant differences in neurocognitive function among younger (<50) Latino and non-Hispanic white participants. In contrast, older (> 50 years) HIV-seropositive Latina/os demonstrated significantly greater neurocognitive impairment compared to their older non-Hispanic white counterparts in terms of processing speed and learning, as well as trend level impairments in memory and global neurocognitive functioning. The observed effect sizes were generally large, and suggest that even after accounting for relevant covariates (ie, quality of education), Latina/o ethnicity may put one at much higher risk for HAND.

Prior research shows that both HIV and aging are risk factors for cognitive decline,^{7,28–30} although research on their combined effects has been equivocal. The current findings extend the line of prior literature suggesting increased risk of neurocognitive decline for older HIV-infected adults,^{6,7} at least with regard to certain at-risk groups such as older HIV-seropositive Latina/os. Specifically, a number of studies show that older HIV-seropositive individuals tend to perform more poorly across multiple neurocognitive domains (eg, learning, memory, executive functions, motor speed) than their younger HIV-seropositive counterparts and be at increased risk for meeting criteria for HAND.^{6,7,31–34} Similarities have led some to observe that the neurocognitive effects of HIV are actually quite similar to the changes in cognition associated with the normal aging process.³³ Older adults are also at an increased risk for vascular disorders and degenerative disease, as well as immunological changes and expression of apolipoprotein E4 (APOE4), all of which may have a negative impact neurocognitive functioning.^{8,35} This is especially relevant for HIV-seropositive older adults, as comorbidities are common in this population.³⁶

The results of this study highlight that HIV-seropositive Latina/os may be uniquely at risk for deleterious neuropathological and neurocognitive sequelae within the context of aging. Although incredibly complex, there are multiple possible explanatory factors that may account for this potentially unique risk, including HIV disease burden, sociocultural factors, and/or comorbid health disparities. In terms of HIV disease burden (eg, HIV duration, CD4 count, AIDS diagnosis, HIV viral load), compared to their non-Hispanic white counterparts,

the younger Latina/o participants in this study had significantly shorter estimated HIV duration. Moreover, compared to their respective counterparts, both younger and older Latina/os were over three times as likely to have an AIDS diagnosis and twice as likely to have detectable HIV viral load. This disproportionate HIV disease burden may relate at least in part to the fact that Latina/os tend to get tested for HIV late in their illness.⁴ However, the current study findings do not suggest that HIV disease burden was significantly associated with neurocognitive functioning among the older participants in this sample.

In terms of sociocultural factors that are strongly associated with neurocognitive test performance (eg, quality of education, acculturation) among racial/ethnic minority populations (particularly Latina/os and African Americans),^{13,20,21,37} these factors also did not figure prominently into the current findings regarding our older HIV-seropositive Latina/o participants. However, US Latina/os do suffer from additional health disparities beyond HIV (ie, higher rates of stroke, diabetes, obesity, and hypertension)^{10,15} that may elevate their risk for HIV-related neurocognitive sequelae in the context of advanced age. Might it be that these health disparities have an increasing impact within an older population due to the increasing prevalence and salience of medical risk factors? The results of one large-scale study suggest that vascular disease factors (ie, history of diabetes, hypertension, heart disease, and stroke) would be particularly important for consideration within the context of the current findings. Specifically, Brickman et al¹⁶ found that compared to their non-Hispanic white counterparts, non-demented Latina/o elders (culturally similar to the current study's Latina/o sample) demonstrated significantly more white-matter hyperintensities which were partially attributable to differences in vascular disease. However, an important limitation of the current study was that vascular disease factors were not examined.

This study also had some additional limitations that merit discussion. First, the majority of subgroups examined in this study were relatively small. Despite this fact, robust effect sizes were observed in the analyses comparing the older Latina/o and non-Hispanic white participants. Second, this study took place in New York City and the majority of Latina/o participants were of Caribbean (Puerto Rican or Dominican) origin. The current findings may not be generalizable to Latina/o subpopulations from other regions of the US or other countries of origin (eg, Mexican/ Mexican-Americans from the Southwest). Third, this study was cross sectional in design, and did not follow an aging cohort over time. Thus, we were unable to determine whether the age-related differences in our populations suggested a different course of disease in Latina/os compared to non-Hispanic whites, or differences in the pools of individuals acquiring HIV disease in older age. That is, results might suggest that for populations surviving into older ages, selective NC advantages are recognized by non-Hispanic whites due to a variety of factors, inclusive of lower burden of cognitively relevant incident comorbidities. Alternatively, these results may reflect differences in when the aging populations are diagnosed with HIV in terms of their underlying disease progression; if the Latina/o populations enter the HIV pool either in more advanced stages of disease, or at a later chronological time point (older age), a cognitively advantageous survivor effect may not be realizable.

While not a limitation per se, it is also worth mentioning that it was not initially anticipated that the older non-Hispanic white group would perform better than the other groups on some of the NC measures (eg, Global NC, Verbal Fluency, Attention/WM). However, this group had the highest education level and reading levels (ie, quality of education; WRAT-3 Reading subtest) of any of the study groups. Based on these two factors, these results make sense. Within the study, we addressed these issues by utilizing demographically-corrected norms that corrected for years of education and covaried for reading level (quality of education) in all cases where this variable was associated with neuropsychological test performance.

Despite the current study's limitations, it also has important strengths that merit attention. This study represents an important first step in specifically examining the neurocognitive functioning of a potentially at-risk population, older Latina/os living with HIV/AIDS. Second, this study utilized a well-validated neuropsychological battery that has been used extensively in HAND research. Further, the converging demographic shifts of the HIV/AIDS epidemics, with this population simultaneously becoming older and more ethnically diverse, make this study particularly timely. The focus of this study on reducing health disparities among the Latina/o population is important given that this is the largest and fastest growing racial/ethnic minority group in the US. Lastly, this study successfully recruited a highly unique and previously understudied research cohort (HIV-seropositive Latina/os).

Moving forward, it is critical for future studies to address the potential role of cardiovascular and other medical comorbidities in HAND risk among aging HIV-seropositive Latina/os. Future studies would also benefit from larger sample sizes, well-characterized Latina/o samples, and longitudinal study designs.

Conclusions

Taken together, the ongoing high rates of HAND, along with Latina/os overrepresentation in the HIV/AIDS epidemic and other health disparities, makes it important to examine the neurocognitive effects of HIV and aging specifically within this population. This study suggests that older HIV-seropositive Latina/o adults may be at increased risk for HAND as compared to their older non-Hispanic white counterparts, particularly in the areas of processing speed and learning. This may be explained by a high disease burden of medical comorbidities within the HIV-positive Latina/o population, but further research is needed to delineate these explanatory factors. Clearly, HAND remains a serious issue for people living with HIV, especially older adults, even in the era of cART. These findings highlight the need for further research to inform future treatment options, advance our understanding the neuropathology of HAND, and improve neurocognitive and health outcomes for aging HIV-seropositive Latina/os.

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Table 1
Neurocognitive Test Battery and Normative Data by Seven Major Ability Areas for
Computation of Average *t* Scores and Deficit Scores^{38–43}

Neuropsychological Domain and Test	Normative Data Source	Normative Data Characteristic ^a
Executive Functioning		
Wisconsin Card Sorting Task–64 Item	Kongs et al 2000 ³⁸	1, 2
Trail Making Test (Part B)	Heaton et al 2004 ³⁹	1, 2, 3, 4
Iowa Gambling Task	Bechara 2007 ⁴⁰	1, 2
Attention/Working Memory		
WAIS-III Letter Number Sequencing	Heaton et al 2003 ⁴¹	1, 2, 3, 4
PASAT Total Correct	Heaton et al 2004 ³⁹	1, 2, 3, 4
Learning		
Hopkins Verbal Learning Test–Revised	Benedict et al 1998 ⁴⁴	1
Brief Visuospatial Memory Test–Revised	Benedict 1997 ⁴²	1
Delayed Recall		
Hopkins Verbal Learning Test–Revised	Benedict et al 1998 ⁴⁴	1
Brief Visuospatial Memory Test–Revised	Benedict 1997 ⁴²	1
Motor		
Grooved Pegboard Time	Heaton et al 2004 ³⁹	1, 2, 3, 4
Speed of Information Processing		
WAIS-III Digit Symbol	Heaton et al 2003 ³⁹	1, 2, 3, 4
WAIS-III Symbol Search	Heaton et al 2003 ⁴¹	1, 2, 3, 4
Trail Making Test (Part A)	Heaton et al 2004 ³⁹	1, 2, 3, 4
Verbal Fluency		
Controlled Oral Word Association Test (FAS)	Heaton et al 2004 ³⁹	1, 2, 3, 4
Semantic (Animal) Fluency	Heaton et al 2004 ³⁹	1, 2, 3, 4

Notes. WAIS = Wechsler Adult Intelligence Scales; PASAT = Paced Auditory Serial Arithmetic Test.

^aNormative data corrects for the demographic characteristics indicated by numbers 1–4: 1 = Age; 2 = Education; 3 = Sex; 4 = Ethnicity.

Table 2

Demographic and Clinical Characteristics of the Sample

	Sample Mean (SD)% N = 126	Younger Group Mean (SD)% n = 82		Older Group Mean (SD)% n = 44	
		NHW n = 20	Latina/o n = 62	NHW n = 22	Latina/o n = 22
Age	47.04 (8.75)	42.70 (6.17)	42.08 (6.00)	57.82 (5.96)	54.18 (4.02)
Education (y)	13.00 (3.04)	13.05 (2.97)	12.39 (2.00)	15.23 (2.54)	13.95 (1.86)
WRAT-3 Reading	91.12 (14.96)	87.42 (16.12)	87.30 (12.72)	106.43 (9.33)	86.59 (15.16)
AMAS US Acculturation ^a	3.44 (0.48)	—	3.41 (0.45)	—	3.49 (0.44)
BDI-FS	3.25 (3.27)	5.05 (4.30)	3.05 (2.84)	3.33 (3.18)	2.05 (2.87)
HIV+ duration (y)	15.92 (6.09)	18.90 (4.46)	13.5 (5.96)	18.42 (7.29)	16.36 (4.23)
CD4 cell count ^{b,c}	446 (266–712)	420 (263–694)	404 (153–582)	664 (362–851)	517 (280–746)
Male	74%	71.4%	72.1%	86.4%	68.2%
Latina/o	66%	0%	100%	0%	100%
AIDS (CD4 <200)	14%	4.8%	21.4%	4.5%	14.3%
HIV RNA detectable	40%	28.6%	50.9%	22.7%	42.9%

Notes. NHW = Non-Hispanic White; WRAT-3 = Wide Range Achievement Test–3rd ed.; AMAS = Abbreviated Multidimensional Acculturation Scale Total US Acculturation Score; BDI-FS = Beck Depression Inventory–2 Fast Screen.

^a Only Latina/o participants;

^b Median;

^c Interquartile range.

Table 3
Mean Neurocognitive (NC) *t* scores for Entire Sample and By Age Group (N = 126)

	Younger Group Mean (SD) n = 82				Older Group Mean (SD) n = 44			
	White n = 20	Latina/o n = 62	F	d	White n = 22	Latina/o n = 22	F	d
Global NC ^a	42.93 (7.66)	41.48 (7.20)	.09	.21	46.83 (5.92)	40.49 (6.47)	3.94**	1.02
Verbal Fluency ^a	46.13 (10.45)	42.94 (11.66)	.40	.28	50.23 (10.81)	41.70 (9.76)	.92	.83
Executive Function ^a	47.38 (13.29)	41.70 (10.02)	2.60	.52	47.91 (9.40)	42.07 (9.55)	1.32	.62
Processing Speed	48.15 (10.55)	46.54 (9.61)	.38	.16	48.56 (6.62)	44.05 (8.13)	4.09*	.61
Attention/WM ^a	40.69 (8.04)	42.71 (7.79)	2.00	.26	46.12 (10.41)	41.50 (8.55)	2.66	.49
Learning ^a	38.63 (12.97)	34.73 (10.46)	.66	.35	46.00 (9.74)	35.24 (10.06)	4.30*	1.09
Memory ^a	38.08 (12.97)	37.19 (11.54)	.02	.07	47.00 (10.36)	34.98 (10.60)	3.84**	1.15
Motor	39.84 (10.32)	42.85 (11.23)	1.06	.27	41.68 (7.95)	41.26 (9.67)	.02	.05

Notes. WM = Working memory;

^a controlled for WRAT-3 Reading subtest score within the Older group comparisons.

* $p < .05$;

** $p = .05-.09$.