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Poor Self-efficacy for Healthcare Provider Interactions Among Individuals with HIV-Associated Neurocognitive Disorders

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Abstract

Two factors that influence HIV health behaviors and therefore may contribute to gaps in the HIV treatment continuum are poor health-related self-efficacy and HIV-associated neurocognitive disorders (HAND). However, the relationship between HAND and self-efficacy has not been assessed. In an HIV sample, 91 individuals with intact cognition (HAND−) and 40 individuals with HAND (HAND+) were administered a measure of self-efficacy for healthcare interactions with providers. Participants with HAND had significantly lower scores on this measure, which were correlated with poorer episodic and semantic memory performance, as well as self-reported memory symptoms in daily life. Findings suggest that neurocognitive impairment, and particularly memory dysfunction, may play an important role in self-efficacy for healthcare interactions in HIV. Further examination of the interplay between HAND and self-efficacy is warranted as these two factors may be important for the public health goal of identifying targets for improving access, delivery, and maintenance of HIV care.

Keywords HIV · Cognition · Self-efficacy · Medication adherence · Episodic memory

Introduction

In recent years, advances in the medical management of HIV infection have greatly improved health outcomes and extended the longevity of persons living with HIV disease (PLWH) such that those who receive proper and consistent care have nearly the same life expectancy as the general uninfected population (Samji et al., 2013). However, successful HIV care involves passing through several stages of a continuum, or "cascade," of treatment that were defined by Gardner, McLees, Steiner, del Rio, & Burman (2011) as testing/diagnosis of HIV infection, linkage to care, engagement/retention in care, prescription of antiretroviral therapy (ART), and successful achievement of viral suppression (through successful medication adherence). Data collected by the Centers for Disease Control (2014) reveal that each successive stage of the continuum demonstrates increasingly greater need for improvement in the care and management of HIV; specifically, out of the approximately 1.2 million people living with HIV infection, an estimated 14% are unaware of their status, 60% are not routinely engaged in care for HIV disease management, and 70% have not achieved viral control (i.e., viral suppression). Stated another way, these numbers from the CDC report (2014) indicate that only 3 in 10 PLWH are experiencing the positive outcomes of successful HIV care in the United States (i.e., virologic control), and most of those who fall short of this goal are aware of their HIV status but nevertheless experience a variety of barriers to HIV care and/or do not properly manage their healthcare regimens. The cascade starkly highlights the need for identifying targets to improve access, delivery, and maintenance of HIV care, not only to benefit those who are already living with HIV but also for the public health importance of interrupting the cycle of HIV transmission (CDC, 2014).

Although many of the steps to enhancing the engagement of PLWH in regular HIV care involve addressing external institutional (e.g., availability of HIV clinics) and/or societal

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barriers (e.g., stigma), efforts should also be geared toward identifying and remediating individual differences that may also contribute to the gaps in HIV care. One such important factor is diagnosis of HIV-associated neurocognitive disorders (HAND). Due to the neurovirulence of HIV, which affects the central nervous system beginning in the early stages of infection (Ellis, Calero, & Stockin, 2009), up to 50% of PLWH are diagnosed with HAND even in the era of combined antiretroviral therapy (cART; Heaton et al., 2010). Broadly, the profile of HIV-associated impairment involves slowed speed of information processing, fine motor impairment, executive dysfunction, and deficient verbal and episodic memory abilities (e.g., Heaton et al., 2010; Reger, Welsh, Razani, Martin, & Boone, 2002). Of clinical relevance, HAND is a robust predictor of real-world functioning, including health-related activities such as medication non-adherence (Heaton, Marcotte, et al., 2004; Hinkin et al., 2002) and retention in care (Jacks et al., 2015). Recent longitudinal findings showing that neuropsychological decline was associated with viremia in a sample in which the majority of PLWH were prescribed ART illustrates the role of HAND-related suboptimal adherence in the clinically important endpoint of virologic control (Heaton et al., 2015).

It is also likely that HAND negatively impacts other stages in the cascade given that the relatively high cognitive demands of health behaviors such as engaging in care, attending medical appointments, and following medical recommendations require a person to use cognitive abilities that are often impaired in those with HAND (Jacks et al., 2015; Waldrop-Valverde, Guo, Ownby, Rodriguez, & Jones, 2014). For example, a person must process incoming information quickly and efficiently during relatively brief interactions with health professionals (speed of information processing); plan and problem-solve arrangements in his/her schedule to incorporate health-related activities (i.e., executive functions); and remember his/her medical appointment date and time, and both learn and recall the medical information received during the appointment (i.e., episodic memory).

Another individual-level factor that likely accounts for some of the treatment gaps illustrated by the HIV cascade is health-related self-efficacy, or a person's self-perceived ability to successfully perform tasks or behaviors related to healthcare. Self-efficacy is a key component of Social Cognitive Theory that has been extensively studied as an important factor in health behavior, in part helping to explain why knowledge alone is often not sufficient to facilitate behavior change (Bandura, 1990). Importantly, there is evidence suggesting that self-efficacy can be successfully leveraged to improve engagement in HIV care (e.g., Shively, Smith, Bormann, & Gifford, 2002). Many studies to date have focused specifically on the outcome of adherence to HIV medications, with findings showing that lower self-efficacy is associated with worse medication adherence

(e.g., Langebeek et al., 2014). In these studies, measures of self-efficacy tend to be task-specific, meaning that they reflect the individuals' beliefs about their ability to take their medication as prescribed (Johnson et al., 2007). Given that gaps exist across all stages of the HIV treatment cascade (i.e., not just for medication adherence), examination of a broader type of self-efficacy for multiple types of healthcare interactions is warranted. Moreover, a common thread across the treatment continuum is the interface between patients and medical professionals, but nevertheless this aspect of self-efficacy has received less attention in HIV. Some studies have examined the role of the patient's perception of healthcare interactions in relation to downstream outcomes such as medication adherence, and better perceived interactions or "engagement" with providers typically relate to better outcomes (e.g., better adherence, Bakken et al., 2000). In a more recent study, patient–provider communication did not moderate the relationship between health literacy and appointment attendance in HIV+ individuals (Waldrop-Valverde et al., 2014). In these studies, the operationalization of patient–provider communication was more consistent with attitudes toward medical providers, including emotional support and professionalism factors, than with the patient's self-perceived ability to navigate conversations and communicate with medical providers, which is more consistent with self-efficacy.

Given that individuals with HAND may be more likely to experience difficulties in healthcare environments and with healthcare professionals, they may subsequently have low self-efficacy for dealing with healthcare interactions as a result. Indirect evidence of this relationship was reported by Manly et al. (1997) who reported that neurocognitively impaired HIV+ individuals were more likely to use confrontive and impulsive methods of coping in stressful situations relative to unimpaired individuals, which suggested that their impairment limited their resources for handling such situations. More direct evidence may be established by examining the Dealing with Health Professionals (DWHP) subscale of the Beliefs Related to Medication Adherence Scale (BERMA; Mcdonald-Miszczak, Maris, Fitzgibbon, & Ritchie, 2004), which addresses self-efficacy for a wide range of healthcare interactions, including confidence regarding communication with healthcare professionals (e.g., doctors, pharmacists) about medications and other treatment options, ability to access and understand medical information when needed, and emotions elicited by healthcare interactions (e.g., anxiety).

Given the known link between poor health outcomes and both HAND and health-related self-efficacy, low self-efficacy among individuals with HAND may result in particularly poor performance of health behaviors and greater vulnerability to adverse health outcomes. Demonstrating that individuals with HAND have lower self-efficacy for

healthcare provider interactions may therefore be an important finding in the effort to address the HIV treatment cascade given that it is an individual-level factor that is highly amenable to intervention and remediation. Accordingly, the present study hypothesized that an effect of HAND would be observed on the BERMA DWHP subscale such that individuals with HAND would demonstrate lower self-efficacy for healthcare interactions relative to PLWH without HAND. The cognitive correlates of BERMA DWHP will also be examined.

Method

Participants

The study sample comprised 131 adults with HIV infection who participated in an R01 parent study funded by the National Institute of Mental Health that recruited participants from local HIV clinics and the greater community of San Diego, CA. This study was approved by the Institutional Review Board of the University of California, San Diego (UCSD). HIV status was determined by enzyme-linked immunosorbent assays with Western Blot test confirmation. Individuals were excluded from the parent study if

their verbal IQ scores were below 70 (based on Wechsler Test of Adult Reading, WTAR; The Psychological Corporation, 2001) or if they reported histories of severe psychiatric (e.g., psychosis), medical (e.g., advanced liver disease), or neurological (e.g., stroke, traumatic brain injury with loss of consciousness > 30 min, seizure disorders) conditions that are known to affect cognition, including substance dependence within 6 months of the study visit (as determined by the Composite International Diagnostic Interview; CIDI version 2.1; World Health Organization, 1998) or positive urine toxicology test for illicit substances on the day of testing. Individuals who were not taking antiretroviral medications (ARV) were also excluded because they would not have completed the BERMA questionnaire.

As shown in Table 1, there were two primary study groups: PLWH who were diagnosed with HAND (HAND+, $n = 40$) and PLWH whose neurocognitive performance was within normal limits (HAND−, $n = 91$). HAND diagnoses were assigned in accordance with current neuroAIDS diagnostic recommendations (i.e., Frascati criteria; Antinori et al., 2007) and were based upon the results of a comprehensive evaluation that assessed the cognitive domains that are commonly affected in HAND (details below). The HAND group comprised two subgroups, including individuals whose neurocognitive impairment did not interfere with

Table 1 Demographic, psychiatric/mood, and HIV disease characteristics

	HAND− (n = 91)	HAND+ (n = 40)	p value
Demographics			
Age	45.81 (7.6)	46.55 (10.34)	.65
Education	13.87 (2.76)	12.9 (2.72)	.07
Ethnicity			
% Caucasian	71%	55%	.07*
% African American	17%	32%	–
% Asian	1%	0	–
% Hispanic	10%	13%	–
% Native American	1%	0	–
Psychiatric/mood			
% Lifetime major depressive disorder	45%	60%	.11
% Lifetime substance use disorder	70%	73%	.80
% Clinically elevated affective distress	34%	40%	.52
HIV disease			
Duration of infection	17.03 [9.26, 20.72]	13.67 [8.11, 19.54]	.27
Nadir CD4	125 [28, 239]	111 [49.25, 306]	.43
Current CD4	535.5 [323.25, 726.75]	499.5 [317, 917]	.79
Plasma viral load (log10)	1.7 [1.7, 1.7]	1.7 [1.7, 1.7]	.35
AIDS status (% AIDS)	70%	58%	.16

HAND HIV-associated neurocognitive disorder, *HAND−* group of PLWH whose cognition performance was within normal limits, *HAND+* group of PLWH with cognitive impairment, *CD4* coefficient of determination 4, *AIDS* Acquired Immune Deficiency Syndrome

*p value for % Caucasian ethnicity represents a contrast with all other ethnicities combined given that the cell sizes for the other groups were small

everyday functioning (i.e., asymptomatic neurocognitive impairment, ANI; $n = 29$) and those who had experienced everyday functioning declines (i.e., syndromic HAND; $n = 11$, including 9 individuals with Mild Neurocognitive Disorder and 2 individuals with HIV-associated dementia). All diagnoses were based on ratings made by a trained clinical neuropsychologist using a standardized procedure described by Woods et al. (2004). As defined by the Frascati criteria, a minimum of mild impairment (or greater) in at least two cognitive domains was required for determination of an impaired global score, and the cognitive impairment must not be clearly attributable to an etiology other than HIV (i.e., the impairment was "incidental," meaning entirely attributable to HIV, or "contributing," meaning that HIV played a large role in the presence of the impairment, but not "confounded," meaning likely attributable to another insult or insults). Moreover, the ANI and syndromic HAND diagnoses were distinguished by the absence or presence of everyday functional decline, respectively, and the role of depression was considered in this differentiation, in accordance with the Frascati criteria (i.e., depression can also manifest real-world function decline) (Antinori et al., 2007).

Given the relatively small sizes of the HAND subgroups, descriptive data are presented in Table 1 collapsed across the ANI and syndromic diagnoses as a combined HAND group, and group differences between the HAND− and HAND groups are displayed. Of note, the pattern of omnibus differences across all three groups is consistent with the two-group findings displayed in the table. The only significant group difference was observed for the sex breakdown between the groups, with a higher proportion of males in the HAND− group compared to the HAND group ($p = .01$). The groups were otherwise comparable with regard to demographics, current and lifetime psychiatric characteristics, and HIV disease characteristics (all $ps > .05$).

Materials and Procedure

Self-efficacy for Healthcare Provider Interactions

The BERMA questionnaire (Mcdonald-Miszczak et al., 2004) contains a 23-item DWHP subscale that was used in the present study to evaluate self-efficacy for healthcare interactions. Sample items from the DWHP subscale include: "I am good at asking questions about my medical conditions"; "I have difficulty talking openly with my physician"; "If I have to approach my pharmacist to get health care information, I know I will have difficulty doing it"; "I would feel on edge right now if I had to speak with a health professional about my conditions or treatments." Participants rated each BERMA DWHP item on a five-point Likert scale ranging from 1 = "*strongly disagree*" to 5 = "*strongly agree*." Some items were reverse-scored so that higher DWHP

summary scores represent better self-efficacy for healthcare interactions, and the subscale range was from 23 to 115.

Prior data support the reliability and factor structure of the BERMA and its subscales (Mcdonald-Miszczak et al., 2004). In the current study sample, the split-half reliability (i.e., Spearman–Brown correlation) of the BERMA DHWP scale was .94 and its internal consistency (i.e., Cronbach's alpha) was .94. To support the criterion-related validity of the BERMA DWHP as a measure of health-related self-efficacy, its correlation with an objective measure of medication adherence was examined in a subset of individuals ($n = 78$) whose ART adherence was assessed over a month with the medication event monitoring system (MEMS; Aprex, Union City, CA). A summary MEMS measure representing the percent of prescribed doses taken correctly was significantly correlated (using Spearman's rho given the non-normal distribution of the MEMS data) with the BERMA DHWP, $rho = 0.31$, $p = .005$.

Neurobehavioral Assessment

Assignment of HAND Diagnoses All participants completed a comprehensive neuropsychological battery that assessed cognitive domains commonly affected in HAND (Antinori et al., 2007). These domains were utilized in determining the diagnostic clinical ratings described above, and they represent composite ratings of demographically adjusted standardized scores, defined as follows: *Learning* included Total Trials 1–5 from the California Verbal Learning Test (2nd ed., CVLT-2; Delis, Kramner, Kaplan, & Ober, 2000), Logical Memory I from the Wechsler Memory Scale (3rd ed., WMS-III; The Psychological Corporation, 1997), and the Immediate Presence and Accuracy scores from the Boston Qualitative Scoring System (BQSS; Stern et al., 1999) of the Rey Complex Figure Test (RCFT); *Memory* included Logical Memory II (3rd ed., WMS-III; The Psychological Corporation, 1997), CVLT-II Long Delay Free Recall, and the Delayed Presence and Accuracy scores from RCFT BQSS; *Executive Functions* included total time to complete Part B of the Trail Making Test (TMT; Heaton, Miller, Taylor, & Grant, 2004; Reitan & Wolfson, 1985) and Total Move Score from the Tower of London, Drexel version (ToL; Culbertson & Zillmer, 2001). *Information processing speed* was assessed with measures including TMT Part A (total time; Heaton, Miller, et al., 2004; Reitan & Wolfson, 1985) and ToL Total Execution Time (Culbertson & Zillmer, 2001). *Attention and Working Memory* included WMS-III Digit Span subtest (total score; The Psychological Corporation, 1997). *Verbal Fluency* included several fluency trials, including animal (Gladsjo et al., 1999; Goodglass & Kaplan, 1972) and action (Woods et al., 2005) fluency tasks. *Motor speed and coordination* were assessed using the dominant

and non-dominant hand trials of the Grooved Pegboard test (Heaton, Miller, et al., 2004; Kløve, 1963).

Neurobehavioral Correlates Associations between self-efficacy for healthcare interactions and several potential correlates were examined among individuals with HAND, including neurocognitive domain performance and self-reported measures that assessed cognitive symptoms in daily life and strategy use for medication adherence. The DWHP subscale was examined in relation to neurocognitive domain performance to determine which cognitive abilities influence self-efficacy for communicating with healthcare providers. The associations between DWHP and self-report questionnaires that indicated the frequency of cognitive symptoms and cognitive strategy use in daily life were also assessed because these indices reflect self-perceived, real-world cognitive difficulties, irrespective of objective cognitive performance, which may influence an individual's impression of how well he/she can handle interactions with healthcare providers.

With regard to neurocognitive domain correlates, a mean T-score was calculated for each cognitive domain. In addition to the domains described above, which were utilized in the also assignment of HAND diagnosis (based on domain clinical ratings), a *Semantic Memory* domain mean T-score was also constructed using the KAIT Famous Faces task (KAIT; Kaufman, 1993) and the Boston Naming Test (BNT; Kaplan, Goodglass, Weintraub, Segal, & van Loon-Vervoorn, 2001) (*nb.* semantic memory was not included in assignment of HAND diagnosis). The mean T-scores were selected for the analysis of correlates instead of the ratings because ratings have restricted range that may limit the ability to detect existing associations.

To relate DWHP subscale scores to real-world cognitive symptoms, the Prospective and Retrospective Memory Questionnaire (PRMQ; Smith, Della Sala, Logie, & Maylor, 2000) was used. The PRMQ is a 16-item self-report inventory that measures the frequency of self-perceived memory difficulties in everyday life on a 5-point Likert-type scale ranging from 1 = "*never*" to 5 = "*very often*." The PRMQ includes equal numbers of retrospective memory complaints (e.g., "How often do you forget something that you were told a few minutes before?") to prospective memory complaints (e.g., "How often do you forget appointments if you are not prompted by someone else or by a reminder, such as a diary or a calendar?"). Prior research supports the internal consistency (Cronbach's alphas ≥ .80), factor structure (Crawford, Smith, Maylor, Della Sala, & Logie, 2003), and predictive validity (Smith et al., 2000; Zeintl, Kliegel, Rast, & Zimprich, 2006) of the PRMQ.

The Prospective Memory for Medications Questionnaire (PMMQ; Gould, McDonald-Miszczak, & Gregory, 1999) was administered to assess the usage of common strategies

that can support adherence to a prescribed medication regimen. The frequency of using each strategy was rated on a scale ranging from 0 = *Never* to 4 = *Always*. Several types of adherence strategies were assessed, including external strategies for a retrospective aspect of adherence (e.g., use of pillboxes); external strategies for a prospective aspect of adherence (e.g., setting medication alarms); internal strategies for a retrospective aspect of adherence (e.g., repeating instructions); and internal strategy for a prospective aspect of adherence (e.g., visualization). A summary score was determined by summing all items (total possible range for frequency of strategy use = 0–112), and a higher score indicates more frequent strategy use.

Self-reported Mood Symptoms All participants completed the POMS (McNair, Lorr, & Droppleman, 1981), which is a 65-item self-report inventory of affective symptoms in which participants rate mood-state adjectives (e.g., "unhappy," "anxious") with respect to how well each adjective describes them over the past 2 weeks on a five-point Likert-type scale ranging from 0 = "*not at all*" to 4 = "*extremely.*" Subscales include depression/dejection, tension/anxiety, anger/hostility, vigor/activation (reverse-scored), fatigue/inertia, and confusion/bewilderment. A summary score representing total affective distress was used in the present analyses, and the raw score was converted to a demographically adjusted z-score (corrected for age and sex); a standard cutpoint was used to define clinically elevated affective distress (Nyenhuis, Stern, Yamamoto, Luchetta, & Arruda, 1997).

Results

Effect of HAND on DWHP

To investigate an effect of HAND on self-efficacy for healthcare interactions (i.e., DHWP), a three-level HAND status variable was chosen as the primary independent variable, with the following group definitions: HAND−, ANI, and Syndromic HAND. The three-level variable was chosen to acknowledge that individuals who have experienced declines in everyday functioning (i.e., syndromic HAND) may be particularly vulnerable to low self-efficacy for healthcare interactions. First, univariate analyses (i.e., correlational or *t* test analyses, as appropriate) were performed to inform the construction of a multivariate regression model predicting DWHP (see Table 2). The following variables from Tables 1 and 2 were associated with both HAND and the DWHP subscales (ps < .05), and were therefore included in the model as covariates: clinical affective distress elevation (note that substitution of lifetime MDD did not alter the findings) and sex. As shown in Table 3, the resulting model was significant overall (p < .0001), and a significant

Table 2 Univariate associations between sample characteristics and BERMA DWHP

Characteristics	Estimate	p value
Demographics		
Age	r = .002	.98
Education	r = .12	.19
Ethnicity (% Caucasian vs other)	t = − 0.97	.33
Sex (% male vs female)	t = − 0.27	.79
Psychiatry		
Lifetime MDD (% yes vs no)	t = − 2.29	.02
Lifetime substance use (% yes vs no)	t = − 0.87	.38
Affective distress (% clinically elevated vs not)	t = 4.32	< .001
HIV disease		
Duration of infection	r = .15	.10
Nadir CD4	r = − .01	.95
Current CD4	r = .02	.81
Plasma viral load	r = − .11	.20
AIDS status	t = − 0.57	.57
Cognition (average T-scores)		
Global average T-score	r = .31	< .001

BERMA DWHP Beliefs Related to Medication Adherence Dealing with Health Professionals, *MDD* major depressive disorder, *CD4* coefficient of determination 4, *AIDS* Acquired Immune Deficiency Syndrome

association between HAND status and DWHP was observed (HAND− *mean* = 96.2, *SD* = 14.2; HAND+ *mean* = 93.3, *SD* = 13.8; *p* = .04; Cohen's *d* = − 0.21) that appeared to be largely driven by the syndromic HAND subgroup (*mean* = 82.1, *SD* = 12.9), which had significantly lower DWHP scores relative to both the HAND− (*p* = 01; Cohen's *d* = − 1.28) and the ANI (*mean* = 97.6, *SD* = 11.7; *p* = .02; Cohen's *d* = − 1.01) subgroups. Given that covariate selection is often based on an alpha threshold of .10, this analysis was repeated with education and ethnicity in the model (i.e., *p* values representing group differences on these variables

were both below a .10 threshold), which did not alter the pattern of findings (and these variables were non-significant predictors in that model).

Correlates of DWHP in HAND

Correlational analyses were performed in order to investigate the association between individual cognitive domains and BERMA DWHP among individuals with HAND. HAND subgroups were combined into one group for analysis of correlates for the sake of power (i.e., separate analyses within the syndromic HAND group alone were not sufficiently powered) and generalizability to HAND as a whole. As shown in Fig. 1, significant findings were observed for episodic memory and semantic memory domains (*p*s < .05), but no other domains were significantly associated with BERMA DWHP (*p*s > .05). Post hoc correlational analyses revealed that within the episodic memory domain, verbal contextual memory was the only measure significantly associated with BERMA DWHP (i.e., Logical Memory II; *rho* = 0.41, *p* = .007) , whereas list-based memory (CVLT LD Free Recall; *rho* = 0.21, *p* = .20) and visual memory (i.e., BQSS Delay; *rho* = 0.01, *p* = .95) were not. Within the semantic memory domain, memory for historical, person-based semantic information appeared to be driving the association with BERMA DWHP (i.e., KAIT Famous Faces; *rho* = 0.37, *p* = .02) , whereas word-based semantic information did not reach statistical significance (*rho* = 0.31, *p* = .05).

Lower BERMA DWHP scores were also associated with greater memory symptoms in daily life (i.e., PRMQ; *p* = .003), which is consistent with the significant relationship between the episodic memory domain and BERMA DWHP reported above. However, there was no association between healthcare-related self-efficacy and use of memory strategies to compensate for memory difficulties (i.e., PMMQ; *p* = .18).

Table 3 Multivariate analysis showing an effect of HAND on BERMA DWHP

	Adjusted R^2	F ratio	β	p value
Model: DV = BERMA DWHP	0.15	6.51	–	< .0001
Sex [female]		0.15	1.7	.69
Affective distress [clinically elevated]		12.83	− 8.79	.0005
HAND status		3.44	–	.04
Syndromic HAND vs HAND−		–	11.05	.01
Syndromic HAND vs ANI		–	11.59	.02
HAND− vs ANI			0.53	.85

Clinical Mood Symptoms standardized, demographically corrected Profile of Mood States (POMS) Summary Z-scores, *BERMA DWHP* Beliefs Related to Medication Adherence Dealing with Health Professionals, *HAND* HIV-associated neurocognitive disorder, *HAND−* group of PLWH whose cognition performance was within normal limits, *ANI* group of PLWH whose cognition performance was impaired but did not interfere with everyday functioning, *syndromic HAND* PLWH whose impaired cognition did interfere with everyday functioning
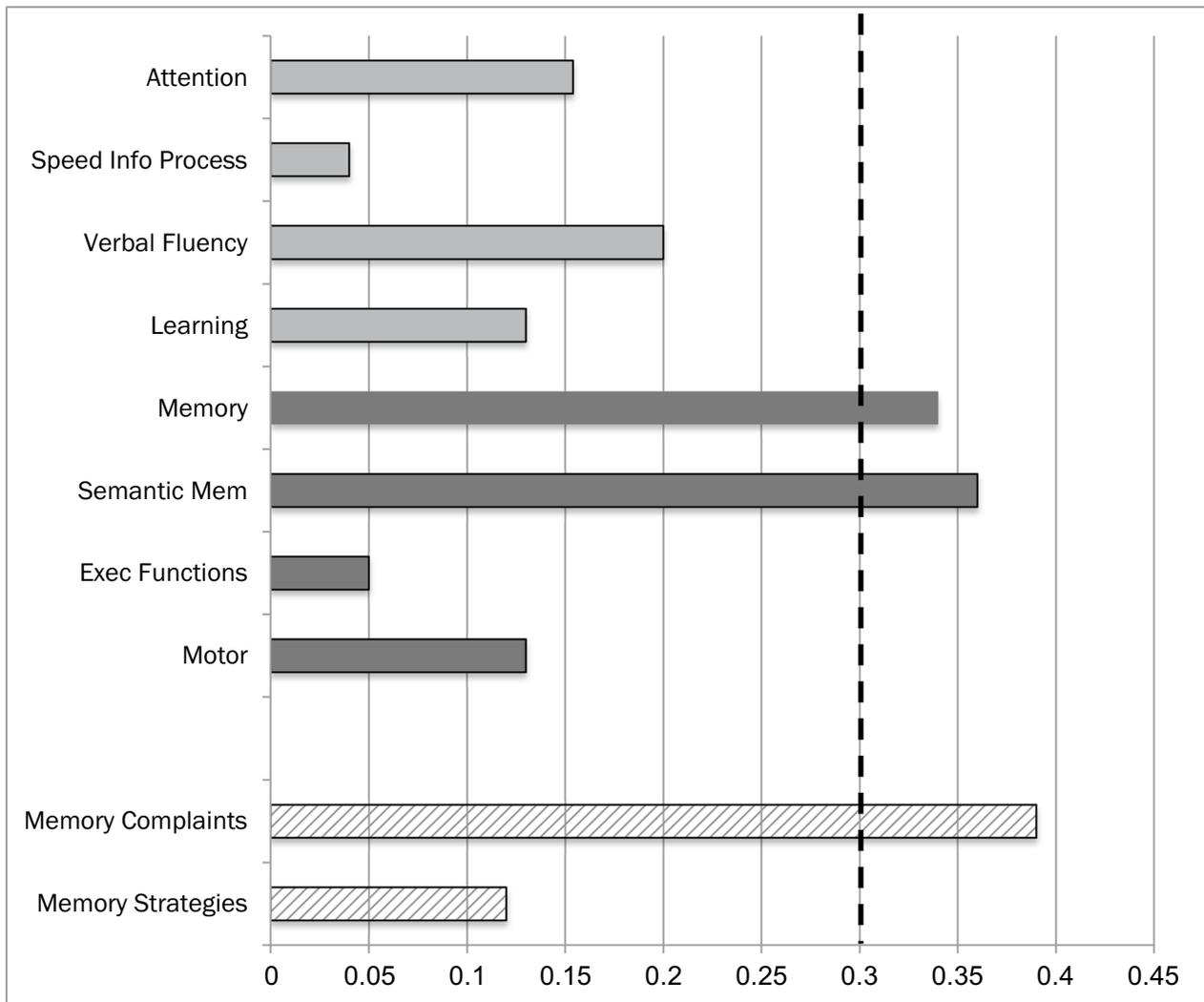
Fig. 1 Self-efficacy for healthcare interactions (BERMA DWHP) is significantly associated with Memory, Semantic Memory, and Memory Complaints (*p*s < .05). *Speed Info Process* Speed of Information Processing, *Semantic Mem* Semantic Memory, *Exec Functions* Executive Functions, *Memory Complaints* Prospective and Retrospective Memory Questionnaire (PRMQ), *Memory Strategies* The Prospective Memory for Medications Questionnaire (PMMQ)

Discussion

The present study revealed that HAND is an important consideration in understanding the role of self-efficacy for healthcare provider interactions in HIV. Specifically, individuals with HAND have lower self-efficacy for healthcare interactions relative to their unimpaired counterparts living with HIV infection and uninfected individuals, even when accounting for cofactors such as mood symptoms. This relationship was particularly evident among individuals with more severe forms of HAND in which neurocognitive impairment interferes with daily functioning, known as syndromic HAND. To our knowledge, this is the first study to demonstrate an effect of HAND on a measure of self-efficacy for health-related communication and to explore its neurobehavioral correlates in an effort to better understand its potential role in the experience and management of healthcare for impaired HIV+ individuals.

Broadly, this finding extends the current literature on health-related self-efficacy among PLWH and raises important questions regarding the role of HAND in the existence of gaps in the HIV treatment continuum. Prior studies have focused separately on the role of the patient's perception of positive provider interactions (e.g., Bakken et al., 2000) and self-efficacy for a person's beliefs about his/her ability to carry out a specific health-related behavior such as medication adherence (Johnson et al., 2007), or even examining the mediating role of adherence self-efficacy on the relationship between provider interactions and the adherence outcome (Johnson et al., 2006). In contrast, the present study

examined self-perceived ability to manage health-related situations and communicate with healthcare providers. Since each stage of the HIV treatment continuum involves an interface with a health-related situation or provider, this type of self-efficacy for healthcare provider interactions may have relevance at each of those stages. Specifically, poor confidence for handling such interactions may prevent a person from seeking HIV testing/diagnosis and linking to care in the first place, or engaging and staying in care long-term. In addition to avoiding healthcare interactions all together, an individual with low self-efficacy for dealing with health situations and professionals may also fail to optimize his/her time with healthcare providers by taking a passive or uninvolved stance, which would also impact each stage of the continuum, possibly even through to the endpoint of having difficulty achieving virologic control through ART adherence. Studies have demonstrated the benefits of a shared medical decision-making (SDM) approach in which patient and doctor collaborate to determine the course of the patient's healthcare, but a recent review suggests that it is still underutilized in treatment of HIV (e.g., Fuller, Koester, Guinness, & Steward, 2017). While many factors ranging from institutional to individual likely contribute to this underutilization of SDM, it is likely to be more difficult to achieve with a patient whose self-efficacy for healthcare provider interactions is low. From the perspective of the provider, understanding that individuals with HAND may have poor self-efficacy for healthcare interactions could influence the approach taken to enhancing communication with these patients. Specifically, the provider should create a comfortable and supportive environment for the patient, in which information is conveyed at a slow conversational pace that allows the patient sufficient time to process information and ask questions. Moreover, the provider should regularly query the patient as to whether he/she has questions given that it may provide a more comfortable opportunity for the patient to do so than if he/she has to interrupt the provider and/or hold the questions for the end, which may be confusing and intimidating. Moreover, the provider may even ask the patient to repeat his/her understanding of the test, results, diagnoses, treatment plan, and alternate treatment options back to the provider to gage the degree of comprehension, rather than relying on the patient's lack of questions as evidence that the information has been understood. In summary, the findings of this study suggest that whenever possible the patient should be supported and encouraged to communicate his/her needs and questions to the provider rather than assuming that they will be raised independently.

Given the limitations of busy clinics and institutional barriers to change, it is also important to work directly with of PLWH to enhance and improve communication with their healthcare professionals, in much the same way that task-specific self-efficacy for managing medication has been recommended as a key intervention goal in prior adherence studies (Johnson et al., 2007). Targeting self-efficacy for healthcare interactions may be particularly relevant for individuals with HAND, as suggested by the results of the present study showing that those with HAND have lower levels of this type of confidence. It is possible that awareness of their impairment makes individuals with HAND more intimidated by healthcare interactions, or they may also have experienced poor interactions with doctors and other healthcare providers in the past related to their cognitive deficits, such as forgetting to ask questions as they had intended or even forgetting healthcare instructions, or having a difficult time following information being provided to them in medical settings. It is also possible that impaired individuals become more easily overwhelmed by the need to juggle information about their health history and symptoms along with the recommendations of providers pertaining to prescriptions (dosing quantity and timing, side effects) and other instructions (e.g., referral to specialist, dietary changes) in a brief and time-pressured exchange with a provider. The contribution of HAND to treatment gaps has not yet been fully established in the literature, but one recent study showed that HIV-associated neurocognitive impairment was a significant predictor of lower retention in care among older individuals (Jacks et al., 2015). Another study that examined neurocognitive impairment in relation to medical visit attendance found no direct relationship but did reveal that impaired HIV+ individuals who took greater advantage of social support resources were less likely to miss medical visits (Waldrop-Valverde et al., 2014). Similarly, self-efficacy for dealing with health professionals may be an important determinant of the success of healthcare interactions that facilitates and perpetuates good clinical care of patients with HAND. The availability of social support resources has also been shown to boost treatment self-efficacy among individuals with HIV, which then was a significant predictor of multiple indices of HIV care, including adherence to medications and provider visits, as well as medical outcomes including CD4 count and viral load (Turan, Fazeli, Raper, Mugavero, & Johnson, 2016). Combined with the results of the prior studies regarding the benefits of social support to HIV care, the present findings suggest that in addition to intervention that bolsters confidence for interaction with health professionals, it might also be important to recommend that people with HAND bring someone with them to their appointments; i.e., social support resources may not only be valuable for getting the HAND patient to attend their appointments, but also to help facilitate the interaction that might be daunting for the patient.

With regard to the specific neurocognitive domains that appear to influence self-efficacy for healthcare interactions, the present findings revealed that episodic and semantic

memory abilities were associated with BERMA DWHP. The relationship to episodic memory was particularly robust, as it was evident across laboratory and symptom measures. Many health behaviors involve episodic memory, including remembering appointments and medical instructions. Memory is also strongly involved in healthcare interactions, including when medical professionals ask a patient to provide a history of his/her symptoms or medical problems, recall prior treatments, and report on the timing of new symptoms and/or side effects. Furthermore, during these healthcare interactions the medical professional is also providing new information that the patient is supposed to remember and utilize. An individual who is aware of his/her memory problems would likely be intimidated by healthcare interactions, which is supported by our results showing that as self-reported memory symptoms increase self-efficacy for healthcare interactions decreases in those with HAND. It is notable that free recall deficits, in particular, are evident in HAND, and therefore strategies that provide structure to facilitate recall may be beneficial. Interestingly, the BERMA DHWP subscale was not associated with self-reported frequency of using memory strategies. This null finding suggests that although individuals with HAND experience memory difficulties that are associated with self-efficacy for healthcare interactions at both the level of objective memory deficits and self-reported memory symptoms, individuals with low self-efficacy are not more likely to employ memory strategies that might benefit them in healthcare settings. Compensatory memory strategies could not only improve the outcome of healthcare interactions (e.g., using a journal to record symptoms and other information that the healthcare professional will query, recording healthcare instructions in writing before leaving the appointment, practicing encoding strategies to help remember important medical information), but could also improve the patient's confidence in handling the healthcare interaction more successfully. With self-efficacy thus bolstered, the patient may be more likely to engage in more healthcare interactions and better overall health outcomes might be achieved. Interestingly, a recent study in PLWH demonstrated that more frequent strategy use (as assessed by the PMMQ) was actually associated with worse ART adherence, perhaps driven by the fact that internal (vs external) strategies were predominantly endorsed, which suggests that guidance toward tailored external memory strategies would be useful in this population (Blackstone et al., 2013).

Expanding upon the association between episodic memory and BERMA DWHP, a post hoc analysis showed that memory for contextual information was associated with BERMA DWHP, whereas memory for list-based verbal information and visual stimuli were not. Specifically, this finding represents the importance of an individual's ability to recall contextual information for informing his/her

confidence in performing successfully in healthcare interactions. Although this pattern may be somewhat counterintuitive since list-based memory tasks place greater demands on executive functions for strategic (vs automatic) encoding and retrieval, it is consistent with converging evidence that suggests an important role of contextual information in health-related behaviors and settings. Notably, a recent study demonstrated that contextual memory deficits (also measured using Logical Memory II) were associated with medication non-adherence, whereas list-learning was not (Obermeit et al., 2015). Combined with the present results, these findings likely reflect the fact that when interacting with health professionals, information is typically requested from and presented to the patient in contextual format, and so memory for a story rather than a list would be more associated with real-world memory demands of medical settings and interactions. Interestingly, individuals with HAND perform more poorly on a context-based health scenario task as well (Morgan et al., 2015). Practically speaking, information need to be utilized in a contextual format in health settings and interactions in order to enhance understanding of treatment options relevant to symptom presentation and overall disease management, but these converging findings suggest that contextualized information should be supplemented with that same information presented in a focused, targeted format. For example, structured and simple record forms could be provided to the patient in order to record the types of information the healthcare professional will ask about at the next appointment, and post-appointment summaries that provide treatment information (e.g., medication regimen, procedure guidelines, follow-up appointment instructions) can be also dispensed in a bulleted, easy to follow style.

The other cognitive domain that was significantly associated with self-efficacy for healthcare interactions in the present study was memory for semantic information. This association is intuitive since in many ways health information is fact-based collective knowledge that is not personally relevant to the individual. For example, over the lifespan we are exposed to information about the role of healthcare professionals, the distinction between illness and wellness, the nature of various healthcare settings (e.g., hospitals, pharmacies), and general facts about medicines and medical treatment. In the current study, a measure of memory for person-based semantic memory in which the participant was tasked with identifying famous individuals based on pictures (e.g., Martin Luther King, Jr.; KAIT Famous Faces test) was significantly associated with BERMA DWHP, whereas memory for naming objects based on pictures (i.e., Boston Naming Test) was not. Although deeper interpretation is speculative given that the relationship was a simple correlation, it is interesting that the this task involved memory for faces because the BERMA DWHP has a considerable proportion of items focused on communicating

and interacting with various health professionals, which is a social aspect of healthcare self-efficacy. PLWH, particularly those with HAND, are at risk for poor social cognition (e.g., Lane, Moore, Batchelor, Brew, & Cysique, 2012), and these deficits may have particular relevance to both objective and self-perceived ability to handle interactions with healthcare settings and professionals. Therefore, poor social cognition may negatively impact self-efficacy for healthcare interactions, and a comprehensive prospective study may be warranted to explore these relationships.

The present study has limitations that restrict the breadth of our interpretation and suggest areas for future directions. The primary limitation of this study is that it was a retrospective study conducted as part of an ongoing parent study and therefore did not have the opportunity to link self-efficacy for healthcare interactions to real-world health behaviors that pertain to the HIV treatment continuum. Nevertheless, the evidence yielded from these analyses does extend the literature by demonstrating that the BERMA DWHP may be a useful measure of self-efficacy for healthcare interactions and that it may be informative in the context of HIV, particularly given evidence of its sensitivity to HAND. Future work with larger sample sizes may explore the relationship between HAND and health-related self-efficacy in terms of the directionality of the relationship. On one hand, the limitations of cognitive impairment may erode an individual's impression of his/her ability to handle healthcare interactions because of the challenges experienced in those settings (e.g., prior memory failures). Alternatively, low levels of this type of self-efficacy may have been pre-existing in these individuals prior to the onset of HAND, in which case HAND may exacerbate the effects of low self-efficacy for healthcare interactions. A well-powered prospective study could also investigate the role of self-efficacy for healthcare interactions relative to the relationship between HAND and health-related outcomes (i.e., mediator vs moderator). The relatively small sample sizes and lack of comprehensive outcome data precluded such analyses in the current study, but prior work has shown that self-efficacy mediated the relationship between health literacy and HIV medication adherence (Wolf et al., 2007). An alternate hypothesis is that self-efficacy for healthcare interactions has the greatest impact on health behavior among those with HAND (i.e., the moderating or mediating variable in this case), whereas those without HAND have the cognitive resources to successfully perform health behaviors despite their low confidence in their abilities. Additionally, the HAND+ group had nearly twice as many African Americans as the HAND− group, but the small cell sizes precluded any fine-grained examination of the role of ethnicity in self-efficacy for healthcare interactions. However, it may be particularly important to further explore this type of self-efficacy among African Americans, particularly in light of an emerging study demonstrating the importance of patient–provider communication (including factors such as comfort and trust) in the uptake of HIV prevention services (Rucker, Murray, Gaul, Sutton, & Wilson, 2017). Our study did not have any measures of HIV stigma, but recent evidence suggests that the experience of HIV stigma, particularly in the healthcare setting, can negatively influence HIV treatment outcomes (Kay et al., 2017). Finally, the HAND effect on the BERMA DWHP scale suggests that future work should examine its association with social cognition and health literacy, both of which are also vulnerable to HAND (Lane et al., 2012; Morgan et al., 2015).

Compliance with Ethical Standards

Conflict of interest Erin E. Morgan, Steven Paul Woods, Jennifer E. Iudicello, Igor Grant, Javier Villalobos, and members of the HIV Neurobehavioral Research Program (HNRP) Group declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional and/or National Research Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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