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Feedback on a Multi-Modal Cognitive Intervention for Adults Aging with HIV: A Focus Group Study

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Abstract

Nearly 50% of adult persons living with HIV (PLWH) experience HIV-Associated Neurocognitive Disorder (HAND), which is associated with deteriorating brain health and cognitive functioning. Multi-modal interventions that simultaneously improve physical activity, nutrition, and sleep hygiene may be of value for adult PLWH, especially as they age and become vulnerable to HAND. We used 4 focus groups of PLWH ($N = 30$; ages 50 years) to solicit feedback about Cognitive Prescriptions, a multi-modal cognitive intervention. Lifestyle and health behaviors pertaining to Cognitive Prescriptions were assessed, including: (a) physical activity, (b) mental activity, (c) nutrition, (d) social engagement, (e) emotional health, (f) sleep hygiene, and (g) substance use. When presented a template of the intervention, participants expressed favorable opinions and remarked they would want to work with a clinician, paraprofessional, or peer to implement such a program into their own daily routines. From this, implications for practice and research are provided.

Keywords

brain fitness; cognitive aging; cognitive fitness; cognitive prescription; cognitive reserve; HIV; neuroplasticity

As the HIV epidemic continues, nurses will be providing care to an increasing number of older adults living with HIV who are experiencing cognitive problems that interfere with their medication adherence, attending clinic appointments, instrumental activities of daily

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living (IADLs), and even driving ability (Vance, Fazeli, & Gakumo, 2013; Vance, Fazeli, Ball, Slater, & Ross, 2014). Approximately 52% to 59% of adult persons living with HIV (PLWH) experience HIV-Associated Neurocognitive Disorder (HAND) at any given time (Bonnet et al., 2013; Heaton et al., 2010). Given that by 2020 70% of PLWH will be 50 years of age and older (U.S. Senate Special Committee on Aging, 2013), concerns mount that normal age-related cognitive declines may interact with neurological sequelae of HIV to increase the prevalence and severity of HAND (Hardy & Vance, 2009; Vance, Fazeli, & Gakumo, 2013). Thus, developing practical interventions to protect and improve brain health and cognition in adults aging with HIV is important to maintain everyday functioning and quality of life.

Cognitive aging and neuroscience literature has provided evidence that lifestyle and health behavior choices promote not only physical health, but brain health and cognition as well. Such lifestyle and health behaviors include: (a) physical activity, (b) mental activity, (c) nutrition, (d) social engagement, (e) emotional health, (f) sleep hygiene, and (g) substance use (Malaspina et al., 2011; Shaffer, 2016; Vance, & Burrage, 2006; Vance, Eagerton, Harnish, McKie-Bell, & Fazeli, 2011; Vance, Fazeli, Moneyham, Keltner, & Raper, 2013). Such evidence has also been observed in the HIV literature. For example, in a sample of 139 adults with HIV, Fazeli and colleagues (2014) observed that the prevalence of HAND decreased significantly as adults engaged in a greater number of the following lifestyle factors: physical activity (a strenuous activity within the past 72 hours), mental activity (full- or part-time employment status), and social engagement (frequent social activity). These researchers observed that if participants engaged in none, one, two, or three lifestyle factors, the prevalence of HAND decreased significantly from 63%, 51%, 33%, and 20%, respectively. These data suggest that active engagement in lifestyle and health behaviors is neuroprotective and benefits brain health and cognition.

Capitalizing on the brain health and cognitive benefits of active engagement in lifestyle and health behaviors, multi-modal approaches have been developed to modify various levels of engagement in several lifestyle and health behaviors. The basic premise underlying these multi-modal approaches is that brain health and cognition can benefit from modifying multiple lifestyle and health behaviors; each behavior may have a unique mechanism that supports brain health and cognition and, by changing multiple behaviors, synergistic benefits may emerge. For example, increasing physical activity may improve cardiovascular function, which increases blood flow and metabolism in the brain (Radak et al., 2016) as well as brain-derived neurotrophic factors (Byun & Kang, 2016). Increasing mental activity may facilitate neurogenesis and neuroplasticity, changing the neuronal environment (i.e., increased brain-derived neurotrophic factor, changes in brain structure volumes; Shah, Weinborn, Verdile, Sohrabi, & Martins, 2017; Sun et al., 2016). And changing one's diet to include more fruits and vegetables rich in antioxidants may reduce neuroinflammation (Islam et al., 2017; Wärnberg, Gomez-Martinez, Romeo, Díaz, & Marcos, 2009). These lifestyle and health behavior changes may produce a greater benefit synergistically than each lifestyle and health behavior change alone.

Several examples of multi-modal interventions exist in the literature. In the Agewell Trial, 75 community-dwelling adults 50 years of age and older, without HIV or any obvious

neurological disorder, were randomized to one of three groups to determine if goal-setting of certain lifestyle factors could improve cognition and delay dementia over a 12-month period (Clare et al., 2015). The groups included: a control group ($n = 27$), a goal setting group ($n = 24$), or a goal setting with mentoring group ($n = 24$). Goal setting emphasized behaviors that targeted improvement for nutrition, health, cognition, physical, and social activities to bolster neuroplasticity, brain health, and cognition. In both goal setting groups, improvements were observed in memory, executive function, balance, agility, flexibility, grip strength, aerobic activity, and cholesterol.

Capitalizing on this multi-modal approach, Vance and colleagues (2011) proposed a similar approach for nurses called “Cognitive Prescriptions,” in which goals in seven lifestyle and health behaviors (e.g., physical activity, sleep hygiene; see Figure 1) could be developed and monitored by the client in order to improve overall health and quality of life, but with the proximal goal of improving or maintaining brain health and cognition. The behavioral goals were explicit and measurable in order to facilitate ease in engaging and monitoring the success of the goal. As seen in Figure 1, as an example of a typical Cognitive Prescription, simple but specific measurable behavioral goals were set (e.g., go for a 30-minute walk 3 times a week). Participants were asked to display their explicitly stated goals in a prominent place in their dwellings, such as on the refrigerator, bathroom mirror, or bedroom door, so that the goals could remain salient to the client. In so doing, clients were reminded of their behavioral goals, and were able to monitor their progress and increase/decrease/change their goals as needed.

An underlying assumption of this Cognitive Prescription approach is that clients are motivated to engage in a change process. Such motivation to complete the behavioral goals may be attenuated by the clients’ knowledge and beliefs about how certain lifestyle factors affect brain health and cognition. In fact, motivational interviewing techniques have been encouraged when developing such client-centered behavioral goals (Pakpour et al., 2015). For example, if physical fitness is not a priority for a client, after learning about the brain health and cognitive benefits of physical activity, the client may be more amenable to engaging in some sort of physical activity. Using motivational interviewing techniques, the physical activity goal would need to be an activity (e.g., water aerobics, walking with a friend, stationary bike) that fits the behavioral repertoire of the client and that s/he would find intrinsically motivating unto itself.

Related to this, four focus groups of 30 older (50 years of age and older) African Americans and Caucasians with HIV who reported cognitive complaints during a telephone screen were asked about their cognitive complaints and what they knew about how physical activity, mental activity, nutrition, social engagement, emotional health, sleep hygiene, and substance use affects brain health and cognition (Vance, Gakumo, Childs, Enah, & Fazeli, under review). In general, the participants reported the usual cognitive complaints such as forgetting appointments and names, trouble finding words (dysnomia), and occasional “foggy” or slowed thinking. When asked, participants expressed a rudimentary understanding that improving lifestyle and health behaviors (e.g., increasing physical activity, reducing substance use) would be somewhat helpful in benefiting brain health and cognition. Unfortunately, they lacked specific details as to how such behavioral engagement

would be helpful to their overall brain health and cognition. Furthermore, few participants indicated that they were actively engaging in any of these activities to improve brain health and cognition. In fact, the general tenor of the focus groups seemed to adopt a passive acceptance of the condition of their brain health and cognition, which suggested that they might not be aware of their ability to protect or improve neurological and cognitive function as they aged; this suggested the opportunity for an education intervention.

Building upon this, the purpose of the qualitative descriptive study reported here was to identify the obstacles and facilitators in delivering a multi-modal cognitive intervention, called Cognitive Prescriptions, in the same group of 30 older (50 years of age and older) adult PLWH described above. To accomplish this, the four focus groups of adult PLWH were presented an example of a Cognitive Prescription and then asked a series of questions about what they liked and/or disliked about it. Guidelines for studying the topic further and delivering multi-modal approaches to improve brain health and cognition in this clinical population are posited to either prevent or ameliorate HAND. Implications for research and practice are also provided.

Methods

Participants

This study was approved by the Institutional Review Board of the University of Alabama at Birmingham. This qualitative, descriptive study, participants were recruited from an HIV clinic at a university medical center using recruitment flyers, brochures, and word of mouth. Initially, 56 potential participants called the recruitment office to learn more about the study; at which time, they were telephone screened to determine eligibility. Inclusion criteria included: (a) being 50 years of age or older; (b) being able to speak English; (c) being diagnosed with HIV for at least 1 year; (d) having at least one cognitive complaint (e.g., difficulty recalling words, forgetfulness); and (e) being agreeable to talk with others with HIV in a focus group. Cognitive complaints were added as an inclusion criterion based on the rationale that those with such issues might be intrinsically motivated to provide feedback about the Cognitive Prescription intervention presented in the focus groups. Exclusion criteria included: (a) being deaf or blind; (b) living in unstable housing (e.g., halfway house, homeless shelter); and/or (c) being diagnosed with a significant neurological or medical comorbidity that would influence cognition (e.g., mental retardation, schizophrenia, vascular dementia, Parkinson's or Alzheimer's disease). Self-reported eligibility criteria were used to recruit participants who could not only fully engage in the focus groups, but would have an inherent interest (e.g., cognitive complaints, living with HIV) in the multi-modal intervention to be discussed.

Once eligibility was determined, participants were placed on a waiting list until a focus group of 8 to 10 people of all African Americans or Caucasians could be formed. Focus groups by culture/ethnic groups were conducted separately because people may be more comfortable expressing ideas using cultural references within their own reference groups; this technique is an accepted protocol in qualitative research (Corfman, 1995). Once enough people were recruited to form a focus group, a time was scheduled for everyone to attend. This process resulted in four focus groups including: (a) Focus Group 1 with 9 African

American women, (b) Focus Group 2 with 9 African American men, (c) Focus Group 3 with 8 Caucasian men and 1 Caucasian woman, and (d) Focus Group 4 with 3 African American women (10 were scheduled).

Instruments

Demographic questionnaire—This instrument assessed basic background information on each participant's age, race/ethnicity, gender, education level, and household income.

Health history questionnaire—An experimenter-generated measure was used to assess the presence of basic health conditions (e.g., self-reported diabetes) and HIV-health indicators (e.g., self-reported CD4+ T lymphocyte count) from participants. Data were not extracted from medical chart records.

Engagement in lifestyle and health behaviors—At the beginning of each focus group discussion, participants were asked to rate their health, sleep quality, healthy eating habits, social support, and mood on a 5-point Likert-type scale (1 = *poor*, 5 = *excellent*). Participants were asked to indicate the frequency in which they engaged in intellectually challenging activities on a 5-point Likert-type scale (1 = *not at all*, 5 = *extremely*). Participants were also asked how many times per week they physically exercised (worked up a sweat), and how many hours they read per week.

Rank order of targeted behavior goals—At the end of each focus group session, participants were asked, *If you were to sign up for this Cognitive Prescription intervention, what areas would you prefer to focus on in your life? Social? Physical activity? Please take the piece of paper in front of you. Please number the areas in order of your preference.* The ranked items included physical activity, mental activity, nutrition, sleep hygiene, social engagement, substance use, emotional health, and coping/resilience; although not a focus of the study, coping/resilience was added as a type of existential goal in case participants were interested.

Interview script—An interview script was developed with 6 primary questions to guide focus group discussions to address what participants liked and/or disliked about the multi-modal Cognitive Prescription protocol. Cues and probing questions were used as needed to solicit discussion from the focus groups (See Table 2).

Procedure

Prior to the start of each focus group, participants were greeted by research staff and consented as indicated by signing an IRB-approved consent form. The focus groups took place in a private room within the School of Nursing on a Saturday, so that there were no distractions or other activities. In the room, the furniture was placed in a square so participants could see each other and have room to write, take notes, and have light refreshments. Participants were provided name placards in which they were instructed to write their real name or pseudonyms so that other participants and the focus group moderator could easily identify participants by name and respond to each other during the discussion. Before beginning the focus group, ground rules were provided (e.g., speak one a

time, speak clearly). During the focus group discussion, participants were provided an example of the Cognitive Prescription protocol (Figure 1) and a method of keeping track of behavioral goals (Figure 2) to review; they were then asked a set of questions about the protocol (Table 2). Each focus group took approximately 1.5 hours and digitally recorded; they were transcribed at a later date.

Data Analysis

The quantitative data were summarized and tallied using descriptive statistics to provide a context in which the qualitative data could be interpreted (Table 1). For the qualitative data, the transcriptions of the focus groups were read and reread to identify and summarize themes relevant to the purpose of the study. We employed an open-coding scheme using conventional content analysis as this was suitable to provide a face valid method of summarizing what participants preferred about the proposed multi-modal cognitive intervention (Hsieh & Shannon, 2005). Themes were coded manually as opposed to using qualitative software because of the size of the study and the preference of the lead author. In addition, field notes were kept concerning the data collection process including recording behaviors and non-verbal activities during the focus groups, which provided a layer of triangulation. Data saturation was achieved as evidenced by no new themes emerging after the third focus group; responses across all focus groups were similar regardless of race.

Results

The results are divided into three sections. The first section provides a brief description of the sample characteristics. The second section provides feedback on the proposed Cognitive Prescription intervention protocol. Finally, the last section provides an incidental observation of concerns expressed in the focus groups.

Sample Characteristics

Most participants were African American (70.0%) and men (56.7%). As seen in Table 1, 56.38 years was the average age of the sample, 12.13 years (circa high school graduate) was the average years of education, and \$14,300 USD per year was the average household income. Participants were had been diagnosed with HIV on average for 16.95 years (range = 4–31 years). Their average, current self-reported CD4+ T lymphocyte count was 609.40 cells/mm³ and their HIV viral load was 464.10 copies/mL; these values reflected good viral suppression and a healthy immune system. Yet, as expected, several people did not know their most current CD4+ T lymphocyte count or viral load. The types of comorbidities varied and included heart disease ($n = 6$), hypertension ($n = 15$), history of stroke ($n = 4$), kidney disease ($n = 1$), liver disease ($n = 1$), hepatitis C ($n = 2$), and diabetes ($n = 2$).

When asked about self-rated health, sleep quality, healthy eating habits, social support, mood, and engaging in intellectual and physical activity, participants rated themselves in the low to moderate range, indicating that, as a group, participants felt their daily functioning in these areas could be improved. When asked about how frequently they engaged in intellectually challenging activities, participants also rated themselves in the low to moderate range. For the intellectual activity of reading, participants indicated that they read an average

of 5.63 hours per week (range = 0 – 30). Finally, participants indicated that they physically exercised, on average, 2.20 days per week (range = 0 – 7).

Feedback on Cognitive Prescription Protocol

Many participants remarked that they would like a formal structure as provided with the Cognitive Prescription (Figure 1). A particular aspect of this multi-modal intervention that the participants liked was its very clear directions: “Like he was saying about having lists (Cognitive Prescriptions), then I know what’s good for me, then I might try it.” Or as another participant remarked, “Even if I read something—if I read something that says, ‘This is good for you, if you do this,’ I try it.” In fact, one participant was particularly appreciative of learning about the Cognitive Prescription:

Everything on here is important. We talked about a lot of good things. Just hearing it from somebody else and everything. It does make a difference. It opens your eyes. I like that we had a chance to talk about it. It wasn't pushed on us so deep like some of the studies that we've done. I appreciate this. Everything is just eye-opening.

The individualized component of developing one’s own behavioral goals was also met with overall approval because “some things won’t work for others.” As this same participant expressed,

It would be easier for you if you sat down with someone and were able to target the things that were a little bit more important to you, whether that was you going to bike for physical exercise or eating certain things. You would want it tailored to what would be easiest for you.

That seemed to be the predominant sentiment in all of the focus groups.

Participants seemed to understand and appreciated the value of keeping track of their lifestyle goals in the Cognitive Prescription and the importance of keeping these goals in mind. As one participant remarked,

I've never had a calendar to record it like this (Figure 2). As you say, just a simple X on the things you do. Put down what you've done. I think that's really good. Give you something to be—what is it? Committed to. Every day, I need to put something down here. I think that's really good.

Another participant mentioned placing the Cognitive Prescription in a visible location.

Yeah, like I said, it's in your face. I could put this on my refrigerator. It's like, “Oh. I've gotta go to the refrigerator to get some water. There it is. Okay. Let me get up and go take this stroll.”

Many participants mentioned they would also like to work with a clinician, paraprofessional, peer, or family member to develop and monitor goals to improve their brain health and cognition. Some thought receiving a phone call from someone checking on their progress would be helpful – “Maybe somebody with a little bit of medical knowledge, background.” Still, there was not a clear consensus on whether working on behavioral goals with a mentor of some kind would always be helpful.

Delivering the intervention in a workshop format was agreeable to most in the group. As one participant remarked,

This is the kind of interaction I like being around. Everybody putting it out there and saying, “Hey, I can relate to a lot of stuff that’s been said in here, because I’ve been through it myself.” Working on myself on a daily basis, it’s a struggle.

Others also remarked that an education workshop explaining how each of these lifestyles and health behaviors affect brain health and cognition would be helpful in choosing what behavioral goals to select. Some discussion about the length of workshops introducing the Cognitive Prescriptions was provided, but no clear consensus resulted; suggestions ranged from an hour to a half a day.

In terms of the behavioral goals, some participants expressed they would not mind working on several lifestyle goals at a time, while others commented they would prefer to work on only one or two goals on the Cognitive Prescription at a time in order to perfect what they were doing. There did not appear to be any clear consensus about this point. In addition, during the focus groups, many expressed a preference for focusing on one goal over another, such as increasing physical activity or improving nutrition. When asked to rank order lifestyle goals they preferred to focus their attention, participants did so from the following list. The average goals are presented from first (1) to last preference (8).

1. nutrition (mean = 3.00)
2. mental activity (mean = 3.13)
3. sleep hygiene (mean = 3.21)
4. emotional health (mean = 4.03)
5. social engagement (mean = 4.14)
6. physical activity (mean = 4.43)
7. coping/resilience (mean = 5.17)
8. substance use (mean = 6.32)

Incidental Observations

Many participants in the focus groups digressed from the topic of brain health and cognition to discuss topics important for them, including comorbidities (e.g., diabetes, fibromyalgia, high blood pressure), frailty, stress, recovery, stigma, and the need for continued emotional and social support. It became clear in the focus groups, that, for many participants, addressing other concerns trumped their concerns about brain health and cognition.

Discussion

We prompted feedback from older adults living with HIV and self-reported cognitive complaints about aspects of a multi-modal cognitive intervention (i.e., Cognitive Prescriptions) they would be amenable to start and incorporate into their daily lives. In a prior study (Vance et al., under review) leading up the analysis of the study presented here,

participants expressed: (a) that they were experiencing cognitive problems that interfered with daily life, (b) the importance of keeping their brain health and cognition as they aged, and (c) varying levels of understanding of lifestyle and health behaviors that were important for brain health and cognition. Despite these acknowledgements, in general, the expressed understandings appeared to be very cursory. For example, participants were aware of the importance of physical activity on brain health and cognition, but could not articulate why it was important or what types of exercise might be of benefit. Furthermore, few participants engaged in behaviors to prevent cognitive loss or improve brain health and cognition; if any behavior was suggested, it was never mentioned in a prescribed or systematic way. In fact, the preventive activity that participants mentioned most was playing games (e.g., computer games, cards, reading) to keep the mind active. A self-initiated multi-modal approach was never suggested. Without an understanding or working knowledge of how these lifestyle and health behaviors can prevent cognitive problems or even improve brain health and cognition, older adult PLWH may not be empowered to engage in such behavior changes to facilitate successful cognitive aging. Therefore, implementing a Cognitive Prescription protocol may start first with education to provide a foundation for the intervention.

Interestingly, these adults in our study reported that they spend about 5.63 hours a week reading (ranging from 0 to 30 hours); this was in contrast to a study of community-dwelling older adults without HIV around the same ages (55 to 64 years old) who read, on average, 2.30 hours a week (Scarmeas, Levy, Tang, & Stern, 2001). But given that only about 30% of adults with HIV were actively employed full-time and part-time, these older adult PLWH may have had more time to read (Vance, Cody, Yoo-Jeong, Jones, & Nicholson, 2015), which represents an opportunity to incorporate intellectual leisure time activities into their daily activities. Furthermore, some evidence has suggested that, as people engaged in more intellectual leisure time activities such as reading and playing board games, the activity might reduce the risk of cognitive impairment with aging (Wang et al., 2006).

Delivery of Cognitive Prescriptions

As for the acceptance and delivery of the proposed Cognitive Prescription intervention, participants were more or less very receptive to it, especially if it were adapted to their particular individual wants and needs. Participants appeared to enjoy the relative simplicity of the approach as it seemed that they could understand how it could work specifically for them. No strong preferences were voiced about who would help develop lifestyle and behavioral goals (e.g., a health care provider or peer), but participants did express a preference with someone more knowledgeable about the topic, such as a nurse or peer health coach. Thus, a trained peer counselor may be an appropriate person, as has been observed in other health promotion protocols in the literature (Lynch et al., 2014).

Integration of the Intervention

Tailoring an intervention to an individual is based on the Health Promotion Model whereby four behavior-specific conditions must be addressed: perceived benefits, barriers, self-efficacy, and interpersonal influences (Walker, Pullen, Hertzog, Boeckner, & Hageman, 2006). Tailored interventions of this kind have been successfully used in older adults to improve physical activity and diet (Walker et al., 2010). A necessary component of such

interventions would be to motivate participants by educating them about the benefits of the intervention. Insights from our focus groups revealed that participants knew something about the relationship between lifestyle factors and brain health and cognition, but lacked specific details or examples about them. Given the focus group format, which the participants seemed to enjoy, a workshop to present information in more detail may be a way to “kick start” the intervention for older adult PLWH. It would be important to make the behavioral program as specific as possible; making the instructions concrete (i.e., Go for a walk 3 times a week) rather than abstract (i.e., exercise more) would improve adherence and monitoring of the Cognitive Prescriptions (LaVigna & Donnellan, 2007).

Strengths/Limitations and Future Directions

Strengths and limitations are a part of all studies; our study was no different. Three limitations are noted. First, African Americans were overrepresented and Caucasians are underrepresented, especially Caucasian women. Although unsuccessful, multiple attempts were made to recruit more Caucasians by asking other participants to encourage their Caucasian friends to participate. Second, an actual questionnaire or systematic evaluation about what older adults living with HIV knew about lifestyle and health behavior influence on brain health and cognition was not administered; perhaps a more systematic study gathering such data would provide more detailed information that could be used to develop an education intervention targeting this clinical population. Third, participants had to indicate some type of cognitive complaint to be included in our study; however, an objective neurocognitive assessment battery was not administered to participants to determine a HAND classification. Perhaps those with HAND would be more motivated to engage in a multi-modal cognitive intervention and might have had different views compared to those who did not have HAND. Furthermore, those without cognitive complaints may possess different views about their cognitive function and this intervention.

Despite these limitations, the primary strength and innovation of this study is that, to the best of our knowledge, it is the first to report: (a) what older adult PLWH know and understand about the association between healthy lifestyle factors and brain health and cognition, and (b) what they liked and disliked about a lifestyle and health behavior intervention that could benefit brain health and cognition.

Implications for Nursing

Nurses will be providing care to increasing numbers of older adults living with HIV and cognitive vulnerabilities, which may compromise everyday function (e.g., medication adherence, driving) as well as quality of life. Fortunately, nurses can use the basic Cognitive Prescription format highlighted here to introduce a practical strategy to begin discussing and educating clients about this topic. Unfortunately, prior research has suggested that older adult PLWH know little about brain health or cognition, and many may just accept that cognitive decline and brain dysfunction are inevitable (Vance et al., under review). In fact, nurses should assess what their clients living with HIV know about brain health and empower patients to be proactive about protecting and improving their own brain health and cognition.

Conclusion

Subjective and objective cognitive impairments in adults living with HIV are well documented, especially in older ages (Cody & Vance, 2016). Unfortunately, few interventions, especially behavioral interventions, have been developed or proposed. Our study provides introductory evidence to suggest that a multi-modal cognitive intervention may be amenable to this clinical population. The next steps are to attempt the intervention with older adult PLWH and to document its feasibility and effectiveness.

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COGNITIVE PRESCRIPTION Mary's Personal Goals		
LIFESTYLE FACTOR	DAILY/WEEKLY GOALS	APRIL 1 – APRIL 7
Physical Activity	1. Go for a 30-minute walk 3 times a week	X X
	2. Stretch for 10 minutes daily	X X X X X
Mental Activity	1. Play high speed videogames 20 minutes daily	X X X
Nutrition	1. Take an omega-3 fatty acid capsule daily	X X X X X X X
Social Engagement	1. Go to Sunday School twice a month	X X
Emotional Health	1. Take quetiapine daily	X X X X X
	2. Listen to inspirational music or inspirational meditations for 30 minutes daily	X X X X
Sleep Hygiene	Not applicable; no sleep problems	-----
Substance Use	Not applicable; no substance problems	-----

Figure 1.

Example of a Cognitive Prescription. This example is for a patient who wants to work on improving physical activity, mental activity, nutrition, social engagement, and emotional health. Daily/weekly goals are developed by her in conjunction with her health care provider. The Xes represent each time Mary completed the activity during the week.

PHYSICAL ACTIVITY GOAL

Go for a 30-minute walk 3 times a week.

Directions: Put an X for each day you go for a walk.

APRIL 2017

SUN	MON	TUES	WED	THUR	FRI	SAT
			1 X	2 X	3	4
5	6 X	7 X	8 X	9	10 X	11
12 X	13	14 X	15	16 X	17	18 X
19	20 X	21	22	23	24	25
26	27 X	28 X	29 X	30		

May 2017

SUN	MON	TUES	WED	THUR	FRI	SAT
					1 X	2
3	4 X	5 X	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Figure 2.

Example of Goal Tracking. This is an example of how a patient may keep track of accomplishing a behavioral goal.

Table 1

Sample Characteristic of the Focus Groups (N = 30)

Variable	Frequency (%)	Mean (SD)	Range
Age (years)		56.38 (3.97)	51 – 64
Race/Ethnicity			
African Americans	21 (70.00%)		
Caucasians	9 (30.00%)		
Gender			
Women	13 (43.33%)		
Men	17 (56.77%)		
Education [†] (years)		12.13 (1.72)	8 – 16
Household Income [‡] (in \$10K USD increments)		1.43 (0.84)	1 – 3
Years Diagnosed with HIV		16.95 (6.67)	4 – 31
Current Self-reported CD4+ T Cell Count (cells/mm ³)		609.40 (441.98)	100 – 2,138
Current Self-reported HIV Viral Load (copies/mL)		464.10 (1,251.71)	0 – 4,000
Number of Co-morbidities		1.50 (1.33)	0 – 5
Self-rated Health (1 = poor; 5 = excellent)		3.17 (0.95)	1 – 5
Self-rated Sleep Quality (1 = poor; 5 = excellent)		2.43 (1.22)	1 – 5
Self-rated Healthy Eating Habits (1 = poor; 5 = excellent)		2.70 (1.21)	1 – 5
Self-rated Social Support (1 = poor; 5 = excellent)		3.37 (1.00)	1 – 5
Self-rated Mood (1 = poor; 5 = excellent)		3.40 (1.04)	1 – 5
Frequency of Engaging in Intellectually Challenging Activities (1 = not at all; 5 = Extremely)		2.41 (0.91)	1 – 5
Hours Reading/Week		5.63 (8.38)	0 – 30
Times/Week Physically Exercising (working up a sweat)		2.20 (2.16)	0 – 7

Note. SD = standard deviation; USD = U.S. dollars.

[†]Education (1 = 1st grade... 12 = completed high school or GED; 13 = some college/vocational training; 14 = associate degree; 16 = bachelor's degree; 18 = master's degree; 20 = doctoral degree).

[‡]Household Income before Taxes (1 = \$0 – \$10K; 8 = +\$70K).

Table 2**Focus Groups Protocol**

INTRODUCTION	
<p>Thank you for coming to our center today. During this next hour and a half, we will be talking about brain health. We will be showing you materials and presenting ideas of how to improve the way you think. We will be recording our discussion and transcribing it word for word; however, we will not include your real name in the transcript which will be used for publication in scientific journals. If you want to use a different name to protect your identity in this group setting, you are welcome to do so. During this time, we ask that you adhere to few basic rules:</p> <ol style="list-style-type: none"> 1 Speak one at a time; 2 Let others have a chance to respond; 3 Be respectful of others comments even if you disagree; and 4 Use that name that is listed in front you on the name card, which you welcome to make up (<i>The name placard should be made in advance with the participant</i>), when speaking or referring to fellow participants. For example, "Fred speaking, I agree with Sam's comment about the brochures." By identifying yourself, we will be able to determine who is speaking when we transcribe the interviews. 	
COGNITIVE PRESCRIPTION INTERVENTION	
<p>Please look at the following Cognitive Prescription. (<i>Hand participants a copy of the Cognitive Prescription.</i>) We plan to develop tailored, individual prescriptions for people like you. We plan to offer an educational workshop and follow-up it up one-on-one with people who will develop personal healthy goals that may also improve brain health. We would ask such people to keep track of their goals and to discuss them on the phone weekly with a coach.</p>	
Primary Questions	Prompts
Q1: Would you participate in such a study? Why or why not?	<ul style="list-style-type: none"> • What do you like about the Cognitive Prescriptions? • What sort of goals would you set for yourself? • How long should the educational workshop be?
Q2: We are considering ways of helping people keep track of their progress on their goals. Here is an example of a physical activity goal. (<i>Hand participants the goal and chart.</i>) This person thought it would be a good idea to go for a 30-minute walk 3×'s a week. She/He put the goal on the refrigerator. Does this seem obvious how to do it? Would this be something you would do if asked?	<ul style="list-style-type: none"> • Can you think of another way in which you can monitor such a goal? Internet? Cell phone?
Q3: We are also considering pairing people who use the Cognitive Prescription with a coach to help them work through obstacles along the way. One way we thought about it was with a weekly 10-20 minute phone call. Would this work for you or not?	<ul style="list-style-type: none"> • Are there certain characteristics of these coaches you would prefer? Clinician? Nurse? Someone who is also positive?
Q4: If you were to do a Cognitive Prescription with us, how many goals do you think you could handle? 1? 2? 3?	
Q5: If you were to sign up for this intervention, what areas would you prefer to focus on in your life? Social? Physical activity? Please take the piece of paper in front of you; please number in order your preference.	
Q7: Are there any other areas where we should have goals?	