

# Review of Recent Behavioral Interventions Targeting Older Adults Living with HIV/AIDS

Lourdes Illa · Marisa Echenique · Victoria Bustamante-Avellaneda · Mario Sanchez-Martinez

Published online: 7 October 2014  
© Springer Science+Business Media New York 2014

**Abstract** Increasing attention has been paid to older adults living with HIV over the past few years given the increasing prevalence of HIV in this age group. Yet, despite numerous studies documenting psychosocial and behavioral differences between older and younger HIV-infected adults, few evidence-based behavioral interventions have been developed for this population. This review found only 12 manuscripts describing behavioral intervention studies in older HIV-positive adults published between 2011 and 2014, and they reported on a total of six interventions. Despite promising findings, there is a clear need for large-scale clinical trials to replicate these initial results and further develop additional interventions to address important clinical issues such as depression, sexual risk behaviors, cognition, and other significant issues affecting this cohort. This represents an exciting opportunity for behavioral scientists and HIV specialists to develop interventions that combine the psychological and behavioral with medical aspects of the disease.

**Keywords** HIV/AIDS · Older adults · Aging · Behavioral interventions · Secondary prevention · Mental health · Depression · Sexual risk behaviors · Cognitive impairment · Stigma

---

L. Illa (✉) · M. Echenique  
Department of Psychiatry and Behavioral Sciences,  
1695 NW 9th Ave, Suite 1404, Miami, FL 33136, USA  
e-mail: lilla@med.miami.edu

M. Echenique  
e-mail: mechenique@med.miami.edu

V. Bustamante-Avellaneda  
Jackson Health System, 1695 NW 9th Ave, Suite 1208, Miami,  
FL 33136, USA  
e-mail: VBustamante@jhsmiami.org

M. Sanchez-Martinez  
200 Tarpon Trail, Jacksonville, NC 28546, USA  
e-mail: msanchezmartinezmd@yahoo.com

## Introduction

The demographics of HIV/AIDS have evolved during recent years with individuals over 50 accounting for more than one fourth of the US HIV/AIDS population. It is estimated that by 2015, nearly half of all people living with HIV in the USA will be aged 50 or older [1]. With the advent of more effective HIV treatments and decrease in mortality rates, the HIV epidemic is increasingly affecting older adults. Although the effectiveness of combination antiretroviral therapy (cART) may lead to longer lives, these older adults face an array of impairing co-occurring medical and psychosocial issues [2, 3, 4].

Evidence suggests that older adults living with HIV may experience high rates of mental health issues such as depression, substance use, loneliness, and social isolation in addition to the impact of HIV on the normal aging progression [5, 6]. In a large sample of persons over 50 with HIV, 39 % presented with symptoms of major depression, with symptoms most related to loneliness and HIV stigma [7]. Moreover, compared to younger HIV-infected adults, older adults report greater unhappiness, negative life events, perceived stress and negative attitudes about aging [6, 8]. Additionally, recent data suggests that LGB adults aged 50 and older may experience higher rates of mental distress than heterosexual older adults [9].

The high rates of depression are of particular importance given the documented associations between depression and other health-related behaviors, including unprotected sex [7, 10] and nonadherence to HIV medications [11, 12]. Although some previous studies have found that older adults are more adherent to their medication regimens than younger adults [13], more recent studies have demonstrated that adherence remains a significant problem for many older adults [14], particularly among those with substance use [5]. Sexual risk behaviors are also a significant issue warranting clinical attention in this population. Despite societal beliefs, older adults

remain sexually active and often engage in high-risk sexual behaviors [15]. Similar to HIV-negative older counterparts, older adults living with HIV also remain sexually active and engage in sexual risk behaviors [16–18].

HIV-related stigma, common among individuals living with HIV, is compounded in older adults by ageism. Evidence suggests that the majority of older adults living with HIV experience HIV-related stigma and that their stigma may be related to internalized shame and blame [19, 20]. HIV stigma also appears to be related to depression and frequently impacts their disclosure of HIV status to family or friends [7, 19, 21]. Furthermore, among HIV-positive women, stigma has also been implicated in sexual practices, sexual functioning, and self-image [22]. Although limited research literature exists [23], one study found that HIV stigma was highest in women who had poor self-esteem, self-silencing behaviors, and lower sexual assertiveness [22]. Recent evidence further suggests that different types of stigma may impact various subgroups of older adults. For instance, being female, heterosexual, using maladaptive coping, and having poor health may be associated with greater stigma. Older age, having greater mastery, increased social support, and longer time since HIV diagnosis may be associated with lower levels of stigma. These findings suggest that even among older adults, interventions may need to be tailored to properly meet the needs of various subgroups [24].

One area that has received considerable attention in the past several years has been the prevalence of cognitive impairment in this age group, reported as one of the highest comorbid conditions among older adults living with HIV [25–27]. Despite ongoing medical advances, the prevalence of HIV-associated neurocognitive disorder continues to be approximately 50 % [28]. Milder forms of cognitive impairment remain a major clinical problem, as they are difficult to treat and become increasingly salient with age [28].

In response to the growing literature documenting increased comorbidity, treatment guidelines for the medical management of HIV in older adults have been established [29]. However, despite numerous studies documenting psychosocial and behavioral differences, only a few studies have evaluated behavioral interventions specifically targeting the older HIV-positive population, and most behavioral interventions today continue to focus primarily on younger persons living with HIV. Given the unique issues salient in older adults living with HIV, innovative interventions are needed to address their distinct needs [8]. This manuscript will review the recent literature on behavioral interventions targeting older adults living with HIV, which to date have focused on mental health issues, sexual risk behaviors, and cognitive impairment (Table 1). Methodological approaches for each clinical intervention are outlined in Table 2.

## Mental Health Issues

A few studies have recently been published on behavioral interventions targeting mental health issues in older adults living with HIV. Heckman et al. examined the effectiveness of a coping improvement group intervention on decreasing depressive symptoms among HIV-positive older adults [30]. Participants were randomized to one of three conditions, a coping improvement group intervention, an interpersonal support group intervention, and a control condition. Participants were 50 years of age or older, had a diagnosis of HIV infection or AIDS, and had a BDI-II score of 10 or higher. Participants with suspected severe cognitive impairment were excluded, but individuals with other disorders, such as substance use, mania, or psychosis were not excluded to obtain a representative sample of HIV-infected older adults typical in community settings. Both intervention conditions consisted of twelve 90-min sessions; separate groups were conducted for men who have sex with men (MSM), heterosexual men, and women, and groups were co-facilitated by Masters-level clinicians. The Coping Improvement Group Intervention addressed the following topics: stressors related to HIV as well as normal aging, adaptive coping skills, and optimizing coping through the use of interpersonal supports. The Interpersonal Support Group Intervention sessions were divided in two sections; in the first 45 min of each session, participants watched a videotape on a specified topic and discussed what adaptations were needed for the videotape to be relevant for HIV-infected older adults. In the final 45 min, participants shared how the session's topic pertained to their own lives. Participants in the control group had access to psychosocial services available in the community. Participants were assessed at pre-, post-, and 4- and 8-month follow-up. Results demonstrated that participants in both the coping intervention group and the interpersonal support group interventions had greater decreases in depressive symptoms than those in the control condition at 4- and 8-month follow-up, suggesting that coping-focused and interpersonal support group behavioral interventions may be effective in decreasing depressive symptoms among older adults living with HIV. This study is one of the first behavioral intervention studies targeting depression in older adults living with HIV. A strength of this study was the inclusion of comorbid disorders to obtain a representative sample of individuals living with HIV. However, most participants in this study were male, African American, had at least a high school diploma, identified as gay or bisexual, and had been living with HIV for over 10 years. Future studies should include persons of other cultural backgrounds, educational levels, and more recent diagnosis to improve the generalizability of the findings.

More recently, a study was conducted to examine the effectiveness of a telephone-delivered supportive-expressive and coping group intervention to reduce depressive symptoms

**Table 1** Behavioral interventional studies targeting older adults living with HIV—2010 to 2014

	Study population	Research objectives	Intervention strategies	Underlying theory	Outcomes
Heckman 2011	<ul style="list-style-type: none"> <li>• <math>n=295</math>, 49 % AA, 67 % M</li> <li>• Mean age=55 years, 54 % &lt;\$10K/year</li> <li>• 13 Years of education, HIV+ for 12.5 years</li> </ul>	<p>Test if coping improvement group intervention reduced depressive symptoms</p> <p>Evaluated efficacy of group interventions for depression in reducing sexual risk behavior</p> <p>Tested whether telephone-based CET and telephone-based SEGT reduced depression in HIV+ older adults</p>	<ul style="list-style-type: none"> <li>• Coping improvement group (<math>n=104</math>)</li> <li>• Interpersonal support group (<math>n=105</math>)</li> <li>• Control (<math>n=86</math>)</li> </ul>	<p>Transactional model of stress and coping</p>	<p>Both interventions had greater decrease in depressive symptom controls</p> <p>Changes in sexual behavior did not vary by intervention condition</p>
Lovejoy, 2014 (2° analysis of Heckman 2011)					
Heckman 2013	<ul style="list-style-type: none"> <li>• Ave age 59 years, 41 % MSM, 20 % Heterosexual male; 39 % F</li> <li>• 59 % AA, 59 % ≤\$10K/year</li> <li>• 13 Years of education</li> <li>• 18 Years HIV+</li> <li>• 56 % AIDS</li> </ul>	<p>Compared efficacy of CET and SEGT in older MSM and heterosexuals</p>	<ol style="list-style-type: none"> <li>(1) Telephone-based, SEGT (<math>n=122</math>)—12 sessions;</li> <li>(2) Telephone-based, CET (<math>n=118</math>)—12 sessions</li> <li>(3) Standard of care control (<math>n=121</math>)</li> </ol>	<ul style="list-style-type: none"> <li>• Transactional model of stress and coping and CBT principles</li> <li>• Humanistic psychology principles</li> </ul>	<p>SEGT reported reduced depressive symptoms than CET and controls at post- and 8-month follow-up</p> <p>Greater decrease in depression among heterosexual men (but not MSM) who received SEGT vs controls</p> <ul style="list-style-type: none"> <li>• Four-session MI had greater decrease in sexual risk behavior</li> <li>• Most robust response in those with highest risk behaviors at baseline</li> </ul>
Heckman, 2014 (2° analysis of Heckman 2013)	<ul style="list-style-type: none"> <li>• MSM (<math>n=149</math>) heterosexual (<math>n=212</math>)</li> </ul>				
Lovejoy, 2011	<ul style="list-style-type: none"> <li>• Ave age 54 years (range 45–66 years)</li> <li>• HIV+ average 17 years</li> <li>• 54 % Male, 2/3 AIDS</li> <li>• 87 % Ethnic minority</li> <li>• 52 % Heterosexual</li> <li>• 85 % &lt;\$20K/year</li> </ul>	<p>Tested efficacy of one- and four-session telephone-administered sexual risk reduction MI for HIV+ middle-age and older adults who engage in risky sexual behaviors</p> <p>Examined changes in depression, anxiety, stress in response to telephone-delivered MI targeting sexual risk behavior</p>	<ol style="list-style-type: none"> <li>(1) One-session MI (<math>n=39</math>)</li> <li>(2) Four-session MI (<math>n=38</math>)</li> <li>(3) Control (<math>n=23</math>)</li> </ol>	<p>Transtheoretical model</p>	<p>Relative to controls, participants in both one- and four-session MI conditions reported decreased depression, anxiety, and stress at 6-month follow-up</p> <p>Intervention reduced unprotected sexual acts (with negative or unknown serostatus partners)</p> <p>Intervention group—increased likely to report;</p> <ul style="list-style-type: none"> <li>• Reduced high-risk sexual behavior</li> <li>• Decreased HIV stigma</li> <li>• Training group improved visual processing speed and timed everyday functioning</li> <li>• Subjective reports of improved cognition</li> </ul>
Lovejoy, 2012 (2° analysis of Lovejoy 2011)					
Illa, 2010	<ul style="list-style-type: none"> <li>• Mean age=51 years, 56 % male, 78 % AA, 38 % &lt;HS education</li> <li>• 54 % Single</li> <li>• 83 % Self-identified as heterosexual</li> </ul>	<p>Tested effectiveness of a sexual risk-reduction behavioral intervention among sexually active HIV+ &gt;45 years</p> <p>Examined effectiveness of sexual risk-reduction behavioral intervention in sexually active HIV+ older women</p>	<ol style="list-style-type: none"> <li>(1) Sexual risk reduction group intervention (<math>n=200</math>)</li> <li>(2) Control—educational brochure and care as usual (<math>n=100</math>)</li> </ol>	<ul style="list-style-type: none"> <li>• Information-Motivation-Behavior Skills (IMB) model</li> <li>• Self-efficacy theory</li> </ul>	<p>Intervention reduced unprotected sexual acts (with negative or unknown serostatus partners)</p> <p>Intervention group—increased likely to report;</p> <ul style="list-style-type: none"> <li>• Reduced high-risk sexual behavior</li> <li>• Decreased HIV stigma</li> <li>• Training group improved visual processing speed and timed everyday functioning</li> <li>• Subjective reports of improved cognition</li> </ul>
Echenique, 2013 (2° analysis of Illa, 2010)					
Vance, 2012	<ul style="list-style-type: none"> <li>• <math>n=46</math></li> <li>• Aged 40 or older, English speaking, HIV+ at least 1 year</li> </ul>	<p>To determine if speed of processing training increases speed of processing performance and everyday functioning</p>	<ol style="list-style-type: none"> <li>(1) 10 h of computer Posit Science “INSIGHT” training</li> <li>(2) Control</li> </ol>		

**Table 1** (continued)

	Study population	Research objectives	Intervention strategies	Underlying theory	Outcomes
Kaur, 2014 (2° analysis of Vance)		To identify predictors of processing speed training gains			<ul style="list-style-type: none"> <li>• Participants with reduced performance at baseline had improved gains.</li> <li>• Improvement in timed everyday functioning was correlated with increased HIV viral load, decreased medication adherence, and decreased executive functioning</li> </ul>
Becker, 2012	n=60 (30 HIV+ and HIV-)	To obtain pilot data on feasibility and efficacy of the SmartBrain CSP	(1) SmartBrain© intervention (2) Usual care		Participants who used the program most showed improvements in cognitive function over the 24-week period

among older adults living with HIV [31•]. Participants from multiple states were randomized to one of three conditions: 12 weekly sessions of telephone supportive-expressive group therapy, 12 weekly sessions of telephone coping effectiveness training, or a standard of care control group. Assessments were conducted pre-, post-, and 4- and 8-month follow-up. Both intervention conditions consisted of twelve 90-min sessions delivered via teleconference technology and led by two Masters or PhD co-therapists. Separate groups were conducted for MSM, heterosexual men, and women. The telephone supportive-expressive group intervention discussed difficulties associated with normal aging, having HIV, and living with HIV as an older adult. Sessions focused on improving social support and communication both within and outside the group. Other topics included view of self, physician-patient relationships, feelings around death and dying, and quality of life. The telephone coping effectiveness intervention focused on appraising stressor severity, developing adaptive coping skills, and optimizing coping by utilizing social supports. The control condition consisted of access to community-based support services. The authors found that participants in the supportive-expressive group therapy intervention reported fewer depressive symptoms than those in the coping effectiveness training intervention and in the control group at post-intervention and 8-month follow-up, suggesting that this intervention may be effective in reducing depressive symptoms in older persons living with HIV. In a more recent analysis of the data, the investigators compared the effectiveness of the two interventions between older MSM and older heterosexuals living with HIV. They found that older heterosexuals living with HIV who received the supportive-expressive group therapy reported significantly greater reductions in depressive symptoms than controls, but the same reduction was not found among the older MSM adults [32•]. This study provides additional evidence that behavioral interventions can be effective in treating depressive symptoms in older adults living with HIV. One of the exciting aspects of this study is that it was delivered via telephone, allowing older adults who have limited transportation, financial resources or access to mental health services to receive group therapy services. The use of telephone may also facilitate the engagement of persons who may feel uncomfortable about taking part in group treatment. The study, however, experienced high attrition rates and specifically found that older adults with more severe depressive symptoms attended fewer teletherapy sessions. Future studies are needed that can effectively engage and address the needs of older adults with more severe depressive symptomatology. Similarly, the difference in response rates between MSM and heterosexual older adults further suggests that MSM older adults living with HIV may face unique stressors requiring more tailored intervention.

Although not designed to target depression, two studies targeting sexual risk behavior have recently reported on

**Table 2** Methodology of behavioral interventional studies targeting older adults living with HIV—2010 to 2014

Recruitment	Inclusion/exclusion criteria	Randomized	Assessments
<p><b>Heckman 2011</b></p> <ul style="list-style-type: none"> <li>• AIDS service organizations in New York City, Cincinnati, OH, and Columbus, OH</li> <li>• Recruitment brochures</li> <li>• Community outreach efforts</li> <li>• Advertisements in AIDS-related media print</li> </ul>	<p><b>Inclusion:</b></p> <ol style="list-style-type: none"> <li>(1) 50+</li> <li>(2) HIV or AIDS</li> <li>(3) BDJ-II score of <math>\geq 10</math></li> <li>(4) <math>\geq 75</math> on the three MS</li> </ol> <p><b>Exclusion:</b></p> <p>&lt;75 on the three MS was used to exclude severe cognitive compromise and who might have difficulty completing research activities</p>	Yes	<ul style="list-style-type: none"> <li>• A-ACASI assessments at pre-intervention, post-intervention, and 4- and 8-month follow-up</li> <li>• Length 90 min</li> <li>• Incentives: Pre-intervention=\$30, post-intervention=\$30</li> <li>4-Month follow-up=\$40</li> <li>8-Month follow-up=\$50</li> <li>• Outcome measure: Geriatric Depression Scale</li> </ul>
<p><b>Heckman 2013</b></p> <ul style="list-style-type: none"> <li>• Recruitment brochures, regular mail, and in “high-traffic” areas of their facilities (e.g., reception areas)</li> <li>• Participants recruited from 24 states</li> </ul>	<p><b>Inclusion:</b></p> <ol style="list-style-type: none"> <li>(1) 50+</li> <li>(2) Self-reported diagnosis of HIV or AIDS</li> <li>(3) A GDS score &gt;10</li> <li>(4) Reliable access to a land-based or cellular telephone for the next 12 weeks</li> </ol>	Yes	<ul style="list-style-type: none"> <li>• Pre-, post-, 4-, and 8-month follow-up</li> <li>• Incentive: Pre-intervention=\$40, post-intervention=\$50</li> <li>4-Month follow-up=\$50</li> <li>8-Month follow-up=\$60</li> <li>• Outcome measures: Geriatric Depression Scale Mental Health and Substance Use Services Utilization Scale</li> </ul>
<p><b>Lovejoy 2011</b></p> <ul style="list-style-type: none"> <li>• Recruitment brochures were sent to AIDS service organizations in five areas as follows: New York City, Atlanta, Philadelphia, Cincinnati, and Columbus, OH.</li> </ul>	<p><b>Inclusion:</b></p> <ol style="list-style-type: none"> <li>(1) Self-reported being HIV seropositive or having a diagnosis of AIDS</li> <li>(2) 45+ years of age</li> <li>(3) English-speaking</li> <li>(4) Access to a landline or cellular telephone</li> <li>(5) one or more unprotected anal or vaginal intercourse in the past 3 month</li> </ol> <p><b>Inclusion:</b></p> <ol style="list-style-type: none"> <li>1) Positive HIV status</li> <li>2) Age 45 or older</li> <li>3) Being sexually active in 12 months</li> </ol>	Yes	<ul style="list-style-type: none"> <li>• Telephone-administered interviews at baseline, 3-, and 6-month follow-up</li> <li>• Incentives: \$20 for baseline interview \$25 for the 3-month FU \$30 for the 6-month follow-up</li> </ul>
<p><b>Illa 2010</b></p> <ul style="list-style-type: none"> <li>• Recruitment brochures</li> <li>• Local clinic</li> </ul>	<p><b>Inclusion:</b></p> <ol style="list-style-type: none"> <li>1) Positive HIV status</li> <li>2) Age 45 or older</li> <li>3) Being sexually active in 12 months</li> </ol>	Yes	<ul style="list-style-type: none"> <li>• Computer-assisted interview software at baseline and 6 and 12 months.</li> <li>Incentives: \$25</li> <li>Supermarket gift certificate</li> <li>• Outcome measures: Demographics HIV knowledge Sexual Risk and Sexual Self-Efficacy Questionnaire</li> </ul>
<p><b>Vance 2012</b></p> <ul style="list-style-type: none"> <li>• Through a larger R03 study</li> <li>• University’s HIV clinic through brochures, flyers, and word of mouth</li> </ul>	<p><b>Inclusion:</b></p> <p><math>\geq 40</math> Years of age          Proficient in English          Diagnosed with HIV for <math>\geq 1</math> year</p> <p><b>Exclusion:</b></p> <p>Being homeless, mentally impaired          H/O brain trauma, or deaf or blind</p>	Yes	<ul style="list-style-type: none"> <li>• Pre- and post-intervention Incentives: \$50 for each assessment \$10 for each 1-h training session up to 10 h.</li> <li>• Outcome measures: Useful Field of View Test (UFOV) Finger Tapping Test Wisconsin Card Sorting Test</li> </ul>

Table 2 (continued)

Recruitment	Inclusion/exclusion criteria	Randomized	Assessments
Becker 2012 <ul style="list-style-type: none"> <li>• Potential participants were identified from prior research activities (none of which involved CSP or other therapies)</li> <li>• By word-of mouth</li> </ul>	Inclusion: Access to the internet Age 40 to 65 years Native language English No major active drug/alcohol use No current major depression No history of neurological disease No history of learning disability	Yes, but changed after 30 participants were enrolled in order to meet recruitment goals and staff availability limitations	Timed Instrumental Activities of Daily Living Test <ul style="list-style-type: none"> <li>• Neuropsychological test battery at study entry and after 24-week follow-up</li> <li>• Questionnaires concerning psychiatric symptomatology</li> <li>• HIV associated Neurocognitive Disorder (HAND) outcomes</li> <li>• Medical Outcomes Study</li> <li>• HIV Health Survey (MOS-HIV) at the baseline, 12-, and 24-week visits</li> </ul>

secondary mental health outcomes. Lovejoy evaluated the effectiveness of a telephone-delivered motivational interviewing sexual risk-reduction intervention (Project SAFER, Seropositive and Aging Forming Essential Risk reduction) on reducing depression, anxiety, and stress in older adults living with HIV [33]. Participants were randomly assigned to one of three conditions—one-session MI, four-session MI, or standard of care control condition—and were assessed at baseline and 3- and 6-month follow-up. Results indicated that participants in both the one-session and four-session MI conditions reported lower levels of depression, anxiety, and stress at 6-month follow-up compared to those in the control condition, suggesting that telephone-delivered MI may improve mental health functioning in HIV-positive older persons. The retention rates in this study were high, suggesting that the intervention is feasible. Although this intervention was not designed to decrease depression, anxiety, and stress, it is possible that the accepting and nonjudgmental approach of motivational interviewing may have resulted in a decrease in symptoms. It is also possible that participants' depressive or anxious symptoms may have been related to relationship concerns or issues of sexual safety and thus symptoms abated with the sexual risk intervention.

Similarly, secondary outcome analysis of a secondary prevention behavioral group intervention for sexually active HIV-positive older individuals (Project ROADMAP (Re-educating Older Adults in Maintaining AIDS Prevention)) revealed that this intervention was effective in reducing HIV stigma among older HIV-positive women [34•]. Although stigma was not directly targeted by the intervention, the social support provided by the group intervention may have contributed to the decrease in stigma, which may speak to the social isolation common among older women living with HIV. Additional studies are needed to replicate these findings and further develop interventions targeting stigma in older adults living with HIV.

### Sexual Risk Behaviors

Increasing attention has been paid to sexual risk behaviors among older adults living with HIV over the past few years. Research indicates that older women are less likely to use condoms and have more difficulty negotiating sexual safety than younger females [35, 36]. Project ROADMAP tested the effectiveness of a sexual risk-reduction behavioral group intervention among sexually active HIV-positive individuals age 45 or older [37]. Participants were randomized to the group intervention or comparison group and assessed at baseline and 6- and 12-month follow-up. Both groups received an educational brochure. Participants in the comparison group did not receive any additional intervention and proceeded with care as usual. Participants in the intervention group were

scheduled for four group sessions designed for HIV-positive older adults. Sessions discussed general HIV education, effects of HIV on sexual behaviors, harm reduction, and assertive communication with sexual partners. A recent analysis conducted by Echenique et al. examined the intervention's effectiveness among older HIV positive women. Results revealed that women in the intervention group were more likely to report a decrease in sexual risk behavior than those in the control group, suggesting that Project ROADMAP may be an effective secondary prevention intervention for sexually active older HIV-positive women. These findings contribute to the existing literature given the paucity of risk-reduction interventions specifically targeting older adults living with HIV despite numerous studies documenting high-risk sexual activity in this group. Larger trials are needed to replicate the findings. Future studies should focus on further developing effective interventions to decrease sexual risk behaviors in older adults living with HIV.

Lovejoy et al. evaluated a telephone-administered motivational interviewing (MI) and behavioral skills training to reduce sexual risk behavior in sexually active HIV-positive older adults [38, 39]. Participants were randomized into one of three conditions: one-session MI, four-session MI, or a control group. The study found that participants in the four-session MI condition had greater decreases in sexual risk behavior compared to those in the control and one-session MI groups, and those participants with the highest risk behaviors at baseline had the most robust response. The intervention in this study seems promising, as would be expected given that motivational interviewing has been proven effective in changing behavior in a number of health areas, such as substance use and adherence to treatment. Additionally, the telephone delivery method makes this intervention easy to implement and accessible to nearly everyone. Larger trials are needed to replicate findings. Efforts should be made to include participants of culturally and educationally diverse backgrounds.

Recently, a secondary data analysis of a study of group mental health interventions for depression in HIV-positive older adults evaluated the efficacy of coping and interpersonal support group interventions in reducing sexual risk behavior [40]. Participants were HIV-positive adults aged 50 and over presenting with depressive symptoms, ranging from mild to severe. They were randomized to one of three conditions: a 12-session coping improvement group intervention, a 12-session interpersonal support group intervention, or control condition. Although sexual risk behaviors were not a focus of the study, participants in the coping improvement group condition could identify sexual safety, or lack thereof, as a stressor for discussion within the group, and one of the 12 sessions in the interpersonal group intervention focused on sexual safety for HIV-infected adults. Results identified no changes in sexual behavior by intervention condition, indicating that behavioral

interventions that target and reduce depression in HIV-positive older adults may be insufficient to decrease sexual risk behavior. This finding may reflect the complexity of behavior change and suggests that addressing one mental health domain such as depression may not be sufficient to decrease sexual risk behavior. Future studies should focus on the development of integrated interventions that can address both depression and sexual risk behaviors.

### Cognitive Impairment

Despite numerous studies documenting continued high prevalence of HIV-associated neurocognitive disorder despite marked improvements in medical treatment, remarkably, only a few behavioral intervention studies have been published. Becker evaluated the feasibility of a cognitive stimulation program "SmartBrain" to improve neuropsychological test performance in persons living with HIV [41]. Thirty HIV-positive and thirty HIV-negative volunteers participated. Participants were age 40 to 65 years; had access to the internet; were native English speakers; and did not have active drug/alcohol abuse or dependence, current major depression, and history of neurological disease including dementia or history of learning disability or attention deficit disorder/attention deficit hyperactivity disorder. The "SmartBrain" intervention included activities in the domains of memory, attention, gnosis, and executive functions and was programmed to adjust the level of difficulty based on each participant's performance. Outcomes revealed that participants who used the program most showed improvements in cognitive function over the 24-week period. Over 50 % of participants completed all 24 weeks of the study, and 54 % of the participants successfully used the system from home, indicating that such interventions are feasible to implement. Cognitive interventions such as these are greatly needed given the high prevalence of HIV cognitive deficits and associated functional impact present despite advances in HIV medical treatment. Larger-scale studies are needed and should include adults over 65 years of age given the demographic trends of HIV. Additionally, given the large number of non-English-speaking individuals living with HIV in the USA and internationally, translation of the program into other languages such as Spanish and Creole should be undertaken to enhance program access to nonnative English-speaking older adults.

Another recent study examined the effectiveness of a computerized processing speed training program in 46 middle-age and older adults infected with HIV [2]. Participants were aged 40 or older, English speaking, and had been living with HIV for at least 1 year. They were randomly assigned to receive 10 hours of computerized processing speed training or a control condition. The training used the Posit Science

“INSIGHT” computer program and was self-administered with a touch-screen monitor. Games were selected to improve visual processing speed, and the difficulty of the exercises was adjusted based on individual participant performance. Results revealed that participants in the training group improved in the domains of visual processing speed and timed everyday functioning as compared those in the control group. Moreover, many of the participants subjectively reported improved cognitive functioning. More recently, [42] conducted a secondary analysis to identify predictors of processing speed training gains observed in the previous study. In general, participants with worse performance at baseline demonstrated significantly greater gains. Additionally, improvement in timed everyday functioning was correlated with higher HIV viral load, poorer medication adherence, and poorer executive functioning. This study addresses an emerging topic in the aging HIV literature and proposes an intervention to improve real-world functioning. Results indicating that processing speed training may improve everyday functioning are promising. Larger clinical trials are needed to replicate these intriguing findings.

## Conclusions

This systematic review examined recent behavioral HIV interventions specifically targeting older adults living with HIV. Consistent with recent literature, the review found a paucity of intervention trials in this area, despite the increasing prevalence of HIV in this age group [43] and considerable evidence of psychosocial and behavioral differences between older and younger adults living with HIV. Only six publications about behavioral intervention studies in older HIV positive adults were published between 2013 and 2014. Moreover, only one of these describes an original intervention trial. The other five consist of secondary analyses of studies published earlier. Six additional manuscripts published from 2010 to 2012 described five other behavioral interventions in older adults living with HIV. Of the six interventions published in the scientific literature over the past few years, two focused on depressive symptoms, two targeted reducing sexual risk behaviors, and the other two tested cognitive training interventions. There are no published studies on behavioral interventions addressing other significant issues in this population, including stigma, adherence, and substance use disorders. Despite recent federal efforts to increase attention to the need for effective interventions and treatment for the older HIV cohort, evidence-based interventions for this cohort remain scarce [2•, 43].

The six intervention studies included in this review had several strengths. All of the studies addressed important clinical issues and were randomized clinical trials. Additionally, three of the studies had relatively large samples and three studies recruited from multiple states. Yet, several limitations also exist. Three of the six studies, including both cognitive

training studies, had small sample sizes. The studies also varied significantly in terms of inclusion and exclusion criteria as well as the outcome measures utilized. Moreover, participants were largely males and adults in their early 50s, and all of the studies were conducted exclusively in English, lacking appropriate evidence to support effectiveness for the more “geriatric” population, females, and ethnic minorities.

Despite promising findings, there is a clear need for large-scale clinical trials to replicate these initial results and further the development of additional interventions to address important clinical issues such as depression, sexual risk behaviors, and cognitive impairment. Future research studies should strive to include more representative sample of the older adult population living with HIV in the USA. Interventions may need to be tailored to account for specific issues related to gender, sexual orientation, and ethnic factors as well as the complex interplay between mental health issues, stigma, cognition, and adherence. More rigorous evidence is also needed on the best strategies to provide services for those aged 50 years and older. Technological advances in video conferencing may provide another mechanism to reach adults with limited access to care in a way that may facilitate therapeutic engagement. Interventions targeting health professionals and other service providers of older HIV positive adults are also needed to raise awareness of emerging issues and health care needs in this population. In summary, there is a vast need for behavioral interventions focused on the needs of older adults living with HIV. This represents an exciting opportunity for behavioral scientists to collaborate with HIV specialists for the development of interventions that combine the psychological and behavioral with medical aspects of the disease.

## Compliance with Ethics Guidelines

**Conflict of Interest** Lourdes Illa, Marisa Echenique, Victoria Bustamante-Avellaneda, and Mario Sanchez-Martinez declare that they have no conflict of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

## References

Papers of particular interest, published recently, have been highlighted as:

- Of importance

1. High KP, Brennan-Ing M, Clifford DB, Cohen MH, Currier J, Deeks SG, et al. HIV and aging: state of knowledge and areas of critical need for research. A report to the NIH Office of AIDS research by the HIV and Aging Working Group. *J Acquir Immune Defic Syndr*. 1999;60 Suppl 1:S1–18.



2. Vance DE, Fazeli PL, Ross LA, Wadley VG, Ball KK. Speed of processing training with middle-age and older adults with HIV: a pilot study. *J Assoc Nurses AIDS Care*. 2012;23(6):500–10. *This study is one of the few demonstrating the effectiveness of a cognitive intervention in older HIV infected adults.*
3. Greene M, Justice AC, Lampiris HW, Valcour V. Management of human immunodeficiency virus infection in advanced age. *JAMA*. 2013;309(13):1397–405.
4. Erlandson KM, Allshouse AA, Duong S, MaWhinney S, Kohrt WM, Campbell TB. HIV, aging, and advance care planning: are we successfully planning for the future? *J Palliat Med*. 2012;15(10):1124–9.
5. Parsons JT, Starks TJ, Millar BM, Boonrai K, Marcotte D. Patterns of substance use among HIV-positive adults over 50: implications for treatment and medication adherence. *Drug Alcohol Depend*. 2014;139:33–40. *This study examines the high prevalence of substance use among older adults infected with HIV and implications for adherence and highlights the need for interventions addressing this issue.*
6. Rueda S, Law S, Rourke SB. Current opinion psychosocial, mental health, and behavioral issues of aging with HIV. *Curr Opin HIV AIDS*. 2014;9(4):325–31.
7. Grov C, Golub SA, Parsons JT, Brennan M, Karpiak SE. Loneliness and HIV-related stigma explain depression among older HIV-positive adults. *AIDS Care*. 2010;22(5):630–9.
8. Do AN, Rosenberg ES, Sullivan PS, et al. Excess burden of depression among HIV-infected persons receiving medical care in the United States: data from the medical monitoring project and the behavioral risk factor surveillance system. *PLoS One*. 2014;9:e92842.
9. Wallace SP, Cochran SD, Durazo EM, Ford CL. The health of aging lesbian, gay and bisexual adults in California. Los Angeles: UCLA Center for Health Policy Research; 2011.
10. Illa L, Brickman A, Saint-Jean G, Echenique M, Metsch L, Eisdorfer C, et al. Sexual risk behaviors in late middle age and older HIV seropositive adults. *J AIDS Behav*. 2008;12(6):935–42.
11. Gonzalez JS, Batchelder AW, Psaros C, Safren SA. Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. *J Acquir Immune Defic Syndr*. 2011;1999:58(2).
12. Springer SA, Dushaj A, Azar MM. The impact of DSM-IV mental disorders on adherence to combination antiretroviral therapy among adult persons living with HIV/AIDS: a systematic review. *AIDS Behav*. 2012;16(8):2119–43.
13. Paterson DL, Swindells S, Mohr J, Brester M, Vergis EN, Squier C, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Ann Intern Med*. 2000;133(1):21–30.
14. Davis T, Thornton A, Oslin D, Zanjani F. Medication and behavioral adherence among HIV + older adults. *Clin Gerontol*. 2014. doi:10.1080/07317115.2014.937844.
15. Brennan DJ, Emlert CA, Eady A. HIV, sexual health, and psychosocial issues among older adults living with HIV in North America. *Ageing Int*. 2011;36(3):313–33.
16. Golub SA, Botsko M, Gamarel KE, Parsons JT, Brennan M, Karpiak SE. Dimensions of psychological well-being predict consistent condom use among older adults living with HIV. *Ageing Int*. 2013;38(3):179–94.
17. Golub SA, Tomassilli JC, Pantalone DW, Brennan M, Karpiak SE, Parsons JT. Prevalence and correlates of sexual behavior and risk management among HIV-positive adults over 50. *Sex Transm Dis*. 2010;37(10):615–20.
18. Lovejoy TI, Heckman TG, Sikkema KJ, Hansen NB, Kochman A, Suhr JA, et al. Patterns and correlates of sexual activity and condom use behavior in persons 50-plus years of age living with HIV/AIDS. *AIDS Behav*. 2008;12(6):943–56.
19. Foster PP, Gaskins SW. Older African Americans' management of HIV/AIDS stigma. *AIDS Care*. 2009;21(10):1306–12.
20. Emlert CA. Measuring stigma in older and younger adults with HIV/AIDS: an analysis of an HIV stigma scale and initial exploration of subscales. *Res Soc Work Pract*. 2005;15(4):291–300.
21. Emlert CA. Experiences of stigma in older adults living with HIV/AIDS: a mixed-methods analysis. *AIDS Patient Care STDS*. 2007;21(10):740–52.
22. Jacobs RJ, Kane MN. HIV-related stigma in midlife and older women. *Soc Work Health Care*. 2010;49(1):68–89.
23. Emlert CA. “You’re awfully old to have this disease”: experiences of stigma and ageism in adults 50 years and older living with HIV/AIDS. *Gerontologist*. 2006;46(6):781–90.
24. Emlert CA, Brennan DJ, Brennenstuhl S, Rueda S, Hart TA, Rourke SB. Protective and risk factors associated with stigma in a population of older adults living with HIV in Ontario, Canada. *AIDS Care*. 2013;25(10):1330–9.
25. Iudicello JE, Woods SP, Deutsch R, Grant I, HIV Neurobehavioral Research Program (HNRP) Group. Combined effects of aging and HIV infection on semantic verbal fluency: a view of the cortical hypothesis through the lens of clustering and switching. *J Clin Exp Neuropsychol*. 2012;34(5):476–88.
26. Woods S, Hoebel C, Pirogovsky E, Rooney A, Cameron M, Grant I, et al. Visuospatial temporal order memory deficits in older adults with HIV infection. *Cogn Behav Neurol*. 2013;26(4):171–80.
27. Scott JC, Woods SP, Carey CL, Weber E, Bondi MW, Grant I. Neurocognitive consequences of HIV infection in older adults: an evaluation of the “cortical” hypothesis. *AIDS Behav*. 2011;15(6):1187–96.
28. Heaton RK, Franklin DR, Ellis RJ, McCutchan JA, Letendre SL, Leblanc S, et al. HIV-associated neurocognitive disorders before and during the era of combination antiretroviral therapy: differences in rates, nature, and predictors. *J Neurovirol*. 2011;17(1):3–16.
29. Abrass CK, Appelbaum JS, et al. The HIV and Aging Consensus Project: recommended treatment strategies for clinicians managing older patients with HIV. American Academy of HIV Medicine, AIDS Community Research Initiative of America; 2011.
30. Heckman TG, Sikkema KJ, Hansen N, Kochman A, Heh V, Neufeld S. A randomized clinical trial of a coping improvement group intervention for HIV-infected older adults. *J Behav Med*. 2011;34(2):102–11. *This study is one of the first behavioral intervention studies targeting depression in older adults living with HIV and findings suggest effective intervention for this group.*
31. Heckman TG, Heckman BD, Anderson T, Lovejoy TI, Mohr D, Sutton M, et al. Supportive-expressive and coping group teletherapies for HIV-infected older adults: a randomized clinical trial. *AIDS Behav*. 2013;17(9):3034–44. *This study provides evidence that a telephone delivered behavioral interventions can be effective in treating depressive symptoms in older adults living with HIV. This type of intervention would allow older adults who have limited access to mental health services to receive group therapy.*
32. Heckman BD, Lovejoy TI, Heckman TG, Anderson T, Grimes T, Sutton M, et al. The moderating role of sexual identity in group teletherapy for adults aging with HIV. *Behav Med*. 2014;40(134–142):2014. *This study is among the first to report the potential role of sexual identity as a moderating factor in response to behavioral interventions.*
33. Lovejoy TI. Telephone-delivered motivational interviewing targeting sexual risk behavior reduces depression, anxiety, and stress in HIV-positive older adults. *Ann Behav Med*. 2012;44(3):416–21.
34. Echenique M, Illa L, Saint-Jean G, Avellaneda VB, Sanchez-Martinez M, Eisdorfer C. Impact of a secondary prevention intervention among HIV-positive older women. *AIDS Care*. 2013;25(4):443–6. *This study provides evidence of the effectiveness of a behavioral intervention in reducing sexual risk behavior and decreasing HIV-related stigma among older women living with HIV.*

35. Neundorfer MM, Harris PB, Britton PJ, Lynch DA. HIV-risk factors for midlife and older women. *Gerontologist*. 2005;45:617–25.
36. Tessler-Lindau S, Leitsch S, Lundberg K, Jerome J. Older women's attitudes, behavior, and communication about sex and HIV: a community-based study. *J Women's Health*. 2006;15(6):747–53.
37. Illa L, Echenique M, Saint-Jean G, Bustamante-Avellaneda V, Metsch L, Mendez-Mulet L, et al. Project ROADMAP: re-educating older adults in maintaining AIDS prevention, a secondary intervention for older HIV positive adults. *AIDS Educ Prev*. 2010;22:138–47.
38. Lovejoy TI, Heckman TG, Suhr JA, Anderson T, Heckman BD, France CR. Telephone-administered motivational interviewing reduces risky sexual behavior in HIV-positive late middle-age and older adults: a pilot randomized controlled trial. *AIDS Behav*. 2011;15(8):1623–34. *This study demonstrated that a telephone-administered motivational interviewing (MI) and behavioral skills training was effective in reducing sexual risk behavior among HIV-positive older adults.*
39. Lovejoy T. Telephone-administered motivational interviewing and behavioral skills training to reduce risky sexual behavior in HIV-positive late middle-age and older adults. *Cogn Behav Pract*. 2014;21(2):224–36.
40. Lovejoy TI, Heckman TG, Sikkema KJ, Hansen NB, Kochman A. Changes in sexual behavior of HIV-infected older adults enrolled in a clinical trial of standalone group psychotherapies targeting depression. *AIDS Behav*. 2014. doi:10.1007/s10461-014-0746-7.
41. Becker JT, Dew MA, Aizenstein HJ, Lopez OL, Morrow L, Saxton J, et al. A pilot study of the effects of internet-based cognitive stimulation on neuropsychological function in HIV disease. *Disabil Rehabil*. 2012;34(21):1848–52. *This study is one of the first to demonstrate the effectiveness of a cognitive intervention in older HIV infected adults.*
42. Kaur J, Dodson JE, Steadman L, Vance DE. Predictors of improvement following speed of processing training in middle-aged and older adults with HIV: a pilot study. *J Neurosci Nurs*. 2014;46(1):23–33.
43. Negin J, Rozea A, Martiniuk AL. HIV behavioural interventions targeted towards older adults: a systematic review. *BMC Public Health*. 2014;14(1):507.