

Three types of self-efficacy associated with medication adherence in patients with co-occurring HIV and substance use disorders, but only when mood disorders are present

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Background: Adherence with medication regimens for human immunodeficiency virus (HIV) is a life-saving behavior for people with HIV infection, yet adherence is challenging for many individuals with co-occurring substance use and/or mood disorders. Medication-taking self-efficacy, which is the confidence that one can take one's medication as prescribed, is associated with better adherence with HIV medication. However, little is known about the influence that other kinds of self-efficacy have on adherence with HIV medication, especially among HIV-infected individuals with co-occurring substance use and/or mood disorders. We sought to examine the relationship between adherence with HIV medication among substance users and three specific kinds of self-efficacy, ie, one's confidence that one can communicate with medical providers, get support, and manage one's mood. We further sought to examine whether symptoms of depression and anxiety moderate these relationships.

Methods: Patients were recruited from three HIV clinics in the southeastern United States as part of an integrated study of treatment for HIV and substance use.

Results: We interviewed 154 patients with HIV and substance use who reported taking HIV medications. Based on symptoms of depression and anxiety using the Patient Health Questionnaire-9 and the Hospital Anxiety and Depression Scale-Anxiety, 63% had probable depression and/or anxiety. Higher levels of self-efficacy in provider communication ($\beta = 3.86$, $P < 0.01$), getting needed support ($\beta = 2.82$, $P < 0.01$), and mood management ($\beta = 2.29$, $P < 0.05$) were related to better self-reported adherence with HIV medication among study participants with probable depression and/or anxiety. The three kinds of self-efficacy were not associated with medication adherence among participants with HIV and substance use only.

Conclusion: In the search for mutable factors to improve medication adherence among individuals triply diagnosed with HIV, substance use, and mood disorders, these findings support previous research indicating the benefit of enhancing self-efficacy, and further point to three specific kinds of self-efficacy that may benefit medication adherence, ie, provider communication, getting support, and mood management.

Keywords: human immunodeficiency virus, self-efficacy, substance use, depression, anxiety, interventions

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Introduction

Since its introduction in 1996, treatment with combination antiretroviral therapy has resulted in remarkable improvements in morbidity and mortality for people living with human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS, PLWHA).^{1,2} Although antiretroviral therapy is a life-saving tool for PLWHA, sustained

adherence is necessary to achieve these positive outcomes.³ Poor adherence with medication may result in drug resistance and lack of viral suppression.⁴ HIV-infected individuals with unsuppressed HIV are much more likely to transmit HIV.⁵

Substance use is consistently related to poorer adherence with HIV medication.^{6–10} The rates of substance use are high among individuals with HIV, with estimates ranging from one-third to over half of individuals with HIV having substance abuse problems.^{11,12} Identifying mechanisms by which substance abuse may influence adherence, particularly mechanisms that are more easily mutable, is critical for the creation of interventions that improve adherence with HIV medication. In previous research, poorer adherence with HIV medication among substance users has been associated with depression, low socioeconomic status, less social support, and the extent and type of substance use.^{7,13,14} Depression and other mental disorders are highly prevalent and frequently co-occur with substance abuse among individuals with HIV.^{8,12,15–22}

Self-efficacy is defined as a belief in one's ability to perform a specific behavior in order to meet a goal.²³ This belief leads to a greater sense of confidence and control, translating into a greater theoretical likelihood of both intending to perform the behavior and actually doing so. Self-efficacy is an important component of a number of theoretical models explaining behavior change, including social cognitive theory,²³ the information, motivational, and behavior model,²⁴ the theory of reasoned action and planned behavior,²⁵ and the integrated behavioral model,²⁶ and is associated with greater medication adherence among PLWHA.^{19,27} However, research that examines the role of self-efficacy in influencing adherence among HIV-infected individuals with substance abuse is limited. In one of few reported studies, Waldrop-Valverde et al found that current cocaine users with greater medication self-efficacy, which is defined as a measure of confidence in one's ability to take medicine as prescribed, were more likely to adhere with their HIV medication dose.²⁸

Few studies have examined the association between adherence with HIV medication and types of self-efficacy other than medication self-efficacy. For example, confidence in one's ability to perform adherence-related behaviors, such as communicating with a medical provider, may be important in determining adherence among substance users. Other types of self-efficacy, such as managing mood and getting social support, may also relate to adherence, because both poorer mental health and less social support are consistently associated with lower levels of adherence with HIV medication.^{15–20,29}

This study explores these issues by examining the relationship between adherence with HIV medication among substance users and three specific kinds of self-efficacy, ie, one's confidence that one can communicate with medical providers, one's confidence that one can get support, and one's confidence that one can manage one's mood. In addition, we examine whether depressive and anxiety symptoms moderate the relationship between these three specific kinds of self-efficacy and adherence with HIV medication. Because depression and anxiety are consistently associated with adherence with HIV medication, we hypothesized that mood disorders may disrupt the confidence of HIV-infected substance users in their ability to communicate with providers, get needed support, or manage their mood. Acquiring a better understanding of the factors that influence the medication adherence behaviors of HIV-infected substance users is critical in developing strategies to improve adherence and reduce the negative health sequelae that result from poor adherence.

Materials and methods

Study recruitment

The data used for this study were collected as part of a larger study that evaluated integrated treatment for HIV and substance use at three HIV clinics in North Carolina between January 2007 and June 2012. At each clinic, patients with HIV infection were routinely screened for substance use by the HIV provider's medical interview, and/or by self-administration of the Substance Abuse and Mental Illness Symptoms Screener.³⁰ This screener has excellent sensitivity (86%) and moderate specificity (75%) for identifying HIV patients with active substance use disorders.³¹

Eligibility criteria were HIV infection, age 18 years or older, English-speaking, receiving medical care on site, and interest in treatment for any type or amount of substance use. Interested patients were consented by the study behavioral health provider and referred to an interviewer employed to collect participant information. Participants completed a baseline interview, which focused on substance use, HIV medications and adherence, and social context. At the time of the baseline data collection used for this analysis, participants had not received any integrated treatment for HIV and substance use. All procedures were approved by the Duke University Medical Center and the University of North Carolina institutional review boards.

Interview measures

Adherence with HIV medication

Adherence with HIV medication was measured using the Center for Adherence Support Evaluation (CASE)

Adherence Index. The CASE Adherence Index is a three-item self-report measure of adherence.^{32,33} The three items are: “How often do you feel that you have difficulty taking your HIV medications on time? By ‘on time’ we mean no more than two hours before or two hours after the time your doctor told you to take it.” (scale 0–3, with 0 as “all the time” and 3 as “never”); “On average, how many days per week would you say that you missed at least one dose of your HIV medications?” (scale 0–5, with 0 as “every day” and 5 as “never”); and “When was the last time you missed at least one dose of your HIV medications?” (scale 0–5, with 0 as “within the past week” and 5 as “never”). Each item refers to “HIV medications” broadly and therefore is inclusive of any medication believed by the patient as treating HIV. The full scale range of the index is 0–13, with 0 indicating the greatest difficulty in adherence and 13 indicating perfect adherence. In the current analysis, we standardized the adherence index through a linear transformation so that the study population mean was 50 and standard deviation was 10. The standardized adherence index was used in multivariable regression models to assess the relationship between degree of adherence with HIV medication and self-efficacy. The CASE Adherence Index is highly correlated across time with changes in HIV RNA and CD4 counts, and outperforms the standard three-day self-report measure.³²

In order to determine what percent of our sample had less than ideal adherence with medication, we combined the CASE Adherence Index with responses on a visual analog scale to create a dichotomous measure of adherence that indicates whether greater than 95% adherence was achieved.^{3,34} The visual analog scale depicts a horizontal line with indications of 0%, 10%, 20%, up to 100%. Participants were asked to, “Put an X on the line at the point showing your best guess about how much of your HIV medication that you take”. There is substantial literature demonstrating the validity of visual analog scales.^{35–37} Complete adherence was identified when the participant both reported 95% or higher on the visual analog scale, and answered “never” or “less than once a week” to the days missed per week on that question of the CASE Adherence Index. Incomplete adherence was identified when the participant reported that he or she was currently taking HIV medications but failed to meet either criteria.

HIV self-efficacy

HIV self-efficacy was measured using three of six subscales of the HIV Self-efficacy Questionnaire.³⁸ The subscales are the “medical provider communication” subscale that

consisted of four items (eg, “How sure are you that you can ask your HIV medical provider things about your medications and treatments that concern you?”); the “getting support” subscale that consisted of five items (eg, “How sure are you that you can get family and friends to help you with the things you need?”); and the “managing mood” subscale that consisted of nine items (eg, “How sure are you that you can do something to make yourself feel better when you are feeling discouraged?”). Each question gives a five-point scale, with 4 indicating “totally sure” and 0 indicating “not at all sure”. We combined the 18 items of these three subscales, weighing each item equally, to create a combined measure of HIV self-efficacy. In the same manner, we combined the items of each subscale, respectively, to create a subscale of each of three specific kinds of HIV self-efficacy, weighing each item equally. The scale ranges of both the combined HIV self-efficacy scale and the three subscales are 0–4, with 0 indicating the lowest self-efficacy, and 4 indicating the highest self-efficacy.

Substance use

Alcohol and drug use were measured using the Addiction Severity Index-Lite (ASI), which is a structured interview assessing problem areas in alcohol-dependent and drug-dependent persons, the severity and patterns of drug use, and the severity and patterns of alcohol use.³⁹ For both alcohol use and substance use, the ASI provides a subjective severity rating and a more objective and standardized composite score ranging from 0 (minimum) to 1 (maximum). The ASI is designed to provide composite scores useful in measuring alcohol and drug use change over time; reductions in ASI composite scores from baseline are considered reliable and valid measures of improvement in the respective domains.⁴⁰ It has been widely used in the settings of medical and addiction treatment.

Depression and anxiety

We measured depressive symptoms using the Patient Health Questionnaire (PHQ-9), which consists of nine items (each item ranges 0–3) on the frequency of symptoms of depression during the past two weeks. Depression severity scores range from 0 to 27. Probable depression is identified as a score of 10 or higher.^{41,42} We measured anxiety using the anxiety portion of the Hospital Anxiety and Depression Scale-Anxiety (HADS-A).⁴³ The HADS-A has seven items, each of which is measured using a four-point ranking for a total scale range of 0 to 28. As recommended by Bjelland et al,⁴⁴ we considered scores ≥ 8 to indicate cases of anxiety.

Based on both mood disorder severity measures, we created a binary mood disorder indicator that equals 1 if the participant has a PHQ-9 score ≥ 10 and/or the participant has a HADS-A score ≥ 8 , and otherwise equals 0.

Perceived physical health

We included an item on self-perceived physical health: “How would you rate your overall health right now?” with answer options “excellent”, “very good”, “good”, “fair”, and “poor” in order to control for confounding by physical symptoms.

Statistical analysis

Of the 203 participants who were interviewed at the time of the baseline visit, those who reported currently taking HIV medication and completed key questions of interest formed the sample of the current study ($n = 154$). Key questions of interest for this study included adherence with HIV medication, HIV self-efficacy, alcohol and drug use, depression, anxiety, physical health, gender, age, race, and education. Descriptive statistics of the study sample, including range, mean, and median, are reported in Table 1.

Multivariable ordinary least squares regression models were used to estimate the association between adherence with HIV medication measured by the standardized CASE Adherence Index and HIV self-efficacy, controlling for the other participant characteristics, including physical health, depression and anxiety scale scores, alcohol and drug use severity, and basic demographics. These statistical models include scores from the depression and anxiety scales as control variables to determine whether there is a relationship between self-efficacy and adherence with HIV medication above and beyond depression and anxiety. Model 1 assesses the association between standardized adherence with HIV medication and combined self-efficacy, and other participant characteristics, including depression and anxiety. Compared with model 1, models 2–4 include a single self-efficacy subscale (communication, getting support, and managing mood self-efficacy), instead of the combined scale. The coefficients of all independent variables, the 95% confidence intervals, and levels of statistical significance are reported in Table 2.

The data were also examined to determine whether any significant relationship between self-efficacy and adherence with HIV medication held true for all participants with HIV and substance use, or only for participants with HIV, substance use, and a mood disorder. This question was tested using an interaction term of any mood disorder by self-efficacy. Specifically, to estimate the effect of mood disorders

Table 1 Participant characteristics at baseline interview ($n = 154$)

	Participants (n)	Proportion of sample
Gender		
Male	98	0.64
Female	55	0.36
Transgender	1	0.01
Age in years, mean, median (range)	45.0, 45.5 (26, 64)	
Race		
African American	126	0.82
Caucasian	20	0.13
Multiracial	8	0.05
Hispanic ethnicity	3	0.02
Education		
1–11 years	47	0.30
12–15 years	87	0.56
16 years	20	0.13
Employed or volunteer	20	0.13
Monthly income, median (range)	\$735 (\$0, \$14,177)	
Mood disorder		
Any probable mood disorder	98	0.64
PHQ-9 depression	68	0.44
HADS-A anxiety	81	0.53
ASI alcohol score (scale range 0–1), mean, median (range)	0.097, 0.010 (0, 0.677)	
Daily alcohol use in past 30 days	8	0.05
ASI drug score (scale range 0–1), mean, median (range)	0.063, 0.028 (0.025, 0.279)	
Substance use in past 30 days		
Any substance	82	0.53
Cocaine or crack	59	0.38
Marijuana or hashish	34	0.22
Heroin	3	0.02
Injected any type of illicit drug	1	0.01
HIV self-efficacy (scale range 0–4), median (range)		
Combined	2.5 (0.6, 4)	
Communication	4.0 (0.8, 4)	
Getting support	2.4 (0, 4)	
Managing mood	2.1 (0, 4)	
Complete adherence	94	0.61
CASE Adherence Index (scale range 0–13), mean, median (range)	8.8, 9.5 (2, 13)	
CASE Adherence Index, standardized (mean = 50, SD = 10), median (range)	51.0 (29.8, 62.4)	
CASE visual analog score, mean, median (range)	92.6, 100 (20, 100)	

Notes: Sample included all participants who reported currently taking HIV medication and completed the following baseline interview measures: self-efficacy, adherence with HIV medication, alcohol and drug use severity, depression, anxiety, physical health, gender, age, race, and education.

Abbreviations: ASI, Addiction Severity Index-Lite; HADS-A, Hospital Anxiety and Depression Scale-Anxiety; HIV, human immunodeficiency syndrome; PHQ-9, Patient Health Questionnaire; CASE, Center for Adherence Support Evaluation.

on the association between adherence with HIV medication and HIV self-efficacy, four additional models (5–8) were built. Compared with models 1–4, these models included a single dichotomous variable indicating the presence (yes) or absence (no) of any probable depression or anxiety instead

Table 2 Association between self-efficacy and adherence with HIV medication in multivariable models, with depression and anxiety included as continuous control variables, with each model using a different type of self-efficacy

	Model 1 Combined self-efficacy	Model 2 Communication self-efficacy	Model 3 Getting support self-efficacy	Model 4 Managing mood self-efficacy
Self-efficacy score	3.07*** (0.79, 5.35)	2.58** (0.38, 4.77)	1.96** (0.29, 3.62)	1.66* (-0.11, 3.42)
Male gender	-2.07 (-5.44, 1.30)	-1.87 (-5.26, 1.51)	-1.99 (-5.38, 1.40)	-2.05 (-5.46, 1.36)
African-American	-0.22 (-4.71, 4.26)	0.64 (-3.88, 5.16)	-0.04 (-4.55, 4.46)	-0.28 (-4.84, 4.28)
Age (divided by 5 years)	-0.09 (-1.20, 1.02)	-0.15 (-1.26, 0.97)	-0.09 (-1.21, 1.03)	-0.16 (-1.29, 0.96)
Years of education	0.86** (0.19, 1.53)	0.95*** (0.27, 1.62)	0.91*** (0.23, 1.58)	0.88** (0.20, 1.56)
Alcohol use severity score	-3.28 (-15.10, 8.53)	-4.20 (-16.09, 7.69)	-3.15 (-15.04, 8.73)	-3.25 (-15.22, 8.71)
Drug use severity score	-16.95 (-45.38, 11.47)	-26.30* (-54.82, 2.22)	-17.03 (-45.70, 11.63)	-17.86 (-46.75, 11.03)
Physical health ranking	-0.08 (-1.64, 1.48)	-0.06 (-1.63, 1.51)	0.05 (-1.51, 1.62)	-0.01 (-1.58, 1.57)
Depression score (PHQ-9)	0.15 (-0.23, 0.52)	0.05 (-0.31, 0.42)	0.10 (-0.28, 0.47)	0.11 (-0.27, 0.49)
Anxiety score (HADS-A)	-0.33 (-0.79, 0.14)	-0.35 (-0.82, 0.12)	-0.40* (-0.87, 0.06)	-0.34 (-0.82, 0.13)

Notes: n = 154. Coefficients and 95% confidence intervals are reported. Age was divided by 5 years to increase the scale of the coefficient above 0.001 and facilitate interpretation. *** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$.

Abbreviations: HADS-A, Hospital Anxiety and Depression Scale-Anxiety; HIV, human immunodeficiency syndrome; PHQ-9, Patient Health Questionnaire.

of continuous depression and anxiety severity scores, and included an interaction term between this combined mood disorder variable and the self-efficacy variable. These models allow the association between self-efficacy and adherence with HIV medication to vary with and without the presence of any mood disorder. With the presence of any mood disorder, the association between self-efficacy and adherence with HIV medication was indicated by linear combination of the self-efficacy term and the interaction term. Without the presence of any mood disorder, the association between self-efficacy and adherence with HIV medication was indicated by the self-efficacy linear term. The models allow the association between adherence with HIV medication and the presence of any mood disorder to change across different self-efficacy levels; therefore, we reported the scale and significance of that association conditional to the mean self-efficacy.

Results

Sample description

Of the 203 participants who were interviewed at the time of the baseline visit, 80% (n = 162) reported currently taking HIV medication. Of those, eight participants provided incomplete data, resulting in a subsample of 154 available for the current study. As shown in Table 1, the majority of study participants were men (64%). Race and Hispanic ethnicity were assessed separately, given that it is possible to identify with Hispanic ethnicity and also consider oneself to be a race such as White or Black. Only 2% of participants identified as being of Hispanic ethnicity. Most identified their race as African-American/Black (82%). The average

age of the participants was 45 years. Nearly one-third (31%) did not complete high school and 87% were unemployed or disabled. Thirty-nine percent of individuals reported less than 95% adherence with HIV medication. Probable mood disorders were relatively common; 44% had a PHQ-9 score indicating probable depression and 53% had an HADS-A score indicating probable anxiety. Crack/cocaine (38%) and marijuana (22%) were the illegal drugs most frequently used in the month prior to interview. Injection drug use was rare in the sample, with only 1% reporting having injected any type of illicit drug in the previous 30 days. Five percent reported daily alcohol use in the past 30 days.

Self-efficacy is linked to higher adherence with HIV medication

Combined HIV self-efficacy was significantly ($P < 0.01$) associated with greater adherence to HIV medication (see Table 2, model 1). Each additional point of combined HIV self-efficacy on a five-point scale was associated with an increase in adherence with HIV medication of 0.31 standard deviations. Two of the three self-efficacy subscales, provider communication and getting support, were significantly associated ($P < 0.05$) with greater adherence to HIV medication (models 2 and 3). The managing mood self-efficacy subscale was associated with greater adherence to HIV medication, with a trend ($P < 0.1$) towards statistical significance (model 4). Neither severity of drug use nor severity of alcohol use was found to be significantly associated with adherence to HIV medication, although the direction of their coefficients was negative, as expected. Educational level was significantly ($P < 0.05$) associated with greater adherence to HIV medication. Neither severity of

depression nor that of anxiety was significantly associated with adherence to HIV medication when included in the models as independent variables.

Association between self-efficacy and medication adherence occurs only when a mood disorder is present

Once a relationship between self-efficacy and adherence with HIV medication was established, we sought to examine for whom this relationship held. Specifically, we examined whether the significant relationship between self-efficacy and adherence with HIV medication was present for all participants with HIV and substance use, or just for participants with HIV, substance use, and mood disorders. To determine the effect of mood disorders on the relationship between self-efficacy and adherence with HIV medication, models that included the presence or absence of any mood disorder as a variable interacting with self-efficacy were estimated (see Table 3). The sample included 98 participants with probable depression and/or anxiety. Among the participants with either depression or anxiety, higher combined HIV self-efficacy was significantly ($P < 0.01$) associated with greater adherence to HIV medication (model 5); each additional point of combined HIV self-efficacy was associated with an increase in adherence of 0.41 standard deviations. However, when neither mood disorder was present, there was no association between combined HIV self-efficacy and adherence with HIV medication. Similar findings were also identified for each of the specific self-efficacy subscales, ie, provider communication ($P < 0.01$), getting support ($P < 0.01$), and managing mood ($P < 0.05$). Lower educational level

remained significantly associated with poorer adherence to HIV medication ($P < 0.05$).

Discussion

The findings in this cohort of HIV-infected substance users indicate that nonadherence with medication was high (38%) and that self-efficacy concerning greater provider communication, getting support, and managing mood were all associated with higher levels of adherence with antiretroviral therapy, but only among individuals with scores qualifying them for probable depression and/or anxiety. Previous research has demonstrated a relationship between general self-efficacy and adherence with HIV medication in non-substance-using populations.^{19,27,45} The current study indicates that specific kinds of self-efficacy are related to better medication adherence among individuals with a likely triple diagnosis of HIV, substance use, and mood disorders. Because confidence in one's ability to communicate with providers, get support, and manage mood are factors that are amenable to change, this finding may be particularly useful.

It is interesting that the three specific kinds of self-efficacy were not associated with adherence to HIV medication among the subsample without probable mood disorder. It is possible that depression and anxiety interfere with provider communication, getting support, and mood management self-efficacy to a greater extent than substance use interferes with them. Therefore, enhancing confidence in one's ability to communicate with providers, get support, and manage one's mood may have the greatest benefit for HIV-infected patients with substance use disorders who also have concurrent depression and/or anxiety. It is also possible that depression and anxiety can interfere with the individual's confidence and willingness

Table 3 Association between self-efficacy and adherence in the absence or presence of any depression or anxiety in multivariate models, with depression and anxiety included as a composite dichotomous variable interacting with self-efficacy

	Model 5 Combined self-efficacy	Model 6 Communication self-efficacy	Model 7 Getting support self-efficacy	Model 8 Managing mood self-efficacy
Self-efficacy if client has any mood disorder	4.06*** (1.54, 6.57)	3.85*** (1.49, 6.22)	2.76*** (0.80, 4.72)	2.22** (0.22, 4.21)
Self-efficacy if client has no mood disorder	1.34 (−2.22, 4.89)	−1.63 (−6.63, 3.38)	0.60 (−2.18, 3.38)	1.21 (−1.38, 3.81)
Male gender	−1.85 (−5.18, 1.48)	−2.00 (−5.35, 1.35)	−1.73 (−5.09, 1.62)	−1.74 (−5.12, 1.64)
African-American	−0.12 (−4.59, 4.36)	1.06 (−3.39, 5.52)	0.14 (−4.36, 4.63)	−0.22 (−4.79, 4.36)
Age (divided by 5 years)	−0.11 (−1.23, 1.02)	−0.16 (−1.27, 0.96)	−0.12 (−1.25, 1.02)	−0.15 (−1.29, 0.99)
Years of education	0.78** (0.12, 1.43)	0.93*** (0.27, 1.59)	0.78** (0.12, 1.44)	0.78** (0.11, 1.44)
Alcohol use severity score	−5.26 (−16.84, 6.32)	−6.93 (−18.54, 4.68)	−5.16 (−16.83, 6.51)	−5.00 (−16.77, 6.78)
Drug use severity score	−16.72 (−45.15, 11.71)	−27.00* (−55.21, 1.20)	−17.45 (−46.30, 11.40)	−16.28 (−45.20, 12.64)
Physical health ranking	−0.23 (−1.74, 1.27)	0.03 (−1.47, 1.53)	−7.45 (−16.81, 1.91)	−0.13 (−1.66, 1.40)
Presence of mood disorder	−1.48 (−5.15, 2.18)	−2.24 (−5.74, 1.26)	−2.15 (−5.69, 1.39)	−1.47 (−5.23, 2.29)

Notes: $n = 154$. Coefficients and 95% confidence intervals are reported. Age was divided by 5 years to increase the scale of the coefficient above 0.001 and facilitate interpretation. *** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$.

to attempt behavior change in general. If so, bolstering self-efficacy of any kind among people with depression and/or anxiety may be helpful in achieving beneficial behaviors such as medication adherence, because self-confidence may provide a general foundation from which to act.⁴⁶ In support of this latter hypothesis, Munoz et al found a relationship between viral suppression of HIV and overall self-efficacy, measured by combining all six subscales of the HIV self-efficacy measure used in the current study.⁴⁷ More research is needed to assess the interaction between mood disorders and other types of self-efficacy in influencing adherence with HIV medication.

The finding that self-efficacy with regard to seeking support is associated with adherence to medication is supported by a rich literature demonstrating the importance of social support to adherence with HIV medication. Satisfaction with social support and perceived and received social support have been directly associated with improvements in medication adherence among diverse populations of HIV-infected individuals,^{19,20,48} including substance abusers.^{49,50} In addition, Gonzalez et al found a relationship between social support and adherence with antiretroviral therapy that was mediated by various factors, such as depression, coping, and negative affect.²⁰ Their study lends support to the current study's finding that accessing social support, or the confidence that one can do so, is particularly important among HIV-infected people with depression.

Despite the potential utility of understanding which specific kinds of self-efficacy relate to adherence with HIV medication, few studies have examined these relationships. We were unable to identify any studies that reported on the relationship between specific subscales in the HIV self-efficacy measure we used and adherence with medication.³⁸ Some studies have used the HIV self-efficacy measure or similar measures to assess outcomes other than adherence with HIV medication, finding relationships between higher HIV self-efficacy and better quality of life⁵¹ and greater likelihood of HIV testing.⁵² In addition, several studies have positively related medication-taking self-efficacy to adherence with HIV medication.^{28,53,54} These studies suggest that interventions specifically related to taking HIV medications are beneficial for adherence. Unique to the current study is the idea that interventions to promote self-efficacy in other domains may also improve adherence with HIV medication.

Taken together, the findings of this study suggest that when working with triply diagnosed patients to improve their medication adherence, it may be beneficial to focus on

improving their skills in getting support from friends and family, communication with medical providers, and managing their mood. This degree of specificity is likely to be found helpful by medical and behavioral health providers and clinic staff. There are a number of steps that providers and clinics caring for PLWHA could take to bolster these specific kinds of self-efficacy. For example, to improve patient-provider communication, Brundage et al⁵⁵ propose interventions based on their patient-provider communication framework. These interventions include improving provider communication skills, teaching providers to use decision aids during discussions with patients, and having patients complete quality of life assessments to enhance their skills in conveying their symptoms to providers. Dickens et al found that, following training, HIV providers incorporated into their practice communication techniques such as speaking slowly and presenting two concepts and then checking for understanding.⁵⁶ In addition, skills-based training on provider communication, mood management, and getting support could be woven into substance use treatment programs for PLWHA. Finally, improving self-efficacy with these interventions should be integrated with the treatment of mood disorders to maximize the effects of both interventions.

The study limitations include use of self-reported data, which lends itself to measurement error. Also, this study's findings may not generalize to geographic areas outside of the southeastern United States where cultural factors may differ. Our population is of substance users willing to seek treatment, and may therefore differ from a general population of substance users. This difference in population may explain why other studies of HIV patients have found a relationship between depression and adherence with HIV medication, whereas ours did not.^{8,14-16} In addition, our study did not include a measure of medication-taking self-efficacy, so we were not able to examine how the three types of self-efficacy we measured relate to medication-taking self-efficacy. This may be an area of future study. Finally, because our sample consisted of current substance users, we were unable to test whether these three kinds of self-efficacy related significantly to adherence among PLWHA and mood disorders but not substance use, and this is another area for future study.

The benefits of antiretroviral therapy are life-saving, but only if high levels of adherence are achieved. Although adherence with antiretroviral therapy is challenging for PLWHA with coexisting substance use and mood disorders, adequate levels of adherence can be achieved. The keys to adherence success are still being discovered; this study reinforces the idea that self-efficacy may be an important

precursor to adherence-related behavior change, and adds three mutable keys, ie, provider communication, getting support, and mood management self-efficacy.

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Disclosure

The authors report no conflicts of interest in this work.

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