HHS Public Access

Author manuscript

Res Nurs Health. Author manuscript; available in PMC 2019 December 04.

Validation of a brief measure of HIV health-related anxiety among women living with HIV

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Abstract

Anxiety symptoms related to health are often present in populations coping with chronic illness, and among women living with HIV (WLWH), anxiety has been linked to a range of negative outcomes. This paper describes the validation of a four-item instrument designed to measure health-related anxiety (HRA) in WLWH by assessing the impact of *thinking about* HIV status and health on difficulty sleeping, lack of appetite, reduced desire to socialize, and difficulty concentrating at school or work. The scale was administered to 238 adult WLWH across three studies. Exploratory factor analysis revealed a one-factor solution; multi-group confirmatory factor invariance analyses supported the single factor model. For construct and criterion validity, correlations between the HRA scale and validated instruments measuring psychological, psychosocial, and physical distress were as predicted. Results support the validity of the HRA scale among WLWH as a brief measure of anxiety related to HIV status and health.

Keywords

anxiety; factor analysis; health; HIV; measurement; women

1 | INTRODUCTION

As of 2012, approximately 1.2 million people in the United States were living with HIV (Centers for Disease Control and Prevention [CDC], 2015). An estimated annual incidence of 45,000 cases combines with broad access to highly active antiretroviral therapy (HAART) and the concomitant increase in life expectancy to drive climbing HIV prevalence (CDC, 2015). Physical illness, medical management, and persistent stigma are significant stressors and increase the likelihood of mental disorders (Spies et al., 2009). In fact, co-morbid psychiatric illness among those with HIV is pervasive, with prevalence rates approaching 50% (Pence et al., 2007). Symptoms of anxiety are particularly common and likely to occur

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

at times of stress, including diagnosis, symptom flair-up, and new HIV-related disability (Brandt et al., 2016; Kemppainen, MacKain, & Reyes, 2013; Pence, Miller, Whetten, Eron, & Gaynes, 2006). Thus, researchers seek to understand relations between illness factors and anxiety, as well as between the symptoms of anxiety and outcomes for people living with HIV and their families. With data across three samples of HIV+ women, the current study provides evidence for the reliability and validity of a brief tool designed to screen for anxiety specifically related to HIV status.

To date, research has relied on diagnostic tools or general measures of anxiety that do not tie symptoms to the experience of HIV. Structured diagnostic instruments, based on the Diagnostic and Statistical Manual of Mental Disorders and the International Classification of Diseases (e.g., the Structured Clinical Interview for DSM-IV) are the “gold standard” for assessing mental health (Spies et al., 2009). However, within the context of a research protocol, these tools are often prohibitively time- and labor-intensive (Myer et al., 2008). Instead, researchers rely upon self-report scales (Kessler, 2002) such as the Hopkins Symptoms Checklist (e.g., Kagee & Martin, 2010) and Brief Symptom Inventory (e.g., Kimerling, Armistead, & Forehand, 1999) to assess a range of psychological symptoms. Also commonly implemented are scales specifically targeting depressive symptoms and anxiety, which frequently co-occur (e.g., the K-10; Spies et al., 2009). HIV researchers have utilized the handful of scales that measure symptoms of general anxiety, including the Hamilton Rating Scale for Anxiety (e.g., Morrison et al., 2002), the Generalized Anxiety Disorder-7 (GAD-7; e.g., Spitzer, Kroenke, Williams, & Löwe, 2006), the Beck Anxiety Scale (e.g., Gonzalez, Solomon, Zvolensky, & Miller, 2009), and the Spielberger State/Trait Anxiety Inventory (Coleman & Holzemer, 1999). Each has been used to demonstrate linkages between symptoms of anxiety and a range of outcomes.

The Patient-Reported Outcomes Measurement Information System (PROMIS), a tool developed and evaluated through support from the National Institutes of Health, also offers a psychometrically sound assessment of the impact of anxiety symptoms on outcomes relevant to clinical care. In a study of the PROMIS tool with a sample of people living with HIV, assessing whether anxiety disrupted daily activities was just as important as measuring the severity of anxiety itself (Edwards et al., 2016). The PROMIS contains items assessing sleep, cognition, and somatic complaints. Although it has been used with HIV+ populations, it is meant as a general clinical tool and does not directly measure the impact of health-related worry. Similar to the current study's measure, it is not meant as a diagnostic instrument of anxiety per se, but meant to assess how anxiety, or non-diagnostic levels of stress, may result in specific symptoms of reduced functioning.

1.1 | Origins of the HRA scale

The Health-Related Anxiety (HRA) scale was developed to accurately capture health-related anxiety specifically associated with a diagnosis of HIV. The measure evaluates the degree to which thinking of one's HIV status is perceived as stressful and affects four basic domains of functioning: difficulty sleeping, lack of appetite, reduced desire to socialize, and difficulty concentrating at school or work. In line with Lazarus and Folkman's (1984) well-established stress and coping theory, stress refers to conditions that exceed an individual's physical or

psychological capacities. They noted that the perception of the psychological situation is most critical in determining the effect of stress. Although many people living with HIV are not meeting clinical levels of anxiety disorders (Brandt et al., 2017), worry over their perceived health can still be associated with negative outcomes. The ability to parse out the impact of health concerns from that of external life stressors and/or anxiety diagnoses can provide clinicians and researchers with more precise information on the sources and degree of stress and anxiety, thereby allowing them to assess more accurately and intervene more effectively. Thus, a brief screening measure that taps symptoms of anxiety proposed to be directly related to the health concerns accompanying an HIV diagnosis, even among those not reporting anxiety symptoms at a clinical level, is needed.

Although the domains assessed by the HRA can be linked to depression (i.e., anxiety and depression overlap in terms of symptomatology; Joiner, 1996), the four areas chosen were those typically assessed related to anxiety outcomes. Both anxiety and depression can restrict one's ability to work, maintain relationships, or even leave the house; however, emotions such hopelessness and despair are the hallmark of depression, whereas worry and fear are indicative of anxiety. Though there is debate about whether anxiety is distinct from depression, or whether both comprise a unitary construct of negative affect (Hinden, Compas, Howell, & Auchenbach, 1997), Brandt et al. (2017) in a recent review presented a model linking HIV/AIDS and anxiety disorders, noting that both anxiety and depression influence and exacerbate one another through shared mechanisms (i.e., biological, behavioral, cognitive, and social processes).

Initially, the HRA measure was published in connection with the Reaching for Excellence in Adolescent Care and Health (NICHD; Wilson et al., 2001) network (e.g., Murphy, Durako, et al., 2001; Murphy, Moscicki, Vermund, & Muenz, 2000; Murphy, Wilson, Durako, Muenz, & Belzer, 2001), and underwent expert review for inclusion in the network. The National Institutes of Health (NIH–Child Health and Human Development, Allergy and Infectious Diseases, and Drug Abuse) and the Health Resources and Services Administration (HRSA) entered into cooperative agreements with investigators establishing a research network in 1994 with the objective of achieving a better understanding of HIV disease progression and co-morbidity in adolescents. The Adolescent Medicine HIV/AIDS Research Network consisted of two interactive groups, one of which was the Basic Science Group (BSG). The BSG was managed by Steering and Executive Committees, supported by a Study Coordinators Group and Data and Operations Center, advised by a Community Advisory Board, and reviewed by a Scientific Advisory Panel. BSG investigators provide expertise in virology, immunology, mucosal immunology, adolescent medicine, epidemiology, sexually-transmitted infections, drug abuse, and behavioral sciences. The BSG reviewed and approved all measures for inclusion in the network, requiring a theoretical foundation and research supported links to other behavioral components under investigation. The overall REACH Psychosocial Model posited that mental health behaviors (e.g., depression and anxiety) could affect protective and risk behaviors such as adherence and sexual risk or alcohol and drug use risk, which in turn can influence disease outcome and quality of life (cf., Murphy, Durako, et al., 2001).

1.2 | Previous applications of the HRA scale

To date, the measure has been used with mothers living with HIV and HIV+ adolescents to examine how worrying about health affects functioning. HRA scores were associated with both individual and family-related outcomes. Among women living with HIV (WLWH), anxiety related to thoughts of being HIV+ was linked to measures of mood and behaviors for mothers as well as their young and adolescent children (Murphy, Marelich, Armistead, Herbeck, & Payne, 2010). In a group of HIV+ mothers enrolled in a disclosure and parenting intervention with their young uninfected children, HRA was associated with mothers' general anxiety; moreover, those with greater HRA scores, along with increased parenting stress and general anxiety, were less likely to engage in family routines and had poorer parent-child communication and parenting discipline (Murphy et al., 2010). In the Parents and Children Coping Together (PACT) project, a longitudinal series of studies examining mothers living with HIV and their uninfected adolescent children, increased maternal HRA was associated with teens' reporting less attachment with peers (Murphy, Marelich, Lanza, & Herbeck, 2012). Additionally, poorer maternal health and increased HRA scores were associated with child depressive symptoms, and among younger children, greater maternal HRA scores were related to more child aggression (Murphy, Marelich, & Herbeck, 2012). These findings highlight the specific negative impact of health anxiety on families coping with HIV.

The health-related anxiety scale has also been used with HIV+ teens (Murphy, Durako et al., 2001; Murphy et al., 2000). Adolescent HRA scores were related to frequent marijuana use and teens reporting greater anxiety related to their HIV status were less likely to endorse engaging in recent sexual activity (Murphy, Durako et al., 2001). For teens, increased worry over health may increase risk for substance use and be associated with sexual behaviors.

This paper reports the steps taken to validate the HRA scale using samples from three studies of adult WLWH: Teaching, Raising, and Communicating with Kids (TRACK), an intervention designed to provide HIV+ mothers with parenting skills and assist them with disclosing their HIV status to their children; TRACK II, a larger, multi-site trial of the intervention utilized in TRACK; and Improving Mothers' parenting Ability, Growth, and Effectiveness (IMAGE), a parenting and self-care intervention for mothers living with HIV. These studies were selected due to their recent data collection, consistent use of the HRA scale and other theoretically-related measures, and their relatively large samples of WLWH. Exploratory and multi-group confirmatory factor invariance analyses were conducted to investigate the structure of the scale. Correlations with other mental and physical health-related measures were used to evaluate construct and criterion validity; such that, increased HRA would be associated with more self-reported symptoms of general anxiety and depressive symptoms, greater stress and stigma, fewer social supports, and increased role limitations and physical symptoms. Although HIV+ women do not represent the largest population of people living with HIV, this study is intended as a first step in the validation of a tool that has the potential to be helpful in both clinical and research settings across a spectrum of those coping with this chronic illness.

2 | METHOD

2.1 | Participants

Data were analyzed from baseline assessments of three intervention studies of WLWH[1] collected within the past decade. Although the HRA scale has been used with HIV+ populations in prior studies, we limited the current validation study to the most recent samples due to the now wide availability of HAART and its associated impact on health status and health-related anxiety. Participants from TRACK II ($N = 96$) were used as the primary scale construction sample (Schulte et al., 2017); TRACK ($N = 80$; Murphy, Armistead, Marelich, Payne, & Herbeck, 2011) and IMAGE ($N = 62$; Murphy, Armistead, Marelich, & Herbeck, 2015) data were used for validation.

2.2 | Procedures

Detailed procedures are provided elsewhere for TRACK II (see Schulte et al., 2017), TRACK (Murphy et al., 2011), and IMAGE (Murphy et al., 2015); brief summaries of each are presented below. All procedures were approved by the appropriate IRBs. All participants in each of the three studies provided written, signed informed consent. Data collection occurred between October 2007 and May 2015 at sites in Los Angeles, CA, and Atlanta, GA. For interviews in Spanish (where required for the assessments), measures were translated into Spanish by the Worldwide Translation Center in San Diego, CA. A translator and two editors completed the translations and evaluated the translated measures for accuracy, grammar, and style. The measures were then back-translated by a translator at UCLA (Marin & Marin, 1991).

2.2.1 | TRACK II—Recruitment materials were provided in Spanish and English to 12 HIV/AIDS service organizations in Los Angeles/Southern California, and 6 organizations in Atlanta, Georgia. These service organizations typically disseminated study flyers by making them available to clients in waiting areas and/or appointment rooms. Interested WLWH contacted research staff who conducted phone screens to determine eligibility. To be eligible, women had to have a confirmed HIV/AIDS diagnosis and be the primary caregiver of a well child (not HIV+) between the ages of 6–14 whoresided with her and was unaware of her HIV status. Interviews were conducted using computer-assisted personal interviewing in the participant's preferred language and at a preferred location with sufficient privacy (e.g., participant's home, recruitment site, etc.). Interviews lasted 75 min, and participants were paid $60 in cash for the assessment.

2.2.2 | TRACK—Procedures for TRACK were the same as TRACK II but with three notable exceptions: study participants were recruited only within Los Angeles County, the participant's child had to be between 6–12 years of age, and participants were paid $45 for the assessment. Recruitment materials were provided to nine service organizations.

2.2.3 | IMAGE—Procedures for IMAGE also mirrored TRACK II in several ways. Women living with HIV with an HIV-child between the ages of 6–14 were recruited from

[1]Five cases were removed from TRACK II baseline as they were recruited from the TRACK control group, leaving 96 unique cases.

eleven Los Angeles/Southern California HIV service organizations and participated in an intervention study for English and Spanish speaking mothers. The IMAGE study, however, did not require the child to be unaware of the mother's HIV status. Participants were paid $60 for completing a 90-min baseline interview.

2.3 | Primary measure

2.3.1 | HIV health-related anxiety—Items were originally developed for a longitudinal study, entitled Reaching for Excellence in Adolescent Care and Health Project (REACH), examining the impact of HIV status on HIV+ teens (Murphy et al., 2000; Murphy, Wilson, et al., 2001). Shortly after, the HRA scale was used with WLWH for the PACT study to help assess the psychological condition of mothers coping with HIV/AIDS (Murphy, Marelich, Dello Stritto, Swendeman, & Witkin, 2002).

Table 1 contains the four items created to assess the degree to which thinking about HIV/AIDS status and health has affected four areas of functioning during the past week: sleep, appetite, desire to engage in social activities, and ability to concentrate at school or work. Items had a 5-point scale, ranging from 1 = *not at all* to 5 = *always*. Summed responses formed a continuous scale, with higher scores representing greater HIV health-related anxiety (reliabilities across the study datasets are provided in section 3).

2.4 | Validation measures

Availability of validation measures varied across the three samples and covered areas related to mental health (depressive symptoms and anxiety) and stressors, HIV-related stigma, social support, and physical functioning.

2.5 | Mental health and stress

2.5.1 | Anxiety—The GAD-7 (Spitzer et al., 2006) was used to measure generalized anxiety symptoms, with higher scores indicating greater levels of anxiety (Cronbach's alpha for TRACK II and IMAGE = 0.92 and 0.91, respectively).

2.5.2 | Depressive symptoms—The CES-D (Radloff, 1977) was used to assess self-reported depressive symptoms, with higher scores indicating more frequent symptoms (alphas for TRACK II and IMAGE = 0.81 and 0.90, respectively).

2.5.3 | Mental health functioning—The anxiety, depressive symptoms, and positive affect subscales of the RAND Mental Health Inventory were utilized (Veit & Ware, 1983), with higher scores indicating greater endorsement of each subscale. Depressive symptoms and positive affect were assessed in IMAGE and TRACK (alphas of 0.85 and 0.81 for depressive symptoms; 0.93 and 0.87 for positive affect), with anxiety measured in TRACK (alpha = 0.86).

2.5.4 | Parenting stress—The Parenting Stress Index (PSI; Abidin, 1990) assessed the degree to which parents experience distress, with higher scores indicating more stress (TRACK II alpha = 0.93).

2.6 | Social factors

2.6.1 | HIV-related stigma—An adapted version of Sayles et al. (2008) internalized stigma scale for individuals living with HIV was used, with higher scores indicating greater perceived HIV stigma. Alphas for TRACK II and IMAGE were both 0.88. The Berger HIV Stigma Scale (Berger, Ferrans, & Lashley, 2001; Murphy, Austin, & Greenwell, 2006) was also used to assess the degree to which participants felt stigmatized due to their HIV status, with greater scores indicating more perceived stigma (TRACK alpha = 0.88).

2.6.2 | Social support—The global measure of the Social Provisions Scale (Cutrona & Russell, 1987) was used to assess social support, with higher scores indicating greater provisions/social support (alphas in IMAGE and TRACK were 0.90 and 0.84, respectively).

2.7 | Physical functioning and symptomatology

2.7.1 | Medical outcomes—Six subscales from the MOS-36 item Short Form Health Survey (Ware & Sherbourne, 1992) were used, including role limitations due to emotional problems, general mental health (although part of the MOS-36, these two subscales were considered as Social Factors), physical functioning, role limitations due to physical problems, vitality, and bodily pain. Higher scores corresponded to better health and functioning for all domains (e.g., fewer role limitations, greater vitality, less bodily pain). All measures were in TRACK II, IMAGE, and TRACK except physical functioning (not assessed in IMAGE). Alphas ranged from 0.72 to 0.93 across the samples.

2.7.2 | HIV symptoms—A symptom illness checklist assessed number/severity of 16 HIV-related illness symptoms within the past 3 months (Murphy, Greenwell, Mouttapa, Brecht, & Schuster, 2006). An index score was created by summing positive responses; higher scores corresponded to greater symptomatology.

2.8 | Analysis

Exploratory factor analysis (EFA) was used to investigate the factor structure of the HRA items on the TRACK II sample (our largest sample). Only the four HRA items were used (no covariates were employed). For confirmatory efforts, a series of multi-group factor invariance analyses applying structural equation modeling (SEM) were performed using the TRACK II, TRACK, and IMAGE samples to confirm the equality of the item correlations and factor loadings across the samples. Validity of the HRA measure was assessed through correlation analyses with the validation measures.

EFA on the TRACK II sample was performed using IBM SPSS (IBM Corp., 2012), imposing principal axis factoring with a one-factor solution. Findings were evaluated using multiple criteria, including percent variance accounted for by the one-factor solution, extracted communalities, scree plot of eigenvalues, and factor loading size (Gorsuch, 1983).

For multi-group confirmatory factor analysis, factor invariance methods through the EQS program were used (Bentler, 2006), applying a maximum likelihood solution and covariance matrix. Model fit was evaluated using multiple fit criteria, including the comparative fit index (CFI), the incremental fit index (IFI), and the standardized root mean squared residual

(SRMR). For the CFI, values of 0.95 or higher indicate good model fit, and for the SRMR a cutoff of 0.06 or smaller indicates good fit (Hu & Bentler, 1999). For the IFI, higher values close to 1.0 indicate good fit (Bollen, 1990). As is typical in CFA (Byrne, 2006), the latent factor variance was set to 1.0 for identification purposes, with parameter and error indices allowed to vary.

Comparison of HRA item correlation matrices across the three samples was performed applying methods outlined by Werts, Rock, Linn, and Joreskog (1976) (see also Dunn, Everitt, & Pickles, 1993). This approach evaluated whether the HRA correlation matrices exhibited different patterns of relationships, or whether they were stable across the "constellation" of factors underlying each dataset (Green, 1992). For validity of the parameter estimates (i.e., factor loadings) across the three samples, a maximum-likelihood solution and covariance matrices were used. The HRA latent factor variance was set to 1.0 for identification purposes; parameter and error indices were allowed to vary. Second, an omnibus test of the equality of the item parameters was made (Bentler, 1995; Byrne, 1994) by comparing nested maximum-likelihood solutions where parameter estimates were constrained across the samples to those where parameters were free to vary.

3 | RESULTS

Demographic characteristics of each of the three samples are presented in Table 2. Across studies, the average age of participants was mid-to-late thirties. While the majority of women in IMAGE and TRACK were Latina/Hispanic, a little more than half in TRACK II self-identified as African American/Black. Marital status for TRACK and TRACK II WLWH was most commonly reported as "never married" followed by "separated/divorced/widowed;" however, IMAGE participants were more likely to report being "separated/divorced/widowed" and "married."

3.1 | Exploratory factor analysis

An EFA was performed on the four HRA items from TRACK II using principal axis factoring. Imposing a one-factor solution, the extracted variance was 76.26% with all factor loadings exceeding 0.80, and high communalities for the items (see Table 1). A scree plot of eigenvalues suggested a one-factor solution. A two-factor solution was also forced; all items continued to have loadings exceeding 0.80 on a single factor after initial extraction, with no items having factor loadings exceeding |0.23| on the second factor. Orthogonal rotation on the forced two-factor solution yielded extremely poor simple structure (Gorsuch, 1983), while an oblique rotation evidenced all items having loadings exceeding 0.83 on one factor, and loadings under |0.23| on the second factor per both pattern and structure matrices. Based on these criteria, the one-factor solution was viewed as acceptable.

3.2 | Multi-group confirmatory factor analysis

Using multi-group factor invariance methods, assessment of equality of the correlation matrices across the three samples resulted in a chi-square of 9.74 (df = 6), with a CFI of 0.99, an IFI of 1.0, and an SRMR of .062, all indicating good fit. Based on these fit criteria, the correlation matrices across the samples were deemed equivalent. Multi-group analyses

constraining parameter loadings across the three samples (essentially constraining loadings to TRACK II sample parameters) resulted in a model chi-square of 28.10 (df = 14), with a CFI and IFI of 0.98, and an SRMR of 0.23. A subsequent three-group model with no constrained parameters yielded a chi-square value of 8.10 (df = 6), with a CFI and IFI of 1.0, and an SRMR of .016. Because these models are nested, a chi-square difference was obtained to evaluate whether one model was significantly superior (Loehlin, 1998). The chi-square difference was 20.0 (df = 8), which was nonsignificant at the standard .01 level. Thus, equality of the parameter estimates across the three samples was tenable. Given the equality of the correlation matrices and parameter estimates, the HRA items functioned similarly across the three samples.

3.3 | Internal consistency reliability

For the TRACK II sample, Cronbach's alpha on the four items showed good reliability (alpha = 0.92; M = 7.61, SD = 4.42). The alpha for HRA in IMAGE was 0.91 (M = 6.69, SD = 3.95), and the alpha for TRACK was also 0.91 (M = 5.95, SD = 3.29). Overall, the HRA measure showed good internal consistency reliability within each sample.

3.4 | Validation

The HRA measure was validated in samples of WLWH through associations with depressive symptoms and anxiety-related measures, and with physical symptoms associated with health anxiety (see Table 3). Bivariate correlations between the HRA measure and validation measures are presented with no additional adjustment or covariates

3.4.1 | Mental health and stress indicators—The anxiety measures exhibited positive correlations with HRA, suggesting that higher general anxiety is associated with greater health-related anxiety. Positive affect showed significant negative correlations with the HRA measure, with lower levels of positive affect associated with greater levels of health-related anxiety. Depressive symptoms were positively associated with HRA, suggesting greater depressive symptomatology was associated with more health-related anxiety.

Parenting stress showed a significant correlation with HRA; higher parental stress was associated with greater levels of health-related anxiety. Feelings of nervousness and depressive symptoms showed negative correlations with HRA; those exhibiting greater feelings of nervousness/more depressive symptoms also reported greater levels of health-related anxiety.

3.4.2 | Social factors—Social support and perceived provisions from others evidenced negative correlations with HRA, with those reporting fewer provisions also reporting greater levels of health-related anxiety. In addition, greater stigma was associated with higher levels of health-related anxiety.

3.4.3 | Physical functioning and symptomatology—Symptoms of HIV were significantly associated with greater health-related anxiety. Emotional problems and how they affect one's role showed negative correlations with HRA, with higher levels of

emotional problems associated with greater levels of health-related anxiety. Physical functioning, vitality, and bodily pain were negatively associated with HRA, with higher levels associated with greater levels of health-related anxiety.

4 | DISCUSSION

Patients with chronic diseases are at high-risk for symptoms of anxiety (Bayat et al., 2011), and among those living with HIV/AIDS, in particular, rates of anxiety disorders or reported symptoms of anxiety can be as high as 38% (Kemppainen et al., 2013). Anxiety symptoms may be the result of the health diagnosis (i.e., HIV/AIDS) or related to general issues such as poverty, neighborhood violence, and unemployment. Still, many investigators use only general anxiety scales in their research with chronically ill populations, which somewhat confounds assessment. It can be difficult to discern which anxiety symptoms stem from general life stressors versus those resulting from the chronic illness. Particularly among WLWH, many of whom also experience stress associated with parenting, limited financial resources, and discrimination related to being members of underrepresented groups, it can be difficult to determine the distinction between general anxiety and health-related anxiety. The HRA scale was developed for people living with HIV/AIDS in order to target anxiety symptoms specifically related to being HIV+.

Utilizing three samples of WLWH, analyses support the viability of the HRA scale as a measure of health-related anxiety due to being HIV+ with good psychometric properties. Validity was supported by its positive association with other measures of general anxiety, parenting stress, nervousness, depressed mood, and perceived and internalized HIV-related stigma. Moreover, HRA scores were negatively associated with measures of positive psychosocial functioning, including positive affect and greater social support. Finally, and perhaps of most interest, greater HRA scores were associated with emotional and physical distress resulting from a medical condition and with higher levels of physical symptomatology specifically of HIV disease. The correlations within the three samples provide evidence that the HRA scale is assessing anxiety, but not to the extent that there is strong overlap between health-related anxiety and general anxiety or other stress measures. Thus, the scale facilitates the identification of health-related anxiety that is not being extracted from existing instruments.

Given elevated rates of anxiety (Brandt et al., 2016; Pence et al., 2006) among WLWH, and associations between HIV-specific anxiety and maternal and child mood and behavior (Murphy et al., 2010), validation of such a tool has implications for both clinical and research settings. For clinical settings, physicians, nurse practitioners, nurses, and clinical care coordinators often have numerous health topics to cover in limited time with patients. The extreme brevity of the HRA scale, taking only 1 min to administer, makes it easy to incorporate into existing assessment procedures and carries little to no burden for patients and clinical staff. Moreover, consistently high scores across appointments may indicate a need for mental health referral or medication management for sleep or anxiety symptoms, depending on positively endorsed items on the scale. In research, the HRA scale's efficiency allows investigators to better hone in on whether anxiety symptoms are disease specific or better described as the product of an independent anxiety or mood disorder. The HRA scale

would also be useful in assessing the impact of HIV/AIDS interventions, whether medical or behavioral, on worry regarding health and functioning related to the chronic illness. Clucas et al. (2011) noted in a review that there is a lack of understanding about the treatment and measurement of anxiety among people in general and particularly WLWH. Thus, this 1-min assessment could be useful in shaping interventions targeting this population.

Several study limitations should be noted. First, given the overlap in the symptoms of anxiety and depression, which some have labeled the “negative mood” factor (Joiner, 1996), the HRA may also identify patients experiencing health-related depression. Although the items inquire about health-related worry, additional studies are needed to further tease apart how the HRA may also be tapping into the impact of sadness on functioning. Moreover, the HRA scale focuses on how health-related worry influences domains of functioning, rather than measuring the degree to which the emotion is felt. The HRA is meant to be a very brief tool for screening behavioral consequences of HIV-related anxiety. To truly measure anxiety and anxiety disorders, it is recommended to use traditional diagnostic instruments.

Second, because the HRA scale focuses on anxiety outcomes associated with thinking of one's HIV status when perceived as stressful, one could view the HRA as a broad measure of stress as expressed through outcomes related to anxiety, but not anxiety itself. Further research may be needed on the HRA to more fully evaluate its clear relationship to anxiety.

Third, all three samples consisted of WLWH with at least one child. Given the disparity in prevalence rates for anxiety disorders among men and women, it is possible there may be gender differences in how health-related anxiety functions. Fourth, additional research is needed on the HRA scale in various age groups. Although the scale has been used previously with an HIV+ adolescent population (Murphy et al., 2000; Murphy, Wilson et al., 2001), further evaluation is needed. Fifth, although the evaluated samples could be considered small, we were focusing only on four items forming a single construct. Sampling adequacy was good for the initial EFA (see MacCallum, Widaman, Zhang, & Hong, 1999, for review of criteria), and we had power at the 80% or better to assess the confirmatory factor analysis effects given the economy of items for the HRA (Westland, 2010). Future research with larger samples, however, should be completed to further verify the HRA scale. Last, test-retest reliability could not be established; future research should incorporate multiple administrations for such an assessment.

5 | CONCLUSIONS

This study provides the first steps in validating a four-item scale focused specifically on HIV health-related anxiety. The major strength of the study includes its use of multiple, diverse samples collected in the past 10-years since HAART has been readily available, allowing us to assess the robust nature and applicability of the measure. The HRA scale's brevity and its ability to capture a unique form of stress, separate from general anxiety, make it easy to incorporate into busy clinical settings and research protocols. To our knowledge, this is the only such validated measure currently available for HIV health-related anxiety.

ACKNOWLEDGMENTS

Special thanks to Brittney Hernandez (University of Connecticut) who assisted with the final stages of the article. Research reported in this manuscript was supported by the National Institute of Mental Health of the National Institutes of Health by Grant Numbers 5R01MH094148 (PI: Marya T. Schulte) and 5R01MH094233 (PI: Lisa P. Armistead). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Funding information

National Institute of Mental Health of the National Institutes of Health, Grant numbers: 5R01MH094148, 5R01MH094233

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TABLE 1

Factor loadings, communalities (h^2), and percent variance for principal axis factoring extraction on HRA items from TRACK II (N = 96)

Items	Factor loading	h^2
1. During the past week: You were thinking about HIV infection/AIDS and your health, and because of that you had trouble sleeping—either getting to sleep or sleeping through the whole night.	0.84	0.71
2. During the past week: You were thinking about HIV infection/AIDS and your health, and because of that you had no appetite, or felt like eating very little.	0.91	0.82
3. During the past week: You were thinking about HIV infection/AIDS and your health, and because of that you had no desire to go out and do any social activities with other people.	0.82	0.67
4. During the past week: You were thinking about HIV infection/AIDS and your health, and because of that you had trouble concentrating at school or work because of worrying about your health.	0.92	0.85
Percent variance	76.26	

Written or read scale instructions: Sometimes worrying about your health can really affect other areas of your life. For example, if you are very concerned about your health, you might have trouble getting to sleep at night, or you might wake up in the middle of the night and be unable to stop worrying. The following questions help us find out which areas of your life have been affected by your worrying during the past week. To answer these questions ask yourself, "During the past week, how often has thinking about HIV infection/AIDS and my health affected this area of my life?" Inter-item correlations are as follows: r_{12} = 0.76; r_{13} = 0.66; r_{14} = 0.81; r_{23} = 0.77; r_{24} = 0.82; r_{34} = 0.75.

TABLE 2

Women living with HIV (WLWH) demographics from TRACK II, TRACK, and IMAGE samples

Demographic characteristics	**TRACK II** ***N*** **= 96**	**TRACK** ***N*** **= 80**	**IMAGE** ***N*** **= 62**
Age M(SD)	38.7 (7.5)	37.4 (6.8)	35.8 (8.2)
Race/Ethnicity (%)			
African American/Black	55	18	26
Latina/Hispanic	37	80	61
Caucasian/White	2	1	3
Multiracial/Other	6	1	10
Marital Status (%)			
Married	21	25	32
Never married	43	41	27
Separated/Divorced/Widowed	36	34	41

TABLE 3

Pearson correlations between sample-specific Health-Related Anxiety (HRA) and validation measures

Validation measure	TRACK II HRA	IMAGE HRA	TRACK HRA
Mental health and stress			
Generalized anxiety disorder-7	0.65***	0.49***	NA
RAND measures			
Positive affect	NA	−0.42**	−0.37**
Anxiety	NA	NA	0.39***
Depressive symptoms	NA	0.52***	0.33**
CES-depression scale	0.60***	0.52***	NA
Parenting stress index	0.40***	NA	NA
Social factors			
Sayles stigma scale (adapted)	0.48***	0.34**	NA
Berger HIV stigma scale	NA	NA	0.35**
Social provisions scale	NA	−0.31*	−0.40***
Physical functioning and symptomatology			
MOS-36 short form			
Role emotional	−0.44***	−0.63***	−0.41***
Mental health	−0.59***	NA	−0.40***
Physical functioning	−0.53***	NA	−0.44***
Role physical	−0.55***	−0.51***	−0.43***
Vitality	−0.53***	−0.41***	−0.37**
Bodily pain	−0.45***	−0.48***	−0.34**
HIV symptoms checklist	NA	0.38**	NA

NA, not applicable.

*$p < .05$.

**$p < .01$.

***$p < .001$.