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Cognitive–Behavioral Stress Management Interventions for Persons Living with HIV: A Review and Critique of the Literature

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Abstract

Background—Psychological adjustment and coping are central to human immunodeficiency virus (HIV) management. To improve HIV-infected patients' ability to cope with stress, a variety of stress management interventions have been designed and evaluated.

Purpose—This paper provides a review and critique of the stress management literature, including a: (1) synthesis of core components of interventions for HIV-infected people, (2) summary of stress, coping, psychological, and health outcomes, and (3) methodological critique and guidance for future research.

Methods—We reviewed 21 stress management interventions designed for HIV-infected individuals that included both cognitive and behavioral skills training.

Results—Most studies noted positive changes in perceived stress, depression, anxiety, global psychological functioning, social support, and quality of life. However, results were mixed for coping and health status outcomes, and a majority of studies employed only brief follow-up periods, focused on HIV-infected MSM, and did not address HIV-specific stressors.

Conclusions—Stress management interventions for HIV-infected persons are a promising approach to facilitate positive adjustment. However, this literature is limited by measurement problems, research design features, a narrow focus on HIV-infected men who have sex with men, and feasibility concerns for intervention dissemination. Future stress management interventions should address these limitations and the unique psychosocial needs of HIV-infected patients using briefer, more cost-effective formats.

Keywords

HIV; Cognitive–Behavioral; Stress; Stress management; Coping

Introduction

As of 2006, there were an estimated 39.5 million individuals diagnosed with human immunodeficiency virus (HIV) infection worldwide [1], with approximately half a million people living with HIV in the USA [2]. Despite a recent increase in prevention efforts directed toward people living with HIV, infection rates have remained relatively stable, with approximately 40,000 new cases of HIV diagnosed annually in the USA [3]. Improved treatments for HIV have provided much reason for hope and optimism for many who are living

with this disease. However, not all patients experience sustained viral suppression, and the long-term clinical benefits of highly active antiretroviral therapy (HAART) extending beyond the first 10 years of care are not yet known [4,5]. Further, maintaining optimal health requires strict adherence to demanding treatments that often carry serious side effects and a lifelong commitment to medical care in a rapidly changing treatment environment [5,6]. Within this context, there is now a growing population of HIV-infected people who face both disease-specific and general life stressors associated with living with a chronic, highly stigmatized illness. To improve HIV-infected patients' ability to effectively manage the many challenges of living with HIV disease, a number of stress management interventions have been designed and evaluated in recent years. The aim of this paper is to provide a review and critique of the stress management intervention literature among HIV-infected individuals.

Although HIV shares some common features with other chronic illnesses, HIV poses a number of unique challenges that heighten patients' vulnerability to psychological adjustment difficulties [7–9]. While some HIV-infected individuals are able to effectively manage their care and lead fulfilling lives, a significant proportion report difficulties coping with stress [10]. In turn, such challenges have been associated with greater psychological distress, diminished quality of life, and high prevalence of comorbid psychiatric disorders [11,12]. Adjustment difficulties may also contribute to poor disease management [7,13]. Indeed, prior investigations have shown that heightened psychological distress is associated with accelerated disease progression as indicated by CD4 decline, increased viral load [13], and fewer natural killer cells [14].

The need for stress management interventions has been recognized since the earliest days of the epidemic [15,16]. However, the public health relevance of stress management interventions has increased considerably in the past decade [17]. Whereas coping interventions in the “pre-HAART” era emphasized the provision of supportive care for patients as they coped with a progressively worsening and ultimately fatal health condition [18], stress management training is increasingly viewed as integral to the broader goal of assuring that patients maintain adequate self-care for their illness [6,19]. In so far as stress management interventions can reduce distress and, potentially, improve disease management and health outcomes, an evaluation of the current state of the science with regard to these interventions is of considerable importance.

There is now a growing literature examining the efficacy of stress management interventions designed for persons living with HIV. Although a number of approaches to promoting stress management among HIV-infected people have been proposed, manualized programs that include both cognitive and behavioral components have shown particular promise and have received the most systematic study in well-controlled intervention trials. Accordingly, we sought to provide a focused synthesis and critique of interventions for HIV-infected people that were guided by cognitive-behavioral approaches. To inform the development of future stress management interventions, our paper (1) summarizes key features of stress management interventions for HIV-infected people that employ cognitive-behavioral intervention strategies, (2) synthesizes stress, coping, psychological, and health status outcomes from these interventions, and (3) provides a methodological critique of the literature and guidance for the future application of stress management interventions in HIV research and care settings.

Literature Search Method and Criteria for Inclusion

Database searches of PsycINFO and Medline were conducted to identify published articles in peer-reviewed journals that tested a stress management intervention for HIV-infected people. Combinations of the following search terms were used to identify relevant articles: *stress management*, *stress*, *coping*, *cognitive-behavioral*, *HIV*, *HIV-positive*, *HIV-infected*, *AIDS*, and *intervention*. A search of references cited in relevant studies was conducted to identify additional articles. English language articles published in peer-reviewed journals were

screened for inclusion. Studies were included if they met all of the following criteria: (1) the intervention's primary aim was to improve stress management skills, (2) the study's sample was composed of only HIV-infected patients, and (3) the intervention included both cognitive and behavioral components designed to improve HIV-infected persons' ability to effectively cope with stress. According to these criteria, 29 papers were included in the review (see Table 1). It should be noted that there were multiple papers that reported subgroup analyses from larger trials or that reported on distinct outcomes from the same sample. Thus, among the 29 papers meeting the inclusion criteria, there were 21 interventions reviewed.

Overview of Stress Management Intervention Approaches and Study Designs

This section describes key features of stress management interventions designed for HIV-infected patients. First, a brief description of the guiding theoretical framework for the interventions' design is provided. Second, core intervention components are reviewed. Next, the research methodologies implemented to evaluate the interventions are summarized. The treatments' duration and length of the follow-up assessments are then described. Lastly, a discussion of study entry criteria and sample characteristics is provided. Table 1 provides an overview of features of the reviewed interventions.

Theoretical Foundation for Stress Management Interventions

The majority of stress management interventions for HIV-infected patients cite Lazarus and Folkman's Transactional Model of Stress and Coping [20] as the guiding theoretical framework for the intervention. This model operationally defines coping as the thoughts and behaviors people use to manage the internal and external demands of stressful situations [20–22]. Critical to intervention development, the model posits that stressors vary in the extent to which they are amendable to change. Coping is both an explanatory concept to describe variability in stress responses and also lends itself to cognitive-behavioral interventions to improve the ability to effectively manage stressors [22]. Thus, this framework typically guided the overall intervention design in which cognitive and behavioral techniques were implemented to modify participants' strategies to effectively manage stress.

Delivery Format, Intervention Components, Study Designs, Treatment Length, and Sample Characteristics

In what follows, the delivery format, intervention components, study designs, treatment length, and sample characteristics of the reviewed stress management interventions are described.

Delivery Format—All but one of the reviewed studies (95%) tested a group-based stress management intervention. The remaining study [23] evaluated a stress management training program using a brief, individualized, nurse-delivered treatment for hospitalized HIV patients. Among studies utilizing a group format, group sizes ranged from four to ten members (mode=7 group members).

Intervention Components—All of the reviewed interventions sought to improve HIV-infected patients' coping skills by encouraging the use of cognitive and behavioral stress management strategies (see Table 1). In addition, a core intervention component for some of the reviewed studies was the inclusion of psychoeducation about the nature and consequences of stress (see Table 1). All but one of the stress management programs sought to modify general coping strategies that could be implemented across a range of stressful situations. However, in one intervention, the specific stressor of grieving an acquired immunodeficiency syndrome (AIDS)-related death was targeted as the key domain to improve coping skills [24]. Additionally, a minority of studies also targeted changes in specific, HIV-related health

behavior domains, such as sexual risk behaviors, substance use, and medication adherence [25–27].

Across all the interventions, the cognitive and behavioral approaches were designed to facilitate adaptive coping and reduce the negative effects of stress. Emotional regulation strategies and reducing overall psychological distress were often specified as goals of the interventions. As a behavioral strategy, the majority of studies (76%) included a relaxation training component, with progressive muscle relaxation the technique most often included (see Table 1). Another key behavioral component of most interventions (62%) was to identify participants' existing social support, discuss the importance of support networks, and encourage adoption of strategies to enhance the use of social support to cope with stress (see Table 1). Furthermore, across interventions, the use of other active coping strategies (e.g., problem solving) was stressed as more adaptive than avoidant coping strategies (e.g., substance use).

In all of the reviewed interventions, stress management skills training also included modules on the use of cognitive strategies to modify HIV-infected people's approach to appraising stressors and modules that encouraged the use of active problem-solving strategies. For instance, cognitive distortions and automatic thoughts about HIV-related stressors were often identified and targeted via cognitive restructuring. In studies evaluating variations of coping effectiveness training (CET) [28–31], the focus was on the stress appraisal process and matching the stressor's level of perceived changeability with the use of either problem- or emotion-focused coping strategies. Similarly, in problem-solving approaches, participants were taught to clearly identify characteristics of specific stressors, brainstorm potential solutions, select a coping strategy, and evaluate the effectiveness of the chosen solution for the problem situation.

Study Design—Among the 21 interventions reviewed, 14 of the studies (67%) were randomized controlled trials (see Table 1). The number and types of control groups included in the research designs varied across the reviewed studies (see Table 1). Only three (14%) studies did not include a comparison or control group. The bulk of investigations utilized a two-group design comparing a stress management intervention to one other condition (86%). Of these, nine studies (43%) contrasted a stress management intervention to a waitlist control group. Across all reviewed studies, five (24%) compared a stress management intervention to both a waitlist control group and an additional comparison condition.

Treatment Length and Follow-up Assessment Interval—As can be seen in Table 1, treatment protocols varied in the number and length of the treatment sessions and timing of follow-up assessments. In the shortest intervention, only three brief, 20- to 30-min sessions were conducted [23]. However, most programs used multiple sessions (range=6–20 sessions; mode= 10 sessions) that were between an hour and two and a half hours in length (mode= 2-h session). Three interventions also supplemented multiple sessions with an additional day-long retreat [25,29,30,32,33]. Only one treatment incorporated booster sessions after the intervention was completed [29,30]. Of note, for more than half of the reviewed studies (52%), follow-up measurement of intervention outcomes was limited to only an immediate postintervention assessment. Study findings involving data from only an immediate postintervention assessment preclude the evaluation of long-term intervention effects. Nine studies (43%) included a longer follow-up period ranging from 3 months to 1 year (mode=6 months).

Study Inclusion Criteria and Sample Characteristics—Studies varied in the stringency of the inclusion and exclusion criteria to participate in the intervention. Studies often limited participation to a specific gender and/or sexual orientation. The bulk of interventions (57%) focused exclusively on men who have sex with men (MSM). Two additional studies

recruited samples that consisted primarily of MSM but included a small subset of heterosexual men [26,34]. A single intervention was conducted with a completely heterosexual male sample [35]. A small number of studies (24%) included mixed-gender samples. However, all of these interventions recruited a disproportionately higher number of men than women (e.g., [31]). Furthermore, only one intervention was exclusively designed for HIV-infected female patients [36,37]. Additionally, the majority of HIV-infected individuals included in the reviewed interventions were Caucasian. While most studies were conducted in the USA, three interventions were conducted with international patient samples [32,33,35,38].

Some studies excluded patients with the presence or history of specific HIV symptoms or an AIDS diagnosis (67%; see Table 1), as well as cognitively impaired patients or those with psychotic symptoms (71%; see Table 1). Although all interventions sought to improve stress management, a surprisingly high percentage of studies (57%; see Table 1) excluded individuals based on current or past psychiatric, substance abuse history, or personality disordered history. The degree to which individuals were experiencing psychological distress, especially their level of depression, often served as either an exclusion or inclusion criteria. For example, some studies only recruited individuals with moderate levels of depression (e.g., [31]), while other interventions would not allow individuals diagnosed with major depressive disorder to participate (e.g., [29]).

Review of Cognitive–Behavioral Stress Management Intervention Outcomes for HIV-infected Patients

This portion of the review focuses on the intervention outcomes for each of the stress management studies. First, outcomes regarding changes in perceived stress and coping are reviewed. Next, a review of mental health outcomes is provided. In addition, outcome indices concerning the impact of interventions on social support and quality of life are reviewed. Finally, we summarize the impact of stress management interventions on health functioning. Table 2 provides an overview of outcomes across interventions.

Stress and Coping Outcomes

A primary aim of the reviewed interventions was to enhance HIV-infected patients' ability to effectively cope with a wide variety of life stressors. As such, we first present findings concerning the impact of stress management interventions on self-reports of perceived stress, use of adaptive coping strategies, and changes in coping self-efficacy.

Perceived Stress—Perceived stress refers to individuals' beliefs regarding the severity and frequency of stressful situations experienced [30]. Surprisingly, only four of the reviewed studies assessed level of perceived stress as an outcome measure [28–31,39]. One study found that participants in the stress management group reported less perceived stress than the waitlist control condition [39]. In a study that compared CET to an HIV information and a waitlist control condition among HIV-infected MSM, the intervention group reported lower perceived stress levels than the HIV information condition at the 3-month assessment; however, this difference was no longer significant at either the 6- or 12-month follow-up assessment [29, 30]. In addition, no differences in perceived stress were found between the intervention and the waitlist control conditions [29,30]. In a second study of CET, individuals in the immediate treatment group reported less overall perceived stress compared to the delayed condition who had not yet received the intervention [31]. In another pilot study of CET with no comparison condition, perceived stress in only two domains (i.e., AIDS-related losses, health concerns) were shown to decrease after the intervention [28].

Coping Strategies—A principle goal of the reviewed interventions was to modify the participants' approach to coping with both general and illness-specific stressors. However,

only 38% of studies examined changes in coping approaches as core study outcomes [27,28, 31–33,40–43]. In addition, there was little consistency in the way in which coping was measured across studies. Indeed, three different coping measures were used (i.e., COPE, Ways of Coping Checklist, Jalowiec Coping Scale), with each study assessing a unique set of coping dimensions. For example, in one study, only changes in the active coping and seeking emotional support dimensions of the situational COPE were reported [32,33], whereas another stress management program reported change across 13 different coping domains of the situational COPE [40]. The variability in coping assessment approaches resulted in more than 20 different coping dimensions being measured across these eight studies.

Overall, there were mixed findings for the effects of stress management interventions on modifying HIV-infected patients' coping approaches. Each study noted some change in coping strategy use among participants receiving the stress management program but found that other hypothesized changes in coping strategies did not change. For instance, comparing a stress management program that also included HAART adherence training to an intervention focusing exclusively on medication adherence, Carrico et al. [27] found no changes in levels of acceptance, positive reinterpretation, and behavioral disengagement but reported a significant change in use of denial coping among those in the combined treatment group. In contrast, Lutgendorf et al. [41] found changes in positive reframing, social support coping, active coping, and acceptance coping but no changes in the use of denial coping. In sum, no consistent pattern of findings emerged with regard to the impact of stress management interventions on various dimensions of coping among HIV-infected patients.

Coping Self-efficacy—Coping self-efficacy refers to one's perceived ability to effectively manage stressors [44]. Of the interventions reviewed, only three studies reported coping self-efficacy outcomes [29–31,40]. First, HIV-infected MSM who completed a CET intervention reported greater coping self-efficacy at the immediate postassessment compared to participants randomized to the HIV information condition; however, group differences were not maintained at the 6- or 12-month follow-up assessments [29,30]. Further, coping self-efficacy did not differ between participants in the CET condition relative to those assigned to the waitlist control group [29,30]. In a second study that evaluated a CET program, participants in an immediate intervention condition reported higher levels of coping self-efficacy compared to the delayed treatment group [31]. In a third study, there was a significant increase in cognitive coping self-efficacy from the baseline to immediate postintervention among those in the stress management condition, with no change among the waitlist control participants [40].

Psychological Adjustment and Psychosocial Functioning

HIV-infected patients experience a variety of disease-specific and general life stressors that can negatively impact psychological adjustment [45]. By improving coping skills, an implicit goal for most stress management interventions was to reduce patient distress in the context of managing multiple stressors. To evaluate the impact of stress management interventions on psychological functioning, some of the reviewed studies included measures of depression, anxiety, and global psychiatric symptom levels as outcome measures. Additionally, a number of studies reported on global indices of wellbeing, including social support and overall quality of life.

Depression—Ten (48%) of the reviewed studies measured changes in depressive symptoms as a core intervention outcome [26,27,32,33,35,38,40,46–49]. Among studies that analyzed changes in depression, five studies found a significant impact of a stress management intervention on depressive symptoms [26,27,35,47,48]. Specifically, participants in the intervention noted fewer depressive symptoms than those in the control condition. Similarly, two studies found a statistical trend for lower levels of depression in the stress management

group relative to a comparison condition [38,40]. Gender differences were also noted in one study comparing a bereavement stress management group to a therapy on request condition; women reported a significant decrease in depressive symptoms, but there was no difference between conditions among men [49]. Two studies found no differences between groups in depressive symptoms but reported that rates of depression declined in both the stress management and control groups over time [32,33,46]. In addition, participants in a support group control condition demonstrated clinical improvement in depressive symptoms, while the stress management intervention participants did not [26].

Anxiety—Anxiety was a second key domain measured in a subset of studies (33%) [23,26,29,30,35,47,48,50]. In two studies, HIV-infected MSM assigned to a stress management program reported lower anxiety levels at an immediate postassessment, compared to those in a waitlist control group [29,30,39]. Two studies found a significant group by time interaction for anxiety levels; those in the stress management condition experienced a decrease in anxiety, with no change in anxiety levels among control group participants [47,48]. Additionally, three studies found that participants in the stress management intervention condition had decreased anxiety levels from the initial preintervention assessment to postassessment [23,39,47,50]. In contrast to these findings, two studies found no difference for anxiety symptoms between stress management training and an HIV-information condition [29,30] or waitlist control condition [35]. In addition, one study found that participants in the support group comparison condition had greater decreases in anxiety levels than those in the intervention condition [26].

Global Psychological Functioning and Symptom Levels—Analysis of total mood disturbance and overall level of psychological symptoms were included in 12 (57%) of the studies reviewed [26,31,32,34,38,40,42,46–48,51,52]. Seven studies found that the stress management intervention group had reduced total mood disturbance levels when compared to the control condition [32,39,40,42,43,48,51,52]. Two studies also assessed whether changes in symptomatology severity were clinically meaningful [26,31]. For instance, in comparing pre- to postintervention functioning among patients assigned to the stress management intervention, 39% improved, 52% showed no change, and 9% worsened [31]. Five studies also found decreases in overall psychological symptoms from the baseline assessment to the postintervention assessment among participants in the stress management program [38–40,46,47,50]. In contrast, one study found no difference between a stress management intervention and a waitlist control group for total mood disturbance at either the immediate postassessment or 6-month follow-up assessment [34]. Additionally, Kelly et al. [26] found that participants in the support group comparison condition reported lower overall symptoms compared to the stress management condition at the postassessment.

Social Support—In addition to stress stemming from specific symptoms, treatment side effects, and disease management challenges, many HIV-infected people experience discrimination, rejection, and a loss of social support because of HIV-related stigmatization [19,53]. As a result, a number of the stress management interventions included modules to improve participants' utilization of social support networks as an additional coping strategy. Eight studies (38%) measured outcomes of overall social support level and support network satisfaction [26,28–31,33,40,41,51]. Two studies noted that participants in the group stress management condition reported enhanced levels of social support in comparison to control group participants [29,30,41]. Three studies that measured multiple dimensions of social support found that participants receiving the stress management intervention improved across some but not all of the social support dimensions [28,40,51]. While most studies noted some improvement on degree of social support after a stress management intervention, one study found no difference in loneliness between immediate and delayed CET conditions [31]. In addition, in a study comparing a group stress management program to a support group, there

was a trend (i.e., $p < 0.10$) for greater perceived social support among the support group condition [26]. In addition to measuring degree of social support, a single study assessed change in social support satisfaction between participants receiving a stress management intervention or experiential therapy; results indicated that social support satisfaction did not differ between the groups [33].

Quality of Life—Quality of life refers to a person's overall state of physical, mental, and social wellbeing [54]. In the reviewed literature, four studies (19%) measured the impact of a stress management intervention on HIV-infected persons' perceived quality of life [34,35,37, 52]. In one study comparing a group stress management program to a waitlist control condition among a sample of heterosexual, Chinese men indicated an increase in overall quality of life at the immediate postintervention assessment for those in the stress management group compared to the waitlist control group [35]. Three additional studies examined quality-of-life outcomes using multidimensional measures [34,37,52]. Across these studies, participants who received the stress management intervention reported improvements on select quality-of-life dimensions, especially their mental health functioning. However, findings were mixed for the stress management programs' impact on other quality-of-life domains.

Health Status Markers

There is growing literature on the impact of stress on immune responses and HIV disease progression. For example, a recent meta-analysis concluded that the number of stressful life events an individual experienced was associated with a decrease in some immune status markers, including natural killer cells and a marginal reduction of T-cytotoxic lymphocytes [55]. Although the specific mechanisms linking stress and immune functioning in HIV-infected patients are not fully understood, these findings have stimulated interest in the possibility that stress management interventions may impact disease progression. Eight of the reviewed studies (38%) included stress hormone levels and immune status markers as intervention outcome variables [25,33,34,36,39,42,47,48,56].

Stress Hormones—Antoni et al. [39] evaluated the impact of a cognitive-behavioral stress management intervention on stress hormone levels in a sample of HIV-infected MSM [47]. Postintervention, participants in the stress management condition had lower neuroepinephrine levels than the waitlist control group, but the two groups did not differ on epinephrine or cortisol levels [39,47]. There was also a group by time interaction for free testosterone levels; those in the intervention group had significant free testosterone increases, while participants in the waitlist control group had significant decreases in free testosterone [47].

CD4 Counts—The attachment site for HIV is the CD4 cell, a type of T-helper lymphocyte [57]. CD4 cell counts are used as a marker of immune status functioning in HIV-infected patients. Five of the reviewed studies measured CD4 counts to assess immune system functioning changes after a stress management intervention. Across all five studies, the stress management intervention and comparison conditions did not differ on CD4 counts [33,34, 36,42,48]. A limitation of these studies concerns the fact that analyses did not control for patients' medical status and HAART medication adherence, hampering the interpretability of findings.

Natural Killer Cells and Naïve T Cells—Natural killer cells are a type of lymphocyte that attack certain virus-infected cells [58]. A single study included measurement of natural killer cells as an immune status marker for the stress management interventions. This study found no difference from the preintervention assessment to postassessment for natural killer cell functioning between the stress management treatment and a waitlist control group [25].

Naïve T cells respond to novel pathogens the immune system has not yet encountered [58]. In a study comparing a group cognitive-behavioral stress management program to a waitlist control condition, participants in the intervention condition had greater naïve T cell levels during the 6-month follow-up assessment than those in the comparison condition [56].

Cytotoxic T Cells—Cytotoxic T cells, also known as suppressor T cells or regulatory T cells, destroy virally infected cells [58]. One study found that the intervention group had higher cytotoxic T cell levels (CD3+ CD8+) at the follow-up assessment from the preintervention assessment [39]. However, Lutgendorf et al. [48] found no difference between a group-delivered stress management intervention and waitlist control group for cytotoxic T cell levels (CD8+) and also found no difference over time.

Review Summary

This review synthesized the stress management interventions designed and tested among individuals living with HIV. Stress management programs have typically been administered over multiple sessions in a group format. With few exceptions, stress management interventions have enrolled only HIV-infected MSM. Overall, there appears to be promising evidence to indicate that stress management programs are effective in reducing perceived stress levels and improving overall psychological adjustment and psychosocial functioning. Although a primary aim of all of the reviewed studies was to improve adaptive coping, there was little consistency in approaches used to assess coping, and findings were, at best, mixed. Among a small subset of studies that included measures of coping self-efficacy, there is some evidence to suggest that stress management interventions improve HIV-infected patients' self-efficacy to effectively cope with stressors. When examining health status markers, there was little evidence to suggest that the interventions improved biological markers of immune system functioning. While stress management interventions for HIV-infected persons show considerable promise to facilitate positive adjustment, a number of conceptual and methodological concerns should be addressed to advance the stress management intervention research among HIV-infected patients.

Methodological Critique and Implications for Future Research

While extant stress management interventions for HIV-infected persons show considerable promise, measurement problems, intervention design features, and a narrow focus on stress management programs for HIV-infected MSM are significant concerns. In addition, the exclusive focus on group-based intervention approaches and the need to target unique concerns of HIV-infected patients raise significant concerns about the feasibility of disseminating interventions to resource-limited settings. These considerations are expanded upon in the succeeding sections.

Measurement of Intervention Outcomes and Processes

Lack of Consensus Regarding Best Practices for Assessment of Coping Hinders Interpretability of Interventions' Effectiveness—There is currently little consensus in the literature regarding how to conceptualize and assess coping [22,59]. Indeed, there are a number of review articles articulating difficulties with measuring coping [22,59–62]. In the studies included in this review, three different coping scales were used. These measures assess the use of coping strategies in response to recently experienced stressors. For analytic purposes, the coping approaches endorsed by respondents were then divided into categories or subscales based on prior conceptualizations of coping types (e.g., problem-focused, emotion-focused) or through exploratory factor analysis [59]. However, the division into coping subscales differed widely across studies.

In the absence of consensus regarding best practices for coping assessment, a greater emphasis on assessment of coping self-efficacy may be warranted. Coping self-efficacy can be assessed without reference to a particular stressor and is arguably of more direct relevance to the way in which coping skills are taught in stress management interventions. That is, interventions typically seek to modify participants' ability and confidence to successfully manage stress across situations using adaptive coping strategies. Thus, the level of coping self-efficacy may generalize well to a variety of stressful situations [44]. Additional research is needed to improve the conceptualization and assessment of coping. However, in the short term, stress management intervention research with HIV-infected people would benefit from greater use of coping self-efficacy to assess overall coping skills.

Need to Identify Active Ingredients of Stress Management Interventions—The reviewed interventions typically implemented multi-session programs with numerous components included in the treatment package. Further assessment of the efficacy of individual treatment components compared to other strategies should be employed. Similarly, the bulk of interventions were tested in a group format. Therapy process variables and nonspecific group factors may be important active ingredients to consider when evaluating the efficacy of stress management interventions. To date, none of the stress management treatments has assessed therapeutic process variables such as group cohesion, strength of therapeutic alliance, and facilitator characteristics (e.g., HIV status). It may be that therapy process variables, especially the provision of additional social support in group interventions, play an important role in treatment outcomes. Given the current practice of evaluating multifaceted intervention packages delivered over the course of multiple sessions, it is difficult to determine which intervention components or therapy process factors are responsible for improvements in adjustment.

Use of Depression Scales that Overlap with HIV Symptoms May Result in Inaccurate Assessment of Depressive Symptoms—In the diagnostic criteria for mood disorders, somatic symptoms are prominent diagnostic features [63]. However, somatic complaints associated with depression (e.g., fatigue, low energy) overlap considerably with symptoms commonly associated with HIV disease manifestation and HAART medication side effects. Common depression self-report measures used in the reviewed studies include somatic items that may inaccurately measure an HIV-infected patient's level of depressive symptomatology [64]. A potential solution for depression assessments for HIV-infected patient samples is to focus on the cognitive and affective domains of depression, rather than physical symptoms that may be a function of HIV or medication side effects, rather than depression [64].

Research Designs to Evaluate Intervention Efficacy

Future Studies Should Include Comparison Conditions with Equivalent Treatment Intensity and Length—The majority of studies compared a stress management intervention condition to a no intervention control group. However, few studies evaluated the intervention against a comparison condition with equivalent intensity and length. In addition, only a few studies compared the intervention to both a waitlist control group and a time-matched comparison condition. To evaluate the efficacy of behavioral interventions, trials should include both a rival treatment and no intervention control group [65]. Thus, future studies should utilize research designs that allow the effect of treatment intensity to be controlled for by using comparison treatments of equal length and intensity. Indeed, in research designs that included support group comparison conditions, differences between the stress management and comparison conditions were often more minimal (e.g., [26]).

Studies Should Include Longer Follow-up Assessments to Assess Long-Term Intervention Efficacy—

There is a need for longer follow-up assessments to evaluate the intervention's impact on sustained changes in stress management skills and also the long-term effects on functioning. Most of the reviewed studies reported only on data from preintervention and an immediate postintervention assessment (52%). Longitudinal assessments may be especially important for the measurement of immune status markers that may vary naturally with time [29,66]. Conducting longer follow-ups could also facilitate a greater focus on within-person variability for intervention outcomes. Thus, greater attention should be given to evaluating the long-term effects of stress management programs and identify characteristics of interventions best able to produce lasting behavior change.

Sample Characteristics

Focus on Samples of High-functioning HIV-infected, Caucasian MSM Limits the Generalizability of Findings to Other HIV-infected Subgroups—

Of the interventions reviewed, 57% of the studies recruited samples comprised entirely of HIV-infected MSM. Given some of the unique stressors faced by HIV-infected gay men (e.g., sexual orientation stigma), outcomes from the stress management interventions may not generalize to other HIV-infected patient populations. A limited subset of studies included both men and women, and only one intervention was tested with an exclusively female sample. The exclusion of women is especially troubling given that rates of HIV infection are on the rise among several subgroups in the USA, particularly among low-income minority women [67]. The reviewed literature also focused on participant samples that were composed predominantly of Caucasian individuals. In addition, intravenous (IV) drug users continue to experience elevated rates of HIV infection [68], but the efficacy of stress management interventions among this population have not been evaluated. To address this gap in the literature, future research should implement and test stress management interventions targeting a broader range of HIV-infected patient populations, especially IV drug users, women, and ethnic minorities. These interventions may benefit from inclusion of intervention modules that address the unique concerns that these groups grapple with.

In addition, a major limitation of the literature concerns the fact that most studies excluded patients who were experiencing psychological distress. Exclusion of patients experiencing distress or Axis I psychiatric disorders likely facilitates better recruitment and retention rates and may enhance the efficacy of interventions. However, an exclusive focus on providing stress management interventions for patients who are experiencing only minimal distress runs counter to the stated goals of the interventions (e.g., improving psychological adjustment, reducing distress). Thus, findings from the reviewed studies are not generalizable to HIV-infected patients reporting mental health difficulties (the very patients who may benefit most from these interventions). Because rates of mental health concerns are often reported to be high among HIV-infected samples [69], future stress management programs should be adapted for individuals experiencing psychological distress. The role of premorbid mental health functioning could then be examined as a potential mechanism influencing the intervention's efficacy. Indeed, one of the reviewed studies noted that individuals with the highest preintervention assessment levels of distress reported the most significant decreases in psychological distress after a stress management intervention [48].

Data Analytic Concerns

Multiple Statistical Comparisons Increase the Likelihood of Type I Errors—

In the reviewed literature, multiple papers were published utilizing data from the same sample of HIV-infected participants but reporting on different outcomes. As such, it was often difficult to determine whether papers from the same research groups were reporting on data from the same or distinct interventions. It was also challenging to discern whether all measured

outcomes were being presented or a limited subset of those assessed. In addition to publishing multiple reports on the same sample, individual papers frequently conducted multiple post-hoc analyses that were not guided by a priori study hypotheses. Furthermore, as seen in Table 2, there was considerable variability in the number of outcome variables included. Overall, studies did not adequately account for the use of multiple statistical analyses or include this as a limitation of the research. Additionally, if a limited subset of outcomes were reported, null findings may be under-reported in this literature. Future studies should focus on analyses guided by a priori hypotheses, report on all key outcomes measured, control for multiple statistical tests, use more conservative alpha levels for exploratory analyses, or report effect sizes and confidence intervals for findings.

Literature Focuses on Statistical Significance with Little Attention Given to Clinical Significance—In the HIV-infected stress management intervention literature, only two studies addressed the extent to which intervention outcomes were not only statistically significant but evidenced some change of practical importance. Greater attention should be given to reporting whether change in outcome measures is clinically significant. In so doing, readers will be able to better gauge the extent to which improvement on these measures is indicative of change that is of practical importance to the participant. A number of methods for assessing clinical significance have been proposed [70–73]. However, as Kazdin [72] notes, clinical significance should be determined by the goals of an intervention. In the case of stress management treatments, clinical significance should focus primarily on the practical change in one's ability to adaptively manage stress. In turn, clinical significance for these interventions would then evaluate the impact of this change on an individual's functioning in other domains such as psychological health and immune functioning. Thus, future research should clearly identify treatment goals and provide measurements of the degree to which HIV-infected patients evidence clinically significant improvement after completing a stress management intervention.

Intervention Dissemination and Tailoring to HIV-infected Individuals

Need for Cost-effective, Easily Disseminated Stress Management Interventions

—Stress management interventions have typically been administered in a group format led by an experienced clinical provider. These treatment programs have involved multiple sessions and a significant time commitment required to participate. Although group-delivered training provides the added benefit of fostering social support, some HIV-infected patients may be reticent to attend groups because of confidentiality concerns or dislike of group meetings. Thus, the usefulness of group stress management interventions may be limited to a relatively small subset of patients who could otherwise benefit from such programs. Group interventions also require significant financial resources to implement and may not be feasible in resource-limited clinic settings. An important gap in the literature is to examine the efficacy of briefer, more cost-effective stress management approaches that can meet the needs of a broad range of patients. One particularly promising intervention approach is the use of technology-delivered programs. For example, Heckman et al. [28] developed a phone-based stress management intervention to target rural HIV-infected patients. Another approach may be the use of computer-delivered interventions. This format affords participants greater confidentiality and flexibility of administration. They are also highly portable and can be implemented in a variety of contexts. For resource-limited outpatient settings, the use of computerized interventions may be more feasible and cost effective to reach a wider subset of patients.

Future Interventions Should Target the Unique Stressors Faced by Individuals Living with HIV

—The reviewed interventions typically provided participants with broad stress management training that could be applied in a variety of stressful situations. While this approach has considerable merit, few interventions have included modules designed to address

the unique challenges of being HIV infected. For example, HIV-infected patients often report significant levels of stigma and discrimination that could be targeted in stress management interventions for this population [53]. In addition, stress associated with maintaining satisfying, intimate relationships with partners could also be highlighted in stress management interventions. These unique challenges, along with others, should be given greater attention within the context of HIV-infected stress management interventions. Therefore, in addition to providing HIV-infected patients with a basic skill set to cope with stress, stress management interventions should also address the unique concerns that individuals living with HIV encounter.

Final Review Conclusions and Agenda for Future Stress Management Research

While the literature on stress management approaches for HIV-infected people has a number of methodological limitations that can be improved upon in future studies, there is considerable promise in cognitive-behavioral stress management interventions to improve the lives of HIV-infected individuals. An important public health priority is to develop stress management interventions to improve HIV-infected individuals' ability to effectively cope with health and life stressors that can be more widely disseminated for use in busy outpatient clinic settings. Additionally, interventions have targeted a small subset of the HIV-infected population and should be expanded to include other HIV-infected patient groups. Few stress management interventions have addressed the unique psychosocial needs of HIV-infected patients using briefer, more cost-effective formats. Thus, an important gap in the literature is to examine the efficacy of briefer psychoeducational stress management approaches that can be of use to a broader range of patients.

Future research should also explore the impact of stress management interventions on health behavior changes that may be relevant to longer-term health outcomes. Such health behaviors could include medication adherence, sexual risk behavior, substance use, and psychiatric treatment seeking behaviors. In addition, research should examine factors affecting the successful dissemination of these interventions to community health clinics with limited staff and financial resources. For example, an examination of the intervention's cost effectiveness, patient acceptability, and key facilitator characteristics that affect the success of the intervention should be evaluated. Future research should also provide clearer, detailed descriptions of intervention components such that additional studies to replicate findings can be conducted.

In sum, the lives of HIV-infected patients are often fraught with numerous psychosocial stressors. While some are able to successfully cope with these stressors and lead productive lives after an HIV diagnosis, a significant majority report difficulty effectively coping with stress. The stress management literature indicates that cognitive-behavioral interventions facilitate positive adjustment and improve coping skills to effectively manage stress. Future research should examine mechanisms responsible for these positive changes and adapt the interventions to best meet the needs of the broader HIV patient population. Particularly important is the need to design and test more cost-effective, brief treatment approaches that can be implemented in under-resourced treatment settings.

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Key characteristics of cognitive-behavioral stress management interventions for persons living with HIV

Table 1

Study citations	Sample gender and sexual orientation (sample size included in analyses); ethnicity	Study exclusion criteria	Study conditions	RCT	Number (length) of intervention sessions	Core intervention components	Assessment time points
[23]	N=90 hospitalized men; ethnicity NR	HIVSX, C/P	E: Individual SM	✓	E: 3 (20–30 min)	GC, GB	Pre, days 2, 3, 4, post
[24,43,49,52]	N=150 men, 85 women; 53% African-American, 28% Caucasian, 13% Hispanic, 6% other		C1: Emotional expression		C1: 3 (20–30 min)		
			C2: WLC E: Group bereavement SM	✓	E: 12 (90 min)	SS, GC	Pre, post, 4, 8, 12 months
[25]	N=64 MSM; ethnicity NR	HIVSX	C: Individual therapy on request E: Group SM	✓	E: 8 (120 min), 1-day retreat	HBC, R, GC	Pre, post
[26]	N=64 MSM, 4 heterosexual men; 62% Caucasian, 29% African-American, 9% Other		C: WLC E: Group SM	✓	E: 8 (90 min)	HBC, R, SS, GC	Pre, post, 3 months
[27]	N=130 MSM; 52% Caucasian, 21% African-American, 20% Hispanic	C/P, MH	C1: Support group		C1: 8 (90 min)		
			C2: WLC E: Group SM and MAT	✓	E: 10 (135 min)	HBC, R, GC	Pre, post
			C: Individual MAT		C: 1 (60 min), 2 (30 min)		

Study citations	Sample gender and sexual orientation (sample size included in analyses); ethnicity	Study exclusion criteria	Study conditions	RCT	Number (length) of intervention sessions	Core intervention components	Assessment time points
[28]	N=12 men, 4 women; 63% Caucasian, 31% African-American, 6% Hispanic		E: Group SM		E: 10 (60–90 min)	SS, SAM	Pre, post
[29,30]	N=149 MSM (N=93 for #30); 82% Caucasian (for #29); 78% Caucasian (for #30)	HIVSX, C/P, MH	C: None E: Group SM	✓	E: 10 (90 min), 1-day retreat, 6 booster	R, SS, SAM, GC	Pre, 3, 6, 12 months
[31]	N=61 men, 29 women; 50% Caucasian, 43% African-American, 5% Hispanic		C1: Group HIV-Info C2: WLC E: Immediate Group Phone SM		C1: 10 (90 min), 6 booster E: 12 (90 min)	SS, SAM	Pre, post, 3 months
[32,33]	N=39 MSM; Ethnicity NR	HIVSX, C/P, MH	C: Delayed Group Phone SM E: Group SM		E: 15 (150 min), 1-day retreat	P, R, SAM, GC	Pre, post, 3, 6 months
[34]	N=40 MSM, 5 heterosexual men; 83% Caucasian, 13% African-American, 3% Hispanic	HIVSX, C/P, MH	C1: Experiential Therapy C2: WLC, then crossed to E or C1 E: Group SM		E: 6 (60 min)	R, GC	Pre, post, 6 months
[35]	N=16 heterosexual men (N=13); 100% Chinese	HIVSX, C/P	C: WLC E: Group SM C: WLC	✓	E: 7 (120 min)	P, R, SS, SAM, GC	Pre, post

Study citations	Sample gender and sexual orientation (sample size included in analyses); ethnicity	Study exclusion criteria	Study conditions	RCT	Number (length) of intervention sessions	Core intervention components	Assessment time points
[36,37]	N=330 women (N=56 for #36); 65% African-American, 11% Hispanic, 13% Caucasian, 11% Other (for #36); 59% African-American, 16% Hispanic, 10% Caucasian, 15% Other (for #37)	HIVSX, C/P, MH	E: Group SM	✓	E: 10 (120 min)	P, R, SS, GC	Pre, post
[38]	N=32 men, 3 women; 100% Chinese	HIVSX, C/P	C: Video E: Group SM		C: 10 (120 min) E: 12 (120 min)	R, SS, GC	Pre, post, 3 months
[39,47]	N=96 MSM (N=73 for #39; N=64 for #47); 66% Caucasian, 29% Hispanic	HIVSX, C/P, MH	C1: Support group C2: WLC E: Group SM	✓	C1: 12 (120 min) E: 10 (135 min)	P, R, SS, GC	Pre, post
[40]	N=125 MSM (N=100); 55% Caucasian, 33% Hispanic	HIVSX, C/P, MH	C: WLC E: Group SM	✓	E: 10 (135 min)	R, SS, GC	Pre, post

Study citations	Sample gender and sexual orientation (sample size included in analyses); ethnicity	Study exclusion criteria	Study conditions	RCT	Number (length) of intervention sessions	Core intervention components	Assessment time points
[41,48]	N=52 MSM (N=40); 62.5% Caucasian, 35% Hispanic, 2.5% African-American	HIVSX, C/P, MH	E: Group SM	✓	E: 10 (120 min)	P, R, SS, GC	Pre, post
[42]	N=36 men, 4 women; 75% Caucasian, 12.5% Asian Americans, 12.5% Hawaiians		C: WLC E: Group SM	✓	E: 14 (75 min)	P, R, GC	Pre, post
[46]	N=15 MSM; 80% Caucasian, 20% African-American	C/P, MH	C: WLC E: Group SM with antidepressant as needed		E: 20 (120 min)	GC, GB	Pre, post, 6 months
[50]	N=50 MSM; 94% Caucasian, 4% Hispanic, 2% African-American	HIVSX, C/P	C: None E: Group SM		E: 10 (120 min)	R, PS	Pre, post
[51]	N=100 MSM (N=62); 61% Caucasian, 32% Hispanic	HIVSX, C/P, MH	C: None E: Group SM	✓	E: 10 (135 min)	R, SS, GC	Pre, post
[56]	Total sample size NR; MSM (N=25); ethnicity NR	HIVSX, C/P, MH	C: WLC E: Group SM	✓	E: 10 (135 min)	R, SS, GC	Pre, post, between 6 and 12 months

When multiple papers were written on a single intervention trial, study citation numbers for these papers are listed in succession.

NR Not reported, MSM men who have sex with men, HIVSX excluded based on HIV symptoms or AIDS diagnosis, C/P excluded because of cognitive impairment or psychosis, MH excluded due to mental health difficulties, E experimental stress management intervention, C comparison/control condition, SM stress management, MAT medication adherence training, HIV-Info HIV informational

condition, *WLC* waitlist control, *RCT* randomized controlled trial, *P* psychoeducation about stress management, *HBC* health behavior change modules (adherence, substance use, sexual risk behaviors), *R* relaxation, *SS* social support enhancement and utilization, *GB* general behavioral coping skills (e.g., variety of behavioral approaches), *GC* general cognitive therapeutic approaches (e.g., cognitive restructuring), *PS* problem solving, *SAM* stressor appraisal and matching of coping approach, *Pre* preintervention assessment, *Post* postintervention assessment

Table 2

Overview of primary study outcomes of cognitive-behavioral stress management interventions for persons living with HIV

Study outcome	Number of interventions assessing outcome	Positive findings: study citation numbers	Mixed findings
Stress and coping			
Perceived stress	4	[31,39]	[28,29/30]
Coping strategies	8		[27,28,31,32]
Coping self-efficacy	3	[31,40]	[29/30]
Psychological adjustment and psychosocial functioning			
Depression	10	[26,27,35,47,48]	[32/33,38,40]
Anxiety	7	[23,47,48,50]	[29/30]
Global psychological functioning and symptom levels	12	[31,32,38,40,42,46–48,51,52]	
Social support	8	[29/30,41]	[28,40,51]
Quality of life	4	[35]	[34,37,52]
Health status markers			
Stress hormones	1		[39/47]
CD4 counts	5		
Natural killer cells and naïve T cells	2	[56]	
Cytotoxic T cells	2	[39]	

When multiple papers from the same intervention reported on an outcome, this is denoted by a “/” between study citation numbers. Positive findings indicate that participants in the stress management intervention demonstrated improved functioning on the outcome. Mixed findings indicate that while stress management participants reported some improvement, findings varied across assessment points or on different dimensions of the construct. Negative findings indicate that participants in the stress management condition did not demonstrate improvement on a particular outcome.