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Randomized Controlled Trial of a Cognitive-Behavioral Intervention for HIV-Positive Persons:

An Investigation of Treatment Effects on Psychosocial Adjustment

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Introduction

HIV infection presents individuals with multiple challenges which may overwhelm their coping resources and impair psychosocial adjustment to the ongoing demands of managing this stigmatized, chronic illness (Heckman et al., 2004; Weaver et al., 2005). Consequently, HIV-positive persons are at substantially elevated risk for developing an affective or adjustment disorder across the disease spectrum (Bing et al., 2001). Randomized controlled trials have examined the efficacy of psychological interventions that are designed to decrease negative affect as well as enhance positive psychological resources among HIV-positive persons (Antoni, 2003; Chesney et al., 2005). Findings generally support the efficacy of interventions for improving psychosocial adjustment, but there are significant limitations to both external and internal validity in trials that have been conducted (Brown & Venable, 2008; Carrico & Antoni, in press; Crepaz et al., 2008; Scott-Sheldon, Kalichman, Carey, & Fielder, 2008). Important, unanswered questions remain regarding the clinical utility of interventions that have been tested because the majority of trials have utilized stringent inclusion criteria and focused almost exclusively on gay men. It is also difficult to determine the active mechanism(s) of interventions that have been tested because most trials have examined group-based interventions. In these trials, it is unclear whether observed treatment effects were due to psychotherapeutic processes or social support received from group members. In fact, there is little evidence for differential efficacy of group-based interventions that have been tested to date, even compared to semi-structured social support groups (Bormann et al., 2006; Chesney, Chambers, Taylor, Johnson, & Folkman, 2003; Kelly et al., 1993; Mulder et al., 1994).

Two well-controlled trials have examined the efficacy of individually delivered, psychological interventions with diverse cohorts of depressed HIV-positive persons. Markowitz and colleagues (1998) observed that individuals randomized to interpersonal psychotherapy and

supportive psychotherapy with imipramine reported reductions in depressive symptoms and improvements in physical functioning over a 16-week intervention period when compared to those in cognitive-behavioral therapy or supportive psychotherapy alone. However, there did not appear to be any significant benefits of cognitive-behavioral therapy beyond the “non-specific” treatment effects of supportive psychotherapy. In the second trial, Safren and colleagues (in press) examined the efficacy of an individual cognitive-behavioral intervention for adherence and depression among depressed men and women on anti-retroviral therapy (ART). Over the 12-week intervention period, individuals in the cognitive-behavioral intervention reported reductions in depressive symptoms and displayed increases in electronically monitored ART adherence compared to those who received a single session adherence intervention. Although these trials provide support for the efficacy of individually delivered interventions among depressed HIV-positive persons, further investigations are needed to examine the long-term efficacy in more representative samples.

The Healthy Living Project is a multi-site randomized controlled trial of a 3-module, 15-session, individually delivered cognitive-behavioral intervention that was designed primarily to reduce HIV transmission risk behavior. Of the 3 modules, the first focused on improving coping skills (5 sessions); the second, on reducing sexual risk behavior (5 sessions); and the third, on improving adherence to HIV/AIDS treatment (5 sessions). One previous investigation reported that this intervention reduced HIV transmission risk behavior over the 25-month investigation period (Healthy Living Project Team, 2007). Because improvements in psychosocial adjustment were hypothesized to mediate intervention-related reductions in HIV transmission risk behavior, one key component of this intervention focused on building the capacity of individuals to execute effective coping responses (Gore-Felton et al., 2005). In the present study, we examined the efficacy of this intervention with respect to measures of negative affect (depressive symptoms, anxiety, burnout, and perceived stress) and positive psychological resources (positive affect, positive states of mind, coping self-efficacy, and perceived social support). We conducted intent-to-treat analyses of intervention effects on psychosocial adjustment from baseline to 5 months post-randomization as well as across the 25-month investigation period. We also conducted moderation analyses to determine whether the intervention was more efficacious among those who presented with elevated symptoms of depression at baseline.

Methods

Procedures

This trial was conducted in four U.S. cities: Los Angeles, Milwaukee, New York, and San Francisco. More detailed information regarding the trial methods, intervention, methods for monitoring intervention fidelity, and intervention effects on the primary outcome measure (HIV transmission risk) have been published elsewhere (Gore-Felton et al., 2005; Healthy Living Project Team, 2007). Between April 2000 and January 2002, HIV-positive individuals were recruited from community agencies and medical clinics for a baseline interview. Participants were eligible for the trial if reporting at least one act of unprotected vaginal or anal intercourse in the previous 3 months with any partner of HIV-negative or unknown serostatus. In addition, individuals were eligible if reporting unprotected intercourse with at least one HIV-positive individual who was not their primary partner. The institutional review boards at each of the participating institutions approved all study procedures. Voluntary, written informed consent was obtained from all participants.

Interviews were conducted in private settings in research offices, community-based organizations, and clinics using laptop computers (Johnson et al., 2003; Weinhardt et al., 2004). Assessments involved a combination of audio-computer-assisted self-interviewing (ACASI) and computer-assisted personal interviewing using the Questionnaire Development

System (Nova Research Company, Bethesda, MD). ACASI has been shown as an effective method of decreasing social desirability bias and thereby enhancing veracity of self-report of sensitive behaviors (Gribble, Miller, Rogers, & Turner, 1999; Turner et al., 1998). Additional assessments were scheduled at 5, 10, 15, 20, and 25 months after randomization. Participants completed psychosocial measures at each assessment, but the 10 month assessment was abbreviated such that only selected measures were administered. Figure 1 summarizes the flow of participants as well as attendance rates for the intervention sessions and assessment interviews.

Randomization

Simple randomization was implemented using computer-generated random numbers stored in a randomization table on a server computer housed at the Los Angeles study site. The randomization website was accessible to each site using a unique logon ID and password. In New York and San Francisco, randomization was done in a second appointment following the baseline interview. In Milwaukee, randomization was done immediately following completion of the baseline interview and establishment of eligibility, without a separate appointment. In Los Angeles, randomization was initially done in a separate appointment; the protocol was changed around June 2001 to randomize immediately following completion of the baseline interview and establishment of eligibility, without a separate appointment.

Intervention Condition

The Healthy Living Project intervention was designed primarily to promote reductions in HIV transmission risk behavior (Gore-Felton et al., 2005). It consisted of fifteen 90-minute individual counseling sessions grouped into three modules, each consisting of five sessions. Module 1 (Stress, Coping, and Adjustment) addressed quality of life, psychological coping, positive affect, and cultivating supportive social relationships. This intervention module was developed using elements of coping effectiveness training, a group-based intervention that has previously been shown to be efficacious for improving psychosocial adjustment among HIV-positive gay men (Chesney et al., 2003). As shown in Figure 1, this module was delivered between baseline and the 5 month assessment. On average, this assessment was two to three months after the completion of the 5-session stress, coping, and adjustment intervention module. Module 2 (Safer Behaviors) addressed self-regulatory issues, such as avoiding sexual and drug-related risk of HIV transmission or acquisition of additional sexually transmitted diseases, as well as disclosure of HIV status to potential partners. Individuals began receiving Module 2 shortly after 5 month assessment and these intervention sessions concluded approximately 2-3 months before the 10 month assessment. Module 3 (Health Behaviors) addressed accessing health services, adherence, and active participation in medical care decision-making. Individuals began receiving Module 3 shortly after 10 month assessment and these intervention sessions concluded approximately 2-3 months before the 15 month assessment. Intervention sessions followed a standard structure and set of activities, but were individually tailored to participants' specific life contexts. In order to monitor intervention fidelity, facilitators attended weekly supervision with a licensed mental health professional that was trained in the delivery of the intervention protocol. In addition, all intervention sessions were audiotaped and representative samples of these tapes were rated by a centralized quality assurance team (Gore-Felton et al., 2005). This intervention protocol is available upon request. Participants received \$10, \$15 and \$20 for attending each session of Modules 1, 2, and 3, respectively.

Wait-List Control Condition

Participants in the wait-list control condition completed assessments but did not receive any active intervention during the 25-month trial (See Figure 1). Because this control condition is

not attention-matched, intervention effects could be attributable to specific treatment components and/or non-specific change processes associated with any supportive psychotherapy.

Measures

Demographics—Age, ethnicity, gender, education, sexual orientation, time since HIV diagnosis, self-reported T-helper cell count, and self-reported HIV viral load were assessed by questionnaire.

Depressive Symptoms—The 21-item Beck Depression Inventory I (BDI) assesses the severity of somatic, affective, cognitive, and behavioral symptoms of depression during the past week (Beck, Steer, Ball, & Ranieri, 1996). In addition to the BDI total score (Cronbach's $\alpha = .89$), we utilized the 13-item BDI-Affective subscale (Cronbach's $\alpha = .86$) to control for confounds between HIV-related symptoms and somatic symptoms of depression (Kalichman, Rompa, & Cage, 2000). For moderation analyses, individuals were classified as presenting with significant depressive symptoms if the baseline BDI total score was greater than or equal to ten.

Anxiety—The 20-item state form of the State-Trait Anxiety Inventory (STAI) assesses anxiety (Spielberger, Gorsuch, & Lushene, 1974). This form of the STAI is designed to assess anxiety at the time the participant completes the measure (Cronbach's $\alpha = .91$).

Burnout—We assessed burnout in the past month with a measure from a trial of coping effectiveness training with HIV-positive gay men (Chesney et al., 2003). Participant responses to each item (e.g., irritated, overwhelmed) range from 0 (not at all) to 4 (extremely). A composite score for this 16-item measure (Cronbach's $\alpha = .93$) is created by summing item ratings.

Perceived Stress—The 10-item Perceived Stress Scale assesses perceived stress during the past month (Cohen, Kamarck, & Mermelstein, 1983). A composite score is created (Cronbach's $\alpha = .88$) and this measure is highly correlated with negative affect.

Positive Affect—We selected two items that measured positive affect from a standard quality of life measure (Ware, 1993). One item assessed happiness during the past four weeks ("Have you been a happy person?"). The second item assessed the degree to which individuals felt calm and peaceful during the past four weeks ("Have you felt calm and peaceful?"). Participant responses to these items ranged from 1 (none of the time) to 6 (all of the time). We created a composite score for positive affect by summing these two items (Cronbach's $\alpha = .78$).

Positive States of Mind—The 6-item Positive States of Mind (PSOM) scale was used to examine the degree to which individuals are able to achieve and maintain desirable cognitive and interpersonal states (i.e., focused attention, productivity, responsible caretaking, restful repose, sensuous non-sexual pleasure, and sharing) during the past week (Cronbach's $\alpha = .80$). Even in the absence of clinically significant levels depressive symptoms, impairments in PSOM may provide an index of the degree to which individuals are vulnerable to experiencing sustained negative affect in response to life events (Adler, Horowitz, Garcia, & Moyer, 1998; Moskowitz, Folkman, & Acree, 2003).

Coping Self-Efficacy—Coping self-efficacy was assessed with an abbreviated (15-item scale) version of a 26-item scale (Chesney et al., 2003; Chesney, Neilands, Chambers, Taylor, & Folkman, 2006). Participants rated from 0 (cannot do at all) to 10 (certain can do) the extent

to which they believe they could perform behaviors important to adaptive coping. Higher composite scores indicate greater coping self-efficacy (Cronbach's $\alpha = .92$).

Perceived Social Support—The 24-item Social Provisions Scale assesses perceived social support (Cutrona, 1989). Items are rated from 1 (Strongly Disagree) to 4 (Strongly Agree). Higher composite scores indicate greater social support (Cronbach's $\alpha = .90$).

Statistical Analyses

We chose a mixed-model methodology to examine the efficacy of the Healthy Living Project intervention because this approach does not require listwise deletion of outcome data and makes less stringent assumptions regarding within subject correlation patterns. Thus, we were able to utilize all available data provided by participants at each time point to obtain more accurate parameter estimates of the intervention effects (Littell, Henry, & Ammerman, 1998). We conducted intent-to-treat analyses of intervention effects from baseline to 5 months in order to examine the efficacy of the 5-session stress, coping, and adjustment intervention module on psychosocial adjustment. Then, we examined whether the number of stress, coping, and adjustment intervention module sessions attended (range: 0 - 5) was correlated with changes in measures of psychosocial adjustment from baseline to 5 months. We also conducted intent-to-treat analyses of intervention effects on psychosocial adjustment using all available data over the 25-month investigation period. In addition, we examined whether the total number of intervention sessions attended (range: 0 - 15) was correlated with changes in measures of psychosocial adjustment over the 25-month investigation period. Finally, we conducted moderation analyses to determine whether intervention effects on psychosocial adjustment were reported among individuals who presented with mild to moderate depressive symptoms at baseline (BDI total score ≥ 10). All analyses incorporated random intercepts and slopes to model an unstructured within-subject correlation of these random effects. Because we examined intervention effects on a number of indicators of psychosocial adjustment in this large trial, as a conservative measure we selected a more stringent p-value for statistical significance ($p < .01$). Because methods for computing model-implied effect size measures is an area of ongoing research in multilevel analysis, we report the Cohen's d effect size statistic (which is the difference in observed means divided by the standard error of the difference of the observed means) at each assessment in Table 1.

Results

Participant Demographics

At baseline, the mean age of the participants was 39.8 years (range 19-67). Most participants were male (79%), of whom 72% were men who have sex with men. Thirty-two percent of participants were Caucasian, 45% were African American, 15% were Hispanic, and 8% were other. Eighty-one percent had education less than a college degree. Sixty-nine percent were on ART. Participants had been diagnosed with HIV for an average of 10.8 (SD = 5.6) years. At baseline, the mean self-reported CD4+ count was 425 cells/mm³ and 15% reported having an undetectable viral load. As we have previously reported, there were no demographic differences between the intervention and wait-list control at baseline (Healthy Living Project Team, 2007). Using independent samples t-tests, there were no differences between the intervention and wait-list control in any measure of psychosocial adjustment at baseline ($p > .10$).

Intent-to-Treat Analyses

No intervention effects on negative affect were observed from baseline to 5 months: BDI ($\beta = -.020$, $t(803) = -.17$, $p > .10$; $d = -.09$); BDI-Affective ($\beta = -.008$, $t(803) = .11$, $p > .10$; $d = -.09$); STAI ($\beta = .035$, $t(803) = .21$, $p > .10$; $d = -.04$); burnout ($\beta = .052$, $t(803) = .29$, $p > .10$);

$d = 0$); and perceived stress ($\beta = .051$, $t(803) = .55$, $p > .10$; $d = 0$). Among participants in the intervention, the number of Module 1 sessions attended was unrelated to changes in negative affect from baseline to 5 months ($p > .05$). Similarly, no intervention effects were observed over the 25-month investigation period ($p > .10$) and the total intervention sessions attended was unrelated to changes in negative affect ($p > .10$).

No intervention effects on positive psychological resources were observed from baseline to 5 months: positive affect ($\beta = .060$, $t(802) = 1.78$, $p = .07$; $d = .08$); coping self-efficacy ($\beta = .119$, $t(803) = .33$, $p > .10$; $d = .11$); PSOM ($\beta = -.035$, $t(802) = -.70$, $p > .10$; $d = .03$); and perceived social support ($\beta = .057$, $t(803) = .46$, $p > .10$; $d = .04$). Among participants in the intervention, the number of Module 1 sessions attended was unrelated to changes in positive psychological resources from baseline to 5 months ($p > .10$). Similarly, no intervention effects were observed over the 25-month investigation period ($p > .10$) and the total intervention sessions attended was unrelated to changes in positive psychological resources ($p > .10$).

Moderation Analyses

Before examining baseline depression as moderator, we examined whether study site moderated intervention effects. Results indicated that there did not appear to be any significant differences in the efficacy of the intervention with respect to any measure of psychosocial adjustment from baseline to 5 months ($p > .10$) or over the 25-month investigation period ($p > .05$) between the four study sites. Among individuals who presented with mild to moderate depressive symptoms at baseline, no effects of the intervention on any measure of psychosocial adjustment were observed from baseline to 5 months ($p > .10$). These findings were unchanged when examining intervention effects over the 25-month investigation period ($p > .05$).

Discussion

The Healthy Living Project intervention was successful in reducing unprotected sexual intercourse with HIV-negative or unknown status partners, which was the primary outcome for this trial (Healthy Living Project Team, 2007). However, findings from the present study do not support the efficacy of this intervention for improving psychosocial adjustment. The lack of intervention effects on psychosocial adjustment may be due in large part to the fact that this treatment focused extensively on providing cognitive-behavioral skills training to decrease sexual risk taking and enhance self-care behaviors such as ART adherence (10 of 15 sessions). Even though the Module 1 (5 sessions) of the intervention focused on managing stress and executing effective coping responses, no intervention effects on psychosocial adjustment were observed at 5 months or across the 25-month investigation period. It may be that the stress, coping, and adjustment module of this intervention was not delivered with the intensity necessary to influence psychosocial adjustment. This is partially supported by the results of previous trials where interventions that consisted of at least ten individual or group sessions were more likely to improve psychosocial adjustment (Crepaz et al., 2008; Carrico et al., 2006; Chesney et al., 2003; Markowitz et al., 1998; Safren et al., in press). Because no effects of the Healthy Living Project intervention were observed on indices of psychosocial adjustment, this precluded subsequent formal tests of mediation (Baron & Kenny, 1986). As such, findings from the present investigation do not support the hypothesis that improvements in psychosocial adjustment mediate intervention-related reductions in HIV transmission risk.

It is also plausible that the effects of the Healthy Living Project intervention on psychosocial adjustment were short-lived, dissipating before the 5 month assessment. Prior trials of group-based cognitive behavioral stress management with HIV-positive gay men have observed that 10-week reductions in depressed mood mediate intervention effects on long-term improvements in transitional naïve T-cell counts and reductions in HIV viral load (Antoni et al., 2005; Antoni et al., 2006). Even transient improvements in psychosocial adjustment during

the 2-3 months between the conclusion of Module 1 (stress, coping, and adjustment) and the 5 month assessment may have mediated long-term intervention effects on reduced HIV-transmission risk behavior. On the other hand, it is noteworthy that decreases in the number of HIV transmission risk acts among individuals in the intervention condition were suggestive at 10 and 15 months post-randomization and significant at 20 months post-randomization. Because the stress, coping, and adjustment module was delivered before the 5 month assessment, the lack of intervention effects on HIV risk behavior at 5 months has some interesting implications. Specifically, this indicates that the stress, coping, and adjustment module alone may not have been sufficient to reduce HIV transmission risk behavior. This is consistent with the results of a meta-analysis of 34 peer-reviewed studies which reported that there is little evidence to support a relationship between negative affect and sexual risk taking that places individuals at risk for contracting or transmitting HIV (Crepaz & Marks, 2001). However, despite the fact that improvements in psychosocial adjustment were not observed and the role of Module 1 remains unclear, this does not exclude the possibility that sessions targeting stress, coping, and adjustment may have been a critical component of the Healthy Living Project intervention. Addressing stress and coping during the first 5 sessions may have substantially assisted facilitators with building a solid therapeutic alliance that could have been crucial to effectively implement later sessions that focused on behavior change. Further process-oriented research and deconstruction trials are needed to examine these unanswered questions regarding the importance of addressing stress, coping, and adjustment in interventions that focus on reducing HIV transmission risk (and potentially other health risk behaviors). Future research should also determine whether group-based interventions are more efficacious and cost effective for improving psychosocial adjustment.

Although the Healthy Living Project tested a cognitive-behavioral intervention, this treatment was largely focused on skills training to promote behavior change. Thus, the intervention did not include important components of cognitive-behavioral therapy such as behavioral activation and cognitive restructuring that may be crucial to decrease negative affect, particularly among depressed individuals (Dimidjian et al., 2006). Because the primary outcome for the Healthy Living Project was HIV transmission risk, inclusion criteria did not require individuals to report elevated psychological distress at baseline. This may partially explain the relatively low levels of distress reported by participants in this trial compared to other trials with depressed HIV-positive persons. However, in contrast to previous trials with depressed HIV-positive persons (Markowitz et al., 1998; Safren, in press), we did not observe effects of the Healthy Living Project intervention on measures of psychosocial adjustment among individuals with elevated depressive symptoms at baseline. Although the present trial did not collect systematic data regarding psychiatric co-morbidities, individuals with severe mental illness (e.g., bipolar disorder) and/or substance use disorders were not excluded as they have been in previous trials of individually delivered interventions. In fact, because the present trial required individuals to report HIV transmission risk behavior or sexual risk taking with a HIV-positive non-primary partner, rates of psychiatric co-morbidities may have been elevated in this cohort (Sikkema, Hansen, Meade, Kochman, & Fox, 2007). Findings from the present trial indicate that more intensive mental health interventions may be necessary to improve psychosocial adjustment among HIV-positive individuals. In particular, future investigations should attempt to develop and test such interventions to meet the unique needs of individuals with psychiatric co-morbidities other than unipolar depression.

References

- Adler NE, Horowitz M, Garcia A, Moyer A. Additional validation of a scale to assess positive states of mind. *Psychosomatic Medicine* 1998;60(1):26–32. [PubMed: 9492235]
- Antoni MH. Stress management and psychoneuroimmunology in HIV infection. *CNS Spectrums* 2003;8(1):40–51. [PubMed: 12627048]

- Antoni MH, Carrico AW, Duran RE, Spitzer S, Penedo F, Ironson G, et al. Randomized clinical trial of cognitive behavioral stress management on human immunodeficiency virus viral load in gay men treated with highly active antiretroviral therapy. *Psychosomatic Medicine* 2006;68:143–51. [PubMed: 16449425]
- Antoni MH, Cruess DG, Klimas N, Carrico AW, Maher K, Cruess S, et al. Increases in a marker of immune system reconstitution are predated by decreases in 24-h urinary cortisol output and depressed mood during a 10-week stress management intervention in symptomatic HIV-infected men. *Journal of Psychosomatic Research* 2005;58:3–13. [PubMed: 15771864]
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 1986;51:1173–1182. [PubMed: 3806354]
- Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. *Journal of Personality Assessment* 1996;67(3):588–597. [PubMed: 8991972]
- Bing EG, Burnam MA, Longshore D, Fleishman JA, Sherbourne CD, London AS, et al. Psychiatric disorders and drug use among human immunodeficiency virus-infected adults in the United States. *Archives of General Psychiatry* 2001;58:721–8. [PubMed: 11483137]
- Bormann JE, Gifford AL, Shively M, Smith TL, Redwine L, Kelly A, et al. Effects of spiritual mantram repetition on HIV outcomes: a randomized controlled trial. *Journal of Behavioral Medicine* 2006;29(4):359–376. [PubMed: 16847590]
- Brown JL, Venable PA. Cognitive-Behavioral Stress Management Interventions for Persons Living with HIV: A Review and Critique of the Literature. *Annals of Behavioral Medicine* 2008;35(1):26–40. [PubMed: 18347902]
- Carrico AW, Antoni MH. The effects of psychological interventions on neuroendocrine hormone regulation and immune status in HIV-positive persons: A review of randomized controlled trials. *Psychosomatic Medicine*. in press
- Carrico AW, Antoni MH, Duran RE, Ironson G, Penedo F, Fletcher MA, et al. Reductions in depressed mood and denial coping during cognitive behavioral stress management with HIV-Positive gay men treated with HAART. *Annals of Behavioral Medicine* 2006;31:155–164. [PubMed: 16542130]
- Chesney MA, Chambers DB, Taylor JM, Johnson LM, Folkman S. Coping effectiveness training for men living with HIV: results from a randomized clinical trial testing a group-based intervention. *Psychosomatic Medicine* 2003;65(6):1038–1046. [PubMed: 14645783]
- Chesney MA, Darbes LA, Hoerster K, Taylor JM, Chambers DB, Anderson DE. Positive emotions: exploring the other hemisphere in behavioral medicine. *International Journal of Behavioral Medicine* 2005;12(2):50–58. [PubMed: 15901213]
- Chesney MA, Neillands TB, Chambers DB, Taylor JM, Folkman S. A validity and reliability study of the coping self-efficacy scale. *British Journal of Health Psychology* 2006;11(Pt 3):421–437. [PubMed: 16870053]
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of Health Social Behavior* 1983;24(4):385–396.
- Crepaz N, Marks G. Are negative affective states associated with HIV sexual risk behaviors? A meta-analytic review. *Health Psychology* 2001;20:291–299. [PubMed: 11515741]
- Crepaz N, Passin WF, Herbst JH, Rama SM, Malow RM, Purcell DW, et al. Meta-analysis of cognitive-behavioral interventions on HIV-positive persons' mental health and immune functioning. *Health Psychology* 2008;27(1):4–14. [PubMed: 18230008]
- Cutrona CE. Ratings of social support by adolescents and adult informants: degree of correspondence and prediction of depressive symptoms. *Journal of Personality and Social Psychology* 1989;57(4):723–730. [PubMed: 2795439]
- Dimidjian S, Hollon SD, Dobson KS, Schmaling KB, Kohlenberg RJ, Addis ME, et al. Randomized trial of behavioral activation, cognitive therapy, and antidepressant medication in the acute treatment of adults with major depression. *Journal of Consulting and Clinical Psychology* 2006;74(4):658–670. [PubMed: 16881773]
- Gore-Felton C, Rotheram-Borus MJ, Weinhardt LS, Kelly JA, Lightfoot M, Kirshenbaum SB, et al. The Healthy Living Project: An Individually Tailored, Multidimensional Intervention for HIV-Infected Persons. *AIDS Education and Prevention* 2005;17(Suppl A):21–39. [PubMed: 15843115]

- Gribble JN, Miller HG, Rogers SM, Turner CF. Interview mode and measurement of sexual behaviors: methodological issues. *Journal of Sex Research* 1999;36:16–24.
- Healthy Living Project Team. Effects of a behavioral intervention to reduce risk of transmission among people living with HIV: The healthy living project randomized controlled study. *Journal of Acquired Immune Deficiency Syndromes* 2007;44:213–21. [PubMed: 17146375]
- Heckman TG, Anderson ES, Sikkema KJ, Kochman A, Kalichman SC, Anderson T. Emotional distress in nonmetropolitan persons living with HIV disease enrolled in a telephone-delivered, coping improvement group intervention. *Health Psychology* 2004;23(1):94–100. [PubMed: 14756608]
- Johnson MO, Catz SL, Remien RH, Rotheram-Borus MJ, Morin SF, Charlebois E, et al. Theory-guided, empirically supported avenues for intervention on HIV medication nonadherence: findings from the Healthy Living Project. *AIDS Patient Care STDS* 2003;17(12):645–656. [PubMed: 14746658]
- Kalichman SC, Rompa D, Cage M. Distinguishing between overlapping somatic symptoms of depression and HIV disease in people living with HIV-AIDS. *Journal of Nervous and Mental Diseases* 2000;188(10):662–670.
- Kelly JA, Murphy DA, Bahr GR, Kalichman SC, Morgan MG, Stevenson LY, et al. Outcome of cognitive-behavioral and support group brief therapies for depressed, HIV-infected persons. *American Journal of Psychiatry* 1993;150(11):1679–1686. [PubMed: 8214177]
- Littell RC, Henry PR, Ammerman CB. Statistical analysis of repeated measures data using SAS procedures. *Journal of Animal Science* 1998;76(4):1216–1231. [PubMed: 9581947]
- Markowitz JC, Kocsis JH, Fishman B, Spielman LA, Jacobsberg LB, Frances AJ, et al. Treatment of depressive symptoms in human immunodeficiency virus-positive patients. *Archives of General Psychiatry* 1998;55(5):452–457. [PubMed: 9596048]
- Moskowitz JT, Folkman S, Acree M. Do positive psychological states shed light on recovery from bereavement? Findings from a 3-year longitudinal study. *Death Studies* 2003;27(6):471–500. [PubMed: 12814129]
- Mulder CL, Emmelkamp PM, Antoni MH, Mulder JW, Sandfort TG, de Vries MJ. Cognitive-behavioral and experiential group psychotherapy for HIV-infected homosexual men: a comparative study. *Psychosomatic Medicine* 1994;56(5):423–431. [PubMed: 7809342]
- Safren S, O'Leirigh C, Tan J, Raminani S, Reilly L, Otto MW, Mayer KH. Cognitive behavioral therapy for adherence and depression (CBT-AD) in HIV-infected individuals. *Health Psychology*. in press
- Scott-Sheldon LA, Kalichman SC, Carey MP, Fielder RL. Stress management interventions for HIV+ adults: A meta-analysis of randomized controlled trials, 1989 to 2006. *Health Psychology* 2008;27(2):129–139. [PubMed: 18377131]
- Sikkema KJ, Hansen MB, Meade CS, Kochman A, Fox AM. Psychosocial predictors of sexual HIV transmission risk behavior among HIV-positive adults with a sexual abuse history in childhood. *Archives of Sexual Behavior*. 2007
- Spielberger, C.; Gorsuch, R.; Lushene, R. *STAI Manual for the State-Trait Anxiety Inventory*. Consulting Psychologists Press; Palo Alto, CA: 1974.
- Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science* 1998;280(5365):867–873. [PubMed: 9572724]
- Ware, J. *SF-36 Health Survey: Manual and Interpretation Guide*. Quality Metric; Lincoln, RI: 1993.
- Weaver KE, Llabre MM, Duran RE, Antoni MH, Ironson G, Penedo FJ, et al. A stress and coping model of medication adherence and viral load in HIV-positive men and women on highly active antiretroviral therapy (HAART). *Health Psychology* 2005;24(4):385–392. [PubMed: 16045374]
- Weinhardt LS, Kelly JA, Brondino MJ, Rotheram-Borus MJ, Kirshenbaum SB, Chesney MA, et al. HIV Transmission Risk Behavior Among Men and Women: Living With HIV in Four U.S. Cities. *Journal of Acquired Immune Deficiency Syndromes* 2004;36(5):1057–1066. [PubMed: 15247559]

Figure 1.
Flow chart of participants in trial

Table 1
Descriptive data for measures of psychosocial adjustment

	Intervention (n = 467)	Control (n = 469)	Cohen's <i>d</i>
	M (SD)	M (SD)	
<i>Negative Affect</i>			
<u>BDI</u>			
Baseline	13.4 (9.0)	14.1 (9.6)	-
5-Months	11.8 (8.6)	12.6 (8.8)	-.09
10-Months	11.3 (8.3)	12.3 (8.9)	-.12
15-Months	10.9 (8.4)	11.3 (7.9)	-.05
20-Months	10.9 (8.5)	11.1 (8.8)	-.02
25-Months	10.6 (8.5)	11.1 (9.3)	-.06
<u>BDI-Affective</u>			
Baseline	7.5 (6.1)	8.1 (6.5)	-
5-Months	6.4 (5.5)	6.9 (5.9)	-.09
10-Months	6.2 (5.4)	6.6 (6.0)	-.07
15-Months	5.8 (5.4)	6.1 (5.2)	-.06
20-Months	5.6 (5.2)	6.1 (5.8)	-.09
25-Months	5.6 (5.3)	6.1 (6.1)	-.09
<u>STAI</u>			
Baseline	36.6 (10.9)	37.6 (11.6)	-
5-Months	36.3 (11.3)	36.8 (11.4)	-.04
15-Months	35.5 (11.1)	35.5 (10.4)	.00
20-Months	34.9 (10.7)	35.4 (10.7)	-.05
25-Months	34.5 (11.0)	35.1 (10.7)	-.06
<u>Burnout</u>			
Baseline	27.9 (13.4)	28.1 (13.9)	-
5-Months	25.7 (13.2)	25.7 (13.6)	.00
15-Months	23.4 (13.1)	24.8 (13.1)	-.11
20-Months	23.7 (12.7)	24.8 (13.7)	-.08
25-Months	23.2 (13.3)	24.8 (13.2)	-.12
<u>PSS</u>			
Baseline	19.3 (7.1)	19.5 (7.1)	-
5-Months	18.3 (7.3)	18.3 (7.2)	.00
10-Months	18.0 (7.2)	18.4 (7.2)	-.06
15-Months	17.4 (6.9)	17.4 (7.1)	.00
20-Months	16.9 (6.9)	17.6 (7.1)	-.10
25-Months	16.7 (7.1)	17.6 (6.9)	-.13
<i>Positive Psychological Resources</i>			
<u>Positive Affect</u>			
Baseline	7.3 (2.4)	7.4 (2.5)	-
5-Months	7.7 (2.4)	7.5 (2.4)	.08

	Intervention (n = 467)	Control (n = 469)	Cohen's <i>d</i>
	M (SD)	M (SD)	
10-Months	7.6 (2.4)	7.5 (2.5)	.04
15-Months	7.7 (2.4)	7.6 (2.3)	.04
20-Months	7.7 (2.3)	7.6 (2.3)	.04
25-Months	7.9 (2.3)	7.6 (2.4)	.13
<u>CSE</u>			
Baseline	96.5 (26.6)	94.5 (28.2)	-
5-Months	100.4 (25.2)	97.6 (27.0)	.11
10-Months	100.5 (25.9)	98.7 (26.7)	.07
15-Months	103.7 (25.6)	102.5 (24.8)	.05
20-Months	103.5 (25.2)	101.5 (26.4)	.08
25-Months	104.8 (24.8)	100.5 (26.5)	.17
<u>PSOM</u>			
Baseline	12.7 (3.3)	12.4 (3.8)	-
5-Months	12.9 (3.5)	12.8 (3.5)	.03
15-Months	13.3 (3.5)	13.0 (3.4)	.09
20-Months	13.2 (3.5)	13.0 (3.6)	.06
25-Months	13.3 (3.4)	13.0 (3.6)	.09
<u>SPS</u>			
Baseline	73.4 (10.8)	73.3 (11.2)	-
5-Months	74.7 (10.8)	74.3 (10.8)	.04
15-Months	75.4 (10.0)	75.3 (10.4)	.01
20-Months	75.3 (10.7)	75.5 (10.3)	-.02
25-Months	75.7 (10.0)	75.5 (9.9)	.02

BDI = Beck Depression Inventory I; BDI-Affective = Affective Symptoms of Depression; STAI = State-Trait Anxiety Inventory; PSS = Perceived Stress Scale; CSE = Coping Self-Efficacy; PSOM = Positive States of Mind; SPS = Social Provisions Scale