Changes in Cognitive Coping Skills and Social Support During Cognitive Behavioral Stress Management Intervention and Distress Outcomes in Symptomatic Human Immunodeficiency Virus (HIV)-Seropositive Gay Men

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Objective: We have previously reported decreases in dysphoria, anxiety, and total mood disturbance in symptomatic HIV seropositive gay men after a 10-week cognitive behavioral stress management (CBSM) group intervention. This structured intervention was designed a) to increase cognitive and behavioral coping skills related to managing the distress of symptomatic HIV, and b) to increase social support among group members. Here we examine the relative contribution of changes in coping skills and social support during the intervention period to reductions in dysphoria, anxiety, and distress-related symptoms in this sample. *Methods:* Participants were randomized to a 10-week CBSM group intervention or to a wait-list control condition. Coping, social supports, and mood were measured before and after the intervention period. *Results:* Members of the CBSM group ($N = 22$) showed significant improvement in cognitive coping strategies involving positive reframing and acceptance, and in social supports involving attachment, alliances, and guidance at the end of the 10-week CBSM program compared with controls ($N = 18$) who showed decrements in these coping abilities and no changes in social support. Improved cognitive coping, specifically acceptance of the HIV infection, was strongly related to lower dysphoria, anxiety, and total mood disturbance in both conditions. Changes in social support and in cognitive coping skills seem to mediate the effects of the experimental condition on the changes in distress noted during the intervention. *Conclusions:* These results suggest that cognitive coping and social support factors can be modified by psychosocial interventions and may be important determinants of the changes in psychological well-being and quality of life during symptomatic HIV infection that can be achieved through this form of intervention. **Key words:** coping, social support, intervention, HIV, quality of life.

INTRODUCTION

Behavioral interventions have been used as adjuncts to medical treatment in HIV infection to help individuals decrease distress, increase abilities to cope with their illness, improve quality of life, and attempt to slow disease progression (1–8). Such interventions are particularly relevant for HIV positive men as they develop symptoms, because the emergence of symptoms is often accompanied by dysphoria, fear, and anxiety, particularly regarding uncertainties about unpredictable stressors in the future (1). Symptomatic HIV infection often undermines denial and may increase a sense of urgency to re-integrate issues of meaning and life goals (2).

We previously reported that a 10-week Cognitive Behavioral Stress Management (CBSM) group intervention reduced dysphoria, anxiety, and total mood disturbance in symptomatic HIV seropositive gay men (3). Several other studies reported positive effects of group interventions on dysphoria and distress among both asymptomatic (4, 5) and symptomatic (eg, Ref. 6) HIV seropositive gay men. These group interventions have also been shown to increase coping skills (4, 7) and social support (8). Despite growing evidence documenting the efficacy of CBSM, the psychological mechanisms by which such interventions may decrease distress in a chronic disease such as HIV have not been delineated. The present report examines what changes in stress moderator variables during a CBSM group intervention might be the most instrumental for modulating distress and dysphoria in symptomatic HIV seropositive gay men.

One variable thought to be important in mediating the effects of CBSM is coping. Pearlin and Schooler (9) outlined a model describing three general ways in which coping behaviors may help buffer the effects of stressors. Coping behaviors can be used to eliminate or modify problem situations, to cognitively reframe the meaning of a problem situation or to manage the emotional consequences of stressors. However, in the early stages of a chronic illness such as HIV, active behavioral coping strategies, such as making changes in diet, exercise, stress, lifestyle, and relaxation, may directly influence disease state and improve adjustment by modifying problem situations. In later stages of an illness, when there may be less that a person can do to actively influence the disease, cognitive and emotional adjustments may be necessary (10). Here cognitive coping strategies such as acceptance and positive reframing may be more important to adjustment than active behavioral coping. These strategies fulfill the change in meaning and emotional management functions of coping discussed above.

Although some work supports the notion that people at early stages of HIV preferentially use more active behavioral coping whereas those with frank acquired immunodeficiency syndrome (AIDS) use more active-cognitive coping (11), less is known about the differential effectiveness of each type of coping strategy across the HIV spectrum. Although one group cited negative survival effects of "realistic acceptance" (12) and supported the adaptive value of minimization and avoidance of illness-related issues (eg, Ref. 13), other studies with HIV+ men have found that denial coping is associated with increases in distress (eg, Refs. 4, 14). Avoidance and denial coping also predict negative long-term effects on immune function (15) and disease progression (16) in this population. Conversely, active coping has been associated with increased survival in HIV (17) and malignant melanoma patients (18). Because the emergence of HIV symptoms may reactivate traumatic ideation from diagnosis and invoke shock, anger, denial, and ultimately acceptance from a new perspective (2), coping strategies that facilitate accepting and integrating life changes pursuant to the infection may be an important resource for symptomatic HIV-infected persons. Thus, rees-

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tablishing a sense of meaning and purpose in the midst of chronic illness is an essential task for adjustment (19, 20).

As symptoms emerge, social support is also a critical issue for HIV-infected men, because shame, fear of stigma and of spreading contagion, and lowered energy levels may lead to self-imposed isolation and withdrawal. These factors may also lead to avoidance by others and less overall social interaction (eg, Ref. 14). As social stigma and AIDS-related bereavement erode the established social network of HIV-infected symptomatic men, it may be those who are able to retain or replace certain types of social support who are best able to adjust psychologically (21). Thus, social supports that address both instrumental and emotional needs may play key distress-buffering roles in this disease (21).

The present study sought to delineate what coping skills and social support changes occurring in the context of a CBSM group intervention are most important in helping HIV-infected men deal successfully with their illness. CBSM teaches individuals to modify maladaptive cognitions, recruit social support, and engage in more adaptive behaviors in order to reduce distress and facilitate adjustment (22–25). Our CBSM intervention was designed to teach men strategies to identify and deal with cognitive distortions aroused in connection with HIV-related issues in their lives, provide a forum for confronting HIV-related issues in group discussions enabling individuals to both air their own HIV-related concerns and see how others have dealt with the same issues, and provide an atmosphere of mutual sharing and social support (24). Because of the cognitive orientation of the intervention, we hypothesized that participants would increase their cognitive coping skills, as indicated by increased use of "positive reframing" and "acceptance" strategies. Because the intervention taught relaxation, which is an active coping strategy, included two modules on coping strategies, and, in general, emphasized confronting disease issues, we also hypothesized that the intervention would result in increased use of active behavioral coping strategies and decreased use of denial coping. Finally, we hypothesized that the group format and social interaction characteristics of the CBSM intervention would result in increased perceptions of social support by enabling participants to utilize social comparison from group-shared information, experience social support within the group context, and model interactions for eliciting social support (26, 27). Thus it was hypothesized that intervention group members would experience increased attachment with others, opportunities for guidance, perception of abilities to rely on others, and increased integration in their social network.

METHODS

Sample Recruitment

Forty mildly symptomatic HIV seropositive gay men (CDC stage B) with clinical or laboratory signs of mildly progressed HIV infection without clinical symptomatology of AIDS were recruited for this study.[1] Fifty-two men met entry criteria and received initial assessments; block randomization was used to assign subjects to intervention and control conditions. Twelve potential participants withdrew before the start of the project, for reasons such as inconvenience or changing their minds about participation. This left a final sample of 22 men in the intervention condition and 18 in the control condition. One subject in the intervention condition completed the intervention but did not complete the psychosocial questionnaires at the postintervention time point.[2] Thus 39 subjects were included in analyses involving change over time. Psychosocial and demographic characteristics of men who withdrew from the study after their initial assessment were compared with those of men remaining in the study in order to rule out the existence of a systematic bias in those men who had withdrawn from the study. No significant differences were found between dropouts and individuals remaining in the study on any psychosocial parameter at baseline (all p's $> .25$). For those dropouts for whom demographic data were available, Mantel-Haenszel χ^2 tests indicated no significant differences between dropouts and study participants for income ($p > .25$), and Pearson χ^2 tests indicated no significant differences between dropouts and study participants on ethnic or relationship status (p's $>$ .25). For other demographic categories, insufficient data regarding dropouts were available for meaningful assessment of differences. CBSM groups were conducted in four cohorts over a period of 2 years. Within each experimental condition, no significant differences between cohorts were found in scores of the coping or social support variables at study entry, or in changes in coping or social support variables over the course of the study (all p's $> .1$). Thus findings for the CBSM and control conditions are reported in the aggregate across cohorts.

Inclusion Criteria. HIV symptoms were assessed in a telephone screening interview before study entry and were confirmed by a prestudy physical examination by a physician or nurse practitioner who confirmed symptomatic status and excluded men with symptoms of AIDS. For study inclusion, subjects must have had at least one non-AIDS HIV-related symptom (28) occurring within 3 years of the study or laboratory signs of mildly progressed HIV (eg, CD4+ counts of < 500 cells/ml or CD4+% $< 29\%$). Reported symptoms included night sweats, fevers, thrush, fatigue, noncervical lymphadenopathy, persistent diarrhea, upper respiratory infections, shingles, bruises, muscle and joint pain, and rashes.[3] A total symptom index was calculated from the sum of all symptoms. For those subjects taking a retroviral agent or combination, a constant dosage for at least 2 months before study entry was required. Subjects concurrently engaged in psychotherapy or support groups were requested to maintain a constant level of involvement in these activities during the 10-week study.

Exclusion Criteria. Subjects with AIDS symptomatology [4] (28), hospitalization in the last 3 months, a chronic condition affecting the immune system other than HIV,[5] or who regularly used potentially immunomodulatory medications such as systemic corticosteroids, antihistamines, or anxiolytic or antidepressant drugs were excluded.[6]

[1] Of the initial 110 men inquiring about the study, 51 potential subjects did not meet eligibility requirements because of factors such as AIDS-defining symptoms, psychiatric diagnoses, and excluded medications or physical conditions, and seven men withdrew before initial screening.

[2] This subject did give a blood sample at 10 weeks and was included in the sample to be consistent with our other reports of this cohort.

[3] Acceptable HIV-related symptoms included the following: night sweats, fever of unexplained origin, recurrent upper respiratory tract infections, unintentional weight loss of more than 10% or 15 pounds within the last 3 months, mucocutaneous oral candidiasis, persistent fatigue interfering with normal activity within the last 6 months, herpes zoster within the last 5 years, lymphadenopathy, diarrhea, oral hairy leukoplakia, chronic recurrent skin rash, muscle or joint pains, unusual bruises or bumps or skin discolorations, or treated tuberculosis.

[4] Excluded conditions. AIDS-related opportunistic infections; Kaposi's sarcoma; high grade B-cell lymphoma; AIDS dementia complex; HIV wasting syndrome; *Pneumocystis carinii* pneumonia; toxoplasmosis of the brain, CMV disease of organ other than liver, spleen, or lymph nodes; active herpes simplex virus infection more than 1 month in the mucous tissues, or any duration in visceral tissues; progressive multifocal leukoencephalopathy (PML), endemic mycosis; candidiasis of esophagus, trachea, bronchi, or lungs; bedridden more than 50% of the day during the last month; and tuberculosis untreated or resolved less than 3 months ago.

[5] For example, cancer, acute or chronic active hepatitis, or autoimmune disease.

[6] The following HIV-related medications were excluded: α interferon, ganciclovir, pentamidine, chemotherapeutic agents, amikacin, amphotericin B, azithromycin, clarithromycin, clindamycin, clofazimine, diphenoxylate, dronabinol, erythropoietin, etham-

Psychiatric or neuropsychological conditions that might interfere with an individual's participation in the intervention such as current drug or alcohol abuse, cognitive impairment, or a current or previous major psychiatric disorder (eg, major depressive disorder or schizophrenia) were also grounds for exclusion. To ensure a homogeneous sample, men with risk factors for HIV such as present or past intravenous substance use, or transfusion before March 1985 were excluded.

Questions from the Structured Clinical Interview for DSM-III-R adapted for use with nonpatient subjects with HIV (SCID-NP-HIV) (29) were used to assess for alcohol and drug abuse and previous psychiatric history. Cognitive functioning was assessed with the Mini Mental Status Exam (MMSE) (30); individuals scoring less than or equal to 26 (1.0 SD below the mean of HIV+ individuals) were excluded. As this study was designed to test effects of the intervention on nonclinically depressed HIV-infected individuals, men with moderate or severe levels of depression (> 17) as assessed by the Hamilton Rating Scale for Depression (HRSD) (31) were excluded. Individuals recently bereaved of a significant other (within the last 6 months) were excluded as such recent grieving might interfere with participation in stress management groups and confound measurements of affect in the present study.

Control Measures. Stressful life experiences occurring in the 6-month period before study entry were assessed with the Life Experiences Survey (LES) (32), a 49-item Likert-scaled instrument. Demographic variables such as age, ethnicity, work status, education, religion, income, and living arrangements were also assessed. Participation in support groups or psychotherapy was assessed using the 22-item psychosocial service subscale of the Service Utilization Scale (33).

Psychosocial Outcome Measures

Profile of Mood States (POMS) (34). This is a 65-item scale assessing mood over the last week using adjectives rated on a 5-point scale from 0 = not at all to 4 = extremely. Items in this scale fall into six factors: anxiety, depression, anger, vigor, fatigue, and confusion. A total mood disturbance (TMD) score is calculated from the sum of the negative mood state subscales minus the vigor subscale. The subscales of interest in the present study were tension anxiety, depression/dejection, and POMS-TMD. The POMS has internal consistencies near .90 or above as well as high external validity (34), and frequently has been used as a measure of distress in chronically ill populations (eg, Ref. 35).

Beck Depression Inventory (BDI) (36). This 21-item inventory assesses somatic, affective, behavioral and cognitive aspects of dysphoria. The BDI has a split-half Spearman-Brown correlation of .93, an internal consistency of .81 for nonpsychiatric patients, and a high concurrent validity with the Hamilton Rating Scale for Depression (.73 to .80 for nonpsychiatric patients) (37) As the BDI addresses depressive ideation targeted by the CBSM intervention in addition to the affective components measured by POMS (38), it was included to provide a more comprehensive measure of dysphoria.[7]

COPE (39). The COPE is a 60-item scale with different forms for assessing either dispositional or situational abilities to cope with stress. This study used the situational version of the COPE, asking how the individual coped with HIV-related physical health symptoms during the past month. COPE subscales are theoretically derived and measure preferential use of hypothesized adaptive coping strategies such as active coping and positive reframing, as opposed to hypothesized maladaptive strategies such as denial. As the CBSM intervention used in this study was designed to alter cognitive appraisals, the COPE subscales of *positive reframing* and *acceptance* were selected to assess the appraisal process. *Active coping* is an adaptive coping strategy that has been associated with lower distress in several studies of patients with HIV (eg, Ref. 40). In our previous work, *denial* has been shown to significantly relate to emotional distress and to disease progression (16). Thus intervention-related changes in these four COPE subscales were of particular interest in this study.

The Social Provisions Scale (SPS) (41). This 24-item self-report scale measures the degree to which an individual perceives their social relationships as providing instrumental and emotional forms of social support representative of potentially distress-buffering features of social relationships. Based on our hypotheses regarding the aspects of social support thought to be important to this group intervention, and our theoretical model (21), we assessed four facets of perceived social support assessed by the SPS: *attachment*, feeling secure and safe in one's relationships; *social integration*, perception of oneself as part of a social network; *reliable alliance*, ability to rely on other people for assistance if needed; and *guidance*, relationships with people who will listen and provide reliable advice if necessary. The SPS has demonstrated adequate reliability and validity in several studies with different populations (eg, Ref. 42, 43). The BDI, the POMS, the COPE, and the SPS were administered at study entry and after the 10-week intervention or waiting-list period.

Immunologic Status

Lymphocyte phenotypes were determined before study entry to establish whether subjects met the inclusion criterion of CD3+CD4+ cell counts between 200 and 500 cells/mm^3. Morning peripheral venous blood samples were collected from all subjects in heparin tubes (Vacutainer-sodium Heparin, Becton-Dickinson, Rutherford, NJ). CD3+CD4+ counts were determined by whole blood three-color direct immunofluorescence flow cytometry by a modification of a method described by Fletcher et al. (44) described in Lutgendorf et al. (3). Per current CDC guidelines (28), CD4+ cell counts and percentages were determined from cells positive for both CD4+ and CD3+ markers.

Procedure

Interested subjects were screened by telephone to assess interest and eligibility. Potentially eligible subjects completed an informed consent, received a physical examination from the study nurse practitioner or physician to confirm non-AIDS symptomatic status, gave an early morning blood sample, and were assessed with the MMSE and the HRSD to confirm eligibility. Subjects meeting eligibility criteria were randomized into an intervention or control condition. All subjects completed psychosocial questionnaires administered by a research assistant 1 week before the intervention.

Intervention Condition. The experimental condition consisted of a 10-week cognitive behavioral stress management (CBSM) group-based intervention referred to as Group Experienced Therapy for Stress Management and Relaxation Training (GET SMART) (24). Participants attended a weekly 135-minute session (90-minute stress management and 45-minute relaxation component) and were instructed to complete relaxation practice twice daily between sessions. The intervention was administered to groups of four to nine men led by two advanced clinical health psychology graduate students who used a detailed training manual (24). These facilitators were supervised weekly by a licensed clinical psychologist (M.A.) and a board certified psychiatrist (G.I.) from audiotapes to ensure adherence to protocol. Topics included increasing awareness of the physiological effects of stress, cognitive-behavioral theory of stress and emotions, identification of cognitive distortions and automatic thoughts; rational thought replacement, coping skills training, assertiveness training, anger management, and identification and use of social supports (24). Sessions included a didactic "technique" component, group discussion, and an opportunity to use newly learned techniques by

butol, foscarnet, methylphenidate, octreotide, tincture of opium, primaquine, pyrimethamine, quinolones, silver sulfadiazine, streptomycin, sulfadiazine, and vinblastine

[7] POMS depression items most closely related to BDI change scores in this sample included more cognitively weighted items: "sad, blue, unworthy, discouraged, lonely, miserable, helpless, and guilty" (r = .37 to .51, p = < .05) BDI items least well correlated with POMS depression scale scores included those measuring satisfaction, self-criticism, appetite, weight loss, sexual interest, and appearance (all r's < .20 and p's > .40).

means of in-session exercises applied to ongoing personal life experiences. Homework was assigned to give participants the opportunity to practice the techniques and deepen their personal integration of new strategies into routine behavior patterns. In addition, participants were taught a variety of relaxation techniques including progressive muscle relaxation (45), autogenic training (46), meditation (eg, Ref. 47) and breathing exercises (48, 49). The teaching emphasized assimilation of strategies that could be used anywhere to achieve relaxation in 2 to 3 minutes, as well as a longer 20-minute relaxation that could be used in a more private situation. Daily self-monitoring cards were collected weekly to assess adherence to home relaxation practice.

Waiting List Control Condition. During the 10-week CBSM intervention, control subjects completed a 10-week waiting period and completed identical assessments (at equivalent pre- and post-time points) to those in the CBSM condition. Two weeks after the posttreatment assessment, control subjects were offered a 1-day didactic and experiential stress management workshop emphasizing the same concepts as those presented in the CBSM intervention group.

Statistical Analyses

A multivariate split-plot randomized experimental design was used in this study, with time (pre- and postintervention) as the within-subjects factor and experimental condition (CBSM, control) as the between-subjects factor. First, equivalence of men in each condition at baseline on demographic and control variables was established using one-way analyses of variance (ANOVAS) and χ^2 tests. Next, as a conservative measure, a multivariate split-plot analysis of the effects of the intervention on coping and social support measures was conducted. This was followed by univariate repeated-measures ANOVAS, with significant interactions followed up with univariate post hoc simple effects tests to examine effects of time within each randomized condition. Pearson correlations across both groups were computed to analyze relationships among individual differences in coping, social support, and affective state. Finally regression analyses were used to evaluate the role of changes in coping and social support as possible mediators of changes in distress and dysphoria observed during the intervention [8] (50).

RESULTS

Participant Characteristics

Sixty-two percent of the men were Caucasians, 35% Hispanics, and 2.5% African Americans. The mean age of subjects was 36.75 (SD = 6.63) years, with a range of 20 to 49 years. Participants were generally well educated, with more than half having completed at least some college education. Eighty-two percent of subjects maintained full-time or part-time employment and 18% were unemployed. The modal income was $20,000 to $30,000. All subjects had received notification of HIV seropositive diagnosis at least 6 months previously, with an average time since diagnosis of 4.53 (SD = 2.85) years.

Control Variables

Members of the CBSM and the control groups were compared on possible confounding variables at study entry. No significant differences between conditions were found on ethnicity, work status, education, religion, living arrangements, or income, using Pearson χ^2 tests (all p's $> .10$). Mantel-Haenszel χ^2 tests indicated no significant differences between conditions on education or income (both p's $> .25$). One-way ANOVAS revealed no significant differences between conditions for age, time since diagnosis, alcohol or drug use, or negative life events at study entry, all p's $> .10$. At study entry, subjects averaged 2.5 (mode = 2; range = 0 to 7) self-reported HIV-related symptoms. A Wilcoxon Mann-Whitney summed rank test indicated no significant differences between conditions in total number of symptoms reported, exact 2-tailed $p = .84$. In addition, a one-way ANOVA indicated that there were no differences in baseline CD3+CD4+ counts between experimental and control conditions, $F(1,38) = .03$, $p = .86$. There were no significant differences between conditions at study entry on the coping or social support subscales included in this study (all p's $> .25$). Pearson correlations indicated that there were no significant associations among change scores of the coping and social support variables and the demographic variables of age, income, and education. One-way ANOVAS on the change scores of the coping and social support variables examined in this study indicated no significant differences in these variables among levels of the demographic variables of ethnicity and living arrangements, all p's $> .20$. However, significant differences in acceptance changes were found between individuals who were employed and those who were unemployed, $F(1,35) = 5.12$, $p < .05$, with unemployed subjects showing greater decreases in acceptance than their employed counterparts. For this reason, all analyses involving acceptance change have also been performed with employment covaried, and these analyses have been indicated in footnotes. Wilcoxon Mann-Whitney tests indicated there were no significant differences between conditions regarding extent of participation in individual therapy or support groups, either at study entry or at the end of the intervention, all 2-tailed exact p's $> .25$. In addition, Wilcoxon Mann-Whitney tests indicated no significant changes in reported involvement in individual therapy or support groups over the course of the study in either condition, 2 tailed exact p's $> .25$. Thus we felt relatively confident that any confounding effects of demographic factors or counseling experiences on outcome variables were randomly distributed between conditions.

Effects of Intervention on Coping and Social Support

Because we had hypothesized that the intervention would increase cognitive and active coping skills, decrease denial, and increase social support, a multivariate split-plot analysis of variance was conducted comparing the 10-week change scores of the relevant coping and social support variables in the CBSM intervention and control conditions. Because the four social support scales were strongly correlated at baseline (r's = .68 to .85, p's $< .01$), they were combined into a social support composite as a data reduction strategy. A significant effect for condition was found: multivariate $F(5,33) = 3.36$, $p < .025$ (see Table 1). Subsequently, univariate repeated-measure split-plot ANOVAS were calculated for each variable to determine significant interactions, followed by simple effects tests to determine group changes responsible for the significant interactions. There was a significant group by time interaction for positive reframing, $F(1,37) = 8.73$, $p < .01$, with participants in the intervention condition showing significant increases in positive reframing, $F(1, 37) = 4.13$, $p < .05$,

[8] Substitutions for missing data were performed in the following manner. Within each condition (CBSM, control), the mean group change score was added or subtracted from a subject's score at the nonmissing time point to yield substituted scores. Significance levels were corrected on all analyses using substituted data.

TABLE 1. Means, (SDs) and Univariate Repeated-Measures Analyses for Coping (COPE) and Social Support (SPS) Among Symptomatic HIV Seropositive Patients Scoring in Intervention and Control Groups

Measures of Coping and Social Support[a]	CBSM[b]		Control		F^c (1,37)
	Pre	Post	Pre	Post	
Positive reframing	12.00 (2.97)	13.09 (2.67)	12.59 (2.95)	11 31 (3.45)	8.73**[d]
Acceptance	11.73 (2.00)	12.91 (2.32)	12.47 (2.50)	10.90 (2.87)	12.57**
Active coping	11.61 (2.71)	12.33 (3.09)	11.38 (2.84)	10.37 (2.87)	4.83*
Denial coping	5.81 (2.48)	5.71 (2.47)	5.56 (2.52)	5.48 (2.14)	.00005
Social support composite	50.86 (10.98)	53.71 (8.70)	53.49 (9 13)	53.15 (9.45)	4.11*

[a] Multivariate model $F(5,33) = 3.47$, $p < .025$.
[b] CBSM = cognitive behavioral stress management
[c] This is the F of the interaction term of each univariate repeated measures ANOVA.
[d] Significance levels: * $p < 05$; ** $p < .01$.

compared with controls, whose positive reframing significantly decreased, $F(1,37) = 4.60$, $p < .05$. There was also a significant group by time interaction for acceptance, $F(1,37) = 12.57$, $p < .005$. Participation in the intervention resulted in significantly increased acceptance scores, $F(1,37) = 4.96$, $p < .05$, in contrast to a significant decline in the acceptance scores of men in the control condition, $F(1,37) = 7.67$, $p < .01$.[9] (see Figure 1). There was a significant group by time interaction for active coping, $F(1, 37) = 4.83$, $p < .05$. Simple effects tests revealed that this was caused by a tendency toward decreased active coping in the controls, $F(1, 37) = 3.02$, $p < .09$, whereas men in the intervention condition showed no significant changes in active coping, $F(1, 37) = 1.84$, $p > .10$. The univariate interaction effect for the social support composite was significant, $F(1,37) = 4.11$, $p = .05$. This was caused by a highly significant increase in social support in the CBSM group ($F(1,37) = 7.11$ $p < .05$), as compared with no change in the controls, $F(1,37) = .09$, NS. There were no significant differences between groups in changes over time in denial coping.

To more specifically determine which facets of social support had been affected by the group intervention, a series of univariate repeated-measures split-plot analyses were performed on the subscales of the Social Provisions Scale relevant to this study. The group-by-time interaction for social attachment approached significance, $F(1,37) = 3.01$, $p < .10$, with the intervention condition demonstrating a significant increase, $F(1,37) = 6.36$, $p < .05$, and the control condition showing no changes, $F(1,37) = .00$, NS. The reliable alliance and guidance subscales both showed group by time interactions approaching significance ($F(1,37) = 3.03$, $p < .10$, and $F(1,37) = 3.17$, $p < .10$, respectively), with these effects related to significant increases in both alliance and guidance in the CBSM group ($F(1,37) = 3.92$, $p = .05$, and $F(1,37) = 6.13$, $p < 05$, respectively), with no changes in the controls, ($F(1,37) = .29$, NS, for reliable alliance and $F(1,37) = .02$, NS for guidance). The social integration subscale did not show any significant between-group differences in movement over time, $F(1,37) = .14$, NS. Because social integration did not show intervention-related changes with time, it was dropped from additional analyses using the social support composite. Thus the social support composite became a combination of social attachment, reliable alliance, and guidance. The univariate group by time interaction of this combined factor was significant ($F(1,37) = 5.17$, $p < .05$) with these effects related to significant increases in social support in the experimental group ($F(1,37) = 9.35$, $p < .01$), and no changes in the controls, ($F(1,37) = .07$, NS). Thus changes in coping and social support during the intervention period were evident, with increased perceived social supports occurring predominantly in the intervention group, and not among controls, whereas coping skills increased in the CBSM group and declined among controls. Social support subscales measuring affiliation and advice seemed to change most as a result of CBSM participation.

Interrelationships Between Psychosocial Variables

Correlates of Decreased Distress. Next, the aspects of coping and social support that showed changes over the course of the intervention were examined to determine relationships with mood outcomes as assessed by dysphoria, anxiety, and total mood disturbance. Change scores of coping and social support variables were used in these analyses because we were interested specifically in how alterations in coping strategies and levels of social support may have been related to the mood outcomes, controlling for initial levels of mood. These calculations include participants in both groups and are shown in Table 2. In general, increases in acceptance showed the strongest relationships to measures of lower distress. Specifically, greater increases in acceptance over the course of the study were significantly associated with lower POMS depression, anxiety, and TMD, and lower BDI depression at 10 weeks, controlling for baseline mood levels.[10] Increased positive reframing showed significant associations with decreased distress outcomes as well, including POMS depression, anxiety, TMD, and BDI scores. Increased active coping showed less strong, but still significant correlations with lower distress, except for the BDI. Increases in denial coping did not show significant relationships with measures of distress. Greater increases in attachment, guidance, and the social

[9] Because the change scores of acceptance were significantly related to work status, as a conservative measure, these MANOVAS were repeated, covarying the categorical variable employed vs. not employed. The condition by time interaction became even more highly significant, $F(1,36) = 10.96$, $p < .005$. With employment status covaried, participation in the intervention resulted in significantly increased acceptance scores, $F(1,36) = 4.55$, $p < .05$, whereas men in the control conditon demonstrated a significant decline in their acceptance scores, $F(1,35) = 6.42$, $p < .025$.

[10] When these correlations were done, covarying employment, significance was maintained.

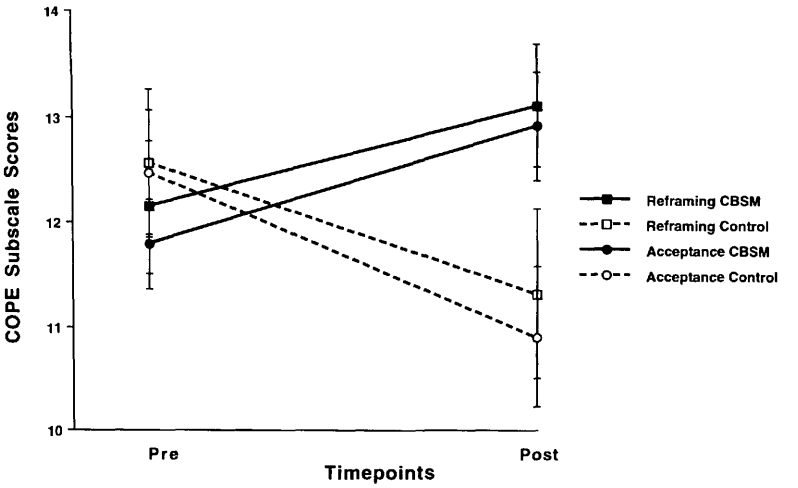

Fig. 1. Changes in COPE reframing and acceptance scores pre- to postintervention in cognitive behavioral stress management (CBSM) and control conditions in symptomatic HIV seropositive gay men.

support composite were significantly associated with lower POMS anxiety, depression, and TMD, but not with BDI scores. Changes in reliable alliance and social integration over the course of the study were each significantly related to lower POMS depression and total mood disturbance.

Changes in coping and social support also showed a strong interrelationship. Across both groups, men with greater increases in positive reframing showed significantly greater increases in attachment ($r = .44$, $p < .005$) and in reliable alliance ($r = .46$, $p < .005$). Acceptance change was significantly related to greater increases in attachment, $r = .46$, $p < .005$. Increased use of active coping was significantly related to greater increases in the social support composite, $r = .37$, $p < .05$. These relationships suggest that enhanced coping skills may have enabled individuals to better use social support, or that support enhanced coping skills, or possibly both.

Mediators of Decreased Distress. Next, regression analyses were used to test whether changes in coping or social support might mediate the mood effects of the experimental condition. Outcome variables were distress variables previously shown to change as a result of the intervention, namely POMS anxiety, total mood disturbance, and BDI scores (3). The coping and social support measures that had shown significant intervention-related changes were tested for mediation. Inasmuch as changes in acceptance and positive reframing were highly correlated ($r = .43$, $p < .01$) these factors were combined to make a variable called cognitive coping change. Change in the social support composite, created from the subscales showing intervention-related change, ie, social attachment, reliable alliance, and guidance, was also used in these analyses.

Potential mediators were first tested individually in path models. When more than one variable individually contributed to mediation of a particular distress measure, the individual tests were followed by tests of models in which the significant

TABLE 2. Partial Correlations Among Changes in Coping Strategies and Social Support with Poststudy Distress Scores, Covarying for Baseline Distress in Symptomatic HIV Seropositive Gay Men

Changes in Coping and Social Support ($N = 39$)	POMS[a]		POMS TMD	BDI
	Anxiety	Depression		
Reframing	−.29*	−.38*	−.46**	−.31*
Active coping	−.31*	−.28*	−.29*	−.20
Acceptance	−.50***	−.36*	−.54***	−.38**
Denial	−.18	.16	.22	−.11
Attachment	−.52***	−.46**	−.55***	−.19
Guidance	−.53***	−.43**	−.49**	−.13
Reliable alliance	−.32*	−.27	−.32*	−.15
Social integration	−.19	−.38**	−.37*	−.13
Social support composite	−.58***	−.49**	−.57***	−.20

[a] POMS = profile of mood states; TMD = total mood disturbance; BDI = Beck Depression Inventory.
* $p < .05$; ** $p < .01$; *** $p < .001$

mediators were tested simultaneously in separate paths between experimental condition and the distress variable. For example, in determining whether coping strategies and social support potentially mediated the effects of experimental condition on POMS-TMD, regression equations were performed as outlined below, following the methodology of Baron and Kenny (50): a) To determine that the potential mediators were related to the independent variable (experimental condition), changes in cognitive coping and in social support were individually regressed on experimental condition. b) To determine that the outcome variable was related to the independent variable and to the potential mediators, POMS-TMD scores were regressed individually on experimental condition and on the coping and social support composites. c) Finally, to determine whether mediation was in fact occurring, POMS-TMD was regressed on experimental condition and the coping and social support composites simultaneously. Baseline POMS-TMD was entered as a control variable in all analyses in which POMS-TMD was an outcome variable (Figure 2).

In the first step of these analyses, experimental condition, entered alone, significantly predicted week 10 POMS-TMD scores (β = .28, $F(1,34)$ = 5.53, $p < .05$), controlling for baseline POMS-TMD. Changes in cognitive coping (β = −.36, $F(1,34)$ = 20.90, $p < .001$) and in the social support composite (β = -.42, $F(1,34)$ = 16.32 $p < .001$), when entered individually also significantly predicted week 10 POMS-TMD scores, controlling for baseline POMS-TMD. When changes in cognitive coping and in the social support composite were tested simultaneously as mediators in this model, the significant standardized β weight associated with the experimental condition as a sole predictor of the POMS-TMD scores dropped from .28 to .02 (NS). In contrast, the standardized β weight uniquely associated with changes in both cognitive coping and in social support remained large and significant: cognitive coping, β = −.31, $F(1,32)$ = 6.15, $p < .05$; social support composite, β = −.26, $F(1,32)$ = 5.62, $p < .05$. These equations suggest that changes in both cognitive coping and social support mediated the effect of the intervention on total mood disturbance (see Table 3).

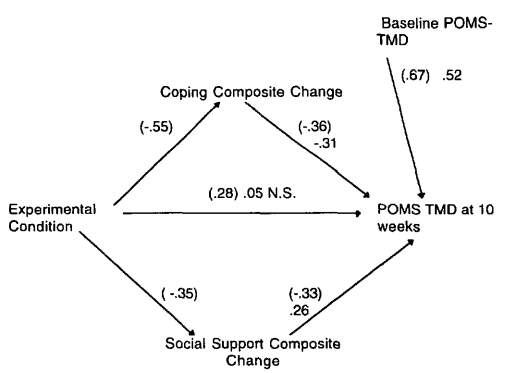

Fig. 2. Path diagram for model testing direct and indirect effects of experimental condition on Distress (Profile of Mood States-Total Mood Disturbance (POMS-TMD)) at posttreatment (10 weeks). All equations control for baseline levels of POMS-TMD. Standardized β weights for factors entered in model individually are within parentheses, and standardized β weights with all factors in the diagram entered simultaneously are outside parentheses. All relationships are significant unless indicated otherwise.

In assessing whether changes in cognitive coping or in social support played a mediational role in the effect of the experimental condition on POMS anxiety, a similar procedure was followed. Experimental condition, entered alone, significantly predicted week 10 POMS anxiety scores (β = .30, $F(1,35)$ = 6.20, $p < .05$), controlling for baseline POMS anxiety. When tested individually, change in cognitive coping (β = −.39, $F(1,35)$ = 10.44, $p < .01$) and change in the social support composite (β = −.46, $F(1,35)$ = 17.89, $p < .001$) each significantly predicted week 10 POMS-anxiety scores, controlling for baseline POMS anxiety. When changes in cognitive coping and the social support composite were entered simultaneously into a regression equation with experimental condition, the social support composite maintained a significant independent relationship with outcome POMS anxiety scores (β = −.35, $F(1,33)$ = 8.33, $p < .01$), but cognitive coping and experimental condition no longer maintained significant relationships with POMS anxiety outcome scores, cognitive coping: β = .16, $F(1,33)$ = 1.12, NS; experimental condition β =.10, $F(1,33)$ = .65, NS. Thus, changes in social support fulfilled the conditions for mediation of the effect of experimental condition on POMS anxiety, with increases in social support associated with lower anxiety outcomes (see Table 4).

In assessing possible mediation of the effect of the experimental condition on BDI scores, a similar procedure was followed. In the first step of these analyses, experimental condition, entered alone, significantly predicted week 10 BDI scores (β = .27, $F(1, 36)$ = 5.34, $p < .05$), controlling for baseline BDI. Changes in cognitive coping (β = −.31, $F(1,36)$ = 6.92, $p < .05$) significantly predicted week 10 BDI scores, controlling for baseline BDI. Changes in the social support composite did not independently predict outcome BDI scores and so was not included in additional tests. When changes in cognitive coping were entered simultaneously into a regression equation with experimental condition, neither cognitive coping nor experimental condition maintained a significant independent relationship with outcome BDI scores. However, both experimental condition and changes in cognitive coping together accounted for 10.8% of the variance in outcome BDI scores, an incremental ΔR^2 that was significant, $F(2,36)$= 4.02, $p < .05$. Thus changes in cognitive coping did not act as a mediator of the effects of the experimental condition on the BDI, but instead had a direct relationship with BDI outcome scores.[11] In summary, these tests support the role of *both* cognitive coping and social support as mediators of the effects of the experimental intervention on POMS total mood disturbance, whereas the effect of CBSM on anxiety was mediated by changes in social support.

DISCUSSION

Previously, we reported that a group-based CBSM intervention significantly attenuated dysphoria, anxiety, and total mood disturbance over a 10-week period in symptomatic HIV seropositive gay men (3). The present report shows that men

[11] When these regressions on POMS anxiety, TMD, and the BDI were repeated, controlling for employment status, the same pattern of mediation was observed.

TABLE 3. Predictors of Profile of Mood States (POMS) Total Mood Disturbance (TMD) After the Cognitive Behavioral Stress Management Intervention

Variables	R	β entered alone	β with all factors in model	ΔR^2	F^a of R^2 change
Step 1, Baseline POMS TMD	.67	.67***	.59***	.45	29.19***
Step 2	.84			.25	9.29***
Experimental condition		.28*	.052 (NS)		
Δ Social support composite		−.42***	−.26*		
Δ Cognitive coping		−.36**	−.31*		

[a] Significance of model $F(4, 32) = 19.44$, $p < .001$.
*** $p < .001$; ** $p < .01$; * $p < .05$.

TABLE 4. Predictors of Profile of Mood States (POMS) Anxiety After the Cognitive Behavioral Stress Management Intervention

Variables	R	β entered alone	β with all factors in model	ΔR^2	F^a of R^2 change
Step 1, Baseline POMS anxiety	.62	.62***	.55	.39	22.69***
Step 2	.79			.24	7.37**
Experimental condition		.30*	.10 (NS)		
Δ Social support composite		−.46***	−.35**		
Δ Cognitive coping		−.39**	−.16 (NS)		

[a] Significance of model $F(4, 33) = 14.22$, $p < .001$.
*** $p < .001$; ** $p < .01$; * $p < .05$.

in this intervention reveal increases in their ability to use acceptance (ie, being HIV seropositive and having symptoms) and positive reframing (to see their situation in a new light), as compared with the men in the control condition who showed significant decrements in both. There were tendencies toward decreased active coping in the control condition whereas men in the intervention condition maintained their levels of active coping. Thus the cognitive changes brought about by CBSM seemed to be independent of behavioral changes. No significant changes were observed in denial coping in either condition. The present study also goes beyond previous reports of group interventions with HIV+ gay men (eg, Ref. 6) by demonstrating intervention-related changes in several domains of social support such as attachment (close emotional connections), guidance (opportunities to talk and receive advice), and alliance (assistance). In contrast there were no significant changes in these aspects of social support among controls. In addition, evidence is presented supporting mediation of distress changes via changes in specific cognitive coping strategies and social support domains.

The effects observed for reframing and acceptance coping skills suggest that CBSM may provide cognitive coping skills to symptomatic HIV infected men precisely at a time when their previous capacities for coping with HIV may have diminished effectiveness. Thus, part of the value of such an intervention may be its availability during a time of increased coping vulnerability. This possibility is consistent with previous findings suggesting that men with symptomatic HIV experience an upsurge in distress (eg, Refs. 1, 2) coupled with a shift from more active behavioral coping strategies to greater use of cognitive strategies (11). The group intervention may facilitate this shift in strategies. It is not known from the present data whether the increases in social support represented increases in perceived social support from group members or from individuals outside the CBSM group. However, our observation that increases in social support occurred in the intervention condition but not in the control condition provides support for the possibility that the social support changes observed in this study were largely intervention-related. Such an intervention effect during a time of vulnerability to social network losses during the course of HIV infection is consistent with our previous finding of a buffering role of a CBSM intervention during the period of HIV seropositivity notification in asymptomatic HIV seropositive men (4).

Cognitive Coping Skills and Distress Reduction

Acceptance was the aspect of coping showing the greatest magnitude of postintervention change, and was part of the cognitive coping composite mediating the effects of the experimental intervention on POMS distress outcomes. This is intriguing in light of the developmental issues facing HIV+ men at this stage of their illness. With the emergence of symptoms in HIV, depression often increases, and an individual may be forced to come to grips with the realities of disease progression. During the process of coping with a chronic disease such as HIV, individuals face a series of adjustment crises, and acceptance must be repeatedly achieved with different disease-related issues (2), and not just in the terminal stages of illness, as previously suggested by Kubler-Ross (51). Whereas "reframing" represents an attempt to see things differently and may facilitate acceptance, "acceptance" suggests a new stage of cognitive integration (eg, Refs. 52, 53). It is possible that acceptance functions at several levels in the process of adjustment to chronic illness: Initially (eg, at the time of initial diagnosis), acceptance may reflect overcoming denial and a willingness to face the realities of one's illness; subsequently (ie, as the disease progresses), acceptance may reflect a process of coming to terms with the implications of

the illness and the development of a new, more integrated sense of meaning regarding one's self and one's illness.

The present findings seem initially to contradict the argument that unrealistically positive optimism about one's future is more adaptive in HIV disease than are realistic beliefs and acceptance (13) and that in fact "realistic acceptance" was related to decreased survival in gay men dealing with full blown AIDS (12). However, a closer look at the definition of "realistic acceptance" used in previous work (12) suggests that it may have highlighted qualities such as stoic pessimism, eg, "preparing oneself for the worst", or, at best "trying" to come to terms with one's illness (12). This suggests quite a different process than that involved in confronting a life situation, coming to terms with it by assimilation of related thoughts and feelings (52), and achieving a new level of understanding and acceptance. In addition, the previously reported negative findings of the impact of acceptance on survival (12) were based on research with men dealing with a diagnosis of AIDS. Confirming the relationship of acceptance to survival in the current population will await collection of longer-term follow-up data on these men.

Social Support and Distress Reduction

Our findings pointed to emotional attachments, alliances, and the ability to get advice as most strongly related to distress reductions during CBSM. These findings tie in with those of Hays et al. (54) who found that greater satisfaction with emotional, practical, and informational social support was related to less depression among a sample including men with either asymptomatic or symptomatic HIV. They found informational support (closest to our SPS guidance subscale) to be the most important support domain for buffering the stress related to the emergence of HIV-associated symptoms (54). The increases in attachment and alliances in our sample may have been related to the group-based nature of the study. The absence of CBSM-related increases in "social integration" suggests that changes in external social networks may take longer than 10 weeks to achieve.

Time-limited group interventions such as this one provide the opportunity for social comparison, provision of new information, suggestion of alternative coping strategies based on experiences of other group members, and input regarding new facets of stressful situations. Such input may have provided the impetus for group members to arrive at new ways of looking at situations, and ultimately greater acceptance of their illness and the security to enable them to face troubling situations such as ramifications of HIV status, and to thereby come up with new perspectives (21). It is also possible that men who increased their adaptive coping skills, perhaps by way of CBSM skills such assertiveness training and anger management, may have increased their attractiveness for social relationships and their ability to elicit social support (55).

The effectiveness of CBSM in symptomatic HIV seropositive men seems to be particularly related to changes in cognitive coping skills and social support, during a time when coping abilities and social support networks may be challenged or naturally diminishing in the lives of these men. The importance of social support may come from its ability to help an individual perceive events as less threatening, thus increasing a sense of control and decreasing helplessness (56). Developing new cognitive coping strategies in a context of social support may be among the elements contributing to affective change (56). Our distress findings may be most consistent with those of Kelly et al. (8) who found that both a social support group and a cognitive behavioral group were effective in reducing depression (SCL-90) in depressed HIV-positive men, although the social support intervention reduced depression to a greater degree. In light of previously determined characteristics that differentiate cognitive therapy responders and nonresponders (57), the present intervention, including cognitive, behavioral, and social support elements may be a particularly useful model for reaching different types of individuals responding to the chronic burden of symptomatic HIV, as well as perhaps, to other chronic diseases.

The present findings need to be viewed in light of several caveats. Most importantly, these findings must be regarded as preliminary given the small sample size. In fact many nonsignificant findings may have been statistically significant with a larger sample. This was a sample of primarily well-educated, middle class Caucasian and Hispanic gay men interested in participating in a stress management study that may have been biased toward participants with an interest in stress-reduction and other health-promoting methods, possibly limiting the generalizabilty of these findings to other HIV-infected populations. Self-selection factors may have biased the sample toward men already using more active coping and less denial than other HIV-infected individuals, thus limiting our ability to detect intervention-related effects on active coping and denial. Whereas men in both conditions engaged in extraneous activities such as relaxation, support groups, and psychotherapy to a similar extent, we cannot rule out the possible confounding effect of these additional activities on the changes in coping skills and social supports reported here. Because we restricted our sample to men who were free of major mental health problems, it is not known how this intervention might affect acutely bereaved, medicated, or individuals with major depressive episodes, or whether the same cognitive and social mediating factors might be operative in these populations. In addition, as this study assessed the effects of CBSM among gay men, the findings may not be generalizable to women. As HIV-infected women represent a growing population, future research should address the applicability of the CBSM paradigm to these women. Several of the positive coping strategies (acceptance, reframing) and resources (social provisions) that were bolstered during the course of the CBSM intervention with symptomatic men in the present study may have important implications for their future mental health and well-being. Relations between changes in these psychosocial variables during the course of an experimental intervention and longer term health outcomes need to be examined over longer periods.

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