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A Pilot study of Cognitive Behavioral Stress Management Effects on Stress, Quality of life, and Symptoms in Persons with Chronic Fatigue Syndrome

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Abstract

OBJECTIVE—The present pilot study was designed to test the effects of a 12 week group-based Cognitive Behavioral Stress Management (CBSM) intervention on stress, quality of life, and symptoms in chronic fatigue syndrome (CFS). We hypothesized that participants randomized to CBSM would report improvements in perceived stress, mood, quality of life, and CFS symptomatology from pre-to-post intervention compared to those receiving a psychoeducational (PE) seminar control.

METHOD—We recruited 69 persons with a bonafide diagnosis of CFS and randomized 44 to CBSM and 25 to PE. Participants completed the Perceived Stress Scale (PSS), Profile of Mood States (POMS), Quality of Life Inventory (QOLI), and a CDC-based CFS symptom checklist pre- and post-intervention.

RESULTS—Repeated Measures ANOVA revealed a significant group $\times$ time interaction for PSS, POMS-total mood disturbance, and QOLI scores, such that participants in CBSM evidenced greater improvements than those in PE. Participants in CBSM also reported decreases in severity of CFS symptoms vs. those in PE.

CONCLUSIONS—Results suggest that CBSM is beneficial for managing distress, improving quality of life, and alleviating CFS symptom severity.

Keywords

CDC symptoms; chronic fatigue syndrome; quality of life; stress; stress management

Introduction

According to the Centers for Disease Control (CDC) (1) the overall prevalence of Chronic Fatigue Syndrome (CFS) in the U.S. is 235 per 100,000 persons (95% confidence interval, 142327 per 100,000 persons) and up to 80% of those affected are women (2). These individuals suffer from severe fatigue that impairs daily activity, diminishes quality of life

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for years, and has no known cure (3). CFS symptoms bring about severe limitations in the lifestyle behaviors, and vocational activities of previously vital, productive, and successful individuals (4). Current medical treatments focus on symptom management (i.e. antidepressants, antifungals, antihistamines, antivirals, CNS depressants or stimulants, immunoglobulins, anti-inflammatories, anticonvulsants, macro-vitamin injections) (5) but are not curative. In fact, symptoms may emerge at unpredictable times, which is one of the features of CFS that makes it particularly stressful. CFS also represents an economic burden for society (e.g., high rates of unemployment due to disability) and healthcare institutions (6).

Hypothetical initiating events for CFS include infections, psychiatric trauma, and exposure to toxins, though etiology remains unknown (7). Many of the symptoms are inflammatory in nature and have prompted a theory of infection-induced illness (8). This presents with an acute onset of illness, with systemic symptoms similar to influenza infection that do not subside (9). Additionally, patients with CFS may experience *distress reactions* that are secondary to the cytokine-induced flu-like symptoms and common symptoms of CFS, which may, in turn, exacerbate symptoms further, creating a vicious cycle (5). To illustrate the role of distress responses in exacerbating or maintaining CFS symptoms, as CFS patients' ability to concentrate and attend decreases, anxiety and irritability may increase, which in turn may further deplete energy and disrupt sleep resulting in a worsening of the physical symptoms causing further distress. Others have suggested that mood disturbances may develop in response to these physical symptoms and that negative mood might further exacerbate symptom experiences (10). In sum, both heightened stress and negative mood experiences may exacerbate the physical symptoms of CFS.

The experience of major stressors (11) has been associated with an exacerbation of CFS symptoms and illness burden. Distress reactions may further dysregulate the immune system since distress/depressive states are related to several immunoregulatory cytokines possibly via alterations in hypothalamic pituitary adrenal (HPA) axis hormones such as cortisol (12). This is salient given work showing that HPA axis functioning is altered in CFS patients (13). Because distress reactions (increased perceived stress and mood disturbance) appear to be a possible common denominator contributing to neuroimmune changes and symptom exacerbation, we have reasoned that effective treatment would need to focus on reducing the patients' distress reactions by changing psychological response processes (14). Indeed, a recent review (15) showed that out of 15 studies, CBT was more successful in alleviating fatigue, depression, physical functioning and more when compared to usual care. One intervention that incorporates a CBT component, the Cognitive Behavioral Stress Management (CBSM), has demonstrated efficacy in several chronic illnesses (16–18). CBSM interventions reduce distress by teaching relaxation techniques, modifying patients' outlook, cognitive appraisals and coping strategies, and when done in a group format may also improve their perceptions of social support (16). Group-based CBSM decreases anxiety and distress, improves mood and quality of life, modulates cortisol output, and improves cellular immune functioning among persons dealing with immunomodulating illnesses or treatments (17–24). Less is known about whether CBSM can modulate distress, quality of life and symptom reports in persons with CFS.

In line with our stress model of CFS symptom exacerbation (10), the present study focused on testing the effects of group-based CBSM intervention (14) on distress, quality of life and CFS symptoms. Specifically, this is a randomized controlled pilot study designed to test the effects of a group-based CBSM intervention on perceived stress, quality of life, and CFS symptoms. First, we hypothesized that those assigned to CBSM would report decreases in perceived stress compared to those in a minimal contact CBSM-based psychoeducation control condition. Second, we hypothesized that CBSM participants would report

improvements in general quality of life compared to controls. Finally, since CBSM-associated reductions in distress are predicted to help reduce CFS symptoms we also hypothesized that those assigned to CBSM would reveal decreases in specific CDC-based CFS symptoms compared to controls.

Methods

Subjects

The majority of participants in the study were recruited via physician referral. Recruitment efforts were also conducted through websites, articles, and conferences. Participants that were eligible to participate had a CFS diagnosis via physical exam and interview by a physician (according to 1994 CDC criteria, 25), were between the ages of 18–60, had at least an 8th grade education, and were fluent in English. Participants were excluded from the study if they had an active or previous medical condition that would explain the presence of chronic fatigue, were positive for Lyme disease, had an infection that was treated with antibiotics within three weeks of the study, had surgery requiring general anesthesia within the past month of the study, on any immunomodulator, a history of major psychiatric illness, currently in psychotherapy, or substance or drug use within 2 years of the onset of CFS. A history of major psychiatric illness (e.g., psychosis) was selected as exclusionary to eliminate any interference with group dynamics during the intervention phase.

The final sample consisted of 69 participants; 44 were randomized to the CBSM condition and 25 to the psychoeducation control group using a 2:1 ratio method. This technique was used to ensure that there was a sufficient sample size for conducting within group analyses in the experimental condition. Participants were mostly women (88.4%) and had a mean age of 45.9 (SD = 9.3; Range = 23–60). They were predominantly Caucasian (76.8%), with the remainder being Latino (17.4%), Caribbean Islander (1.4%), Biracial (1.4%), or of another ethnic group (2.9%). Most of the participants had a high school diploma or greater (97%), with participants completing trade school (4.3%), some college (26.1%), college graduate (39.1%), and graduate degree (21.7%). Employment status included full time (13.2%), part time (18.8%), unemployed (15.9%), retired (4.3%), student (2.9%), and on disability (44.9%). Moreover, most of the participants were married (46.4%), followed by being single/not married (21.7%), divorced (18.8%), or in a closed relationship (11.6%). The majority had at least one child (59%) and earned an average of \$20,000–\$30,000 annually.

Procedures

Potential participants underwent a phone screening and psychiatric screening assessment to determine eligibility. At baseline (T1), participants completed the informed consent, psychosocial questionnaires, and the symptom checklist. After the baseline assessment, participants were randomized either to a 12-week cognitive behavioral stress management (CBSM) group or a half-day psychoeducational (PE) seminar. After the intervention period (T2), a second assessment was conducted. Participants were compensated \$20 for each assessment completed.

The CBSM intervention (14) consisted of 12 weekly group meetings held in 2-hour sessions. Each 2-hour session consisted of two parts: a relaxation component lasting from 20–30 minutes, and a didactic and discussion component that lasted 90 minutes. During the relaxation component, participants were instructed in specific relaxation techniques, including progressive muscle relaxation and visualization techniques. During this 20–30 min period, participants discussed their views on the helpfulness of the techniques, as well as any barriers to practice, and the progress of their at-home practice. During the 90-min didactic component, participants were taught to better recognize how stress impacts them

emotionally and physically, and the relationship between thoughts, feelings, and behaviors. The primary therapeutic technique used was cognitive restructuring targeting cognitive appraisals of ongoing stressors. In contrast to previously studied CBT techniques that target CFS-specific cognitions and physical de-conditioning behaviors, a specific focus of CBSM is on teaching participants general stress management skills that they can apply to ongoing life events as well as CFS-specific stressors (26). In addition to cognitive restructuring, they also learned specific coping skills and interpersonal communication skills such as assertiveness and anger management, which are designed to better attract, utilize and maintain social support, an important stress moderator. Homework pertaining to session topics was assigned each week and was collected and discussed in the subsequent week. Home practice of relaxation techniques was also encouraged. The CBSM groups were led by a post-doctoral clinical fellow and advanced psychology graduate students. The half-day PE condition summarized many of the strategies from the 12 week CBSM group but in a condensed format. The seminar was scheduled during the 6th week of the CBSM group and was run by a clinical post-doctoral fellow. Participants in both conditions were given a workbook and three relaxation tapes to practice at home.

Measures

Three sets of measures were employed to comprehensively characterize the main outcomes of this study: distress, quality of life, and CFS symptoms. Each set of measures was chosen for its established reliability and validity in a wide range of medical populations.

Distress—Participants' perceptions of stress were assessed with the Perceived Stress Scale (PSS; 27). The PSS is composed of 14 items asking individuals to rate the extent to which they have felt overwhelmed by stressful events during the last 30 days on a scale from 0 (never) to 4 (very often). Sample items include "How often have you felt nervous and "stressed?", "How often have you found yourself thinking about things that you have to accomplish?", and "How often have you felt that things were going your way?". Positive items were reverse scored so that higher scores on this scale indicate greater levels of perceived stress. We also administered the Profile of Mood States (POMS, 28) to measure overall mood disturbance. The POMS is a 65 adjective checklist used to assess Total Mood Disturbance (TMD) as well as 7 mood states: Tension/Anxiety, Depression/Dejection, Anger/Hostility, Vigor/Activity, Fatigue/Inertia, Confusion-Bewilderment, and Friendliness(35). Each item is rated on a 5 point scale from 0= not at all to 4= extremely. A TMD score was obtained by adding the negative mood factors of Tension-Anxiety, Depression-Dejection, Anger-Hostility, Fatigue-Inertia, and Confusion-Bewilderment and subtracting the sum of the positive mood factors of Vigor-Activity and friendliness.

Quality of Life—Quality of life was measured with the Quality of Life Inventory (QOLI; 29), which is a quality of life indicator that assesses the importance and satisfaction in 17 life areas. A subscale score was derived for each domain and scores were computed by multiplying the importance rating (0= not important to 2= extremely important) by the satisfaction rating (−3= very dissatisfied to 3= very satisfied). The total overall raw score was composed by the sum of the non-zero products of the importance and satisfaction scores. Raw scores were converted to T-scores as well. Higher raw and T scores reflect greater quality of life, while lower overall QOLI category reflects a greater quality of life (1= high, 2= average, 3= low, 4= very low). The QOLI has been shown to have good test reliability and to correlate highly with other well being measures (29,30).

Frequency and Severity of CFS Symptoms—On the Centers for Disease Control (CDC) Symptom Inventory for Chronic Fatigue Syndrome (31), patients were asked to rate the frequency (1 = Some of the Time to 5 = All of the Time) and severity (1 = Very Mild to

5 = Very Severe) of 19 CFS-related symptoms during the past month. These include 8 commonly experienced CDC-defining CFS symptoms: post-exertional fatigue, unrefreshing sleep, memory and concentration problems, muscle aches and pains, joint pain, sore throat, tender lymph nodes and swollen glands, and headaches ($\alpha = .82$). It also measures 11 other symptoms such as diarrhea, fever, chills, sleep problems, nausea, abdominal pain, shortness of breath, sensitivity to light, and depression ($\alpha = .74$). This measure provides a reliable and broad indicator of CFS symptomatology (31).

Statistical Analyses

Data was analyzed utilizing an analysis of variance (ANOVA) for repeated measures. The within group factor was time and the between group factor was group assignment. The preintervention (T1) and postintervention (T2) scores on distress measures, quality of life and overall CFS symptomatology were the main outcome measures¹.

Results

Baseline Information

At study entry patients reported an average of 12.14 CFS symptoms from the CDC checklist ($SD = 2.89$), with an average frequency of 3.36 ($SD = .32$) and average symptom severity of 2.03 ($SD = .36$). The most commonly endorsed symptoms were unusual fatigue after exertion (97.4%) and unrefreshing sleep (96.1%), with the prevalence of the remaining symptoms ranging from mild to widely. Descriptive information for stress and quality of life measures is provided in Table 1. In general, based on normative comparisons this is a sample reporting elevated levels of stress and a compromised quality of life.

Figure 1 demonstrates participant flow through the study. Of 113 individuals initially meeting study criteria in the study, 44 were excluded for assorted miscellaneous reasons (e.g., scheduling and transportation problems, inability to commit to 12 weekly sessions). Of the remaining 69 who were randomized to CBSM ($N = 44$) or PE ($N = 25$), there were 38 participants who received CBSM and 20 who received PE. A total of 11 participants were lost to follow-up (CBSM, $N = 6$; PE, $N = 5$) resulting in a final sample of 58 that were used for statistical analyses. Independent t-tests and chi square tests revealed no significant between-group differences on any sociodemographic or outcome variable, p 's $> .15$.

Intervention Effects

A significant interaction of time $\times$ group emerged for PSS [$F(1, 53) = 5.07, p = .028$], such that participants in the CBSM condition experienced greater decreases in perceived stress from T1–T2 than participants in the PE group. Additionally, a significant group $\times$ time effect was found for POMS-TMD [$F(1, 51) = 4.12, p = .048$], such that CBSM participants reported greater decreases over time in mood disturbance than PE participants. In a secondary analysis, we found a significant but marginal group $\times$ time interaction effect for the POMS-Fatigue subscale, $F(1, 51) = 3.53, p = .06$, with greater reductions in CBSM vs. PE. (See table 2). Significant effects were found for the group $\times$ time interaction on overall QOLI category scores [$F(1, 49) = 10.65, p = .002$], showing that participants in the CBSM group evidenced greater improvements from T1–T2 than those in PE. (See table 2). We also found a significant group $\times$ time interaction for QOLI raw scores [$F(1, 49) = 4.0, p = .05$] and QOLI T scores [$F(1, 49) = 4.0, p = .05$], showing again that those in the CBSM group had greater improvements from T1–T2 compared to those in PE. Moreover, there was a significant group $\times$ time interaction for total CFS Symptom Severity, $F(1, 56) = 4.32, p = .042$, such

¹Intent to treat analyses were not utilized in this study due to the fact that it was a pilot study

that those assigned to CBSM reported greater decreases in symptom severity than those in PE. There was no group X time effect on total CFS symptom frequency though there were significant group X time interactions for unrefreshing sleep [$F(1, 52)=6.59, p < .01$] such that participants assigned to CBSM showed improvements vs. controls.

DISCUSSION

The results of the present pilot study suggest that adding relaxation and coping and interpersonal skills training to CBT when done in groups (i.e., CBSM) may reduce distress, enhance quality of life, and reduce CFS symptoms. Participants in CBSM revealed reductions in perceived stress and total mood disturbance and showed a tendency to reduce fatigue reports. Running in parallel with these effects we found that those assigned to CBSM showed improvements in a widely used measure of quality of life, suggesting improved general well-being. Finally, patients receiving CBSM also reported decreases in mean symptom severity across a comprehensive set of CDC-based CFS symptoms experienced in the past month. These findings join with prior work showing that group-based CBSM can reduce stress/distress and improve quality of life, stress physiology, and health-related indicators in medical populations with conditions such as cancer or HIV/AIDS (24,25).

CFS patients are hypothesized to have a Hypothalamic Pituitary Adrenal (HPA) axis dysregulation and altered immunoregulation, which may be aggravated by stress (13,32–34) and may serve to maintain the symptom cluster of CFS such as fatigue, muscle pain, unrefreshing sleep, and weakness. It is possible then that distress may further deplete energy and cause sleep disruptions resulting in additional decrements in worsening of symptoms. As mentioned previously, given that distress reactions appear to be a possible common denominator contributing to multiple abnormalities (fatigue, HPA axis alterations, immune dysfunction) characterizing CFS, it is reasonable to propose that effective treatment would also need to focus on reduction of the patients' distress reactions and the present study showed that it was likely beneficial.

Meta-analyses have found moderate effects for individual-based cognitive behavioral therapy (CBT) interventions focused on physical activity and on deconditioning models in CFS, though drop-out rates ranged up to 42% (38). However, a more recent review has suggested that CBT shows clinical improvements in 40% of people versus a 26% improvement in usual care (15). Group-based CBT combined with body awareness and exercise training has also been shown to be effective for CFS in recent work (39). In line with our stress model of CFS symptom exacerbation, the present study focused on testing the effects of group-based CBSM intervention in individuals diagnosed with CFS and our findings suggest that CBSM may reduce CFS symptoms in parallel with improvements in perceived stress, negative mood, and quality of life. A full-scale trial should next test whether CBSM produces parallel changes in symptoms and neuroimmunologic processes that might explain its stress-reducing effects on symptom reports. In view of other work showing that CBT combined with exercise training may be beneficial for CFS, it is reasonable also to conduct comparative effectiveness trials testing a stress management approach (e.g., CBSM) vs. CBT approaches targeting physical re-conditioning.

This pilot study is limited by a small sample size, reliance on self-report measures, and lack of a wide ranging measure of fatigue impairment. Given that our sample was predominantly Caucasian women on disability and with a high education, generalizability of results is also in question. It is unknown whether effects found persist beyond the relatively short follow-up period used in this preliminary study, and whether it might have been helpful to have maintenance sessions at the conclusion of the weekly intervention sessions. Selection bias may be a possible limitation as well given that participants were recruited through physician

referrals and other methods, such as websites and conferences. Furthermore, although significant differences were found between groups their clinical relevance has yet to be determined. Given that the control condition differed from the CBSM condition in time between intervention completion and post-testing, it may be possible that decrements in the control group may have been caused by the fact that they completed their intervention several weeks before the CBSM group. Alternatively these differences could have been produced by unequal attention time between conditions. Systematic differences in expectations is a possibility and future work should address this issue.

In sum, the results of this pilot study indicate the feasibility and potential benefits of a stress management-based group CBSM intervention for persons with CFS. Future work should focus on recruiting a larger sample, and comparing the effects of CBSM with those of well-established CBT-based re-conditioning interventions and other control conditions with equal contact time. Further we recommend utilizing more fine-grained analyses of symptoms by monitoring objectively verifiable symptoms, using a wide range assessment of fatigue, and monitoring parallel changes in HPA axis regulation (e.g., di-urnal cortisol pattern) and pro-inflammatory cytokines in persons with CFS undergoing group-based CBSM. Because many patients were unable to commit to the 12-week structured program due to transportation and scheduling issues, it may also be optimal to develop and test other modes of delivering this and other forms of psychosocial interventions for this population. This intervention has the potential to offer a reasonably low cost self-regulatory approach to the management of this perplexing syndrome.

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Figure 1.
Participant Flow Through The Study

Table 1

Means, standard deviations, and range on stress, mood, and quality of lifemeasures.

VARIABLE	Mean	Standard Deviation	Range
Perceived Stress	27.99	8.71	4–49
Overall Quality of Life (QOLI) Category	3.18	.91	1–4
QOLI Raw Score	.68	1.66	–3.80–4.70
QOLI T-Score	67	35.39	0–67
POMS- Total Mood Disturbance	40.46	36.29	0–167

Table 2

Means, standard deviations, and effects on perceived stress, mood, quality of life, and CFS symptoms in CFS participants assigned to Cognitive Behavioral Stress Management (CBSM) or control conditions.

VARIABLE	CBSM		CONTROL		Group X Time F value	p value	Cohen's D
	T1	T2	T1	T2			
	M(SD)	M(SD)	M(SD)	M(SD)			
Perceived Stress	29.22(8.77)	27.11(10.05)	22.39(7.31)	23.46(6.72)	F(1,53)=5.07	p= .03*	d= .41
POMS-Fatigue	18.35(5.14)	17.85(7.34)	16.74(8.06)	20.09(6.99)	F(1,51)=3.53	p= .06	d= -.31
POMS- Total Mood Disturbance	44.01(32.85)	34.03(34.43)	21.62(26.32)	27.35(21.61)	F(1,51)=4.12	p= .05*	d= .22
Quality of Life (QOLI) Category	3.13(.98)	2.81(1.15)	2.84(.90)	3.26(.87)	F(1,49)=10.65	p= .002**	d= -.43
Quality of Life (QOLI) Raw Score	.85(1.88)	1.17(1.83)	1.12(1.46)	.82(1.37)	F(1,49)=4.0	p= .05*	d= .21
Quality of Life (QOLI) T-score	36.75(14.60)	39.28(14.17)	38.74(11.41)	36.42(10.56)	F(1,49)=4.0	p= .05*	d= .22
Total CDC Symptom Severity	2.07(.38)	2.01(.33)	1.96(.32)	2.08(.39)	F(1,56)=4.32	p= .04*	d= -.20