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How Stress Management Improves Quality of Life After Treatment for Breast Cancer

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The range of effects of psychosocial interventions on quality of life among women with breast cancer remains uncertain. Furthermore, it is unclear which components of multimodal interventions account for such effects. To address these issues, the authors tested a 10-week group cognitive–behavioral stress management intervention among 199 women newly treated for nonmetastatic breast cancer, following them for 1 year after recruitment. The intervention reduced reports of social disruption and increased emotional well-being, positive states of mind, benefit finding, positive lifestyle change, and positive affect for up to 12 months (indeed, some effects strengthened over time). With respect to mechanisms tested, the intervention increased confidence in being able to relax at will. There was also evidence that effects of the intervention on the various outcomes examined were mediated by change in confidence about being able to relax. Thus, this intervention had beneficial effects on diverse aspects of quality of life after treatment for breast cancer, which appear linked to a specific stress management skill taught in the intervention.

Keywords: breast cancer, stress management, relaxation training, quality of life

Treatment of breast cancer requires significant psychosocial adaptation (Irvine, Brown, Crooks, Roberts, & Browne, 1991; van't Spijker, Trijsburg, Duivenvoorden, 1997). Symptoms of depression and anxiety are common, along with reports of subjective stress and decrements in sexual and interpersonal functioning (Andrykowski, Cordova, Studts, & Miller, 1998; Carver, Lehman, & Antoni, 2003; Schag et al., 1993; Wimberly, Carver, Laurenceau, Harris, & Antoni, 2005). Conversely, the experience of breast cancer is not wholly negative; many women perceive benefits (as well as threats) in the experience (Taylor, 1983). These include improved personal resources and skills, an enhanced sense of purpose, enhanced spirituality, closer ties to others, and changes in life priorities, collectively termed *benefit finding* (Lechner & Antoni, 2004; Tomich & Helgeson, 2004).

Many factors have been identified as sources of resiliency among women with breast cancer—variables that buffer negative experiences or foster positive ones (Carver, 2005a). Such factors as optimism, effective coping strategies, and social support from one's spouse or family members yield fewer negative and more positive experiences during treatment and beyond (Alferi, Carver, Antoni, Weiss, & Duran, 2001; Carver et al., 1993; Stanton, Kirk, Cameron, & Danoff-Burg, 2000; Carver et al., 2005). Such work provides a blueprint for psychosocial interventions to enhance resiliency factors, although the effectiveness of such interventions remains controversial (Newell, Sanson-Fisher, & Savolainen, 2002).

One approach, cognitive–behavioral stress management (CBSM), combines cognitive–behavior therapy and relaxation techniques (Antoni, 2003). CBSM teaches stress management skills in an active group-based environment. Its theoretical basis holds that techniques to minimize physical tension and anxiety-

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producing thoughts can promote fewer negative and more positive experiences. Accordingly, this intervention provides training in anxiety-reduction skills, training to increase awareness of sources of stress and indicators of stress, training to notice and replace negative thoughts, and training in cognitive and interpersonal coping skills to improve the ways patients manage stressors and maintain their social support networks (Antoni, 2003).

In an initial study, this intervention decreased incidence of moderate depression in the 25%–30% of the sample with moderate depression at entry and increased benefit finding and optimism (Antoni et al., 2001). We recently conducted a second trial in a somewhat more distressed group, in which primary psychiatric outcomes were specified as intrusive thoughts about cancer, interviewer-rated anxiety symptoms, and general distress. The CBSM intervention succeeded in decreasing these negative sequelae up to 9 months after the intervention had ended (Antoni et al., in press).

The present article has two purposes. First, the trial just described included a number of additional outcomes, variables that are of considerable interest to psychologists, although they are of less interest to medical audiences. These outcomes include positive affect, positive states of mind, benefit finding, positive lifestyle changes, and disruption of interpersonal functioning. All of these are now recognized as important in their own right, given a heightened awareness that such outcomes do not necessarily relate closely to distress per se. In this article we report results from the same trial on these additional outcomes. The second aim of the article is to report our effort to test whether any of the specific skills taught in the intervention (or any nonspecific aspects of group participation) account for the beneficial effects obtained. We did this by creating a measure with items that target each major skill taught. We expected CBSM to increase self-perceptions of these skills; we planned to test the changes in skill perceptions as potential mediators of other beneficial outcomes.

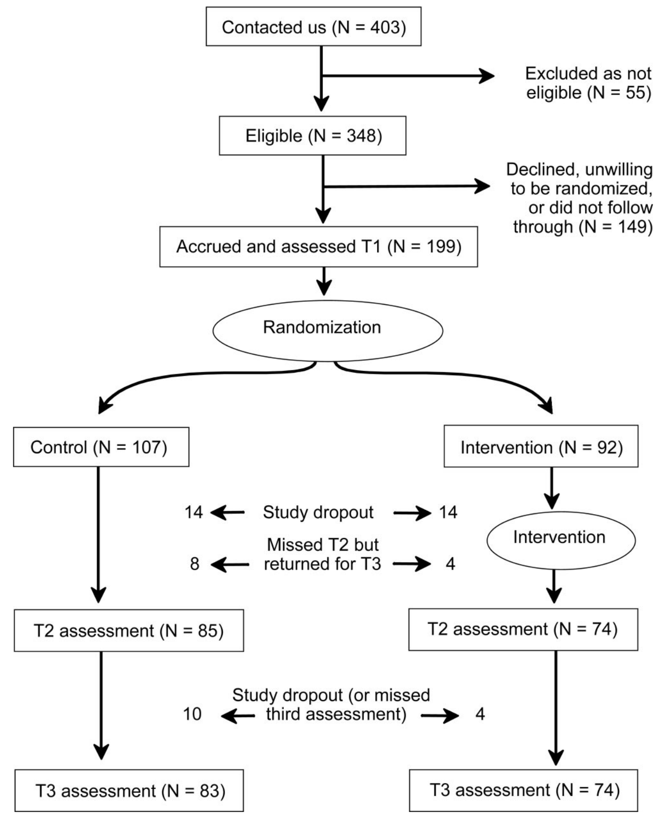

Figure 1. Experimental design and flow diagram of participation. T = Time.

Method

Participants were 199 women with nonmetastatic breast cancer. Some received letters from their physician, others from the American Cancer Society. The study was described as an opportunity for women under treatment for breast cancer to learn stress management. Interested women called us and spoke with a female assistant who screened for eligibility (see Figure 1; all information in that diagram is consistent with Consolidated Standards of Reporting Trials criteria; Altman et al., 2001). Participants had to have had surgery for primary breast cancer in the 8 weeks before initial assessment and be diagnosed with breast cancer at Stage III or below. Exclusions were for prior cancer (n = 35), prior psychiatric treatment for serious disorder (hospitalization or diagnosis of psychosis, major depressive episode, panic attacks, suicidality, or substance dependence; n = 17), and lack of fluency in English (n = 3).

Outcome variables were collected at study entry (Time 1) and 6 and 12 months after entry (Times 2 and 3). Attrition is described in Figure 1. Attrition did not differ significantly by condition at Time 2, $\chi^2(1, N = 159) = 0.40, p > .54$, or Time 3, $\chi^2(1, N = 157) = 1.21, p > .38$. We used an intent-to-treat analysis, estimating missing data using full information maximum likelihood (FIML; see the *Analytic Strategy* section); thus, the entire sample was represented in all analyses.

At each time point, those who dropped out were compared on key variables with those retained. Those who stopped by Time 2 were more likely to be Hispanic, $\chi^2(2, N = 199) = 16.89, p > .001$, and younger, $F(1, 197) = 8.06, p < .005$. There was no significant difference for completers versus noncompleters on stage, $\chi^2(3, N = 199) = 6.60, p > .08$; number of positive nodes, $F(1, 197) = 0.33, p > .55$; marital status, $\chi^2(1, N = 199) = 0.82, p > .40$; or presence versus absence of chemotherapy, $\chi^2(1, N = 199) = 0.00, p > .99$; or radiation, $\chi^2(1, N = 199) = 1.76, p > .20$, nor on any outcome variable (described in the *Quality of Life Assessments* section) assessed at Time 1 (all Fs < 1, ps $> .4$). Those who stopped between Times 2 and 3 did not differ from completers on any outcome assessed at Time 2 (all Fs < 1, ps $> .3$) or on any medical or demographic variable.

Procedure

Participants completed a first assessment on recruitment, 4–8 weeks postsurgery, then were randomly assigned to the intervention or control condition (always labeled a 1-day seminar rather than a control group). The intervention occurred over a 10-week period that began 10–12 weeks after surgery. Women in the control group were invited to attend a 1-day seminar during this period (80 of 107 attended; attendance did not relate to any outcome variable). A second assessment (Time 2) occurred 3 months after the intervention ended (6 months after the initial assessment). A third assessment (Time 3) occurred 6 months later. Thus, the period of follow-up spanned approximately 1 year after randomization.

Participants in both conditions met in groups of up to 8 in a room equipped with flat couches for muscle relaxation exercises and a table and chairs for group discussions. Both the intervention and the 1-day seminar were co-led by female postdoctoral fellows and advanced predoctoral trainees in clinical psychology. Leaders rotated between intervention and control cohorts. Assessments were handled by persons who did not conduct the intervention with that cohort.

Intervention. The closed, structured, manualized group intervention (Antoni, 2003) met weekly for ten 2-hr sessions. It interwove CBSM techniques with didactics, including in-session experiential exercises and out-of-session assignments (e.g., practicing relaxation). Women received recordings of a group leader reciting relaxation exercises, which they were urged to use daily. The intervention aimed at teaching women to cope better with daily stressors and optimize their use of social resources, focusing on cancer- and treatment-related issues. The intervention used group members and leaders as role models (for positive social comparisons and support), encouraged emotional expression, replaced doubt appraisals with confidence (Beck & Emery, 1985), and honed skills in anxiety reduction (by muscle relaxation and relaxing imagery; Bernstein & Borkovec, 1973) and skills in conflict resolution and emotional expression (via assertion training; Fensterheim & Baer, 1975). On average, participants attended 7.08 sessions ($SD = 2.58$, $Mdn = 8$, range = 1–10). Interventionists were trained in the protocol over a 10-week period. All sessions were videotaped, and treatment fidelity was ensured by two clinical psychologists, who monitored the videotapes at multiple points during each cohort. Any deviations in protocol were communicated to the interventionists on detection.

Control seminar. Control participants received a condensed, educational version of the information from the intervention, lasting 5–6 hr, at approximately the midpoint of the 10-week period of the intervention group within their cohort. The seminar lacked the therapeutic group environment and emotional support; opportunities to role play the techniques and receive group feedback; the opportunity to observe other members model new appraisals, relaxation techniques, and coping strategies; and the weekly home practice. This procedure has at least two benefits over a no-treatment control. By providing information relevant to breast cancer experiences, it diminishes differential attrition in the control condition, a major pitfall of no-treatment controls. Providing information related to adjustment in an educational seminar also creates a stronger test of the intervention's impact. The main drawback is that this control provides a dose of most ingredients of the intervention, thus working against predictions. This procedure does not control for attention time, with less than one third the contact hours of the CBSM groups (20 vs. 6 hr).

Quality of Life Assessments

Illness-related interpersonal disruption. It is important for persons treated for cancer to remain engaged in interpersonal activities (cf. Carver et al., 2003; Schag et al., 1993). Two subscales of the Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gilson, 1981) were used to assess adverse impact of cancer and its treatment on social interactions and recreational and pastime activities. The full Sickness Impact Profile, with 12 areas of impact, has been validated on a variety of patient groups (Bergner et al. 1981). Participants are to report any recent disruption in the activities named as a result of their illness and its treatment. An example item bearing on social interaction is "I am avoiding social visits from others," and an example item bearing on recreational activities is "I am cutting down on some of my usual recreation and pastimes, for example, watching TV or reading." Higher scores (computed by a weighted formula; Bergner et al., 1981) represent more disruption. Alpha among raw responses averaged (across three assessments) .84 for the Social Interaction subscale and .72 for the Recreation and Pastimes subscale.

Positive outcomes. Several distinct positive outcomes were assessed. The Positive States of Mind (PSOM; Horowitz, Adler, & Kegeles, 1988) measures self-perceptions of the capacities to experience focused attention, productivity, responsible caretaking, restful repose, sharing, sensuous nonsexual pleasure, and sensuous sexual pleasure. These are all positive experiences that people under stress may find themselves unable to attain. The PSOM was designed to detect changes in the ability to achieve and appreciate such positive experiences (Adler, Horowitz, Garcia, & Moyer, 1998). It has adequate psychometric properties (Adler et al., 1998). Responses were summed; average alpha was .77.

Positive emotional experience was measured with the Affects Balance Scale (ABS; Derogatis, 1975), which has been used in previous research on women with breast cancer (e.g., Northouse, 1990). The ABS is a set of adjectives assessing aspects of positive and negative feelings separately. Participants made ratings of the extent to which they had experienced the feeling "during the past week including today," using choices that ranged from *never* (0) to *always* (4). The positive affect scales assess affection, contentment, vigor, and joy. These scales were averaged to form an index of positive affect. The average alpha was .95.

Benefit finding was measured by 17 items that began with the stem "Having had breast cancer . . ." and ended with a benefit that might plausibly follow a cancer experience (Tomich & Helgeson, 2004). The items pertained to family and social relations, life priorities, spirituality, career goals, self-control, and ability to accept. Response options ranged from *I disagree a lot* (0) to *I agree a lot* (3). Participants could also indicate that an item was not applicable. We scored this measure by averaging responses to all items not marked as not applicable. This item set overlaps extensively (11 items) with that of Tomich and Helgeson (2004); it is the same item set Antoni et al. (2001) used. The average alpha was .94.

This study also included a scale of three items inspired by the experience of benefit finding but focused on responding to the challenge of cancer and its treatment with positive changes in lifestyle. These items used the same stem and response options as the benefit finding scale. The items were ". . . has led me to eat a healthier diet," ". . . has led me to exercise more regularly," and ". . . has led me to try to live a healthier lifestyle." The average alpha was .91.

Perceived Stress Management Skills and Nonspecific Effects of Intervention

To probe for possible "active ingredients" behind the intervention's effects, we created a set of items that we call the Measure of Current Status (MOCS; Carver, 2005b). The MOCS has two sections. Items in Part A measure participants' current self-perceived status on several skills that are targeted by the intervention: the ability to relax at will, recognize stress-inducing situations, restructure maladaptive thoughts, be assertive about needs, express anger effectively and appropriately, and choose appropriate coping responses as needed. Part B assesses potential nonspecific effects of the intervention: feelings of normalcy versus alienation, cohesiveness with other patients, perceptions of care from persons around the respondent, and a sense of being better off than other cancer patients. All items were framed to be sensible to participants in both conditions. Ratings for Part A were made on a scale from *I cannot do this at all* (0) to *I can do this extremely well* (4). Ratings for Part B were made on a scale from *strongly disagree* (0) to *strongly agree* (4). These items were completed by participants at each assessment.

As this is a new measure, responses were submitted to principal-components analyses at each time point (separately for Parts A and B). Part A consistently yielded four factors (a few items failed to load consistently on any factor and were discarded). *Relaxation* was formed by two items: "I am able to use muscle relaxation techniques to reduce any tension I experience" and "I am able to use mental imagery to reduce any tension I experience." *Awareness of Tension* was formed by three items, including "I can easily recognize situations that make me feel stressed or upset." *Getting Needs Met* was formed by three items, including "I can ask people in my life for support or assistance whenever I need it." *Coping Confidence* was formed by five items, including "It's easy for me to decide how to cope with whatever problems arise" and "I can come up with emotionally balanced thoughts even during negative times." Items on each scale were averaged; average alphas for these sets of items were .71, .77, .86, and .89, respectively.

Part B consistently yielded a very clear four-factor solution (one item loaded on multiple factors and was omitted). *Feeling Cared for* was composed of three items, including "I definitely feel as though people care about my well-being." *Normalization* consisted of three items, all reverse-coded, including "Knowing that I've been diagnosed with cancer makes me feel like an outsider in life." *Downward Comparison* was composed of two items, including "I'm better off than most people who have cancer."

Bonding was made up of two items, including "I feel a sense of connection to other people who have cancer." Items on each scale were averaged; average alphas were .77, .76, .68, and .85, respectively.

Analytic Strategy

Intervention effects were tested by latent growth-curve modeling (LGM; Duncan, Duncan, Strycker, Li, & Alpert, 1999; Llabre, Spitzer, Saab, & Schneiderman, 2001; B. Muthén, 1997), a form of structural equation modeling. In LGM, a trajectory of change over repeated measurements is computed for each participant. Differences in the properties of these trajectories then are predicted from other variables (Llabre, Spitzer, Siegel, Saab, & Schneiderman, 2004). The properties of interest are the intercept (the trajectory's starting value) and slope of change over repeated measurements. These properties were modeled as latent variables from data at Times 1, 2, and 3. The main predictor was intervention versus control condition (coded as 1 vs. 0). For the slope, loadings represent the time linked to each assessment point: 0 represents the initial assessment, 6 represents the 6 months elapsed until the second assessment, and 12 represents the time elapsed until the third assessment. The structure of this model is shown in Figure 2.[1]

The path from condition to intercept (M_I) reflects the group difference in initial values and should be nonsignificant (no initial group difference). The path from condition to slope (M_S) reflects the extent to which change in the dependent variable over time relates to condition. A significant effect indicates a difference in mean trajectories between groups. This is analogous to a Group × Time interaction in repeated measures analysis of variance (ANOVA). The method for testing mediation, described later, extends the same logic to modeling two dependent variables simultaneously.

An important advantage of LGM over repeated measures ANOVA is its ability to use all available data. In ANOVA, any participant missing any data is deleted. This reduces sample size (and power) and yields biased estimates, compromising efforts to use an intent-to-treat approach (Enders, 2001). LGM uses a process called FIML. FIML uses all available data for each person, estimating missing information from relations among variables in the full sample. These procedures have been shown to be quite robust even when there are a great many missing data (Schafer & Graham, 2002). We used FIML, as implemented in Mplus (L. K. Muthén & Muthén, 1998). Thus, all participants are represented in the analyses.

Another advantage of LGM is flexibility in addressing nonlinear change. For example, recovery may plateau. LGM can address such nonlinearities by estimating the later time point instead of specifying it.

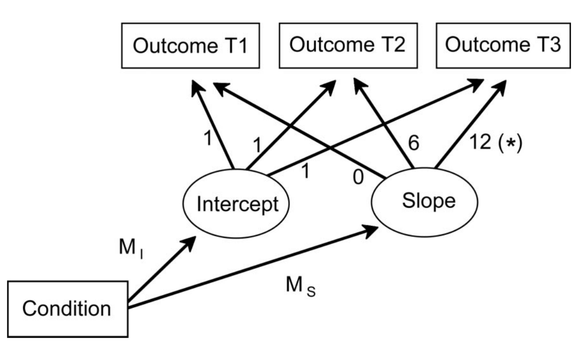

Figure 2. Structural model of latent growth curves using outcome variables at three assessments (at 6-month intervals) to define two latent variables (intercept and slope) and using experimental condition (intervention vs. control) to predict those latent variables. M_I is the differential effect of the intervention on the intercept of the growth curves. M_S is the differential effect of the intervention on change over time. An asterisk indicates that in some models tested, this loading was estimated rather than specified as 12. T = Time.

In effect, it draws a line from Time 1 to Time 2 and estimates how many months would pass (at that rate of linear change) by the time the line reached the Time 3 data point. If the outcome were to stop changing completely at Time 2, Time 3 would be estimated as being identical to Time 2; if it continued to change at the same rate, Time 3 would be estimated at its true value. In the analyses reported in this article, we began with a model in which Time 3 was specified as 12 months after Time 1; if that model did not fit well, we tested a model in which Time 3 was freely estimated.

We report several indexes of model fit, including chi-square (in which the ideal is a nonsignificant chi-square); comparative fit index (CFI), for which values above .95 indicate good fit; the root-mean-square error of approximation (RMSEA), for which values below .05 indicate good fit; and the standardized root-mean-square residual (SRMR), for which values below .10 indicate good fit (Kline, 2005). Specific effects were tested with the z statistic, with a .05 two-tailed significance level. Standardized effect sizes are reported as Cohen's d, for which values of 0.20 are regarded as small, 0.50 as medium, and 0.80 as large (Cohen, 1992). Effect sizes were calculated without measurement error, as described by Raudenbush and Xiao-Feng (2001).

Results

Characteristics of the sample, by condition, are presented in Table 1. Comparisons revealed no significant difference between conditions. All variables in Table 1 were examined as potential control variables. Most were tested as direct influences on the latent variables (direct projections to intercept and slope in Figure 2). We used controls only if they contributed significantly or improved overall model fit (none is included unless mentioned).

Mean correlations among outcome variables (i.e., averaged across the assessments) are shown in Table 2. As can be seen in the table, some pairs of variables were substantially correlated. One should keep these associations in mind in interpreting the results.

Illness-Related Disruption of Interpersonal Activities

The first outcomes to be examined were indicators of illness-related disruption of social and interpersonal activities. For the scale bearing on disruption of social interactions, when all three time points were specified, the model fit the data, $\chi^2(2, N = 199) = 2.04$, $p = .36$ (CFI = 0.997, RMSEA = .028, SRMR = .027). Condition did not predict variation in intercept ($z = 0.74$) but did have a significant relation to slope (see Table 3). We tested group differences at Times 2 and 3 by centering the intercept at those time points and recomputing the model, testing the condition effect on the intercept. When the intercept was centered at Time 2, there was a condition effect on the intercept ($z = 2.34$, $p < .002$; $d = 0.36$). Centering at Time 3 led to an even more substantial effect of condition on intercept ($z = 3.39$, $p < .001$; $d = 0.60$). Thus, the groups differed significantly at both follow-ups.

Next we examined disruption of recreational pastimes. When all three times were specified, the model fit the data well, $\chi^2(2, N = 199) = 0.37$, $p = .83$ (CFI = 1.000, RMSEA = .01, SRMR = .028). Condition did not predict variation in intercept ($z = 1.12$) but did have a significant relation to slope (see Table 3). Centering the

[1] Separate multilevel models determined that effects relating to separate treatment groups were minimal (all $ps > .20$); given this and additional problems that would be introduced by small group sizes, we felt justified in disregarding this variable in the main analyses.

Table 1
Demographic and Medical Variables

Variable	Control	Intervention	Statistic	p
Age at diagnosis	50.83 (8.97)	49.58 (9.11)	$F(1, 197) = 0.96$	.33
Years education	15.59 (2.28)	15.76 (2.57)	$F(1, 197) = 0.25$	.62
Ethnicity	70 (65%) non-Hispanic White 28 (26%) Hispanic 9 (8%) African American	66 (72%) non-Hispanic White 20 (22%) Hispanic 6 (7%) African American	$\chi^2(2, N = 199) = 0.93$	.63
Married/partnered	65 (64%)	54 (59%)	$\chi^2(1, N = 199) = 0.09$	.77
Employed	85 (79%) yes	65 (71%)	$\chi^2(1, N = 199) = 2.43$	.14
Stage	17 [0], 44 [I], 39 [II], 7 [III]	10 [0], 32 [I], 43 [II], 7 [III]	$\chi^2(3, N = 199) = 2.79$	.43
Nodes (*n* with positive nodes)	[36] 4.53 (4.71)	[40] 3.95 (4.21)	$F(1, 74) = .32$	.57
Segmental surgery	61 (57%)	40 (43%)	$\chi^2(1, N = 199) = 3.62$	.07
Radiation	65 (64%)	54 (59%)	$\chi^2(1, N = 199) = 0.09$	.77
Chemotherapy	57 (53%)	60 (65%)	$\chi^2(1, N = 199) = 2.91$	.11
Hormonal	60 (56%)	54 (59%)	$\chi^2(1, N = 199) = 0.05$	.88

Note. Standard deviations and percentages are in parentheses.

intercept at Time 2 failed to yield a condition effect on intercept ($z = 0.81$), but centering at Time 3 did produce a condition effect ($z = 2.52$, $p < .02$; $d = 0.43$), indicating a significant group difference at Time 3.

Positive Outcomes

Positive states of mind. The next class of variable to be examined was positive experiences, starting with the PSOM. Age was included in this analysis as a control (relating positively to PSOM). When the last time point was freely estimated, the resulting overall model fit the data well, $\chi^2(4, N = 199) = 4.28$, $p = .37$ (CFI = 0.998, RMSEA = .019, SRMR = .027). Time 3 was estimated at 9.26 months since Time 1. Experimental condition did not predict intercept ($z = 1.19$) but had a significant relation to slope (see Table 3), indicating differential change over time. With the intercept centered at Time 2, the group difference was not significant ($z = 1.21$). When the intercept was centered at Time 3, the difference was significant ($z = 2.06$, $p < .04$; $d = 0.39$).

Positive emotions. The next outcome was the positive affect index from the ABS. Age was included as a control (relating positively to positive affect). When all three time points were specified, the model fit the data well, $\chi^2(4, N = 199) = 4.63$, $p = .33$ (CFI = 0.997, RMSEA = .028, SRMR = .027). Condition did not predict variation in intercept ($z = 0.69$) but did have a significant relation to slope (see Table 3). Centering the intercept at Time 2 and Time 3 failed to yield condition effects on the intercept ($z = 0.44$ and $z = 1.37$, respectively).

Table 2
Correlations Among Outcome Variables, Averaged Across Three Assessments

Variable	1	2	3	4	5	6
1. Social interaction[a]	—	.64	−.47	−.41	.06	.07
2. Recreation and pastimes[a]		—	−.41	−.31	−.02	−.16
3. Positive states of mind			—	.51	.10	.11
4. Positive affect				—	.29	.25
5. Benefit finding					—	.52
6. Lifestyle change						—

[a] Higher scores represent greater disruption.

Benefit finding. When the last time point was allowed to be freely estimated, the model for benefit finding fit the data quite well, $\chi^2(1, N = 199) = 0.325$, $p = .57$ (CFI = 1.000, RMSEA = .000, SRMR = .006). Time 3 was estimated at 7.72 months. Condition did not significantly predict variation in intercept ($z = 1.61$) but did have a significant relation to slope (see Table 3), indicating differential change. When the intercept was centered at Time 2, experimental condition did not predict the intercept ($z = 0.54$), nor was there such an effect at Time 3.

Positive lifestyle change. The lifestyle change measure yielded a reasonable fit to the model in which all three time points were specified. However, when concurrent stress unrelated to cancer[2] was added to the model as a control variable, fit was quite good, $\chi^2(8, N = 199) = 5.22$, $p = .73$ (CFI = 1.000, RMSEA = .000, SRMR = .029; concurrent stress related positively to lifestyle change at Times 1 and 2 and inversely at Time 3). Experimental condition did not predict the intercept ($z = 0.89$) but did have a significant relation to slope (see Table 3). When the intercept was centered at Time 2, condition did not predict the intercept. When the intercept was centered at Time 3, the effect on the intercept approached significance ($z = 1.81$, $p = .07$, two-tailed; $d = 0.29$).[3]

Specific Stress Management Skills and Nonspecific Effects

Next we turned to the question of whether the intervention affected reports on the stress management skill sets (MOCS scales). First examined was MOCS Relaxation. The model specifying Time 3 as 12 months after Time 1 did not fit the data. When Time 3 was freely estimated, however, model fit was very good, $\chi^2(1, N = 199) = 0.092$, $p = .76$ (CFI = 1.000, RMSEA = .000, and SRMR = .006). The predicted temporal value for Time 3 was 6.64 months, indicating only very slight change from Time 2 to

[2] Noncancer stress was measured with a single item inquiring about the current level of non-cancer-related stressors at study entry and at each subsequent measurement point.

[3] We also assessed aspects of quality of life measured by the Functional Assessment of Cancer Therapy—General (Cella et al., 1993). We found intervention effects on the Emotional Well-Being and Additional Concerns About Breast Cancer subscales but not on other subscales. Space constraints preclude a full description of those results.

Table 3
Estimated Means and Standard Deviations of Dependent Variables at Three Time Points, by Experimental and Control Condition, and Group Effects on Slope Over Time

Outcome	Time 1		Time 2		Time 3		Group effect on slope		
	M	*SE*	*M*	*SE*	*M*	*SE*	*z*	*p*	*d*
Social interaction[a]									
Control	891.17	14.71	873.38	12.37	855.60	13.92	2.52	.02	0.47
Experimental	877.61	16.53	832.88	13.87	788.15	15.47			
Recreation and pastimes[a]									
Control	318.53	6.43	305.06	4.84	291.59	6.02	2.86	.005	0.53
Experimental	330.61	7.08	300.26	5.35	269.92	6.62			
Positive states of mind									
Control	22.07	0.38	22.92	0.34	23.47	0.36	3.00	.004	1.16
Experimental	21.31	0.41	23.33	0.41	24.31	0.43			
Positive affect									
Control	2.85	0.21	2.90	0.21	2.94	0.21	2.19	.03	0.31
Experimental	2.78	0.20	2.90	0.20	3.03	0.20			
Benefit finding									
Control	3.32	0.09	3.40	0.08	3.42	1.09	3.31	.001	0.82
Experimental	3.16	0.10	3.51	0.10	3.59	0.10			
Lifestyle change									
Control	2.77	0.18	2.95	0.15	3.14	0.20	2.64	.01	0.52
Experimental	2.60	0.18	3.05	0.15	3.50	0.21			
MOCS Relaxation									
Control	2.26	0.09	2.48	0.09	2.52	0.10	4.05	.001	0.86
Experimental	2.12	0.11	2.90	0.11	2.97	0.11			
MOCS Coping									
Control	3.31	0.08	3.34	0.07	3.37	0.08	1.94	.06	0.40
Experimental	3.16	0.08	3.31	0.08	3.46	0.09			
MOCS Getting Needs Met									
Control	3.51	0.09	3.51	0.08	3.50	0.09	0.96	.34	0.31
Experimental	3.41	0.10	3.49	0.09	3.57	0.11			
MOCS Awareness of Tension									
Control	3.20	0.08	3.24	0.07	3.29	0.09	0.99	.33	0.24
Experimental	3.27	0.09	3.38	0.08	3.50	0.10			

Note. MOCS = Measure of Current Status.
[a] Higher scores represent greater disruption.

Time 3. Experimental condition did not predict intercept (z = 0.95) but had a substantial relation to slope (see Table 3). Centering the intercept at Time 2 yielded a condition effect on intercept ($z = 3.06$, $p < .003$; $d = 0.54$), indicating a group difference at Time 2. Centering the intercept at the time estimated for the third assessment (6.64 months) also yielded a condition effect on intercept ($z = 2.88$, $p < .004$; $d = 0.33$), indicating a group difference at Time 3.

The MOCS scale for coping confidence had a good fit to the data, $\chi^2(2, N = 199) = 2.20$, $p = .33$ (CFI = 0.999, RMSEA = .022, SRMR = .017). Condition did not predict intercept, (z = 1.32); its relation to slope approached significance (see Table 3). Analyses of the other specific stress management skill and nonspecific scales from the MOCS yielded no evidence that reports on them were affected by the intervention.

Mediation

The last analyses tested whether increases in the self-perceived ability to relax might mediate effects of the intervention on the quality of life variables. Each outcome that had been affected by the treatment (i.e., had a condition effect on slope) was reexamined in the following way. The final model from the previous analysis of that outcome was elaborated into a more complex one, shown in Figure 3. The top part of Figure 3 is the general model used to evaluate the effect of condition on outcome variables (as in Figure 2). The bottom shows the same model, as used to evaluate the effect of condition on MOCS Relaxation. In the next analyses, these models were estimated simultaneously. In each case, Time 3 data were handled as they had been handled in the final model described earlier: That is, if Time 3 was specified as 12 months in the final model, it was specified as 12 months here; if it was freely estimated earlier, it was freely estimated here.

Also included in these analyses was a predictive path from the slope of MOCS Relaxation to the slope of the outcome variable. The question of interest is what including this path does to the path from condition to the slope of the outcome variable. If relaxation confidence mediates the effect of condition on the outcome, having the predictive path from MOCS slope to outcome slope should weaken or eliminate the path from condition to outcome slope. We tested this in two ways. First, we assessed the significance of the loading that remained. The results of these analyses are summarized in Table 4. Although not shown in the table, all of these models fit the data reasonably well. As is indicated in Table 4 (column 2), in each of these analyses the direct effect of condition on the slope of the outcome variable was greatly reduced after we added the relaxation path. In no case did a significant relation remain.

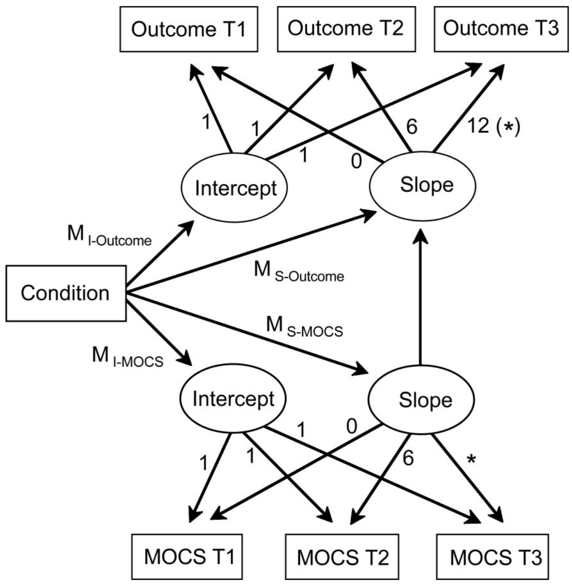

Figure 3. Mediational model, in which experimental condition predicts the slope of an outcome variable across three time points ($M_{S\text{-Outcome}}$), experimental condition predicts the slope of the Measure of Current Status (MOCS) Relaxation scale across three time points ($M_{S\text{-MOCS}}$), and the slope of the MOCS predicts the slope of the dependent variable. Mediation is suggested if $M_{S\text{-Outcome}}$ no longer is significant in this model and if setting the $M_{S\text{-Outcome}}$ path to zero does not significantly change model fit. M_I is the differential effect of the intervention on the intercept of the respective growth curves. M_S is the differential effect of the intervention on change over time. An asterisk indicates that in some models tested, this loading was estimated rather than specified as 12. T = Time; $M_{I\text{-Outcome}}$ = mediational path of intervention effect on outcome intercept; $M_{I\text{-MOCS}}$ = mediational path of intervention effect on MOCS intercept.

As a further step, we compared that model against a model in which the prediction from condition to outcome slope was fixed to zero. If that model does not differ significantly from the prior one, it indicates that the remaining role of condition is negligible. In each case, this final step yielded no difference between pairs of models (see Table 4, column 3). These findings thus are consistent with the position that the quality of life outcomes caused by the intervention occurred via changes in the women's perceptions of being able to relax when they desired to do so.

As noted earlier, Antoni et al. (in press) have reported outcomes from this trial on cancer-related thought intrusion (Impact of Event Scale; Horowitz, Wilner, & Alvarez, 1979), self-reported negative emotions (by ABS), and interviewer-rated anxiety (by Hamilton Rating Scale for Anxiety; Hamilton, 1959). We also tested mediation of effects on those outcomes. As can be seen in Table 4, MOCS Relaxation also appeared to act as mediator of those effects.[4]

Discussion

This study provides clear evidence that group-based stress management intervention can produce substantial and durable improvements in diverse aspects of psychosocial adjustment in women undergoing treatment for nonmetastatic breast cancer. Effect sizes from 0.33 to 0.50 are often taken as clinically meaningful (Hays & Wooley, 2000; Norman, Sloan, & Wyrwich, 2003). Effects obtained in this study on trajectories of change were clearly at or above these levels. Effects emerged across diverse domains; many were sustained for 9 months after the intervention.

Efficacy of Psychosocial Treatments

Early reviews of psychosocial interventions with cancer patients reported that the interventions reduce emotional distress, enhance coping, foster social support, and encourage stress management (Andersen,1992; Luebbert, Dahme, & Hasenbring, 2001; Meyer & Mark, 1995; Trijsburg, van Knippenberg, Rijpma, 1992). However, many studies reviewed were flawed. A more recent review (Newell et al., 2002), on studies that met stringent criteria for clinical trials (Mulrow & Oxman, 1997), reached a different conclusion. Newell et al. concluded that evidence of the efficacy of psychological treatment on distress and quality of life among people with cancer is inconclusive. They also noted a total lack of evidence for the efficacy of the interventions for improving social functioning, although this is a key aspect of how patients view their recovery and life after treatment (Carver et al., 2003; Schag et al., 1993).

Our findings are very much at odds with those conclusions. What is the reason for the discrepancy? One key difference between this study and those in Newell et al.'s (2002) review is the samples. Studies in that review examined patients dealing with diverse cancers at different stages of disease and treatment, whereas our sample was all women with breast cancer who were at the start of treatment. Other research on breast cancer has also shown positive influences from such interventions (Andersen et al., 2004; Scheier et al., in press). For example, one recent trial of women with Stage II–III breast cancer showed that a group-based intervention that was focused on stress management reduced anxiety, increased social support, improved diet, and reduced smoking (Andersen et al., 2004).

That study, although valuable, exemplifies a major limitation in this field: a lack of evidence for the durability of the effects (Newell et al., 2002). Only one follow-up assessment was reported, which was right at the conclusion of the intervention. Do the effects last beyond the period of participation, as patients return to their home, their life, and their roles as partners, parents, and workers? Studies using longer follow-ups are uncommon, although effects of these interventions sometimes emerge well after adjuvant treatments end (Andersen, 1992; see also Scheier et al., in press). Our study helps advance the field by showing that a CBSM intervention can produce substantial and durable effects on measures representing recovery of social functioning, reduction of negative affect, and increases in positive experiences.

Indeed, it is noteworthy that several of the effects actually solidified from 6 months to 12 months. A similar pattern also has been found in a recent trial using a different intervention that was implemented at a different point in the course of medical treatment (Scheier et al., in press). It is important to see whether such consolidation is a reliable phenomenon and how durable it is across time. Accordingly, we strongly recommend that more stud-

[4] We also conducted exploratory mediation analyses using MOCS Coping Confidence. The results were less supportive of a mediational role for this scale than for MOCS Relaxation.

Table 4
Testing Whether Effects of the Intervention on Diverse Outcomes Were Mediated by Changes in Perception of Being Able to Relax When Desired (MOCS relaxation)

Dependent variable	Initial effect of condition on slope (z)	Effect of condition on slope (z) with control for MOCS Relaxation slope	Chi-square ($df = 1$, $N = 199$) difference and p for change in model fit when condition path set to 0
SIP Recreation and Pastimes	2.86**	0.29	0.08, $p > .7$
SIP Social Interaction	2.52*	1.01	0.81, $p > .4$
PSOM	3.00**	0.57	0.49, $p > .4$
Positive emotions	2.19*	0.82	1.65, $p > .1$
Benefit finding (17 items)	3.31***	0.76	0.55, $p > .4$
Benefits: Lifestyle change	2.64**	0.28	0.11, $p > .6$
FACT Emotional Well-Being	2.96	0.37	0.18, $p > .6$
FACT Additional Concerns	1.99	0.37	0.12, $p > .7$
IES Intrusion	3.46***	1.13	0.86, $p > .4$
Interviewer-rated anxiety	2.71**	0.28	0.09, $p > .7$
Emotional distress	2.48*	0.63	0.62, $p > .4$

Note. MOCS = Measure of Current Status; SIP = Sickness Impact Profile; PSOM = Positive States of Mind; FACT = Functional Assessment of Cancer Therapy; IES = Impact of Events Scale.
* $p < .05$. ** $p < .01$. *** $p < .001$.

ies follow participants for longer periods after the psychosocial intervention comes to its conclusion.

Mediation

We also obtained evidence of an active ingredient in the intervention. Evidence suggests that each effect on well-being was largely attributable to participants' confidence in having learned specific stress reduction techniques for relaxing at will. In contrast, there was no support for a role of various nonspecific factors or other aspects of stress management. The pattern thus shows the efficacy of an intervention that teaches specific stress management skills for use during and after the period of active medical treatment for breast cancer. It also raises some questions.

One question is why no CBSM effects emerged on other skills addressed by CBSM. One possibility stems from the fact that relaxation played a part in each week's session, whereas other skills were taught only on particular weeks. Similarly, whereas homework each week included relaxation, the topics of the cognitive–behavior therapy homework changed each week—thus, homework exposure time likely differed for relaxation versus cognitive–behavior therapy exercises. Perhaps more total exposure is needed for a person to feel a real improvement with respect to any given skill. One might also ask whether the skills other than relaxation really matter. Perhaps women dealing with nonmetastatic breast cancer are just as well off learning only relaxation techniques. This question suggests the desirability of a study to dismantle the various modes of the intervention. We are now starting such a study.

It is not surprising that relaxation skill would relate to effects on distress (Luebbert et al., 2001). It is less intuitive, however, that effects on social functioning and benefit finding would also relate to that skill. Perhaps women who felt that they could use a physical technique to ward off tension and anxiety were more willing to reengage in social activities (Antoni, 2003; Burish, Snyder, & Jenkins, 1991). Also plausible is that confidence in having relaxation skills to ward off stress instilled more openness to positive experiences in the period of active treatment and recovery (Antoni, 2003; Tedeschi, Park, & Calhoun, 1998).

Limitations and Issues of Generality

In evaluating the generalizability of this work, one should keep in mind that the sample was self-selected, middle class, educated, and mostly White. One should also recall that there was some differential attrition, with Hispanic women and younger women more likely to leave the study. It thus remains to be seen whether this intervention is equally effective in improving well-being among minority women. This requires tests of culturally appropriate versions of psychosocial intervention, because the concerns of these women with breast cancer and their acceptance of these therapeutic techniques may diverge from those of the women studied in this article (Chamberlain Wilmoth & Sanders, 2001).

However, we note that women in this present study were not excluded for elevated levels of anxiety or depression, as is often done. Interventions on people with cancer have stronger effects on those who begin with elevated distress (Boesen et al., 2005; Nezu, Nezu, Felgoise, McClure, & Houts, 2003; Sheard & Maguire, 1999). This study may represent women across a broader range of distress than some others, including our earlier study (Antoni et al., 2001). If so, the results would be more generalizable to clinic populations.

We also note limitations on generalization regarding process variables. First, the findings do not rule out the possibility that the intervention effects relied on processes other than those assessed. The measure used in this study was limited to a few key candidates. The process findings are also limited in another way. The results suggest the importance of having a tangible, portable, and readily applicable skill that can be used in virtually any setting. It is unknown, however, whether it is confidence in the skills or their actual use that matters. Diary studies of skill use and psychosocial states in the natural environment (Schwartz & Stone, 1998; Stone & Shiffman, 1994) may address this question in future work.

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