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Improvements in Emotion Regulation Following Mindfulness Meditation: Effects on Depressive Symptoms and Perceived Stress in Younger Breast Cancer Survivors

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Abstract

Objective—Mindfulness meditation reduces psychological distress among individuals with cancer. However, mechanisms for intervention effects have not been fully determined. This study tested emotion regulation strategies as mediators of intervention effects in a sample of younger women treated for breast cancer, a group at risk for psychological distress. We focused on two distinct strategies targeted by the intervention—rumination and self-kindness—and further examined the broader construct of mindfulness as a potential mediator.

Method—Women ($n=71$) with Stage 0–III breast cancer diagnosed at or before age 50 who had completed cancer treatment were randomly assigned to a 6-week mindfulness intervention or wait-list control group. Assessments occurred at study entry, post-intervention, and a 3-month follow-up.

Results—In single mediator analyses, increases in self-kindness ($CI_B=-7.83, -1.93$), decreases in rumination ($CI_B=-5.05, -.31$), and increases in mindfulness ($CI_B=-6.58, -.82$) each mediated reductions in depressive symptoms from pre- to post-intervention. Increases in self-kindness also mediated reductions in perceived stress ($CI_B=-5.37, -.62$) from pre- to post-intervention, and increases in self-kindness ($CI_B=-5.67, -.22$) and in mindfulness ($CI_B=-5.51, -.16$) each mediated intervention effects on perceived stress from pre-intervention to 3-month follow-up. In multiple mediator analysis, only self-kindness mediated intervention effects on depressive symptoms from pre- to post-intervention ($CI_B=-6.41, -.61$), and self-kindness and mindfulness together mediated intervention effects on perceived stress from pre-intervention to follow-up ($CI_B=-6.77, -.35$).

Declaration of Conflicting Interests

None to disclose.

Conclusions—Self-kindness played a consistent role in reducing distress in younger women with breast cancer. The efficacy of this understudied emotion regulation strategy should be evaluated in other clinical populations.

Keywords

depression; emotion regulation; self-kindness; mindfulness; cancer

Breast cancer is the most common cancer in women, and approximately 25% of women are diagnosed before age 50. Younger women report higher levels of distress at diagnosis, treatment, and into survivorship compared to older women and age-matched controls (Champion et al., 2014). Mindfulness-based interventions reduce depressive symptoms and stress in cancer survivors and other populations (Goyal et al., 2014; Zainal, Booth, & Huppert, 2013); however, mechanisms underlying mindfulness intervention effects are not fully understood. Our group found that a standardized intervention, Mindful Awareness Practices (MAPs), reduced depressive symptoms ($p = .094$) and perceived stress ($p = .001$) in younger breast cancer survivors (Bower et al., 2015); the goal of the present report is to assess mediators of intervention effects.

Ideally, mechanisms are tested through mediators that are both theoretically related to the outcome and likely to be influenced by the intervention (Chen, 1990). Theory and empirical evidence suggest that mindfulness interventions reduce distress through improvements in emotion regulation, or the ways by which individuals alter, experience and express their emotions (Roemer Williston, & Rollins, 2015). Strong evidence links impaired emotion regulation to depression (Joormann & Gotlib, 2010) and to higher perceived stress (Prakash, Schirda, & Hussain, 2015). Thus, we focus on two conceptually distinct emotion regulation strategies targeted by mindfulness interventions: rumination and self-kindness.

Rumination is a maladaptive emotion regulatory process that involves a passive, repetitive focusing of attention on the causes and consequences of distressing emotional experiences. Rumination plays a key role in depression; the tendency to ruminate predicts depression onset and may maintain depressive symptoms (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Self-kindness, conversely, is an adaptive emotion regulation strategy involving the generation of kindness towards the self in the face of suffering (Neff, 2003). Self-kindness is one component of self-compassion, a multi-dimensional construct that is associated with lower depressive symptoms (MacBeth & Gumley, 2012). In recent experimental work, Diedrich and colleagues (2014) found that directing kind thoughts towards the self was as effective as cognitive reappraisal in reducing induced negative mood in depressed participants.

Mindfulness interventions, including MAPs, include exercises to help individuals “step back” and avoid entrenchment with automatic distressing thoughts, and thus refrain from rumination. Mindfulness interventions reduce rumination in cancer survivors (Labelle, Campbell, & Carlson, 2010) and individuals with past and present mood disorders (Ramel, Goldin, Carmona, & McQuaid, 2004), and preliminary evidence indicates that decreased rumination mediates intervention effects on psychological distress (Gu, Strauss, Bond, & Cavanagh, 2015).

The MAPs intervention also includes exercises designed to promote kindness towards the self. Indeed, mindfulness interventions have been shown to increase self-compassion (MacBeth & Gumley, 2012), and such increases have been shown to mediate mindfulness intervention effects on depressive symptoms and perceived stress (Gu et al., 2015; Shapiro, Bishop, Astin, & Cordova, 2005). However, self-compassion includes multiple constructs, including mindfulness (Neff, 2003). Thus, the specific effects of self-kindness have not been determined.

Here, we examine mediators of the MAPs intervention on depressive symptoms and perceived stress. We hypothesized that increases in self-kindness and decreases in rumination would each uniquely contribute to reductions in distress in multiple mediation analyses, an approach that facilitates the identification of “active ingredients” of interventions. To contextualize results, we also examined a more global mediator, mindfulness, consistent with the larger literature on mindfulness (Gu et al., 2015).

Method

Participants and Procedure

The parent study was a Phase II RCT designed to evaluate a mindfulness-based intervention compared to a wait-list control group (Bower et al., 2015), and was approved by the UCLA IRB ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01558258) Identifier Clinical Trials # NCT01558258.). All participants provided informed consent. Participants were 71 women diagnosed with Stage 0–III breast cancer at or before age 50, who had completed primary treatment (i.e., surgery, radiation, and/or chemotherapy) at least 3 months previously, had no evidence of active disease, and were naïve to mindfulness practice. Participants were recruited through invitations to participants in an earlier study, physician referrals, and the Internet (see CONSORT diagram in Bower et al., 2015). Interested women ($n = 151$) were screened by telephone to determine eligibility; 11 were ineligible and 69 declined to participate. Participants completed an in-person assessment at pre- and post-intervention and an online questionnaire at a 3-month post-intervention follow-up. Participants who did not complete the post-intervention assessment ($n = 6$) or for the 3-month follow-up ($n = 6$) did not differ from the rest of the sample on demographic, medical or study variables (p 's $> .05$).

MAPs intervention—Participants were randomized to a wait-list control or a 6-week MAPs program developed at the University of California, Los Angeles. MAPs participants met for 6 weekly, 2-hour group classes that included presentation of theoretical materials on mindfulness; experiential practice of meditation (e.g., breath awareness, relational mindfulness, mindful walking); incorporation of mindfulness into daily life; managing barriers to effective practice; and a psychoeducational component for breast cancer survivors. Classes were taught by Diana Winston, an expert with over 10 years of experience teaching MAPs. Participants were instructed to practice formal mindfulness exercises at home, beginning with 5 minutes and increasing to 20 minutes daily, and completed weekly logs documenting home practice. Of relevance to the proposed mediators, self-kindness was woven throughout the intervention (e.g., reminders by the instructor to be kind to oneself, or “gently” return attention to the present moment), and explicitly practiced in weeks 3 and 4

through the practice of loving kindness meditation, in which participants were asked to generate caring, warm and positive feelings towards the self and others. Rumination was implicitly addressed through the practice of maintaining attention on the present moment, which may lead to improvements in basic cognitive processes that underlie rumination (Joormann & Gotlib, 2010), and explicitly in weeks 4 and 5, in which participants learned about shifting one's relationship with difficult thoughts by "disidentifying," or viewing thoughts as separate from the self. Participants learned tools to facilitate disidentifying, including use of metaphors (e.g., visualizing thoughts as clouds passing through the sky).

Measures

Demographic and clinical characteristics were assessed via self-report. The 20-item Center for Epidemiologic Studies-Depression scale (CESD; Radloff, 1977) assessed affective and vegetative symptoms of depression during the past week on a 0–3 scale. The 10-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) assessed global appraisals of life stress during the past week on a 0–4 scale. Rumination was assessed with the 6-item subscale of the Rumination and Reflection Scale on a 1–5 scale (Trapnell & Campbell, 1999; "My attention is often focused on aspects of myself I wish I'd stop thinking about.") Self-kindness was assessed with the 5-item subscale of the Self-Compassion Scale on a 1–5 scale (Neff, 2003; "When I'm going through a very hard time, I give myself the caring and tenderness I need.") Of note, unlike the full self-compassion scale, this measure of self-kindness avoids substantial conceptual and item overlap with the measure of mindfulness. These measures were hypothesized prior to analyses, and chosen to represent distinct dimensions of emotion regulation. Mindfulness was assessed using the total score of the 39-item Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) on a 1–5 scale. Internal consistency in the current study was adequate to high for all psychosocial measures (Table 1).

Analytic Approach

Single mediator analyses were conducted to evaluate whether emotion regulation strategies mediated intervention effects on depressive symptoms and perceived stress at post-intervention and 3-month follow-up. Analyses at post-intervention are of concurrent associations between mediators and outcomes, whereas analyses at follow-up allow an examination of temporal associations. Although intervention effects at 3-month follow-up were not significant, and marginally significant for depressive symptoms at post-intervention, we tested for mediation because significant indirect effects can be present even in the absence of a significant total or direct effect (Zhao, Lynch, & Chen, 2010), leading to recommendations that mediation tests are best guided by theory (Stanton, Luecken, MacKinnon, & Thompson, 2013). All analyses used an analysis of covariance approach that controlled for study entry values of each mediator and outcome variable. The relationships among the intervention, mediator, and outcome can be characterized by four regression coefficients/paths: the effect of the intervention on the mediator (a), effect of the mediator on the outcome (b), the *total effect* (c) (effect of intervention on the outcome, including mediators) and the *direct effect* (c') (effect of the intervention on the outcome, independent of mediators). The product of the a and b paths represents the mediated, or *indirect effect*; this is the effect of interest when testing mediation. We tested the significance of the

mediated effect using a non-parametric bootstrap approach (5,000 random samples) and obtained point estimates, standard errors and 95% bias-corrected bootstrap confidence intervals for each indirect effect. The mediated effect is significant if the CI_B upper and lower bounds exclude zero. When more than one mediator was significant, multiple mediation was used to identify the extent to which each mediator uniquely contributed to the outcome, controlling for effects of other mediators. Listwise deletion addressed missing data at post ($n = 6$) and follow-up ($n = 6$); results were similar using intent-to-treat analysis (last observation carried forward). Analyses were performed in Stata 13.1 (StataCorp, 2013).

Results

Participant characteristics are reported in Table 2, and descriptive statistics for outcomes and mediators in Table 3. On average, participants were 47 years old, non-Latina white, and 4 years post diagnosis. Depressive symptoms were elevated at study entry (overall $M = 16.68$, $SD = 10.07$); 48% of participants scored at or above 16, indicative of clinically significant depressive symptoms. There was a chance baseline imbalance between groups: the control group had higher levels of depressive symptoms, less radiation treatment, and were more likely to be married and have a smoking history (all p 's $\leq .10$). These variables were included as covariates.

Single and Multiple Mediator Models: Concurrent Change at Post-Intervention

As shown in Table 4, the intervention influenced the mediators (a paths) and the mediators were associated with the outcomes (b paths). The mediated effect (ab path) of the intervention on depressive symptoms was significant for rumination, $b(SE) = -2.03(1.14)$, self-kindness $b(SE) = -4.45(1.51)$ and mindfulness $b(SE) = -3.17(1.43)$. When examining these mediators together in a multiple mediator model, self-kindness remained significant, $b(SE) = -3.51(1.48)$, indicating that self-kindness mediated intervention effects on depressive symptoms independent of changes in rumination or mindfulness. Only self-kindness mediated effects of the intervention on perceived stress, $b(SE) = -2.53(1.20)$; thus, no multiple mediator analysis was conducted.

Single and Multiple Mediator Models: Prospective Change at 3-Month Follow-Up

Single mediator analyses revealed no significant mediators of intervention effects on depressive symptoms at follow-up. However, increases in self-kindness, $b(SE) = -2.05(1.27)$, and mindfulness, $b(SE) = -2.64(1.39)$ during the intervention predicted a decline in perceived stress at follow-up. In multiple mediator analysis, the total indirect effect, but not the individual indirect effects, was significant, $b(SE) = -3.56(1.64)$, indicating that as a set, changes in mindfulness and self-kindness mediated intervention effects on perceived stress at the follow-up.

Discussion

We hypothesized that a 6-week mindfulness intervention would improve depressive symptoms and perceived stress in younger breast cancer survivors by reducing rumination and enhancing self-kindness, two emotion regulation processes that are linked to depression

and targeted by the MAPs program. Results at post-intervention partly supported hypotheses: increased self-kindness and decreased rumination, as well as increased mindfulness, each mediated the relationship between the intervention and declines in depressive symptoms. Further, self-kindness mediated reductions in depressive symptoms independent of changes in rumination and mindfulness. However, only self-kindness mediated reductions in perceived stress at post-intervention. While these analyses did not establish temporal precedence for the mediators, analyses of the 3-month follow-up data revealed that increases in self-kindness and mindfulness during the intervention predicted sustained reductions in perceived stress.

While the intervention was not associated with reductions in distress at 3-month follow-up, we observed significant indirect effects in some analyses. There are several reasons why this phenomenon can occur (Rucker, Preacher, Tormala, & Petty, 2011). We speculate that since the intervention was explicitly designed to target self-kindness, rumination, and mindfulness, it may have exerted a stronger influence on these mediator pathways than on the total effect, leading to differential power to detect these effects.

Previous studies have identified changes in repetitive negative thinking, cognitive and emotional reactivity, mindfulness, and self-compassion (Gu et al., 2015; Shapiro et al., 2005) as key mechanisms for mindfulness interventions. Our results add to this literature and focus on specific emotion regulation processes. In particular, self-kindness emerged as an important mediator of effects on depression, over and above other strategies. This is interesting given the established relationship between rumination and depression, and supports the presence and efficacy of this positive emotion regulation strategy in mindfulness-based interventions. Strong effects of self-kindness on perceived stress are also consistent with literature linking positive emotions to stress resilience (Fredrickson, 2013). Self-kindness may be particularly relevant for younger breast cancer survivors, a vulnerable group dealing with a non-normative chronic illness (Pinto-Gouveia, Duarte, Matos & Fraguas, 2015). Identifying this strategy's efficacy in other clinical populations, particularly in the context of high self-criticism (e.g., social anxiety disorder) or when other strategies such as reappraisal are difficult to implement (e.g., depression; Joorman & Gotlib, 2010) is an important topic for future research.

While this study tested the unique contributions of emotion regulation strategies, these strategies likely work in concert and may emerge differently over time. Weekly assessments during the intervention would allow a more fine-grained analysis of the temporal nature of these strategies. The nature of emotion regulation may also change over time; for example, participants may first rely on specific tools taught in the intervention to reduce rumination in the immediate context of distress, but developing mindfulness may eventually circumscribe the onset of rumination and negative emotional reactivity. This might explain the delayed positive effects of the intervention through mindfulness on perceived stress seen in this trial.

This study is limited by its lack of an active control group, chance baseline imbalance between groups on depressive symptoms, and relatively small sample. Power may have been low for mediation analyses. While conceptually distinct, our mediator variables were correlated; in multiple mediator analysis, the indirect effect may be rendered insignificant

solely due to multicollinearity. Analyses with larger samples are required to confirm the results.

Strengths of the study include a randomized design, a follow-up assessment that allowed for testing of temporal precedence of the proposed mediators, and choice of mediators likely to be influenced by the intervention and conceptually and/or empirically linked to depression and stress. Results demonstrate that self-kindness plays a key role in reducing distress among younger survivors, and contribute to a growing literature assessing mediators of mindfulness interventions in cancer survivors and other populations (Gu et al., 2015; Stanton et al., 2013).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Public Health Significance Statement

These findings demonstrate that self-kindness plays a central role in reducing distress following mindfulness meditation in younger women with breast cancer, a vulnerable group reporting elevations in stress and depression for years after diagnosis and successful treatment. Whether bolstering the self-kindness component of mindfulness meditation enhances its efficacy requires study, as does this strategy's efficacy in other clinical populations.

Correlations for Outcome Variables, Mediators, Covariates and Minutes Practiced and Scale Reliability

Table 1

	CES-D	PSS	Rumination	Self-Kindness	FFMQ	Home practice	Marital status	Radiation treatment	Smoking history
CES-D	--								
PSS	.70***								
Rumination	.48***	.52***							
Self-Kindness	-.30*	-.36**	-.56***						
FFMQ	-.46***	-.42***	-.49***	.63***					
Home practice	-.10	.04	-.04	.10	-.001				
Marital status	-.12	-.001	.09	-.13	-.12	-.17			
Radiation treatment	-.16	-.16	-.26*	.06	.17	.20	-.07		
Smoking history	.04	-.13	-.07	.10	.11	-.32**	.11	.004	
Cronbach's alpha	$\alpha > .90$	$\alpha > .87$	$\alpha > .88$	$\alpha > .84$	$\alpha > .90$				

Note. Reliability coefficients were calculated at each time point; the lowest reliability is reported.

Abbreviations: CES-D = Center for Epidemiologic Studies - Depression Scale; FFMQ = Five Facet Mindfulness Questionnaire; PSS = Perceived Stress Scale.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 2

Characteristics of the Sample

	Total (N = 71)	Intervention (n = 39)	Control (n = 32)
Age, M (range)	47 (28–60)	46 (28–60)	48 (31–60)
Years since diagnosis, M (<i>SD</i>)	4 (2.4)	4 (2.4)	4 (2.5)
Ethnicity, N (%)			
White	54 (76)	29 (74)	25 (78)
Other	17 (24)	10 (26)	7 (22)
Marital Status, N (%)			
In committed relationship	46 (65)	22 (56)	24 (75)
Family Yearly Income, N (%)			
Over \$100,000	42 (60)	24 (62)	18 (58)
Employment, N (%)			
Employed full or part-time	51 (72)	31 (79)	20 (63)
Cancer treatments received, N (%)			
Chemotherapy	52 (73)	30 (77)	22 (69)
Radiation therapy	48 (68)	30(77)	18(56)
Surgery Type, N (%)			
Lumpectomy	35 (49)	22 (56)	13 (41)
Mastectomy	36 (51)	17 (44)	19 (59)
Current endocrine therapy	45 (63)	24 (62)	21 (66)

Note. M = mean; SD = standard deviation

Means and standard deviations for study variables pre and post-intervention and at the 3 month follow-up

Table 3

Study Variables	MAPs group						Wait-list control group					
	Pre-intervention (n = 39)		Post-intervention (n = 35)		Follow-up (n = 31)		Pre-intervention (n = 32)		Post-intervention (n = 30)		Follow-up (n = 28)	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
CES-D	14.67 (8.19)	10.06 (7.06)	13.97 (9.14)	19.13 (11.63)	17.67 (11.35)	17.29 (11.7)	17.46 (6.80)	13.97 (6.71)	16.87 (6.47)	19.25 (6.65)	19.60 (7.17)	18.89 (8.94)
PSS	3.53 (.92)	3.14 (.88)	3.09(.77)	3.81 (.83)	3.52 (.74)	3.42 (1.07)	3.11 (.89)	3.53 (.69)	3.55 (.87)	2.84 (.76)	2.91 (.85)	2.99 (.88)
Rumination	123.89 (22.67)	136.26 (16.26)	137.19 (19.07)	118.84 (20.54)	122 (12.79)	120.93 (20.14)	Self-Kindness					
FFMQ												

Note. CES-D = Center for Epidemiologic Studies - Depression Scale; FFMQ = Five Facet Mindfulness Questionnaire; MAPs = Mindful Awareness Practices; PSS = Perceived Stress Scale. Follow-up was 3 months after the last MAPs class.

Table 4

Single and Multiple Mediator Analyses: Bootstrap Resampling Point Estimates and 95% Confidence Intervals for the Indirect (Mediated), Direct, and Total Effect at Post-Intervention and 3-Month Follow-up

Outcome	Single Mediator	Point Estimate (BS SE) [CI] ^a	a paths b(SE)	b paths b(SE)	Direct effect b(BS SE) [CI] ^a	Total effect b(BS SE) [CI] ^a
CESD Post	Rumination	-2.03 (1.14) CI [-5.05, -.31]	-.37(.16) p = .02	5.47 (1.65) p = .002	-3.27 (1.93) CI [-6.86, .86]	-5.30 (2.16) CI [-9.53, -.93]
	Self-Kindness	-4.45 (1.51) CI [-7.83, -1.93]	.56 (.15) p < .001	-7.94 (1.65) p < .001	-.59 (2.01) CI [-4.23, 3.58]	-5.04 (2.16) CI [-9.36, -.76]
	Mindfulness	-3.17 (1.43) CI [-6.58, -.82]	.37 (.08) p < .001	-8.6 (3.3) p = .01	-2.12 (2.35) CI [-6.62, 2.48]	-5.29 (2.17) CI [-9.68, -1.16]
PSS Post	Rumination	-1.08 (.82) CI [-3.55, .02]	-.37(.16) p = .02	2.88 (1.25) p = .02	-3.67 (1.56) CI [-6.66, -.62]	-4.75 (1.62) CI [-7.82, -1.52]
	Self-Kindness	-2.53 (1.2) CI [-5.37, -.62]	.58 (.14) p < .001	-4.34 (1.36) p = .002	-2.03 (1.90) CI [-5.61, 1.86]	-4.56 (1.75) CI [-7.96, -1.11]
	Mindfulness	-1.73 (1.23) CI [-4.36, .47]	.38 (.08) p < .001	-4.53 (2.61) p = .09	-2.87 (1.95) CI [-6.61, 1.02]	-4.6 (1.67) CI [-7.99, -1.42]
CESD Follow-up	Rumination	-1.09 (1.06) CI [-3.33, .5]		2.95 (1.98) p = .14	1.12 (2.64) CI [-4.08, 6.43]	.03(2.5) CI [-4.46, 5.46]
	Self-Kindness	-1.18 (1.51) CI [-4.68, 1.48]		-2.1 (2.25) p = .355	1.17 (2.49) CI [-3.83, 6.09]	-.01 (2.47) CI [-5.12, 4.63]
	Mindfulness	-1.52 (1.56) CI [-4.43, 1.73]		-4.13 (3.97) p = .3	1.66 (2.47) CI [-2.98, 6.83]	.14 (2.54) CI [-4.6, 5.24]
PSS Follow-up	Rumination	-0.73 (1.02) CI [-3.09, .94]		1.94 (1.64) p = .24	.44 (2.34) CI [-4.05, 5.13]	-.29 (2.15) CI [-4.46, 3.99]
	Self-Kindness	-2.05 (1.27) CI [-5.67, -.22]		-3.52 (1.81) p = .06	1.50 (2.39) CI [-3.13, 6.25]	-.56 (2.10) CI [-4.75, 3.55]
	Mindfulness	-2.64 (1.39) CI [-5.51, -.16]		-6.93 (3.2) p = .04	2.38 (2.36) CI [-2.11, 7.11]	-.26 (2.06) CI [-4.11, 4.04]
Outcome	Multiple Mediator	Point Estimate (BS SE) [CI] ^a				
CESD Post	Rumination	-1.16 (.97) CI [-3.06, .74]				
	Self-Kindness	-3.51 (1.48) CI [-6.41, -.61]				
	Mindfulness	-0.51 (1.36) CI [-3.17, 2.14]				
Total Indirect Effect		-5.18 (1.69) CI [-8.49, -1.87]				

Outcome	Single Mediator	Point Estimate (BS SE) [CI] ^a	a paths b(SE)	b paths b(SE)	Direct effect b(BS SE) [CI] ^a	Total effect b(BS SE) [CI] ^a
PSS Follow-up	Self-Kindness	-1.31 (1.32) CI [-3.9, 1.29]				
	Mindfulness	-2.25 (1.39) CI [-4.97, .46]				
	Total Indirect Effect	-3.56 (1.64) CI [-6.77, -.35]				

Note: Results are reported as unstandardized regression coefficients.

BS SE = Bootstrapped standard errors; CES-D = Center for Epidemiologic Studies - Depression Scale; CI = Confidence Interval; Follow-up = 3 months after the last class; Post = post intervention; PSS = Perceived Stress Scale.

^a Bootstrapped bias corrected 95% confidence intervals.