

Mindfulness-Based Relationship Enhancement

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Using a randomized wait-list controlled design, this study evaluated the effects of a novel intervention, mindfulness-based relationship enhancement, designed to enrich the relationships of relatively happy, nondistressed couples. Results suggested the intervention was efficacious in (a) favorably impacting couples' levels of relationship satisfaction, autonomy, relatedness, closeness, acceptance of one another, and relationship distress; (b) beneficially affecting individuals' optimism, spirituality, relaxation, and psychological distress; and (c) maintaining benefits at 3-month follow-up. Those who practiced mindfulness more had better outcomes, and within-person analyses of diary measures showed greater mindfulness practice on a given day was associated on several consecutive days with improved levels of relationship happiness, relationship stress, stress coping efficacy, and overall stress.

The field of intimate relationships, while largely characterized by a focus on distressed or at-risk couples, has long harbored a prominent precursor to the current positive psychology movement (Seligman & Csikszentmihalyi, 2000). Couples researchers have elucidated the origins of love and intimacy (e.g., Berscheid & Walster, 1978) and, more recently, have focused on the dynamics of well-functioning relationships (Wenzel & Harvey, 2001). Strengthening the relationships of even well-functioning couples may lead to

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important benefits, such as improvement in abilities to overcome life challenges and enhancements in parenting and child outcomes (Sayers, Kohn, & Heavey, 1998). However, there have been few if any controlled trials of interventions specifically aimed at enhancing the relationships of well-functioning couples. Although a few studies have combined distressed and nondistressed couples (e.g., Ross, Baker, & Guerney, 1985), nearly all clinical researchers have focused on developing effective therapies for distressed couples (e.g., Baucom, Hahlweg, & Kuschel, 2003; Greenberg & Johnson, 1988; Snyder & Wills, 1989) or early prevention interventions for premarital or at-risk couples (Guerney, 1977; Markman, Floyd, Stanley, & Storaasli, 1988).

The aim of the present randomized controlled study was to test the efficacy of a novel couples program, Mindfulness-Based Relationship Enhancement. Mindfulness meditation methods foster greater awareness, ease, and fresh discovery in all of life's experiences, with the ultimate purpose of enhancing access to innate resources of joy, compassion, and connectedness. "Mindfulness" has been described as the ability to remain focused on the reality of the present moment, accepting and opening to it, without getting caught up in elaborative thoughts or emotional reactions to situations (Kabat-Zinn, 1990). Mindfulness techniques are used to develop a perspective on thoughts and feelings that cultivates recognition of them as passing events in the mind, rather than identifying with them or treating them as necessarily accurate reflections of reality. By practicing the skills of moment-to-moment awareness, people seek to gain insight into patterns in their thoughts, feelings, and interactions with others, and to skillfully choose helpful responses rather than automatically reacting in habitual, overlearned ways (Teasdale et al., 2000). In recent years mindfulness has been applied efficaciously in several interventions. Applications of the Mindfulness-Based Stress Reduction program (Kabat-Zinn, 1982) have been empirically supported across a variety of nonclinical (e.g., Shapiro, Schwartz, & Bonner, 1998) and clinical populations (depression—Teasdale et al., 2000; cancer—Specia, Carlson, Goodey, & Angen, 2000; psoriasis—Kabat-Zinn et al., 1998). Promotion of a mindful perspective is also integral to Dialectical Behavior Therapy (Linehan, 1993) and Acceptance and Commitment Therapy (Bach & Hayes, 2002), albeit without training in mindfulness meditation *per se*.

For the present study, we adapted the Mindfulness-Based Stress Reduction program to enhance the relationships of nondistressed couples. Building on the notion that healthy individual functioning is important to successful marriages, current reviewers of the couples literature (e.g., Sayers et al., 1998) have advocated the development of programs aimed in part at boosting individual partners' stress coping skills. One application of a stress coping approach has demonstrated promising results in quasi-experimental studies (Bodenmann, Charvoz, Cina, & Widmer, 2001).

The theoretical foundation for testing a mindfulness approach to boosting partners' stress coping skills and enhancing their relationships was based on three salient aspects of this type of intervention, as follows: First, mindfulness

meditation, like other meditation techniques (Benson, Beary, & Carol, 1974), is likely to promote the well-known relaxation response, resulting in psychophysiological changes that are the opposite of those of stress-induced hyperarousal. Researchers have suggested that psychophysiological soothing techniques are likely to translate into a calmer approach to shared difficulties and challenges (Gottman, 1993). Second, in mindfulness a fundamental emphasis is placed on the acceptance of one's experiences without judgment. Through acceptance, participants often report an increase in the compassion they feel for themselves and greater empathy for others (Shapiro et al., 1998). Notably, theorists in the area of enhancement of healthy relationships endorse the importance of acceptance (Wenzel & Harvey, 2001), as do numerous marital therapy researchers (e.g., Christensen & Jacobson, 2000). Third, mindfulness appears to have wide generality in its effects. In keeping with the tenets of positive psychology, mindfulness is highlighted as a "way of being" in all of life experience, rather than a way to cope with specific troublesome aspects of life (Kabat-Zinn, 1990). This global approach of incorporating all experiences — whether enjoyable or difficult — into mindful, nonjudging awareness appears to be particularly applicable to optimal interpersonal functioning.

We hypothesized that the mindfulness condition would be superior to the wait-list condition on both summary and daily measures of relationship and individual functioning. Specifically, we hypothesized that those in the intervention would demonstrate benefits on (a) measures of relationship satisfaction, autonomy, relatedness, closeness, acceptance of partner, daily relationship happiness, and daily relationship stress, as well as on (b) measures of individual well-being including optimism, spirituality, individual relaxation, psychological distress, daily coping efficacy, and daily overall stress. Moreover, we tested whether mindfulness couples would demonstrate greater resilience to the impact of daily stress, and if day-to-day time spent in mindfulness practice would predict same-day or following-days' levels of relationship happiness, relationship stress, stress coping efficacy, and overall stress.

Method

Participants

The participants were 44 nondistressed heterosexual couples (22 intervention, 22 wait-list) recruited principally from employees and their partners at a major hospital via advertisements placed in employee newsletters and gathering places. To qualify for the investigation, a couple had to be married or cohabitating for at least 12 months, surpass relationship distress and psychological distress cutoff criteria (T score of 58 on the Global Distress Scale — Snyder, 1997; T score of 65 on the General Severity Index of the Brief Symptom Inventory — Derogatis & Melisaratos, 1983), and could not be practicing meditation or yoga exercises on a regular basis. The mean age of the participating women was 37 years ($SD = 10.9$, range 23 to 69) and of the men was

39 years ($SD = 12.4$, range 24 to 69). Both the women and men were mostly very well-educated (82% of women and 63% of men had done graduate-level studies), had at least one child, and all were Caucasian except for one African American woman. Thirty-seven couples were married, and 7 were cohabitating. The mean duration of their relationships was 11 years.

Overall Design and General Procedures

Structured screening interviews were held approximately 1 month before the beginning of intervention cycles. The program was described as a challenging opportunity to develop inner resources for growth and change. Interviewees were informed of immediate entry versus wait-list randomization procedures, and emphasis was placed on commitment to attend sessions and complete homework assignments during their assigned intervention. Participating couples were assigned to one of two conditions. The Mindfulness-Based Relationship Enhancement condition (6 to 8 couples per group), consisting of 8 weekly 150-minute group sessions plus a full-day retreat, provided training in mindfulness meditation methods. The wait-list control condition, in which couples tracked their daily stress levels at specific intervals, controlled for the effects of measurement reactivity in couples not currently receiving the intervention. After the completion of follow-up measures, wait-list couples were invited to participate in the intervention program; however, data from their participation in the program were not used in the study.

Measures

Summary measures were administered before and after the intervention and 3 months later, and daily measures were recorded for 2 preintervention weeks (baseline period, collected just prior to the intervention) and the final 3 weeks of the 8-week program (treatment period, collected immediately after the intervention ended). Summary measures were selected to tap two distinct (though related) outcome domains that the intervention might affect: relationship functioning (relationship satisfaction, autonomy, relatedness, closeness, acceptance of partner, and relationship distress) and individual well-being (optimism, spirituality, individual relaxation, and psychological distress). Diary measures also assessed these two domains (daily relationship satisfaction and relationship stress, and individual stress coping efficacy and overall stress).

Summary Relationship Measures

Quality of Marriage Index (QMI). The QMI (Norton, 1983) utilizes 6 Likert-type items to assess global relationship satisfaction (e.g., "We have a good relationship"). This measure has demonstrated high internal consistency (alpha coefficient for both women and men = .97) and excellent convergent and discriminant validity (Heyman, Sayers, & Bellack, 1994). Internal consistency in the current study was also good (α for women = .95, for men = .86). The QMI correlates very highly ($r = .85$ for women, $.87$ for men) with

the most commonly used measure of marital functioning, the 32-item Dyadic Adjustment Scale (DAS; Spanier, 1976), and has been deemed equivalent to the DAS for many purposes (Heyman et al., 1994). In this study formulas for deriving DAS scores from QMI scores were applied to facilitate comparisons with the many studies that have used the DAS.

Autonomy and Relatedness Inventory (ARI). The ARI (Schaefer & Burnett, 1987) is a 48-item self-report inventory with twelve scales assessing perceived partner behavior along major dimensions of independence/dependence and love/hostility. Scales of interest in the current investigation included the Relatedness Scale, assessing the extent to which each partner believes his or her partner contributes to a sense of the respondent's togetherness; and the Autonomy Scale, assessing the degree to which each partner believes his or her partner contributes to a sense of the respondent's independence within the relationship. Rankin-Esquer, Burnett, Baucom, and Epstein (1997) reported alpha coefficients for the Relatedness and Autonomy scales were good (Relatedness for females = .72, for males = .78; Autonomy for females = .70, males = .80). Reliability coefficients in the current study were good (Relatedness for females = .89, for males = .88; Autonomy for females = .85, males = .74). ARI scales have been demonstrated to have significant stability, as well as good predictive validity to measures of demoralization, across a 3-year period (Schaefer & Burnett, 1987).

Inclusion of Other in the Self Scale (IOS). The IOS (Aron, Aron, & Smolman, 1992) is a single-item pictorial instrument that measures interpersonal closeness. From a series of overlapping circles, respondents select the pair that best describes their relationship with an individual. The IOS has demonstrated test-retest reliability, discriminant validity, predictive validity for whether romantic relationships are intact 3 months later, and convergent validity with other measures of closeness (Aron et al., 1992) and also with marital satisfaction ($r = .62$ with DAS satisfaction subscale).

Acceptance of Partner Index (API). The API was devised for this study as an index of relational processes that were expected to change as a result of participation in the mindfulness intervention (i.e., perception of ability to accept difficult characteristics in the partner or relationship). This process was measured by two items (e.g., "Considering characteristics of your partner, or your relationship, which you find difficult to deal with, over the last 2 months [3 months at follow-up] how easy has it been for you to stop struggling and just allow such things to be?"), with responses indicated by marking 100-mm VAS scales. The alpha coefficients for API were good (for women .81, for men .87).

Global Distress Scale (GDS) From the Marital Satisfaction Inventory-Revised (MSI-R). The GDS (Snyder, 1997), a widely used scale of relationship distress in couples, contains 22 true/false items, with responses summarized into normalized *T*-scores in which higher scores reflect greater discontent with the relationship. Snyder (1997) has reported high internal consistency for the GDS (α for both women and men = .91), and provided data supporting

its criterion, discriminant, and construct validity. Internal reliability in the current study was good (α for women = .75, for men = .76). Analyses have validated use of the GDS with nonclinical samples (Snyder, 1997).

Summary Individual Measures of Psychological Well-Being

Revised Life Orientation Test (LOT-R). Dispositional optimism versus pessimism was assessed by the LOT-R (Scheier, Carver, & Bridges, 1994), a 6-item Likert scale (plus 4 fillers) that yields a continuous distribution of scores. The authors report a Cronbach's alpha of .78 (in the current study α = .81) and a 28-month test-retest reliability of .79 (Scheier et al., 1994).

Index of Core Spiritual Experiences (INSPIRIT). Spirituality was assessed by the 7-item INSPIRIT (Kass, Friedman, Leserman, Zuttermeister, & Benson, 1991) designed to assess core elements of spiritual experiences such as the perception of a highly internalized relationship between God and the person. The Cronbach alpha for this scale was reported as .90 (α = .85 was found in the present sample) and higher scores have been demonstrated to predict enhanced physical and psychological health (Kass et al., 1991).

Individual Relaxation Index (IRI). The IRI was devised for this study to assess each individual's perception of his or her ability to relax. This was measured by two items (e.g., "Over the past 2 months [3 months at follow-up], how easy has it been for you to wind down and relax at the end of the day?") marked on 100-mm VAS scales. The alpha coefficients for the IRI were good (for women .81, for men .76).

Brief Symptom Inventory (BSI). The BSI was used to assess psychological distress because of its brevity, sensitivity to change, and well-documented reliability and validity (Derogatis & Melisaratos, 1983). Each of its 53 items is rated on a 5-point Likert-type scale. The General Severity Index, a weighted frequency score based on the sum of the ratings of all items, was used as a measure of current distress. This index has a reported alpha of .85 (Derogatis & Melisaratos, 1983); in the current study, the coefficient was .89.

Daily Measures of Relationship Functioning and Individual Psychological Well-Being

Daily Diary. Participants completed a daily diary sheet as a global prospective measure of (a) relationship happiness, (b) relationship stress, (c) stress coping efficacy (perceptions that their coping efforts were successful; Aldwin & Revenson, 1987), and (d) overall stress. In training participants to complete the diaries, investigators clarified the meaning of the word "stress" in the diary items as referring to *subjective feelings of distress* related to the day's events, as distinguished from the number of stressful events. All four variables were indicated by marking 100-mm visual analogue scales (VAS), in which higher scores reflected greater amounts (e.g., for stress coping efficacy, the item read: "Please indicate how successful you were in coping with all types of stresses today by marking the line below," with anchors set as *not at all successful* and *extremely successful*). Similar VAS measures are extensively

used in clinical settings to measure subjective phenomena, and have been shown to be valid, reliable, rapid, and sensitive in measuring such variables as global affect, pain, and fatigue (e.g., Cella & Perry, 1986). For couples participating in the mindfulness intervention, diaries also asked participants how many minutes were spent in completing the day's formal mindfulness homework assignment.

Treatment Credibility

Prerandomization expectations regarding the intervention were measured by a credibility questionnaire completed by all study participants based on an overview of the program provided during the screenings. The measure was adapted from Borkovec and Nau's (1972) format, which has been frequently used for this purpose (e.g., Gil et al., 1996). The questionnaire asked subjects to rate, on 10-point Likert-type scales, how confident they were in the program, how logical the program seemed, how successful they thought it would be, how helpful the leaders would be, and whether they would recommend the program to a friend.

Intervention Description

A treatment manual was developed to specify the methods and techniques to be used in the intervention. The overall structure of the intervention bore some resemblance to standard cognitive-behavioral couples' programs (e.g., Prevention and Relationship Enhancement Program; Markman et al., 1988) in that sessions included such common elements as skills instruction, didactic presentations, couples exercises, group discussions, and relied strongly on homework assignments for skills development. However, the contents of each of these elements differed in important ways in the mindfulness program (e.g., continual development of a single generic skill, that of mindful attention, versus various domain-specific skills such as problem-solving strategies; didactic focus on stress reactivity versus sexual functioning). The intervention was directly modeled on Kabat-Zinn's mindfulness program in terms of format, teaching style, sequence of techniques, composition of topics, and homework assignments (for a complete description, see Kabat-Zinn, 1990, and Kabat-Zinn & Santorelli, 1999). Modifications were incorporated to meet needs specific to working with nondistressed couples to enhance their relationships. Interventions consisted of 8 weekly 2.5-hour evening meetings plus a single full-day (7-hour) Saturday retreat session. The average attendance rate at group sessions was 80% (range 61% to 100%). Couples were additionally assigned daily homework assignments.

Sessions. Table 1 provides a brief summary of intervention sessions. First, couples were presented with the rationale that mindfulness training allows them to gain access to important information about their mutual interactions and their thoughts, feelings, behaviors, and environment, thereby helping them to understand themselves, their relationship, the nature of any problems, and potential solutions. Participants were not encouraged to target any

TABLE 1
MAIN TOPICS OF INTERVENTION SESSIONS

Session 1	Welcome and guidelines, loving-kindness meditation with partner focus, brief personal introductions, introduction to mindfulness, body-scan meditation, homework assignments (body scan, and mindfulness of a shared activity)
Session 2	Body-scan meditation, group discussion of practices and homework, introduction to sitting meditation with awareness of breath, homework assignments (body scan plus sitting meditation, and pleasant events calendar including shared activities)
Session 3	Sitting meditation, group discussion of practices and homework with didactic focus on pleasant experiences, individual yoga, homework assignments (alternating body scan with yoga plus meditation, and unpleasant events calendar including shared events)
Session 4	Sitting meditation, group discussion of practices and homework with didactic focus on stress and coping, dyadic eye-gazing exercise and discussion, homework assignments (alternating body scan with yoga plus meditation, and stressful communications calendar including communications with partner)
Session 5	Sitting meditation, taking stock of program half over, group discussion of practices and homework with didactic focus on communication styles, dyadic communication exercise, homework assignments (alternating sitting meditation with yoga, and attention to broader areas of life [e.g., work] that impact relationship, exploration of options for responding with mindfulness under challenging conditions)
Session 6	Partner yoga, sitting meditation, group discussion of practices and homework with didactic focus on broader areas of life (e.g., work) that impact relationships, homework assignments (alternating sitting meditation with yoga, and attention to obstacles and aids to mindfulness)
Full Day Session	Multiple sitting meditations and walking meditations, individual and partner yoga, mindful movement and touch exercise, dyadic and group discussions
Session 7	Sitting meditation, group discussion of experiences during full day session, discussion of obstacles and aids to mindfulness, loving-kindness meditation, mindful touch exercise and discussion, homework assignments (self-directed practice)
Session 8	Partner yoga, sitting meditation, group discussion/review of program focusing on lessons learned, personal and relationship-related changes, and wrap-up

particular, specific set of behaviors for change as their primary goal. Rather, a nonstriving attitude was advocated as most helpful to enhancing their relationships and reducing stress. The program actively involved participants in learning and practicing a range of formal (body scan meditation, yoga exercises, and sitting meditation) and informal (e.g., mindfulness during routine activities) meditation-based methods. As in standard mindfulness programs, couples also were presented with didactic material on topics such as the impact

of stress on mental, physical, and relationship health. They participated in structured exercises based on these topics and discussions of their experiences of practicing mindfulness.

Home practice. Practice of the formal mindfulness techniques was guided by audiotapes (except during the final week, when participants transitioned to self-guided practice), and required a special time for each partner of about 30 to 45 minutes per day, 6 days per week. Informal mindfulness techniques to practice during the conduct of everyday living were also assigned each week. The details of certain informal mindfulness exercises were recorded daily by each partner on specialized forms (e.g., shared pleasant moments, challenging communications).

Couple-focused adaptations. Principal adaptations to the standard Kabat-Zinn protocol that were specifically targeted at enhancing couples' relationships included: (a) greater emphasis on loving-kindness meditations, with a particular focus on one's partner; (b) incorporation of partner versions of yoga exercises, in which partners physically supported and facilitated one another in the performance of therapeutic, often pleasurable postures; (c) mindful touch exercises, with each partner paying close attention to the giving and receiving of a gentle back rub, followed by dyadic discussion of the implications of this for sensual intimacy (i.e., sensate focus; Spence, 1997); (d) a dyadic eye-gazing exercise (adapted from S. Levine & Levine, 1995), with partners acknowledging and welcoming the deep-down goodness in one another; (e) application of mindfulness to both emotion-focused and problem-focused approaches to relationship difficulties; and (f) the context for practicing various mindfulness skills, both in-session and at home, was tailored to bring couples' relationships into focus (e.g., partners were encouraged to be more aware during *shared* pleasant activities, unpleasant activities, and stressful interactions, and to discuss and keep daily records about new understandings arising from such interactions). In addition, group discussion and didactic components provided opportunities to consider the impact of these exercises on relationship functioning.

Intervention Leaders' Training and Treatment Integrity

All intervention sessions were jointly led by a married couple composed of a clinical psychology doctoral student (J.W.C.) and a health educator (K.M.C.) who is a certified yoga instructor. Both intervention leaders had extensive experience practicing and teaching mindfulness, and had attended multiple seminars for health professionals directed by Kabat-Zinn which provided specific training in the conduct of mindfulness interventions. Sessions from this study were audiotaped, and a random selection was checked for treatment integrity as described by Waltz, Addis, Koerner, and Jacobson (1993). Leaders' adherence to the specific elements of the intervention (e.g., employing partner yoga exercises, assigning mindfulness home practice) was assessed by trained undergraduate honors students (100% interrater agreement was demonstrated across three sessions). Treatment competence (e.g., rapport

with group members, clear directive comments) was assessed by two licensed clinical psychologists acquainted with mindfulness interventions. Adherence raters judged that therapist behaviors adhered to protocols on 100% of rated items, and the mean competence rating was 4.93 out of a maximum of 5.00.

Results

Intervention outcomes were evaluated by two distinct sets of analyses. Standard regression models were employed for summary measures, and multi-level models were applied to daily diary measures. In all outcome tests, the fundamental unit of analyses was couple dyads.

Equivalency of Conditions

A series of regression and chi-square analyses determined that randomization procedures resulted in roughly equal groups at baseline, with no significant differences in means of dependent variables, demographic characteristics, or treatment credibility. Attrition from the two conditions was also equivalent, resulting in 22 in each condition. For couples in the treatment group, dropout was defined as those who requested to withdraw at any point during the intervention (7 of 29; further evaluations were not collected from these), or couples in whom either partner was not present in five or more sessions (none were dropped for this reason). For wait-list couples, dropout was defined as those who declined to complete further evaluations (6 of 28).

Analyses of differences between study completers and those who dropped out produced a significant main effect for number of children for treatment completion, $F(1, 55) = 4.35, p = .04$, which did not interact with gender. Those who dropped out were likely to have more children (for women, $M = 0.8$ for completers vs. $M = 1.5$ for dropouts; for men, $M = 0.9$ for completers vs. $M = 1.6$ for dropouts). Chi-square analyses by gender also revealed a significant difference in men for history of individual psychological therapy, $\chi^2(1, N = 57) = 5.21, p = .02$, with dropouts more likely to have been in individual therapy (77% of dropouts vs. 41% of completers).

Outcome analyses were based on data from study completers only. Prior to testing for treatment effects, another set of regression and chi-square analyses were performed to determine whether postrandomization attrition may have resulted in important group differences in pretreatment means of dependent variables, demographic characteristics, or treatment credibility. However, no significant differences were found. Pre-, post-, and follow-up means for all measures are displayed in Tables 2 and 3.

Treatment Effects on Summary Measures

Separate $2 \times 3 \times 2$ (Treatment Condition by Time by Gender) multivariate analyses of variance (MANOVAs) with repeated measures were used to conduct comparisons between the mindfulness and wait-list conditions on pre-,

TABLE 2
 MEANS AND STANDARD DEVIATIONS OF MALE STUDY COMPLETERS ON RELATIONSHIP AND INDIVIDUAL SUMMARY MEASURES

Variable	Intervention Men (n = 22)						Control Men (n = 22)					
	Pre		Post		Follow-Up		Pre		Post		Follow-Up	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Relationship satisfaction (QMI)	37.09	4.92	39.70	3.51	39.59	4.15	36.39	5.63	36.05	6.54	36.11	6.38
Autonomy (ARI)	15.14	2.77	16.05	2.36	16.32	1.89	15.14	2.42	14.73	3.31	14.25	3.19
Relatedness (ARI)	16.73	2.16	17.55	1.74	17.41	1.62	16.14	2.36	15.59	2.75	15.30	2.58
Closeness (IOS)	4.77	1.38	5.14	1.08	5.05	1.29	5.18	1.05	4.91	1.34	4.95	1.47
Acceptance of partner (API)	73.15	17.23	80.13	14.67	79.15	14.26	74.13	17.77	67.61	19.58	70.32	18.57
Relationship distress (GDS)	50.05	7.59	48.86	6.64	49.00	6.29	49.73	8.00	50.41	7.32	50.95	8.20
Optimism (LOT)	17.23	3.26	18.82	2.94	18.53	3.04	16.73	3.95	17.32	4.62	16.56	5.03
Spirituality (INSPIRIT)	2.20	0.62	2.45	0.70	2.40	0.74	2.38	0.53	2.36	0.55	2.39	0.58
Individual relaxation (IRI)	58.72	29.97	71.22	27.20	72.38	22.15	58.65	22.47	60.13	21.86	53.90	25.02
Psychological distress (BSI)	0.20	0.13	0.14	0.10	0.15	0.08	0.23	0.15	0.25	0.16	0.29	0.18
Treatment credibility	8.54	1.07	—	—	—	—	8.09	0.98	—	—	—	—

TABLE 3
MEANS AND STANDARD DEVIATIONS OF FEMALE STUDY COMPLETERS ON RELATIONSHIP AND INDIVIDUAL SUMMARY MEASURES

Variable	Intervention Women (n = 22)						Control Women (n = 22)					
	Pre		Post		Follow-Up		Pre		Post		Follow-Up	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Relationship satisfaction (QMI)	39.05	6.00	41.43	3.66	41.39	3.69	38.59	5.82	38.05	6.74	37.94	6.29
Autonomy (ARI)	16.91	3.01	17.91	2.29	17.73	2.03	17.00	2.00	16.68	1.89	15.90	2.93
Relatedness (ARI)	16.23	2.91	17.18	1.87	17.27	2.00	16.59	2.52	16.18	2.58	15.29	3.27
Closeness (IOS)	4.50	1.34	4.91	0.97	4.95	1.13	4.77	1.02	4.77	0.97	4.62	1.28
Acceptance of partner (API)	64.77	23.68	75.11	16.68	76.59	19.36	67.61	20.64	68.59	19.60	70.90	18.26
Relationship distress (GDS)	48.32	7.38	46.77	6.44	46.91	6.46	49.18	6.55	49.73	6.50	50.57	7.24
Optimism (LOT)	18.18	2.75	19.68	1.99	19.30	1.81	17.45	3.98	17.23	4.73	17.08	4.64
Spirituality (INSPIRIT)	2.39	0.66	2.57	0.74	2.54	0.69	2.35	0.52	2.30	0.57	2.28	0.58
Individual relaxation (IRI)	55.40	22.04	65.88	16.54	70.25	20.58	57.06	28.85	51.97	23.36	53.71	27.54
Psychological distress (BSI)	0.27	0.19	0.18	0.11	0.19	0.10	0.27	0.16	0.32	0.17	0.31	0.25
Treatment credibility	8.58	1.17	—	—	—	—	8.55	1.34	—	—	—	—

post-, and follow-up summary measures of (a) relationship functioning and (b) individual psychological well-being. The interdependency of male and female scores was handled by treating gender as a repeated within-subjects factor (Markman et al., 1988). When MANOVAs were significant, univariate $2 \times 3 \times 2$ analyses of variance were then employed to reveal the locus of effects. Also, to determine whether preintervention treatment credibility scores may need to be controlled, post-hoc multivariate regression tests were conducted within the treatment group only to discover whether credibility was predictive of improvements (pre-to-post residualized scores; Baucom, Sayers, & Sher, 1990). However, these treatment credibility tests were nonsignificant.

Relationship Outcomes

Results of the multivariate test indicated a significant Treatment \times Time interaction, $F(12, 29) = 2.11, p = .050$. Neither treatment, $F(6, 35) = 1.40, p = .242$, nor time, $F(12, 29) = 1.24, p = .303$, was significant. Gender showed a significant effect, $F(6, 35) = 7.88, p < .001$, which did not interact with treatment, $F(6, 35) = 0.62, p = .712$, or time, $F(12, 29) = 0.58, p = .838$. Because only the significant Treatment \times Time interaction was highly pertinent to our hypotheses, and gender did not interact with treatment in any subsequent test, the following univariate reports focus exclusively on Treatment \times Time interactions.

Pre-to-post univariate tests revealed significantly superior scores in mindfulness couples on measures of relationship satisfaction (QMI; $F[1, 42] = 12.11, p < .001$), autonomy (ARI; $F[1, 42] = 11.80, p < .001$), relatedness (ARI; $F[1, 42] = 16.62, p < .001$), closeness (IOS; $F[1, 42] = 5.48, p = .024$), acceptance of partner (API; $F[1, 42] = 6.25, p = .016$), and relationship distress (GDS; $F[1, 42] = 4.95, p = .031$). A supplementary test showed the mindfulness treatment was also significantly superior to the wait-list treatment at posttest in terms of estimated DAS relationship satisfaction scores derived from QMI scores, $F(1, 42) = 12.11, p < .001$. Univariate analyses conducted to test for significant changes between posttest and 3 months follow-up were nonsignificant, indicating that posttreatment effects were generally maintained at follow-up.

Individual Outcomes

The MANOVA of effects of the intervention on individual summary outcomes also demonstrated a significant Treatment \times Time interaction, $F(8, 33) = 3.04, p = .011$, suggesting that any significant main effects needed to be interpreted with that in mind. Treatment showed a trend toward significance, $F(4, 37) = 2.25, p = .083$, and time was significant, $F(8, 33) = 3.01, p = .012$. Gender was not significant as a main effect, $F(4, 37) = 0.56, p = .692$, nor when interacting with treatment, $F(4, 37) = 0.58, p = .555$, or time, $F(8, 33) = 0.74, p = .656$. Because the effects of time and treatment were of no interest given the significant multivariate interaction, and gender did not

interact with treatment in subsequent tests, the reports on univariate tests below focus exclusively on Treatment \times Time effects.

Univariate pre-to-post tests showed significantly superior outcomes in the mindfulness condition for optimism (LOT-R; $F[1, 42] = 5.82, p = .020$), spirituality (INSPIRIT; $F[1, 42] = 10.12, p = .003$), individual relaxation (IRI; $F[1, 42] = 5.41, p = .025$), and psychological distress (BSI; $F[1, 42] = 20.46, p < .001$). Univariate analyses were conducted to test for significant changes between posttest and 3 months follow-up. Again, all were nonsignificant, suggesting that posttreatment effects were generally maintained at follow-up.

Daily Diary Analyses

Diary Completion Rates

Daily diary measures were completed for 2 weeks before the intervention (baseline period), and again during the final 3 weeks of the intervention (treatment period). The diary completion rate was 97% (2,985 of 3,080 potentially reportable days across 88 participants, range 69% to 100%). Analyses revealed that individual completion rates were significantly related to participants' relationship status. Married partners were somewhat more likely to complete their diaries, $F(1, 86) = 8.47, p = .005$, although the mean difference was small (married $M = 98\%$ vs. cohabitating $M = 92\%$).

Treatment Effects on Diary Variables

Model. Multilevel models integrate data from multiple levels of sampling, such as this study's two levels (within-couples level, including variables such as daily recordings of relationship happiness; and between-couples level, including variables such as treatment condition). To examine treatment effects on diary variables, multilevel regression was used to test whether the average levels of these variables were significantly different in the two groups as they progressed from the baseline to the treatment period (Affleck, Zautra, Tennen, & Armeli, 1999; G. Affleck, personal communication, October 25, 2002). As recommended by Barnett, Raudenbush, Brennan, Pleck, and Marshall (1995), the interdependency of male and female scores in these models was handled by treating gender as a repeated within-couples factor. That is, the data involved a pair of parallel scores (e.g., relationship happiness) for each couple at each of the two diary periods. Thus, a couple with complete data had 4 observations: 1 for each partner for each diary period.

The within-couple predictors in these models were therefore diary period (baseline vs. treatment periods) and gender (and their interaction if significant). The sole between-couples predictor was treatment condition, along with its interactions with within-couples variables. Couples' intercepts were allowed to vary freely (i.e., random effects components; Singer, 1999). Tests for autocorrelation were performed, but all results indicated that autocorrelation was

TABLE 4
MULTILEVEL RANDOM EFFECTS ESTIMATES FOR DIARY OUTCOMES

Predictor	<i>b</i>	<i>t</i>	<i>p</i>
Daily relationship happiness			
Intercept	74.6639	23.92	<.0001***
Diary period	-2.1654	-2.45	.0160*
Treatment	4.8662	1.10	.2768
Gender	-0.9989	-1.63	.1076
Treatment × Diary Period	6.9909	5.59	<.0001***
Daily relationship stress			
Intercept	24.6637	8.66	<.0001***
Diary period	1.3864	1.41	.1613
Treatment	-1.9615	-0.49	.6289
Gender	1.5358	2.24	.0273*
Treatment × Diary Period	-4.7541	-3.41	.0010***
Daily stress coping efficacy			
Intercept	70.5044	31.11	<.0001***
Diary period	-0.2529	-0.25	.8057
Treatment	-0.3549	-0.11	.9123
Gender	-3.0064	-4.21	<.0001***
Treatment × Diary Period	5.2001	3.57	.0006***
Daily overall stress			
Intercept	37.1242	14.94	<.0001***
Diary period	2.0586	1.67	.0975
Treatment	0.8621	0.25	.8074
Gender	2.8381	3.31	.0014**
Treatment × Diary Period	-3.5098	-2.01	.0474*

* $p < .05$; ** $p < .01$; *** $p < .001$. Refer to Appendix for a detailed description of models tested.

not significantly present.¹ The Appendix provides a more complete description of the linear equations that were tested. All multilevel analyses were generated using PROC MIXED in SAS (SAS Institute, 1996).

Results. Table 4 presents outcomes for the diary variables. Significant Treatment × Diary Period interactions demonstrated linear effects of greater

¹ As recommended by Singer (1999), alternative unconditional models for each variable were constructed to compare continuous-time autoregressive within-person residual structures versus the less complicated default assumption of compound symmetric within-person residuals. Values of goodness-of-fit statistics produced by these tests suggested that for all diary variables, compound symmetry provided a far better model of the within-person residuals. Any additional concern about this issue was allayed by Singer's (1999) statement that even in data sets that initially demonstrate autocorrelation, autoregressive correction functions are typically not needed after important relevant fixed and random effects are entered into the regression analyses.

improvements in the mindfulness versus the control group for both relationship variables (relationship happiness, relationship stress) and individual variables (stress coping efficacy, overall stress).

Process Relationships of Impact of Daily Stress

Model. To examine treatment effects on the day-to-day impact of relationship stress and overall stress on other diary variables, a series of multilevel analyses were planned to test for differential changes across days (baseline through treatment) in same-day associations between these stress variables and (a) daily relationship happiness, and also (b) daily stress coping efficacy. Both intra-individual (own relationship stress, own overall stress), and intra-couple variables (partner's relationship stress, partner's overall stress) were a potential focus of analyses. To control for Type I error and also potential redundancy between the various stress predictors, as recommended by Bryk and Raudenbush (1992), an omnibus multivariate test was first performed for each of the two outcomes. In these models, daily observations were nested within couples, with gender treated as a repeated within-couples factor. Thus, the analyses integrated female and male pairs of parallel scores for each couple on each day of diary collection, such that a couple with complete data had 70 observations: 1 for each partner for each diary day across 2 preintervention weeks (14 days) and the final 3 weeks of the treatment period (21 days). Within-couple predictors included time (day-to-day linear effect — no quadratic effect was found), gender, stress (relationship or overall, for self or partner), and all potential two-way interactions. Treatment condition was the principal between-couples predictor; also, the individual mean levels of relevant stress variables were included as control variables. Treatment condition was additionally combined in all potential interaction terms with within-couple predictors. Final models were gradually derived by dropping nonsignificant interaction terms (those indicating a trend toward significance, $p \leq .10$, were retained). To control for potentially spurious within-person associations, all stress predictors were person-centered (Affleck et al., 1999; Barnett et al., 1995).

Results. While controlling for other predictors,² the omnibus test for stress coping efficacy showed independent relationships to exist with own relationship stress ($b = -0.2598$, $t = -6.58$, $p < .0001$), own overall stress ($b = -0.4426$, $t = -14.23$, $p < .0001$), and partner's relationship stress ($b = -0.1115$, $t = -3.00$, $p = .0027$). Post-hoc univariate tests on these relationships were then performed using the same additional predictors (time, condition, gender, mean of stress variable), along with significant interactions (as indicated above, nonsignificant interaction terms were dropped step by step), with intercepts and stress slopes treated as random effects. Two models with

² Because of our focal interest in the significant interactions between stress variables, in the interest of brevity only these results are reported. Please contact the first author for a comprehensive report of these outcomes.

significant Time \times Treatment \times Stress interactions revealed that in mindfulness couples, stress coping efficacy showed a progressively decreasing association across time with levels of (a) own relationship stress ($b = 0.0022, t = 2.02, p = .0432$), and (b) own overall stress ($b = 0.0024, t = 2.91, p = .0036$). These findings indicate a process by which daily stress coping efficacy became increasingly resilient to, or less reactive to, the impact of daily stress factors.

Process Relationships Between Daily Mindfulness Practice and Daily Outcomes

Practice rates. Within the mindfulness condition, treatment period diaries included a report of the number of minutes participants had spent doing their formal mindfulness homework assignments. Out of 924 potentially reportable treatment period days, mindfulness participants completed diaries on 868 days (94% overall, range 62% to 100%), and on 631 of these days participants reported spending some time practicing their mindfulness skills (73% overall, range 10% to 100%). During this period, on average participants reported practicing their mindfulness homework for 32 minutes per day (range 10 to 51). Mean practice rates were significantly related to duration of relationship, $F(1, 42) = 5.59, p = .023$, such that the longer the relationship, the more partners practiced.

Model. Analyses examined whether minutes spent in formal mindfulness exercises were predictive of same-day daily outcomes variables (relationship satisfaction, relationship stress, stress coping efficacy, and overall stress). Also, to clarify whether increases in mindfulness practice preceded and may have had a causative influence on day-to-day fluctuations in these variables, tests were conducted for lags of 1, 2, and 3 days' practice. Daily observations were again nested within couples in these models, with gender treated as a repeated within-couples factor, such that a couple with complete data had 70 observations (1 for each partner for each of the 35 days of diary recordings). Mindfulness practice and gender were the within-couple predictors in these models, with mean levels of practice as between-couples control variables. In lagged models, the lagged day's level of the dependent variable was also included as a within-couples control variable. Intercepts and mindfulness practice slopes were treated as random effects. Practice rates were person-centered to control for potentially spurious within-person associations.

Results. All same-day tests indicated significant associations with mindfulness practice in the expected directions; that is, greater practice was associated with increased relationship happiness ($b = 0.0612, t = 4.23, p < .0001$), decreased relationship stress ($b = -0.0644, t = -5.64, p < .0001$), increased stress coping efficacy ($b = 0.0655, t = 4.67, p < .0001$), and decreased overall stress ($b = -0.0915, t = -4.70, p < .0001$). Lagged results showed that increased mindfulness practice was also significantly predictive of improved levels on several consecutive days of relationship happiness (for following day, $b = 0.0400, t = 2.84, p = .0045$; for 2nd day, $b = 0.0417,$

$t = 2.85, p = .0043$), relationship stress (for following day, $b = -0.0511, t = -3.55, p = .0004$; for 2nd day, $b = -0.0377, t = -2.71, p = .0058$), and stress coping efficacy (for following day, $b = 0.0300, t = 1.94, p = .0500$; for 2nd day, $b = 0.0485, t = 3.05, p = .0023$; for 3rd day, $b = 0.0498, t = 3.04, p = .0024$). For overall stress there was a marginally significant improvement on the third day ($b = -0.0302, t = -1.74, p = .0823$).

Mean Mindfulness Practice Rates' Relationship to Summary Outcomes

Post-hoc regression tests were performed on data from the treatment group only to determine whether mean mindfulness practice rates (derived from diaries) were predictive of summary outcomes that had evidenced significant posttest between-group differences. Averaged residualized couple scores were the dependent variables in these tests. Results indicated mean mindfulness practice rates predicted improvements for the majority of outcomes, including autonomy ($b = 0.051, p = .032$), acceptance of partner ($b = 0.656, p = .010$), spirituality ($b = 0.018, p = .008$), individual relaxation ($b = 0.749, p = .035$), psychological distress ($b = -0.042, p = .002$), with a trend toward significance for optimism ($b = 0.075, p = .066$).

Discussion

The results of this study provide empirical support for a mindfulness-based relationship enhancement program designed for relatively happy, nondistressed couples. Mindfulness was efficacious in enriching current relationship functioning and improving individual psychological well-being across a wide range of measures. Because the probability of encountering ceiling effects is high when intervening with relatively happy couples (Christensen & Heavey, 1999), these findings are very encouraging. The findings also lend support to those who have advocated couples programs designed to boost individual partners' stress coping skills (Bodenmann et al., 2001). Furthermore, we found empirical support for the rationale of adopting a mindful approach to enhancing stress coping skills and relational functioning in that process of change measures showed improvements in individual relaxation, acceptance of partner, confidence in ability to cope, and overall functioning across a range of domains.

The mean posttest effect size across all relationship measures in this study was 0.50. Because of the absence of studies aimed at strengthening relationships in relatively well-functioning couples, it is difficult to compare the results of this study with others. Nonetheless, this effect size compares favorably to Giblin, Sprenkle, and Sheehan's (1985) finding of an average 0.35 effect size for self-report instruments in prevention studies, and Hahlweg and Markman's (1988) meta-analysis finding of 0.52 for prevention studies. Moreover, since most prevention studies have not actually demonstrated enhancing effects, but rather, have helped to stave off deterioration of relationship

functioning, the mean effect size of 0.54 for relationship quality improvements in the present study is noteworthy. Regarding individual well-being outcomes, the average effect size in this study was 0.59, which is similar to Speca et al.'s (2000) average effect size of 0.54 for mindfulness with cancer patients.

A novel feature of the present investigation relative to previous couples intervention studies was its focus on participants' adherence to intervention skills. Results were encouraging, showing that most couples applied themselves well to the daily practice of mindfulness exercises (average of 32 minutes per day), and a clear dose/response relationship was observed. Future studies can seek to determine minimum amounts of effective mindfulness practice, and also focus on bolstering adherence in those who practice less.

Beyond demonstrating the effects of the mindfulness intervention, this study's application of multilevel modeling makes a singular contribution to the wider body of couples research. The present multilevel results showed mindfulness brought about significant improvements in day-to-day relationship happiness, relationship stress, stress coping efficacy, and overall stress. Importantly, these findings were obtained by first calculating estimates for each couple in the sample, and then aggregating them to derive reliable results for the average couple — thus avoiding the problem of overlooking the impact of couple differences, as in standard regression approaches. Moreover, the advantages offered by this statistical approach were particularly well suited for the analysis of real-time processes in participants. We found that over the course of the intervention, couples' confidence in their ability to cope with stress became increasingly resilient to the effects of day-to-day stress. Furthermore, the tangible day-to-day influence of mindfulness was highlighted by the finding that greater mindfulness practice on a given day was associated, on the same day and for several consecutive days, with improved levels of relationship happiness, relationship stress, stress coping efficacy, and overall stress. Future studies could profit from using daily data collection to examine hypothesized therapeutic processes (e.g., relaxation, acceptance), as well as how partners' attitudes and behaviors interactively affect one another (e.g., would same-day or next-day relationship happiness become more resilient to the negative effects of arguments).

Several limitations of the present study should be noted. First, although the 3-month follow-up results offer encouragement, longer-term follow-up would be needed to examine the durability of enhancement changes. Limits also come from the fact that, like most research with couples, this study's sample was almost entirely White, well-educated, middle-class, and entirely heterosexual. Caution is in order therefore in generalizing these results to diverse populations. Additional limitations to our conclusions come from lack of control for nonspecific factors (e.g., attention from an intervention provider), the utilization of only one team of intervention leaders, reliance on self-report data, and diary collection methods (e.g., diaries are more reliable when date stamps can be confirmed; Gil, Carson, Sedway, & Porter, 2000). These issues can only be

addressed by future attention-placebo or alternative-treatment investigations which employ more diverse samples, multiple treatment teams, additional measures (observational, psychophysiological, and even physiological) and improved diary collection procedures. Future studies also can test more refined hypotheses of how mindfulness operates, analyze predictors of treatment outcome, and determine whether modifications might be called for to suit the needs of particular types of couples. For example, considering that attrition in this study was related to number of children, strategies to accommodate children's needs could make the program more accessible to parents.

In conclusion, future studies might target couples dealing with specific stressors. Mindfulness could potentially be combined with parenting skills training (Kabat-Zinn & Kabat-Zinn, 1997), or be revised for couples undergoing infertility counseling (Stanton & Burns, 1999) or those adapting to a major illness in one of the partners (Halford, Scott, & Smyth, 2000). Finally, given that the methods of Mindfulness-Based Relationship Enhancement are largely derived from the Buddhism and yoga meditation traditions (Kabat-Zinn, 1982), further efforts are needed to transpose the wealth of information these Asian psychologies contain about methods for transforming ordinary living into a richer, more mature happiness (M. Levine, 2000).

Appendix

In a recent methodological paper, Affleck et al. (1999) suggested that researchers reporting multilevel results make available descriptions of the linear equations that were tested, one for each level of analysis. Using the test of treatment effects on relationship happiness as an example, the following paragraphs describe the two levels employed in these models. Table 4 presents the results for the model's fixed effects after nonsignificant interaction terms were dropped. To obtain linear equations for the other multilevel results reported in this article, please write to the first author.

Level 1 within-couples model. Variation within couples arises due to temporal variation within each partner, gender differences, and Gender \times Time interactions. The Level 1 model was formulated as

$$Y_{it} = \beta_{0i} + \beta_{1i}(\text{diary period})_{it} + \beta_{2i}(\text{gender})_{it} + r_{it}, \quad (1)$$

where Y_{it} is the observed outcome (relationship happiness) t for couple i , with $t = 1, 2$ outcomes per couple and $i = 1, \dots, 44$ couples; β_{0i} is the average daily relationship happiness for couple i across the study's two diary periods; $(\text{diary period})_{it}$ is a linear time contrast coded 0 for the baseline diary period and 1 for the treatment diary period, and β_{1i} is therefore the linear rate of change in relationship happiness across the two partners in couple i ; $(\text{gender})_{it}$ is coded .5 for women and $-.5$ for men, so that β_{2i} is a couple's mean relationship happiness difference between female and male partners averaged across the two diary periods; and the final term, r_{it} , is the residual component of relationship happiness associated with couple i during diary period t , and is

assumed to be a normally distributed random variable with a mean of 0 and a constant variance. An interaction between diary period and gender, if significant, could be included as an additional within-couples term.

Level 2 between-couples model. Estimates of β_{0i} , β_{1i} , and β_{2i} were obtained for each couple in the sample. These estimates then became the dependent variables at Level 2, which expressed each of these effects as a function of a mean value across all couples, plus the effect of the Level 2 predictor, plus a deviation score corresponding to random residual variation in couple i . The Level 2 model was expressed as

$$\begin{aligned}\beta_{0i} &= \gamma_{00} + \gamma_{01}(\textit{treatment}) + \mu_{0i}, \\ \beta_{1i} &= \gamma_{10} + \gamma_{11}(\textit{treatment}) + \mu_{1i}, \\ \beta_{2i} &= \gamma_{20} + \gamma_{21}(\textit{treatment}) + \mu_{2i},\end{aligned}\quad (2)$$

where the randomly varying effect of β_{0i} is represented as a combination of γ_{00} , an overall mean value for relationship happiness across couples; plus γ_{01} representing the effect of treatment condition on couples' average level of relationship happiness, with (*treatment*) coded as 0 for wait-list couples and 1 for mindfulness couples; plus μ_{0i} , representing couple i 's residual deviation from the overall mean for relationship happiness. β_{1i} is represented as a sum of γ_{10} , the mean linear rate of change in relationship happiness across all couples; plus γ_{11} , the interactive effect of (*treatment*) on the mean linear rate of change in relationship happiness; and μ_{1i} , couple i 's deviation from the overall mean for linear change in relationship happiness. Finally, β_{2i} is the sum of γ_{20} , the mean difference in relationship happiness between female and male partners across the sample; together with γ_{21} , the interactive effect of (*treatment*) on this mean difference between females and males; plus μ_{2i} , the deviation score for couple i relative to the sample's mean difference in partners' relationship happiness.

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