
An Empirical Study of the Mechanisms of Mindfulness in a Mindfulness-Based Stress Reduction Program



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S. L. Shapiro and colleagues (2006) have described a testable theory of the mechanisms of mindfulness and how it affects positive change. They describe a model in which mindfulness training leads to a fundamental change in relationship to experience (reperceiving), which leads to changes in self-regulation, values clarification, cognitive and behavioral flexibility, and exposure. These four variables, in turn, result in salutogenic outcomes. Analyses of responses from participants in a mindfulness-based stress-reduction program did not support the mediating effect of changes in reperceiving on the relationship of mindfulness with those four variables. However, when mindfulness and reperceiving scores were combined, partial support was found for the mediating effect of the four variables on measures of psychological distress. Issues arising in attempts to test the proposed theory are discussed, including the description of the model variables and the challenges to their assessment. © 2009 Wiley Periodicals, Inc. *J Clin Psychol* 65: 613–626, 2009.

Keywords: mindfulness; mindfulness-based stress reduction

Mindfulness practice originated in Buddhist traditions where it occupies a central place in a system designed to lead to the cessation of mental suffering (Thera, 1992). In that

The authors are grateful for the support of the staff and instructors of the University of Massachusetts Medical School, Center for Mindfulness in this study.

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context, mindfulness is a way of employing attention to afford the practitioner insight into the impermanent nature of the personal self. Insight is posited to occur through the recognition of conditioned chains of mental processes and the attendant woes that follow from these. Mindfulness was introduced into secular therapeutic settings through the pioneering work of Kabat-Zinn (Kabat-Zinn, 1982, 1990) who developed mindfulness-based stress reduction (MBSR), and Linehan (1993), who developed dialectical behavior therapy for borderline personality disorder. More recently developed interventions including mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002) and acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999) also rely heavily on the integration of mindfulness skills. Although reviews of mindfulness-based programs have supported their efficacy in enhancing well-being and improving symptoms in a number of disorders, the psychological mechanisms of action and the Western psychological constructs that may be related to mindfulness and its clinical effects have not been clearly explicated.

S. L. Shapiro, Carlson, Astin, and Freedman (2006) have presented an interesting model of the mechanisms by which mindfulness training may have its effects on well-being. The model is based on a definition established by Kabat-Zinn (1994), which posits that mindfulness arises from the simultaneous cultivation of three components: (a) clear intention as to why one is practicing, such as for self-regulation, self-exploration, or self-liberation; (b) an attention characterized by the observation of one's moment-to-moment experience without interpretation, elaboration, or analysis; and (c) a quality of attending characterized by an attitude of acceptance, kindness, compassion, openness, patience, nonstriving, equanimity, curiosity, and nonevaluation. S. L. Shapiro et al. posit that mindfulness cultivated in this way facilitates a fundamental shift in perspective they call *reperceiving*. Reperceiving is described as a change in relation to perceived experience and appears to be similar to or synonymous with terms such as *decentering*, *defusion*, and *distancing*. These terms are widely used in the recent literature on mindfulness-based treatments and refer to an ability to observe one's thoughts and feelings as temporary events in the mind not necessitating particular responses, rather than as reflections of the self that are necessarily true or important (Fresco, Segal, Buis, & Kennedy, 2007; Hayes et al., 1999). S. L. Shapiro et al. (2006) describe reperceiving as a metamechanism of change that results in greater clarity, objectivity, and equanimity and facilitates additional direct mechanisms such as self-regulation, values clarification, cognitive and emotional flexibility, and exposure. These latter may be outcomes in themselves, or, in turn, contribute to or become mechanisms for other outcomes such as symptom reduction.

Mindfulness-based stress reduction (MBSR) is one of the most widely known clinical programs designed to give instruction and experience in mindfulness practice, as well as guidance and suggestion in integrating mindfulness into everyday life to facilitate increased well-being and reductions in psychological distress. Reviews (R. A. Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004; Salmon et al., 2004) have shown that participation in the MBSR program is associated with reductions in a number of measures of psychological distress and reported medical symptoms. A recent study of MBSR participants found that time spent formally practicing mindfulness predicted increases in the self-reported tendency to be mindful in daily life, which, in turn, mediated reductions in stress and improvements in psychological functioning (Carmody & Baer, 2008).

Changes related to participation in MBSR afford an opportunity to examine empirically elements of Shapiro and colleagues' posited model. The present study tested several of the associations predicted by their model. Study participants were

adults with stress-related problems who completed a packet of self-report measures before and following participation in a 7-week (eight-session) MBSR program. If the model is valid, then changes in mindfulness should predict changes in self-regulation, values clarification, cognitive and behavioral flexibility, and exposure. Further, these changes should be mediated by changes in re-perceiving or decentering.

Method

Participants

Participants were adults enrolled in 17 MBSR classes at the University of Massachusetts Medical School's Center for Mindfulness between September 2006 and July 2007. Participants reported a wide range of problems including illness-related stress, chronic pain, anxiety, and personal and employment-related stress. Class leaders were MBSR instructors certified through the Center for Mindfulness MBSR teacher certification program. Each class included approximately 20–25 participants of whom about half were referred by their health care practitioner and half were self-referred. Participation in the program was on a self-pay basis. All program participants were asked on the intake questionnaire whether their self-report responses could be used for research purposes, on the condition that they were not identified as individuals. Three-hundred twenty (68%) of the 473 who enrolled in the program consented to the use of their data and the 309 (97%) of those consenting who provided data at both pre- and post-MBSR were included in analyses. Of these 309, 278 (90%) attended six or more of the eight weekly sessions, whereas 7 participants attended five sessions or fewer. The all-day session in Week 6 was attended by 260 (84%) of these participants. Attendance data for 24 participants were unavailable.

The mean age of the sample was 49.50 years ($SD = 11.36$, range = 19–77) and 68% were women. Most were married (60%) or cohabitating (7%), whereas 16% were single; 14% were separated, divorced, or widowed; and 3% did not answer this question. Most participants reported white collar and professional occupations. Differences between the participants who failed to provide both pre- and posttreatment data ($N = 11$) and the rest of the sample ($N = 309$) were examined using one-way analysis of variance and chi-square analyses. No significant differences were found for demographic variables (age, gender, marital status) or for any of the dependent variables as measured at either pre- or posttreatment. However, because the subgroup with incomplete data is so small, these analyses may have had insufficient power to detect differences. Visual inspection suggested that those with only pre-MBSR data ($N = 6$) may have had slightly lower perceived stress levels than those with complete data, whereas those with only post-MBSR data ($N = 5$) may have had slightly more medical symptoms. On balance, however, the 309 participants included in analyses appear to be representative of the slightly larger group that consented to participate.

Procedures

Participants completed baseline questionnaires immediately prior to preprogram orientation sessions held during the 3 weeks prior to the beginning of each group. The MBSR program consisted of eight weekly classes of 2-1/2 hours each, with an all-day class held on a weekend day during the sixth week. Postprogram questionnaires were completed during the last class of the program. Participants

were given two compact discs (CDs) containing four 45-minute tracks of instructions for home mindfulness practice and were asked to practice for 45 minutes each day.

Measures

S. L. Shapiro et al. (2006) do not recommend specific measures for testing their model. They suggest that the Meta-cognitions Questionnaire (Wells & Cartwright-Hatton, 2004) might be used to assess the attentional component, but that the scale focuses on cognitions and does not include attention to emotions or sensations. We chose the following instruments because they appear consistent with the descriptions of the variables in the model.

Mindfulness. We assessed mindfulness in several ways. Our primary measure was the Five-Facet Mindfulness Questionnaire (FFMQ; R. A. Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), a 39-item inventory assessing multiple facets of mindfulness. The FFMQ has been shown to have strong psychometric characteristics, including adequate to good internal consistencies for all facets and significant correlations in predicted directions with a variety of other constructs (R. A. Baer et al., 2006, 2008). Although test-retest reliability has not been evaluated, for a previous version of this measure (Kentucky Inventory of Mindfulness Skills; R. A. Baer, Smith, & Allen, 2004), these figures were .65 and .83 for the Observing and Nonjudging scales, respectively. Although the entire FFMQ was administered to maximize consistency with the definition of mindfulness used by S. L. Shapiro et al. (2006) only selected subscales were used for most analyses. For example, one of three critical elements of the mindfulness definition is attention, which they describe as “observing the operations of one’s moment-to-moment, internal and external experience” (p. 376). This was measured with the Observing scale from the FFMQ because it closely matches this definition of attention. The Observing scale assesses the tendency to observe or notice internal and external present-moment experiences. A second critical element of this mindfulness definition is attitude, described as the qualities one brings to attention. These qualities include patience, nonjudging, compassion, and acceptance. We assessed attitude in two ways. For most of the analyses described later, we used the Nonjudging and Nonreactivity scales of the FFMQ, which measure the tendency to respond to one’s experiences with a nonjudgmental, nonreactive, and accepting attitude. In addition, because these scales do not include items that explicitly mention patience or compassion, we examined responses to several additional items written for this purpose.

The third critical element of mindfulness that S. L. Shapiro and colleagues (2006) posit as essential in mindfulness is intention, or the reasons for engaging in mindfulness practice. An earlier study (D. H. Shapiro, 1992) with a sample of experienced meditators found that the primary intentions for engaging in meditation practice included self-regulation, self-exploration, and self-liberation (wisdom, spirituality, compassion, peace of mind). We assessed the strengths of these intentions in our sample by asking participants at program entry to rate their reasons for wanting to learn mindfulness on a 5-point Likert scale (1 = *Not at all important for me*, 5 = *Very important for me*). Two statements reflected each of these three types of intention. The content of the two self-regulation items included coping better with stress, pain, or emotions, and feeling better physically and emotionally. The two self-exploration items described increasing self-awareness and self-understanding. The two self-liberation items described increased spirituality, wisdom, or insight, and increased peace of mind.

Reperceiving. As described by S. L. Shapiro et al. (2006), reperceiving involves a fundamental shift in perspective that allows the practitioner to adopt the stance of witness to moment-to-moment experience and which they describe as similar to the Western psychological construct of decentering (Safran & Segal, 1990). The recently developed Experiences Questionnaire (EQ; Fresco et al., 2007) is designed to assess decentering and has demonstrated good psychometric properties, including internal consistency of .83 and significant convergent correlations with related constructs. Test-retest reliability has not been examined. It includes 11 items rated on a Likert scale.

Self-management/self-regulation. This is described as the capacity to maintain stability of functioning in the face of unpleasant internal states and to be less controlled by particular emotions and thoughts. We chose the Self-Regulation Scale (SRS; Diehl, Semegon, & Schwarzer, 2006) to assess this component of the model. The authors describe this scale as a measure of attention in the interest of keeping a favorable emotional balance, an important component of self-regulation. It includes the ability to focus attention on a given task, to regulate internal (thoughts, feelings) and external distractions, and to work toward a desired outcome or goal. The scale includes elements of cognitive, emotional, and behavioral self-regulation, with an emphasis on attentional self-regulation. With its central emphasis on learning to direct attention in specific ways, it seems ideal for assessing the outcomes of MBSR. Diehl et al. (2006) report good psychometric properties for this instrument, including internal consistency of .82, test-retest reliability of .62, and significant convergent correlations with related constructs.

Values clarification. S. L. Shapiro et al. (2006) describe this element of their model as recognition by individuals of what they truly value and is meaningful for them in their lives. We chose the Purpose in Life Scale from the Scales of Psychological Well-Being (SPWB; Ryff, 1989) to assess this variable. High scorers on this scale hold beliefs that give life purpose, feel clear about what they are trying to accomplish in life, and have a sense of meaning, purpose, and goal-directedness. Strong psychometric properties have been reported for all scales of the SPWB (Ryff, 1989; Ryff & Keyes, 1995; Ryff & Singer, 2006), including internal consistencies above .87, test-retest reliabilities above .81, and strong convergent validity correlations.

Cognitive, emotional, and behavioral flexibility. S. L. Shapiro et al. (2006) describe this variable as adaptive and flexible in responding to the environment. We chose the Environmental Mastery Scale from the SPWB (Ryff, 1989) to assess this construct. High scorers on this scale have a sense of competence in managing their environment, can make effective use of the opportunities the environment affords, and can either choose, create, or modify environments to suit their needs.

Exposure. Several authors have argued that the practice of mindfulness functions as exposure to internal experiences, including sensations, cognitions, and emotions (R. Baer, 2003; Kabat-Zinn, 1982; Linehan, 1993). Similarly, S. L. Shapiro et al. (2006) suggest that willingness to remain in contact with unpleasant internal experiences is an important outcome of mindfulness practice. To assess this variable, we chose a subset of items from an experimental version of the Acceptance and Action Questionnaire (Bond et al., 2008). Example items include “If an unpleasant memory comes into my head, I try to get rid of it” (reverse-scored) and “When I feel uneasy, I do whatever I can to get rid of those feelings” (reverse-scored). High scorers, therefore, are endorsing high levels of willingness to be exposed to unpleasant internal experiences. In

our sample, internal consistency (alpha) for these items was .76 (adequate) and item-total correlations ranged from .42 to .66. Test-retest reliability has not been reported.

Symptoms and perceived stress. Psychological symptoms were measured with the anxiety and depression items of the Brief Symptom Inventory (BSI; Derogatis, 1992). To include the spectrum of symptoms only the total score (Global Severity Index) is reported here. Internal consistency and test-retest reliability for the Global Severity Index are both .90 (Derogatis, 1992). Reductions in the Anxiety and Depression scales of the BSI have been shown in several studies of MBSR (Carmody, Reed, Merriam, & Kristeller, 2008; S. Shapiro, Schwartz, & Bonner, 1998). Medical symptoms were measured with the Medical Symptom Checklist (MSCL; Kabat-Zinn, 1982), which lists 110 common medical symptoms. Participants check those they have experienced in the last month. Although internal consistency and test-retest reliability have not been reported, significant reductions in the MSCL have been reported in many studies of MBSR (Kabat-Zinn, 1987; Kabat-Zinn & Chapman-Waldrop, 1988; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn et al., 1992; Williams, Kolar, Reger, & Pearson, 2001). Perceived stress was measured with the Perceived Stress Scale (PSS; S. Cohen, Kamark, & Mermelstern, 1983; S. Cohen & Williamson, 1988), a widely used and well-validated 10-item scale assessing the extent to which situations during the past month have been perceived as unpredictable, uncontrollable, and overwhelming. Participation in MBSR has been associated with reductions in perceived stress (Carmody, Crawford, & Churchill, 2006). The authors of the scale reported both internal consistency and test-retest reliability to be high, and significant convergent correlations with related constructs were obtained.

Table 1
Means and Standard Deviations, Paired Sample t Tests, and Pre- and Post-MBSR Effect Sizes for All Variables

Variable	Pre-MBSR		Post-MBSR		<i>t</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Mindfulness facets (FFMQ)						
Observe	25.67	5.44	30.20	4.81	-16.41***	.95
Describe	26.82	6.48	29.69	6.06	-11.38***	.66
Act with awareness	22.91	5.34	27.13	4.94	-15.96***	.92
Nonjudge	24.09	7.10	29.37	5.92	-17.21***	.99
Nonreact	18.51	4.11	23.04	3.85	-18.93***	1.10
Decentering (EQ)	31.15	6.97	39.77	6.32	-21.63***	1.29
Attentional self-regulation (SRS)	30.48	6.14	35.07	5.38	-14.95***	.88
Environmental mastery (PWB)	34.33	7.97	39.29	7.73	-14.92***	.86
Purpose in life (PWB)	37.13	7.04	40.98	6.91	-11.65***	.68
Exposure	13.86	3.77	16.07	3.83	-9.60***	.56
Perceived stress (PSS)	20.90	6.73	14.59	5.94	17.73***	1.02
Medical symptoms (MSCL)	19.15	11.91	12.18	9.53	14.10***	.81
Psychological symptoms (BSI)	13.09	8.68	7.33	0.38	12.93***	.74

Note. MBSR = Mindfulness-based stress reduction; FFMQ = Five-Facet Mindfulness Questionnaire; EQ = Experiences Questionnaire; SRS = Self-Regulation Scale; PWB = Psychological Well-Being Scale; PSS = Perceived Stress Scale; MSCL = Medical Symptom Checklist; BSI = Anxiety and Depression items from Brief Symptom Inventory. *** $p < .001$.

Results

Changes From Pre- to Post-MBSR

Changes in all variables from pre- to post-MBSR can be seen in Table 1. Paired-sample *t* tests showed that all variables changed significantly and in the expected directions. Pre- and post-MBSR effect sizes (Cohen's *d*) were computed using a formula suggested by Rosenthal (1984) for matched-pairs data ($d = t/df$). Effect sizes for all variables were moderate to large.

Intentions

Intentions for self-regulation, self-exploration, and self-liberation were assessed at pre-MBSR using two items each on a 5-point Likert scale. The two items were summed to derive a score for each type of intention. Therefore, possible scores for each type of intention ranged from 2 to 10. For self-regulation, the mean was 9.34 ($SD = 1.09$). For self-exploration, the mean was 8.35 ($SD = 1.81$). For self-liberation, the mean was 8.26 ($SD = 1.64$). Thus, most participants reported very high levels of all three types of intention, and variability was low. Correlations between intentions at pre-MBSR and extent of change in other variables over the course of the intervention were computed. Very few were significant (only slightly more than would be expected by chance), and these were small. For example, participants with the highest intentions for self-regulation showed slightly greater changes in perceived stress and environmental mastery ($r_s = .17$ and $.16$, respectively, $ps < .01$). In general, it appears that very high levels of intention for self-regulation, self-exploration, and self-liberation were present in the sample, but variability was too low to allow significant relationships with other variables to emerge.

Because the intention variable was largely unrelated to the other variables of interest, it was not included in the remaining analyses.

Testing Mediation Models

S. L. Shapiro and colleagues (2006) suggest that increased mindfulness will lead to increased reperceiving or decentering, which, in turn, will lead to improvements in four dependent variables: self-regulation, values, flexibility, and exposure. We conducted several tests of this element of their model. First, we examined relationships between mindfulness and reperceiving (decentering). For the mindfulness variable, we used the sum of the Observing (attention) and Nonjudging and Nonreactivity (attitude) scales of the FFMQ. Each of these subscales includes seven or eight items. Coefficient alpha for this three-facet version of the FFMQ was .90. Reperceiving was measured by the EQ. Mindfulness and reperceiving were very strongly correlated at pre-MBSR ($r = .81$, $p < .0001$) and at post-MBSR ($r = .74$, $p < .0001$). These two variables also were strongly correlated in degree of change from pre- to post-MBSR ($r = .73$, $p < .0001$). In addition, for both of these variables, pre- and posttreatment change was significantly correlated with pre- and posttreatment change in the four proposed dependent variables (self-regulation, values, flexibility, and exposure). These intercorrelations satisfied the first requirement for mediation as described by Baron and Kenny (1986) and can be seen in Table 2.

The next step in testing mediation is to enter both the independent variable (IV; pre- and posttreatment change in mindfulness) and the proposed mediator (pre- and posttreatment change in reperceiving) into a regression equation as simultaneous predictors of the dependent variable (DV). Support for mediation is found if the beta

Table 2

Correlations Between Pre- and Post-MBSR Change Scores for Mindfulness and Reperceiving and Pre- and Post-MBSR Change Scores for Other Variables

Change in	Change in reperceiving	Change in mindfulness
Reperceiving (EQ)	--	.73**
Self-regulation (SRS)	.59**	.56**
Flexibility (Environmental mastery: PWB)	.40**	.45**
Values (Purpose in life: PWB)	.42**	.43**
Exposure (willingness)	.22**	.39**
Perceived stress (PSS)	.48**	.51**
Psychological symptoms (BSI)	.32**	.37**
Medical symptoms (MSCL)	.14*	.18**

Note. Mindfulness measured by three facets of Five-Facet Mindfulness Questionnaire (observe, nonjudge, nonreact). MBSR = Mindfulness-based stress reduction; EQ = Experiences Questionnaire; SRS = Self-Regulation Scale; PWB = Psychological Well-Being Scale; PSS = Perceived Stress Scale; BSI = Anxiety and Depression items from Brief Symptom Inventory; MSCL = Medical Symptom Checklist. * $p < .05$. ** $p < .01$

Table 3

Regression Analyses Showing Prediction of Pre- and Post-MBSR Change in Four Dependent Variables by Pre- and Post-MBSR Change in Mindfulness and Reperceiving (Entered Simultaneously) in MBSR Participants

Dependent variable	Variables entered	<i>B</i>	<i>SE</i>	β	<i>p</i>
Self-regulation	FFMQ change	.12	.03	.25	.0001
	EQ change	.31	.05	.41	.0001
Values	FFMQ change	.13	.04	.25	.002
	EQ change	.20	.07	.24	.003
Flexibility	FFMQ change	.18	.04	.35	.0001
	EQ change	.13	.07	.15	.06
Exposure	FFMQ change	.16	.03	.47	.0001
	EQ change	-.07	.05	-.12	.13

Note. MBSR = mindfulness-based stress reduction; FFMQ = Five-Facet Mindfulness Questionnaire (sum of observe, nonjudge, and nonreact facets); EQ = Experiences Questionnaire.

coefficient for the IV drops significantly when the mediator is included in the model. We tested mediation four times, once for each of the proposed DVs, and found little support for the proposed mediation model. In most cases, the beta coefficient for the IV dropped only slightly, and the IV (mindfulness) remained a significant predictor of the DV. The pattern of findings was also very similar when we tested an alternative model in which reperceiving is the IV and mindfulness is the mediator. Thus, the findings do not support a sequential model in which improvements in mindfulness lead to improvements in reperceiving (decentering), at least as measured by the instruments used here. A more defensible interpretation is that mindfulness and reperceiving/decentering are highly overlapping constructs, both of which improve over the course of MBSR. Table 3 shows regression analyses in which both mindfulness and reperceiving were entered simultaneously as predictors of each of the four DVs. In most cases, both are significant predictors, and mindfulness may be a stronger predictor than reperceiving for some variables. However, because mindfulness and reperceiving are so highly correlated, the problem of multicollinearity makes these beta coefficients difficult to interpret (J. Cohen, Cohen, West, & Aiken, 2003).

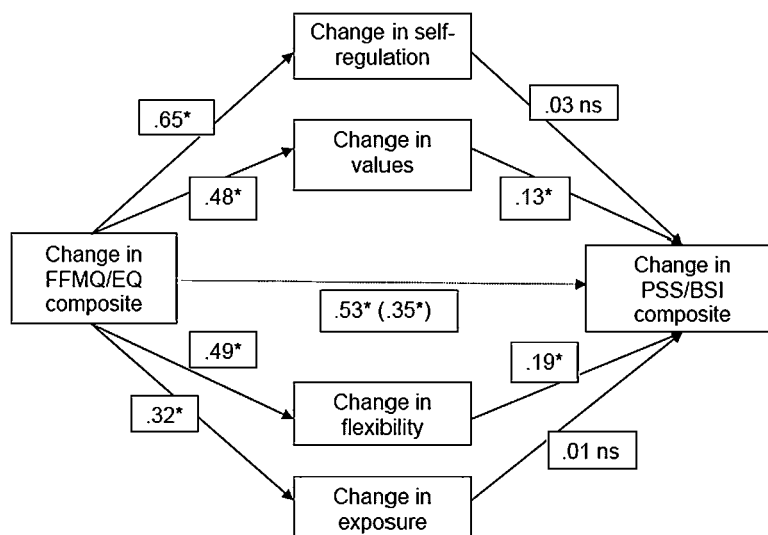


Figure 1. ns = not significant; FFMQ = Five Facet Mindfulness Questionnaire; EQ = Experiences Questionnaire; PSS = Perceived Stress Scale; BSI, Brief Symptom Inventory.

We conducted these analyses a second time using the items that we had written specifically for this study to assess the attitude component of mindfulness. The pattern of findings was virtually identical. Because these items have not been previously validated, they are not considered further.

Additional Mediation Analyses

The model described by S. L. Shapiro et al. (2006) also suggests that changes in the four variables described earlier (self-regulation, values, flexibility, and exposure) may serve as mechanisms leading to reductions in psychological symptoms. To test this model, we took two preliminary steps. First, because mindfulness and reperceiving/decentering were so highly correlated, we created a composite variable by converting these two variables to z -scores and averaging them. Thus, pre- and posttreatment change in the mindfulness/reperceiving composite variable served as the IV for the following analysis. Similarly, because changes in psychological symptoms and perceived stress also were highly correlated ($r = .66$), we converted these two variables to z -scores and averaged them. Thus, pre- and posttreatment change in the psychological symptoms/stress composite variable served as the DV (We did not include medical symptoms because its relationships with other variables were considerably weaker.). To maintain consistency, pre- and posttreatment changes in the four potential mechanisms (self-regulation, etc.) also were converted to z -scores. These four potential mediators were tested simultaneously in a combined model shown in Figure 1. Results are consistent with partial mediation of the relationship between increased mindfulness/reperceiving and psychological symptom/stress change. Two of the proposed mediators (values and flexibility) were significant predictors of the DV. However, the beta coefficient for the relationship between mindfulness/reperceiving and symptoms/stress remained significant (.35), suggesting that there is a direct relationship between mindfulness/reperceiving and stress/symptoms that is not entirely mediated by the variables measured here. S. L. Shapiro et al. (2006) note the possibility that decentering may also have direct effects on

symptoms and so the remaining significant correlation between mindfulness/reperceiving and symptom variables could perhaps be expected.

Discussion

The primary goal of this study was to test several predictions based on the theory proposed by S. L. Shapiro et al. (2006) of how the practice of mindfulness leads to beneficial outcomes. A large sample of MBSR participants completed measures of relevant variables at pre- and posttreatment. Both mindfulness (as measured by scales of the FFMQ) and reperceiving/decentering (as measured by the EQ) showed significant increases from pre- to postintervention. The four variables proposed as potential mechanisms of action (self-regulation, cognitive, behavioral, and emotional flexibility, values clarification, and exposure) also increased significantly over the course of treatment, and levels of symptoms and stress were significantly reduced. Although mindfulness, reperceiving, and the other four variables changed in the predicted directions and degree of change was significantly intercorrelated among all variables, evidence for mediation, according to the criteria of Baron and Kenny (Baron & Kenny, 1986) was weak. Increases in reperceiving were not found to mediate the relationship between improvements in mindfulness and the other four dependent variables. A more plausible interpretation of our findings is that mindfulness and reperceiving (decentering) are highly overlapping constructs and that both of these variables change with participation in MBSR. However, values clarification and increases in cognitive, emotional, and behavioral flexibility were found to be partial mediators of the relationship between a composite mindfulness/reperceiving variable and psychological symptom reduction.

There has been lively debate about whether mindfulness is best understood as a technique or a disposition—whether the construct is more accurately understood through the mental behaviors employed in its cultivation or as a quality of consciousness (Brown, Ryan, & Creswell, 2007). S. L. Shapiro et al. (2006) suggest that the practice of mindfulness leads to a different relationship to experience described as decentering or reperceiving. The use of these terms may contribute to increased conceptual clarity in the discussion of these complex issues. However, the very high correlations between the measures of mindfulness and reperceiving used here (FFMQ and EQ) suggest that the tendencies to be mindful and decentered in daily life, as measured by these instruments, are very similar. Future refinements in the definition and measurement of these two variables may help to clarify their relationships, including to what extent they are distinct and whether they develop simultaneously or sequentially as a regular mindfulness practice is initiated and maintained.

Although S. L. Shapiro et al. (2006) give central importance to the intention with which people approach mindfulness practice, our findings revealed very few significant relationships between participants' reported intentions for practicing mindfulness and any of our other variables. As might be expected in the context of a stress-reduction program, participants rated self-regulation the most highly of the three types of intentions measured (9.34 from a possible high of 10). Nevertheless, they rated intentions for self-exploration and self-liberation very highly also (8.35 and 8.26, respectively) and variability across participants was low. However, our methods for assessing these intentions had not been previously validated and they were administered only at pre-MBSR. Further investigation of the role of intentions for mindfulness practice in a clinical population will require more discussion about whether types of intentions can be meaningfully separated in this population. More discriminating

measures than the items used in the present study also will be required. Future studies might ask participants about their intentions for each practice session, assess intentions at both pre- and post-MBSR, or assess intentions more comprehensively.

Other measurement issues must be noted. Our reliance on self-report measures was a potential limitation of this study necessitated by the phenomenological nature of S. L. Shapiro et al.'s model. Self-report methods can be subject to response biases, and it is possible that MBSR participants who agreed to have their responses used for research purposes (68%) were more motivated to report positive changes. Because S. L. Shapiro et al. (2006) do not suggest particular measures that would be useful in testing their theory, where possible we chose existing scales for which there is some evidence of validity and reliability. We used the FFMQ to assess mindfulness because it is based on factor analyses of several recently developed mindfulness questionnaires, and therefore provides an empirically based integration of current thinking about how mindfulness may be conceptualized and measured (R. A. Baer et al., 2006). Although Baer and colleagues (2008) found that scores on the Observing scale of the FFMQ were not predictive of psychological adjustment in nonmeditating samples, in the present sample, the Observing scale was positively correlated with well-being and negatively correlated with symptoms at both pre- and post-MBSR, and in keeping with expectation scores on this scale increased significantly from pre- to postprogram. The present sample had all agreed to participate in a meditation-based program; thus, it is possible that the relationship between the Observe scale and psychological adjustment in nonmeditators is moderated by willingness to engage in meditation or openness to experience in general. We used the only measure of re-perceiving (decentering) of which we are aware (EQ). For self-regulation, we chose a measure that is well validated, brief, and appears to capture elements of self-regulation that are closely related to the stability of emotional and attentional functioning skills taught in MBSR. However, other measures of self-regulation may have yielded different findings. In the case of flexibility, we chose the Environmental Mastery subscale from Ryff's (1989) Well-Being Scale, which is consistent with the discussion of S. L. Shapiro et al. (2006). Since our data were collected, the construct of psychological flexibility has been more clearly articulated within the literature on acceptance and commitment therapy and the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2008) has been developed to assess it. Whether this conceptualization is consistent with S. L. Shapiro et al. (2006) is unclear. Finally, our only unpublished measure consisted of items from the experimental item pool for the AAQ-II assessing willingness to maintain contact with unpleasant cognitions and emotions. Although the content of these items is consistent with the discussion of S. L. Shapiro et al. (2006), this subset of items has not been previously published.

The present findings are consistent with a number of previous studies (R. A. Baer et al., 2008; Carmody & Baer, 2008; Lau et al., 2006) that have shown that changes in scores on mindfulness scales mediate the relationship between meditation practice and well-being. Several authors, however, have noted (Carmody et al., 2008; Grossman, 2008) that it remains unclear whether operational definitions of mindfulness in the clinical literature, or respondents' semantic understandings of mindfulness scale items, concord with the original meaning of the term in the Buddhist system. Although this issue merits ongoing dialogue, mindfulness is only one arm in that system which is oriented toward the reduction of suffering. From a more immediate clinical perspective, a more fruitful focus may be delineating the qualities of attending to experience that lead to well-being as reported by

participants in mindfulness training and finding the most accessible ways of cultivating those qualities, while at the same time keeping in view the possibility of more penetrating investigation into the underlying processes of consciousness. Overall, we agree with S. L. Shapiro et al. (2006) that mindfulness represents a rich and complex phenomenon, and that testable theories are important in advancing our understanding of how mindfulness-based interventions lead to beneficial outcomes in clinical settings. Sound methods for assessment of variables such as mindfulness, decentering, and self-regulation are essential for testing such theories. Continued research that is sensitive to the wide range of theoretical perspectives and methodological approaches that can be brought to bear on these important questions is clearly needed.

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