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Decreased Symptoms of Depression After Mindfulness-Based Stress Reduction: Potential Moderating Effects of Religiosity, Spirituality, Trait Mindfulness, Sex, and Age

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Abstract

Objective: Mindfulness-based stress reduction (MBSR) is a secular meditation training program that reduces depressive symptoms. Little is known, however, about the degree to which a participant's spiritual and religious background, or other demographic characteristics associated with risk for depression, may affect the effectiveness of MBSR. Therefore, this study tested whether individual differences in religiosity, spirituality, motivation for spiritual growth, trait mindfulness, sex, and age affect MBSR effectiveness.
Methods: As part of an open trial, multiple regression was used to analyze variation in depressive symptom outcomes among 322 adults who enrolled in an 8-week, community-based MBSR program.
Results: As hypothesized, depressive symptom severity decreased significantly in the full study sample ($d = 0.57$; $p < 0.01$). After adjustment for baseline symptom severity, moderation analyses revealed no significant differences in the change in depressive symptoms following MBSR as a function of spirituality, religiosity, trait mindfulness, or demographic variables. Paired t tests found consistent, statistically significant ($p < 0.01$) reductions in depressive symptoms across all subgroups by religious affiliation, intention for spiritual growth, sex, and baseline symptom severity. After adjustment for baseline symptom scores, age, sex, and religious affiliation, a significant proportion of variance in post-MBSR depressive symptoms was uniquely explained by changes in both spirituality ($\beta = -0.15$; $p = 0.006$) and mindfulness ($\beta = -0.17$; $p < 0.001$).
Conclusions: These findings suggest that MBSR, a secular meditation training program, is associated with improved depressive symptoms regardless of affiliation with a religion, sense of spirituality, trait level of mindfulness before MBSR training, sex, or age. Increases in both mindfulness and daily spiritual experiences uniquely explained improvement in depressive symptoms.

Introduction

Depression is one of the world's most urgent health problems, affecting an estimated 350 million people.[1] Moreover, depression is the leading cause of disability, and by the year 2030, depression is projected to be the number 1 cause of global disease burden.[2] Given the concerning prevalence of both minor depression and major depression in the community, there is a critical need for effective, widely available approaches to reducing depressive symptoms, particularly among persons at risk by virtue of subclinical symptoms.[3,4] Mindfulness training offers a promising, scalable approach to reducing symptoms across a wide range of mental and medical conditions, including depression.[5]

Mindfulness-Based Stress Reduction (MBSR) is a standardized, 8-week program that involves intensive training in mindfulness meditation to help individuals cope with stress, pain, and illness.[6,7] Recent meta-analyses conducted with clinical and nonclinical populations have concluded that MBSR consistently reduces psychological distress, including

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symptoms of stress, anxiety, and depression.[8–10] Despite accruing empirical support for mindfulness-based interventions and increasing knowledge of the psychological mechanisms of change,[11] very little is known about who benefits most from mindfulness training. Outcomes may be maximized by identifying subgroups of people who may be better suited to MBSR by virtue of their motivations for meditation training, dispositional tendencies toward mindfulness and spirituality, demographic characteristics, and levels of symptom severity. Likewise, if no subgroups emerge, clinicians can feel confident in referring a wide range of patients to MBSR training.

Mindfulness has been defined as a state, a dispositional trait, and a skill that can be strengthened through meditation practice.[12] Although mindful practices have been taught for centuries as a part of Buddhist, contemplative Christian, and other spiritual traditions, the meditation practices taught in MBSR are psychoeducational and secular.[6,7] The teaching philosophy of MBSR presumes that if mindfulness can be strengthened through practice regardless of faith tradition or spiritual orientation, MBSR program outcomes should be consistent across individuals who differ on religiosity and spirituality, among other individual differences.[13,14] However, to date, no empirical studies have examined whether symptom reduction following MBSR is, in fact, consistent across lines of religious affiliation, spiritual beliefs, or spiritually motivated reasons for pursuing mindfulness training. Voluminous research[15] has shown that positive aspects of religion and spirituality are commonly associated with mental health, including lower risk of depression. The authors previously reported that improved mental functioning and well-being after MBSR was partly explained by a combination of enhanced daily spiritual experiences and increased mindfulness, suggesting possible interactive or synergistic effects.[16] It remains to be determined, however, whether having a religious affiliation, engaging in MBSR for spiritual growth, or being more or less attuned to daily spiritual experiences might predict decreased depression symptoms following MBSR. Similarly, relatively little is known regarding potential sex or age differences in MBSR outcomes,[9] particularly for depressive symptoms, which affect women at a higher rate than men.[17]

One small randomized clinical trial[18] with college students found that higher baseline levels of trait mindfulness were associated with larger post-MBSR increases in mindfulness, and larger declines in perceived stress, up to 1 year after training. No studies, however, appear to have examined the potential role of trait mindfulness or other pertinent individual difference factors, such as religiosity, spirituality, and sex, on changes in depressive symptoms in a community-based MBSR program that enrolls adults with varying degrees of psychological symptoms. In theory, the outcomes and underlying psychological and spiritual processes of MBSR-related changes in mood, stress, self-awareness, and insight are likely interdependent.[13] There are, however, relatively few empirical data at present on the degree to which improvement in psychological symptoms after MBSR may be partly explained by changes in both mindfulness and spirituality.[19]

In summary, there remains a major gap in understanding whether improvement in depressive symptoms following MBSR is consistent across people with different religious beliefs, spiritual perceptions, or individual differences in trait mindfulness or initial mood symptoms at the start of the course. Because MBSR is secular and welcomes participation by any individual regardless of faith tradition or sense of spirituality, the study hypotheses are that in a large, self-selected community sample (1) depressive symptoms will decrease in MBSR program participants, as demonstrated in prior studies of both clinical and nonclinical samples;[8,9] (2) the magnitude of improvement in depressive symptoms will not vary significantly across potential moderating variables, including religiosity, spirituality, trait mindfulness, and sex; and (3) changes in mindfulness and changes in daily sense of spirituality will uniquely predict variation in improved depressive symptoms.

Methods

Study design

The methods of this study have been described in detail elsewhere.[16] Briefly, study participants completed standardized self-report questionnaires via the Internet before and after taking an 8-week, self-pay community MBSR course at a large academic integrative medicine center. The medical center's institutional review board approved the study. MBSR program participants were eligible for the online survey study if they were (1) at least 18 years of age, (2) proficient in English, and (3) able to use a computer with Internet access from home, work, or a public location. To protect against social desirability bias and potential evaluation bias, MBSR course instructors were not directly involved in participant recruitment, consent, or assessment procedures.

Participants

Three hundred and twenty-two participants provided data on the pre-MBSR survey. Two hundred and thirteen individuals provided data on the post-MBSR survey, a response rate of 66%. Demographic characteristics are presented in Table 1. Participants were primarily well educated white women who were married and working full-time. Half of study participants met cutoff criteria for a ''likely case'' of clinical depression. Nearly two thirds of the sample reported affiliation with a religion. While the most commonly reported motivations for taking the MBSR program were to help manage stress, to improve mental health, and to promote personal growth and self-discovery, more than 40% of participants endorsed a motivation ''to explore or deepen my sense of spirituality.'' Over half the sample reported prior practice of mindfulness, meditation, or contemplative prayer, with a median of less than 1 year of practice.

Procedure

Study participants were surveyed within 1 week before the first MBSR class session and again within 1 week after the last MBSR class. The secure, online survey was administered by using ViewsFlash software (Cogix, Monterey, CA) and included basic demographic information and a battery of standardized self-report questionnaires. Among other psychosocial variables, the questionnaires assessed symptoms of anxiety and depression, mindfulness of thoughts and feelings, and spirituality. As described previously,[16] participants were offered compensation ($10) for completing the surveys once grant funding was obtained.

Table 1. Demographic Characteristics for Full Study Sample ($N=322$)

Characteristic	*Value*
Age (y)	
Mean ± SD	45 ± 12.2
Range	20–100
Sex, *n* (%)	
Male	84 (26.1)
Female	238 (73.9)
Race/ethnicity, *n* (%)[a]	
Hispanic	8 (2.5)
White non-Hispanic	305 (94.7)
Black	10 (3.1)
American Indian or Alaska Native	5 (1.6)
Asian	8 (2.5)
Other	2 (.6)
Highest level of education, *n* (%)	
High school	1 (.3)
Some college	16 (5.3)
College degree	107 (33.2)
Graduate degree	198 (61.5)
Annual household income, *n* (%)	
$0–$10,000	6 (1.9)
$10,001–$20,000	4 (1.2)
$20,001–$40,000	28 (8.7)
$40,001–$65,000	46 (14.3)
$65,001–$100,000	69 (21.4)
>$100,000	144 (44.7)
Prefer not to respond	25 (7.8)
Work status, *n* (%)	
Employed full-time	222 (68.9)
Employed part-time	35 (10.9)
Unemployed	26 (8.1)
Disabled	13 (4.0)
Retired	26 (8.1)
Marital status, *n* (%)	
Married, living with spouse	187 (58.1)
Living with partner	31 (9.6)
Separated	7 (2.2)
Divorced	30 (9.3)
Widowed	6 (1.9)
In an intimate relationship but not living together	16 (5)
Single	45 (14)
Religious affiliation, *n* (%)	
Not religiously affiliated	118 (36.6)
Jewish	14 (4.3)
Muslim	2 (0.6)
Hindu	1 (0.3)
Buddhist	5 (1.6)
Christian—specific denomination	126 (39.1)
Christian—nondenominational	29 (9)
Unitarian-Universalist	18 (5.6)
Other	9 (2.8)
Motivation for attending MBSR course, *n* (%)	
Improve mental health	201 (90.1)
Help manage stress	199 (89.2)
Personal growth or self-discovery	181 (81.2)
Improve physical health	136 (61.0)
Explore or deepen my sense of spirituality	110 (49.3)
Pressured to attend by someone else	3 (1.3)
Prior practice of mindfulness, meditation, or contemplative prayer, *n* (%)	
Yes	181 (58.2)
Time spent practicing mindfulness, meditation, or contemplative prayer (y)	
Median	<1
Range	0–45
Interquartile range	0–3.0

[a]Percentages for ethnicity subgroups total to >100% because some participants selected multiple categories.

SD, standard deviation; MBSR, mindfulness-based stress reduction.

Intervention

The intervention followed a standard 8-week MBSR course based on the work of Jon Kabat-Zinn.[6] Courses were taught by highly experienced instructors with an average of 13 years (range, 10–20 years) teaching MBSR and a minimum of 7 days of professional education and training coordinated by the Center for Mindfulness in Medicine, Health Care, and Society (Worcester, MA). In addition, when hired, MBSR instructors had a minimum of 3 years' personal experience with mindfulness meditation, including at least two extended teacher-led retreats in mindfulness (*Vipassana*) meditation. As part of the MBSR program, participants were instructed to practice 20–45 minutes of formal meditation daily, 6 days per week, in addition to the informal practice of being mindful during everyday activities. Weekly class time lasted 2.5 hours. Additionally, the course included 1 full-day (7-hour) meditation retreat on the weekend of the sixth week. Written materials and audio CDs of guided mediations and yoga were provided to support home practice.

Measures

Hospital Anxiety and Depression Scale (HADS). The HADS[20] is a widely used clinical screening instrument intended to assess common symptoms of anxiety and depression. Although the HADS alone is not intended to diagnose clinical mood or anxiety disorders, subscale cutoff scores of 8 or higher indicate a likely case of anxiety or depressive disorder.[21] The HADS-depression (HADS-D) subscale is reported here (Cronbach $\alpha=0.82$).

Daily Spiritual Experience Scale. This 16-item scale is intended to transcend the boundaries of specific religions by measuring subjective experience of ordinary spiritual experiences on a daily basis.[22] This scale was chosen because everyday spiritual experiences, characterized by a sense of self-transcendence, are expected to increase with intensive training in mindfulness.[13] Items were reverse scored so that higher total scores indicated increased perceptions of self-transcendence and daily spiritual experiences.[23] Scores on this well-validated scale have previously been related to quality of life and multiple indicators of psychological distress and well-being in normative samples.[24] Because our sample included a diverse range of religious affiliations and nonaffiliation, the term ''a higher power'' was substituted for eight items that used the word ''God'.' The internal reliability of the scale was high ($\alpha=0.93$) in this sample.

Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). The CAMS-R was used to measure four aspects of trait mindfulness: attention, awareness, acceptance, and present focus. Previous psychometric evaluation of the CAMS-R found the instrument to be reliable and valid.[25] Further, an interim report from this study found that the CAMS-R was sensitive to change in mindfulness of thoughts and feelings following MBSR.[16] The Cronbach α was .80 in the present study.

Other measures. Religious affiliation was coded as follows: 1 = endorsing a religious affiliation and 0 = no religious affiliation. Motivation for spiritual growth was coded as the following: 1 = endorsing ''yes'' when asked about taking MBSR ''to explore or deepen my sense of spirituality'' and 0 = ''no.'' Sex was coded as 1 = female and 0 = male.

Data analysis

Descriptive statistics were performed using SPSS software, version 19 (IBM, Armonk, NY). Variables were screened for distributional assumptions before analysis. All continuous variables approximated a normal distribution with skewness and kurtosis less than 1.0. Categorical variables were sufficiently balanced across subgroups (Table 2). Changes in depressive symptoms for the full study sample, and for participant subgroups as a function of potential moderating variables, were tested using paired-sample *t* tests. As a preliminary step for regression models, baseline differences in depression symptom severity as a function of potential moderating variables were analyzed using one-way analysis of variance. Separate multiple regression models were then run to test for differences in the change in depressive symptoms following MBSR as a function of six potential moderating variables: (1) having a religious affiliation versus not having a religious affiliation; (2) expressing motivation to take MBSR for spiritual growth or not; (3) baseline spirituality, measured as the continuous (grand mean centered) score on the Daily Spiritual Experience Scale; (4) baseline trait mindfulness, measured as the continuous (grand mean centered) score on the CAMS-R; (5) sex; and (6) age.

Baseline depression symptom severity was significantly higher ($F_{1,313} = 9.16$; $p = 0.003$) for participants who did not complete the postintervention survey ($n = 103$; mean ± standard deviation HADS-D score, 8.56 ± 3.81) compared with those who did ($n = 212$; mean HADS-D score, 7.16 ± 3.90). Because depression symptom severity at baseline was a known cause of missing data after the intervention, maximum likelihood estimation in Mplus, version 5 (Muthén & Muthén, Los Angeles, CA), was used to incorporate pre-MBSR depression scores as a predictor of post-MBSR scores.[26] Each regression model therefore included three predictors in explaining variability in depressive symptom outcomes: (1) baseline depression symptom severity; (2) a candidate moderating variable, ; and (3) the interaction between baseline symptom severity and a candidate moderator, such as religious affiliation or motivation for spiritual growth. In these models, a significant interaction indicated that the residualized change in depression symptoms differed across levels of the potential moderating variable, which was interpreted as support for a moderation hypothesis.[27]

Unique associations between MBSR-related changes in mindfulness, spirituality, and depressive symptoms were tested using hierarchical multiple regression, in which baseline depressive symptoms were entered in block 1, demographic characteristics (age, sex, religious affiliation) in block 2, and changes in spirituality and mindfulness in block 3. Effect sizes were calculated using the standardized mean difference ($d = t/\sqrt{df}$)[28] for paired *t* tests and standardized regression coefficients (β) and R^2 for regression models.[29] Statistical significance for all parameter estimates was set at $z = 1.96$, $\alpha = 0.05$, two-tailed.

Results

Mean depressive symptom severity at baseline for the full sample fell on the borderline of the abnormal range (HADS-D score, 7.62 ± 3.92; range, 0–18), with 50% of participants ($n = 161$) meeting criteria for a likely case of depression.[21] The mean mindfulness score at baseline (CAMS-R score, 29.40 ± 5.65) fell approximately 1 standard deviation below

Table 2. Association of Baseline Depression Symptom Severity with Potential Moderating Variables

Moderator	*Participants* (n)	*Mean baseline HADS-D score (95% CI)*	*SD*	*SEM*	*df*	F/r *value*	p-*Value*
Religious affiliation							
No	117	7.85 (7.18–8.51)	3.62	0.34	1, 313	$F = 0.64$	0.42
Yes	198	7.48 (6.91–8.05)	4.09	0.29			
Motivation for spiritual growth							
No	134	7.92 (7.23–8.60)	4.00	0.35	1, 263	$F = 0.93$	0.34
Yes	131	7.45 (6.78–8.12)	3.89	0.34			
Sex							
Male	82	7.52 (6.65–8.40)	3.99	0.44	1, 313	$F = 0.06$	0.81
Female	233	7.65 (7.14–8.15)	3.91	0.26			
Age	322	NA	NA	NA	NA	$r = -0.13$	0.02
Baseline spirituality score	311	NA	NA	NA	NA	$r = -0.33$	< 0.001
Baseline mindfulness score	315	NA	NA	NA	NA	$r = -0.56$	< 0.001

HADS-D, Hospital Anxiety and Depression Scale-depression subscale; CI, confidence interval; df, degrees of freedom; SEM, standard error of the mean; NA, not applicable.

that reported for healthy young adults.[25] Baseline daily spiritual experiences (Daily Spiritual Experience Scale score, 62.75 ± 17.70) fell in the normal range for U.S. adults.[23] As shown in Table 2, baseline depression symptom severity did not differ as a function of religious affiliation, motivation for spiritual growth, or sex. At baseline, depression symptom severity was negatively correlated with both spirituality and trait mindfulness scores (Table 2).

As expected, depressive symptom severity significantly decreased among MBSR program completers ($n = 200$; pre-MBSR mean HADS-D score, 7.14 ± 3.91; post-MBSR mean HADS-D score, 5.38 ± 3.76; $t = 8.08$; df = 199; $p < 0.001$; $d = 0.57$). As shown in Table 3, no tests of moderation were significant because baseline symptom severity was the only significant predictor of post-MBSR depression symptom scores in each model. As shown in Figure 1, decreases in depressive symptoms were similar in magnitude for the full study sample and all participant subgroups, with the exception of symptom severity groups. Effect sizes consistently fell in the medium range, except for unlikely cases of depression, which showed a small reduction in symptoms, and likely cases of depression, which showed a large reduction.

Zero-order correlations in the full sample of study completers found that decreased depressive symptoms were significantly correlated with both increased mindfulness ($r = -0.31$; $p < 0.001$) and increased perceptions of daily spiritual experiences ($r = -0.30$; $p < 0.001$). Increased mindfulness and enhanced perceptions of spirituality were also significantly correlated ($r = 0.21$; $p = 0.003$). Hierarchical multiple regression analysis, controlling for baseline depression scores (block 1), as well as age, sex, and religious affiliation (block 2), revealed that changes in both mindfulness ($\beta = -0.17$; $p = 0.001$) and daily experiences of spirituality ($\beta = -0.15$; $p = 0.006$) uniquely explained variation in post-MBSR depression scores (block 3: R^2 change = 0.057; $p < 0.001$). These effect sizes (β) for changes in mindfulness and spirituality were of similar magnitude and fell in the small-to-medium range ($\beta = 0.10$–0.30).[29]

Discussion

The primary goal of this study was to better understand how individual differences in religiosity, spirituality, trait mindfulness, sex, and age might affect depressive symptom outcomes following MBSR, a secular 8-week course in intensive meditation practice. The self-selected community sample, on average, reported subclinical symptoms of depression at baseline, with 50% of study participants meeting the HADS criteria for a likely case of clinical depression.

Table 3. Moderation Models of Change in Depressive Symptoms Following Mindfulness-Based Stress Reduction ($N = 322$)

Variable	*b*	*SEM*	*β*	p-*value*	R^2
Religious affiliation					
Intercept	0.47	0.68	0.12	0.49	0.46
Baseline symptom severity	0.69	0.08	0.72	0.00	
Religious affiliation	0.40	0.85	0.05	0.63	
Baseline symptom severity × religious affiliation	−0.05	0.10	−0.07	0.62	
Motivation for spiritual growth					
Intercept	1.33	0.65	0.36	0.04	0.47
Baseline symptom severity	0.61	0.07	0.64	0.00	
Motivation for spiritual growth	−1.01	0.89	−0.14	0.26	
Baseline symptom severity × motivation for spiritual growth	0.07	0.11	0.08	0.54	
Sex					
Intercept	0.37	0.80	0.10	0.65	0.47
Baseline symptom severity	0.75	0.10	0.79	0.00	
Sex	0.50	0.93	0.06	0.59	
Baseline symptom severity × sex	−0.14	0.11	−0.17	0.22	
Age					
Intercept	0.94	1.65	0.25	0.57	0.47
Baseline symptom severity	0.67	0.22	0.69	0.00	
Age	−0.01	0.03	−0.02	0.89	
Baseline symptom severity × age	0.00	0.01	−0.02	0.95	
Sense of spirituality					
Intercept	0.95	0.43	0.25	0.03	0.48
Baseline symptom severity	0.62	0.05	0.65	0.00	
Baseline spirituality	0.00	0.02	−0.01	0.90	
Baseline symptom severity × baseline spirituality	0.00	0.00	0.11	0.26	
Trait mindfulness					
Intercept	1.10	0.49	0.29	0.03	0.47
Baseline symptom severity	0.61	0.06	0.64	0.00	
Baseline mindfulness	−0.07	0.07	−0.11	0.28	
Baseline symptom severity × baseline mindfulness	0.00	0.01	0.04	0.69	

b, unstandardized regression coefficient; β, standardized regression coefficient.

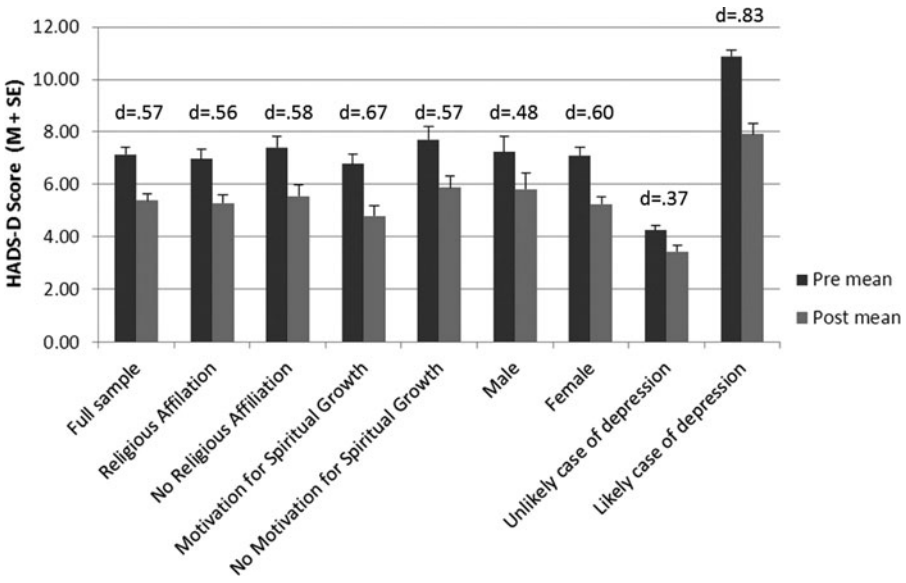

FIG. 1. Decreased depression symptom scores (Hospital Anxiety and Depression Scale-depression subscale [HADS-D]) following mindfulness-based stress reduction were significant for the full study sample and for all participant subgroups (all p-values ≤ 0.002). Within-group effect sizes are shown as the standardized mean difference ($d = t/\sqrt{df}$).

Consistent with our first hypothesis, symptoms of depression decreased following the MBSR program. This finding replicates and extends similar observations from other MBSR programs at large academic medical centers,[30–33] in what appears to be the largest sample size to date.

Consistent with the theoretical foundation of MBSR as a secular meditation training program, depressive symptoms decreased across all subgroups in this study. Specifically, depressive symptom outcomes did not differ as a function of religious affiliation (i.e., having a religious affiliation or not), baseline sense of daily spiritual experiences, sex, or age. Moreover, decreased depressive symptom severity was consistent whether participants stated that they took MBSR for spiritual growth or not. Reduced depressive symptoms were also unrelated to trait levels of mindfulness before beginning the MBSR course. The magnitude of change in depressive symptoms fell in the medium range across nearly all participant subgroups, indicating significance for real-world practice. Persons with more severe depressive symptoms at baseline reported large-magnitude symptom improvement after MBSR, consistent with a prior meta-analysis that mainly included studies with a pre–post design.[8] These results are important because they provide empirical support that MBSR is beneficial across individual differences in religiosity, spiritual orientation, sex, and age.

This study extends a very small number of moderation studies to date, in which a common theme has emerged to suggest that certain psychological traits, including attachment style,[34] dispositional mindfulness,[18] and current depressive symptoms,[8] may help determine who is most likely to gain the greatest mental health benefits from participating in MBSR. Another recent trial on a clinical sample of patients diagnosed with an anxiety disorder found that individual differences in baseline depression symptoms, anxiety sensitivity, and diagnostic severity differentially moderated outcomes of group cognitive-behavioral therapy (CBT) versus an adapted MBSR program, such that CBT outperformed MBSR among those with no to mild depressive symptoms and very high anxiety sensitivity, whereas at follow-up adapted MBSR outperformed CBT among patients with moderate to severe depressive symptoms and among those with average anxiety sensitivity.[35] The current findings build on earlier results by demonstrating consistent MBSR-related decreases in depressive symptoms across religious and spiritual variables, which are known to be related to mental health and propensity for depression.[15] Moreover, in the present study, all moderation models were fit to the intention-to-treat sample ($n = 322$), which allowed analysis of all available observations and minimization of estimation bias by properly handling missing data. Taken together, the present findings and earlier findings point to a complex relationship between psychological dispositions, current symptoms, and religion and spirituality; these variables are interrelated yet may play different roles in influencing MBSR outcomes. For example, higher levels of trait mindfulness at baseline were associated with greater increases in mindfulness, well-being, empathy, and hope, and with greater decreases in perceived stress in a small randomized trial of healthy college students;[18] however, the present study on a self-selected community sample of adults with clinically relevant depressive symptoms did not find that preintervention levels of trait mindfulness moderated symptom outcomes. It is possible that individual differences in trait mindfulness, and possibly other demographic, psychosocial, and health-related variables, could operate differently across studies as a function of study design (e.g., randomized clinical trial versus observational study), outcome measures (e.g., negative affect versus positive emotions and well-being), and sample characteristics (e.g., age range and whether participants have clinically relevant symptoms).

There are many possible explanations for reduced depressive symptoms following MBSR. The current results suggest that changes in depressive symptoms following MBSR are explained, in part, by increased mindfulness of thoughts and feelings and by an enhanced perception of spirituality in daily life. Given the connection between spirituality and mental health,[15] mindfulness practice could parallel religious and spiritual practices, such as prayer and meditation. Each of these contemplative practices may

cultivate an inner life characterized by grace, patience, gratitude, and benevolence, which are associated with mental balance, psychological well-being, and resilience to depression.[15,36,37] Other MBSR outcome studies have reported that reduced depressive symptoms may be partially explained by lower levels of rumination, a known risk factor for depression onset and symptom severity.[38–40] Equally likely, the decrease in depressive symptoms may arise from the practice of disengaging from depressive thoughts and recognizing that they are just mental events rather than truth—a core skill called decentering, as taught in mindfulness-based cognitive therapy (MBCT) for chronic depression.[41] Whereas MBSR is typically taught to a heterogeneous group of community participants who share the common experience of stress but need not have a formal diagnosis, MBCT is intentionally designed as a therapy to help diagnosed patients prevent relapse of recurrent major depression. The mechanisms underlying symptom reduction with mindfulness-based interventions, including MBSR and MBCT, are an active topic of empirical investigation and may involve increased mindfulness, emotion regulation skills and self-compassion on the one hand, and lower levels of rumination and avoidance on the other.[11] Notably, compared with MBCT, which was originally designed to treat patients after their depression has remitted, the present study supports mindfulness training for people with active symptoms of depression. Furthermore, it is possible that simply developing a meaningful routine practice of meditation might increase one's confidence in the ability to exert personal control in enhancing self-care, an ability related to happiness and well-being.[42] Future studies are needed to further elucidate these and other possible psychological mechanisms of change.

This study had several limitations that merit discussion. First, because the design was observational and did not include a comparison group, changes in depressive symptoms cannot be causally attributed to MBSR. Second, nearly one third of study participants did not complete their post-MBSR surveys, thereby limiting the generalizability of the findings. In fact, participants who did not complete the study had more severe depressive symptoms at baseline. The clinical implications of this finding suggest that individuals who are more depressed may require additional support when they are referred to an MBSR program, including (1) additional attention from MBSR group instructors during the 8-week course; (2) additional contact with the course instructor between sessions to check in on such individuals' experience with the class and with ongoing home practice; and (3) coupling MBSR training with individual psychotherapy when symptoms are severe enough to potentially interfere with class attendance, daily meditation practice, or otherwise fully engaging with the program. Although regression models in this study included all participants and allowed for missing data, thereby minimizing attrition bias, it is still possible that regression to the mean could have explained greater symptom improvement among participants with higher levels of depressive symptoms at baseline. Improvements in depressive symptoms, however, were consistent across all demographic subgroups and were uniquely explained by increases in mindfulness and daily spiritual experiences, suggesting an association with MBSR, which has been causally linked with changes in depression symptoms, mindfulness, and spirituality in prior studies.[8,43–45] A third limitation is that mindfulness was measured by using a self-report scale, a method that remains controversial.[46] Finally, demographic characteristics, while similar to those in several other MBSR outcome studies at academic medical centers, limit generalizability to other populations.

Conclusions

MBSR—a secular meditation training program—is associated with improved depressive symptoms regardless of affiliation with a religion, one's sense of daily spiritual experiences, one's initial trait level of mindfulness, sex, or age. These results are consistent with the teaching philosophy of MBSR, which presumes that people can benefit whether they pursue mindfulness training as a secular or spiritual practice. In addition, changes in mindfulness and daily spiritual experiences uniquely explained improvement in depressive symptoms, pointing to possible psychological and spiritual mechanisms of change for future study.

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Author Disclosure Statement

Dr. Wolever has an investment in and is the chief scientific advisor for eMindful, a company that provides live online mindfulness classes. No competing financial interests exist for the other authors.

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