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# Outcomes of a Multimodal Resilience Training Program in an Outpatient Integrative Medicine Clinic

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## Abstract

**Objective:** To investigate the outcomes of resilience training (RT) in an outpatient clinical setting on symptom relief for current or recurrent depression, as well as perceived stress and state and trait anxiety.

**Design:** Observational effectiveness study.

**Settings/Location:** Penny George Institute for Health and Healing, Allina Health, Minneapolis, MN.

**Participants:** A total of 728 men and women age 18 years and older who participated in the RT program between December 1, 2007, and November 31, 2012. Of these individuals, 371 were considered study contributors and completed at least one questionnaire both before (pre-RT) and after (post-RT) completion of the program. The remaining participants were considered study non-contributors and did not complete any questionnaires.

**Interventions:** RT is a mindfulness-based program that synergizes elements of mindfulness meditation with nutrition and exercise into a cohesive intervention.

**Outcome measures:** Depressive symptoms, as well as state and trait anxiety and perceived stress.

**Results:** Among the 371 RT participant contributors, depressive symptoms, perceived stress, and state and trait anxiety improved significantly from pre-RT to post-RT. Furthermore, among participants with depression at baseline, Center for Epidemiologic Studies Depression Scale-10 scores decreased by a mean of 44.0% (from 17.5 to 9.8), a value below the cutoff for significant depressive symptoms. Baseline perceived stress scores were the most predictive of program success.

**Conclusions:** This study provides evidence that a multimodal RT program delivered in a real-world clinical setting improves symptoms of depression, anxiety, and stress. Limitations of this effectiveness study include a homogeneous population of mostly white women and a large amount of randomized, imputed, and missing data. Future work should include a randomized controlled trial and potentially studies to separate RT into the three components to determine which may be primarily responsible for the improved outcomes.

## Introduction

MINDFULNESS- AND MEDITATION-based programs aimed at helping participants manage stress, depression symptoms, and anxiety and promoting well-being are growing in popularity. They have been delivered and studied in a wide variety of patient and non-patient populations.<sup>1–7</sup> A well-known program, mindfulness-based stress reduction (MBSR), was developed by Jon Kabat-Zinn to treat anxiety, reduce stress, and promote self-management of chronic pain.<sup>8–10</sup> Subsequent programs, such as mindfulness-based cognitive therapy (MBCT), have primarily focused on preventing relapse in participants with recurrent depression.<sup>11–15</sup> Several studies have measured mindfulness-based programs,

including MBSR and MBCT, for participants with current depression,<sup>16–20</sup> but this remains an understudied area in the evidence base.

Based on the work of Dr. Henry Emmons,<sup>21</sup> an 8-week program called resilience training (RT) was developed at the Penny George Institute for Health and Healing (PGIHH) specifically for the treatment of individuals with current depression. The group-based RT program shares common elements with, but is distinct from, other mindfulness-based interventions because RT synergizes key elements of mindfulness meditation along with nutrition and exercise recommendations into a cohesive intervention.

In a wait-list comparison pilot investigation of the RT program, 20 clinically depressed health care professionals

assigned to RT were compared with 20 clinically depressed health care professionals assigned to a wait-listed group.<sup>22</sup> After completion of RT, the Center for Epidemiologic Studies Depression Scale (CESD-10) mean depression scores decreased 63%, Patient Health Questionnaire mean depression scores decreased 70%, scores on the Perceived Stress Scale (PSS-4) decreased 48%, trait anxiety on the State Trait Anxiety Inventory (STAI) decreased 23%, and Workplace Productivity and Activity Impairment presenteeism scores decreased by 52%. Between-group comparisons with the wait-list group were all statistically significant, and all improvements (except absenteeism) persisted up to 2 months after RT.

The present study builds on this wait-list pilot investigation of the efficacy of RT and other small efficacy studies of mindfulness-based programs by examining the clinical effectiveness of RT in a larger population. While several randomized controlled trials of mindfulness-based programs have involved larger and more general samples,<sup>14,15,19</sup> most previous studies have included very targeted participant groups, such as patients with cancer or cancer survivors;<sup>2</sup> patients with chronic conditions, such as fibromyalgia or cardiovascular diagnoses;<sup>5</sup> veterans;<sup>23,24</sup> mothers of children with disabilities;<sup>25</sup> and pregnant women.<sup>26</sup>

In this effectiveness study of the RT program offered at an integrative medicine clinic, the inclusion criteria were broadened to include all participants who enrolled in RT over 5 years. We investigated the effect of RT on depression, stress, anxiety, pain, quality of sleep, and fatigue and explored what participant characteristics at baseline, if any, are associated with RT program success. The role of this research is to build on previous work conducted in controlled settings by examining the effectiveness of RT in the less predictable context of a real-world, clinical setting.

## Materials and Methods

### *RT program description*

Details of the RT program have been previously published<sup>22</sup> but are briefly described here. RT is a manualized 8-week group-based program designed for patients to discover and develop self-care skills and advance personal capacity for well-being. RT integrates three components: (1) mindfulness meditation, (2) nutrition, and (3) exercise recommendations. The RT program consists of 2.5-hour group mindfulness sessions for 8 consecutive weeks with a trained facilitator. All RT facilitators had a mental health degree, had a minimum of 5 years of personal meditation practice, and went through RT training with Dr. Emmons, who is MBSR-trained. Participants also received individualized guidance from one of the RT program's psychiatrists, clinical nutritionists (licensed nutritionist), and exercise physiologists. Individual nutrition and exercise sessions are each 1 hour and take place at or near the beginning of the program.

Mindfulness has been defined as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally";<sup>27</sup> the technique is conceptualized as a cognitive stance that allows a more accurate apperception of the nature of mental events. The mindfulness meditation component of the RT program integrates this capacity into everyday life as a coping resource for dealing with intensive physical symptoms, chronic medical conditions, and difficult emotional situations. The focus of the diet and nutrition component is to

measure, replenish, and optimize nutritional status in order to provide rational, customized guidance to participants for potentially helpful dietary choices and supplementation. The nutrition component consists of an initial consultation, individualized dietary recommendations, and follow-up sessions if needed. The focus of the exercise component is for participants to receive customized training and activity recommendations, including a demonstration of recommended exercises with or without exercise equipment. This component consists of an individual intake session, fitness assessment, results consultation, and exercise prescription (including modes of exercise, frequency, duration, intensity, and techniques for adherence). Appendix A summarizes the content included in the weekly group mindfulness sessions.

To facilitate use of the skills provided in the weekly group sessions, participants are provided with a pre-recorded, 20-minute guided meditation CD, created by Dr. Emmons, to use at home each day. The CD introduces a meditation sequence to help participants elicit mindfulness, including some of the key elements, such as breath awareness.

### *RT program setting and participants*

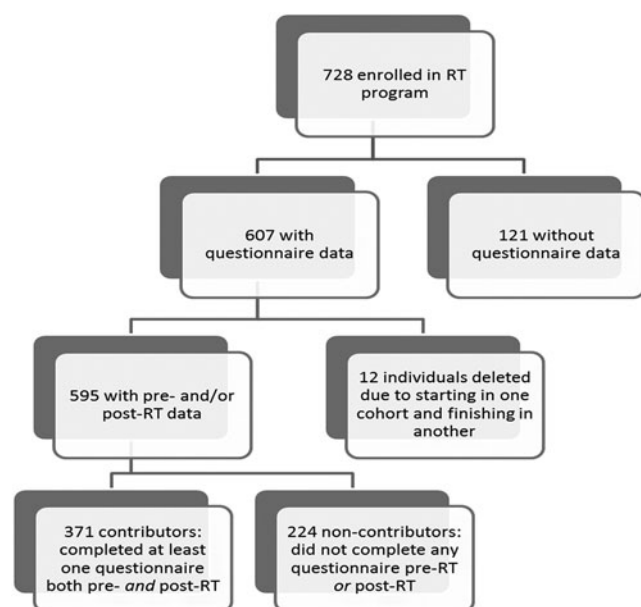
The RT program is conducted at the PGIHH outpatient clinic, housed on the campus of Abbott Northwestern Hospital in Minneapolis, Minnesota. RT program participants are patients of Allina Health due to the RT program's individualized appointments, and all Allina Health patients provide written documentation granting (or not granting) permission for their medical record to be used for general research purposes, as required under Minnesota Statute Sections 144.291 to 144.298. Only individuals who granted permission were included in this effectiveness study of the RT program.

Participants included men and women age 18 years and older who participated in the PGIHH RT program between December 1, 2007, and November 31, 2012. Of 728 individuals enrolled in the program, 121 were excluded because they did not provide any questionnaire data. Additionally, 12 individuals were excluded because they participated in two or more cohorts of the RT program and therefore did not follow the standard 8-week schedule. Because this was an effectiveness study, there were no other specific inclusion or exclusion criteria for participant enrollment. The final sample included 595 participants. Of these individuals, 371 were considered study contributors and completed at least one questionnaire both before and after RT (it did not have to be the same questionnaire). The remaining 224 participants were considered study non-contributors and did not complete any questionnaires before or after RT (Fig. 1).

### *Measurements*

Demographic data, including age, sex, and race, were obtained retrospectively through electronic medical records (Epic; Verona, WI). Because demographic data are self-reported and patients often choose not to answer these questions, missing demographic data are common.

Depression, stress, anxiety, fatigue, pain, and quality of sleep outcome measures were obtained from standardized self-administered questionnaires that patients completed before (pre-RT) and after (post-RT) the 8-week program. At the first session, research staff or RT program facilitators



**FIG. 1.** Flow of participants in the Penny George Institute for Health and Healing Resilience Training study. CONSORT (Consolidated Standards of Reporting Trials) diagram showing the number of participants in the study and reasons for dropout. RT, resilience training.

explained that the questionnaires were solely for research purposes and were completely voluntary.

Depressive symptoms were measured with the CESD-10 scale,<sup>29,30</sup> a reliable and validated self-report questionnaire. The inventory comprises 10 multiple-choice questions and scores range from 0 to 30; a cutoff score of 10 indicates significant depressive symptoms.

Perceived stress was ascertained via the PSS-4,<sup>31,32</sup> a brief, validated, and widely used psychological instrument. The PSS-4 has four questions with a total score ranging from 0 to 16; a higher score indicates higher perceived stress.

State and trait anxiety were assessed through the STAI,<sup>33</sup> which is a psychological inventory consisting of 40 questions. Scoring is based on a four-point Likert scale ranging from 1 (not anxious) to 4 (highly anxious), with overall scores varying from 20 to 80 for each type of anxiety.

Fatigue, pain, and quality of sleep were assessed through three separate questions by asking participants to circle one number, on a scale from 0 to 10, to indicate the average overall level of fatigue, pain, or feeling of rest they experienced during the past month. Zero indicated “no fatigue,” “no pain,” and “not rested at all,” while 10 indicated “worst fatigue,” “worst pain imaginable,” and “very rested.” To reduce participant burden, single questions were used to assess these outcomes instead of using longer, existing measures.

The Allina Health institutional review board approved this study with a waiver of informed consent. Through completion of the paper questionnaires, consent to be part of the research study was implied.

#### Statistical analysis

For any question on any questionnaire in which a participant selected more than one answer, a single answer was generated through a randomization process. For partially

completed questionnaires, imputations were calculated according to standard methods. Single items that were left unanswered in the CESD-10 were imputed as equivalent to the average calculated from the remaining questions.<sup>30</sup> When two or fewer items of the STAI questionnaire were left unanswered, per the STAI scoring convention, the prorated full-scale score was in those cases obtained by determining the mean weighted score for the scale items to which the participant responded, multiplying that value by 20, and rounding the product to the next highest whole number.<sup>33</sup> Appendix B describes the number of randomized and imputed answers and missing questionnaires for study contributors.

Continuous data were summarized by using means and standard deviations, and differences between groups were assessed by using a two-sample *t*-test with  $\alpha=0.05$ . Categorical data were summarized by using frequencies and percentages, and differences between groups were assessed by a chi-square test. Pearson correlations were run for contributors to observe the association in score change from baseline to program completion between depression and perceived stress (PSS-4), anxiety (STAI), and self-report average pain.

Although all participants had a clinical diagnosis of depression, not all scored above the depression threshold on the CES-D ( $\geq 10$ ) at baseline. Thus, pre- and post-RT outcome measures were divided into three groups for analyses: all contributors, those who were depressed before RT (CESD-10  $\geq 10$ ), and those who were not depressed before RT (CESD-10  $< 10$ ). For within-subject changes from pre- to post-RT, *p*-values were calculated by a two-tailed paired *t*-test for normally distributed data and a Wilcoxon signed rank-sum test for non-normally distributed data. Mean changes between depressed and non-depressed groups were compared by using a two-sample *t*-test. Logistic regression was used to evaluate demographic variables and baseline measures associated with program success, defined as a non-depressed state after RT (CESD-10  $< 10$ ). Interaction and confounding (alteration of odds ratio by  $\geq 10\%$ ) by demographic variables were assessed for all outcome measures.

All statistical analyses were calculated by using SAS software, version 9.3 (SAS Institute, Inc., Cary, NC). No adjustments were made to account for multiple comparisons.

#### Results

Of 728 individuals participating in the RT program during the study timeframe, 371 (50.9%) were deemed contributors because they completed at least one outcome questionnaire before and after RT (Table 1). A total of 357 participants did not fill out any outcome questionnaire; of these, 224 did not complete pre-RT or post-RT questionnaires and were considered non-contributors. The mean age of 371 RT program contributors (47.6 years) was approximately 2 years older than that of the 224 RT program non-contributors (45.6 years). Study contributors were 64.7% female and 64.4% white. Overall, there were no statistically significant differences between contributors and non-contributors for any demographic variable (i.e., age, sex, race).

Score change in perceived stress, state and trait anxiety, and average pain all had a statistically significant, positive correlation with change in depression (Fig. 2). Anxiety correlated well with depression ( $r=0.71$  for state [ $p<0.01$ ];  $r=0.74$  for trait [ $p<0.01$ ]), while perceived stress and

TABLE 1. PARTICIPANT CHARACTERISTICS AT STUDY ENTRY

| Characteristic             | Contributor     | Non-contributor | p-value |
|----------------------------|-----------------|-----------------|---------|
| Participants, <i>n</i> (%) | 371 (62.3)      | 224 (37.7)      | –       |
| Mean age $\pm$ SD (y)      | 47.6 $\pm$ 11.9 | 45.6 $\pm$ 12.9 | 0.10    |
| Sex, <i>n</i> (%)          |                 |                 | 0.81    |
| Female                     | 240 (64.7)      | 142 (63.4)      |         |
| Male                       | 61 (16.4)       | 35 (15.6)       |         |
| Unknown                    | 70 (18.9)       | 47 (21.0)       |         |
| Race, <i>n</i> (%)         |                 |                 | 0.97    |
| White                      | 239 (64.4)      | 144 (64.3)      |         |
| Other/unknown              | 132 (35.6)      | 80 (35.7)       |         |

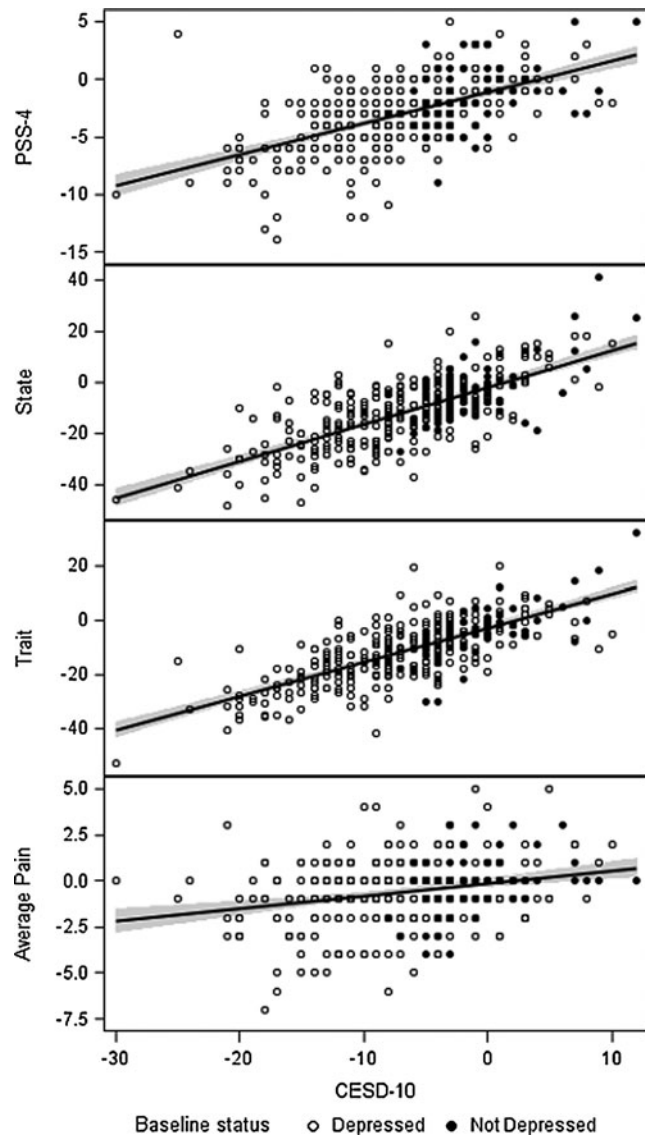
Contributors are defined as those who finished at least one outcome measure before and after resilience training (RT). Non-contributors are defined as those who did not fill out any outcome measures before or after RT. The *p*-values for between-group comparisons were calculated by a two-sample *t*-test for continuous data and a chi-square test for frequency data.

SD, standard deviation.

average pain showed less correlation ( $r=0.58$  [ $p<0.01$ ];  $r=0.26$  [ $p<0.01$ ], respectively).

For study contributors ( $n=371$ ), all outcome measures had a statistically significant change from baseline to program completion (Table 2, column 1). When contributors were divided into baseline depressed (CES-D  $\geq 10$ ;  $n=299$ ) and non-depressed (CES-D  $< 10$ ;  $n=67$ ) cohorts ( $n=5$  without a pre-RT CESD-10 measurement), all outcomes remained statistically significantly different from baseline except for average and worst pain scales for the baseline non-depressed participants (Table 2, columns 2 and 3). Similarly, between-group analyses showed significant differences among all outcome measures except for average and worst pain scales. CES-D mean depression scores decreased 36.9% for all study contributors. Of note, the depressed cohort had a mean decrease of 44.0% from pre- to post-RT, changing from 17.5 to 9.8, a value below 10, the cutoff of significant depressive symptoms.

Results from logistic regression predicting RT program success (non-depression as measured by CESD-10 score  $< 10$  after program completion) are summarized in Table 3. Among the 371 study contributors (column 1), older patients had greater odds of RT program success, as each additional year of age increased the odds of program success by 4% (odds ratio [OR], 1.04; 95% confidence interval [CI], 1.01–1.06). Compared with female participants ( $n=240$ ), male participants ( $n=61$ ) had 74% lower odds (OR, 0.26; CI, 0.14–0.46) of RT success. There was no statistically significant difference in program success between whites and participants of other/unknown race. Baseline depression, perceived stress, state and trait anxiety, sleep quality, and fatigue were statistically significant predictors of program success while average and worst pain scores were not. The subgroup analysis of 299 individuals, who were depressed at baseline, produced largely similar results (Table 3, column 2). Neither age nor fatigue remained significant predictors of program success among depressed individuals. Perceived stress scores at baseline were the most predictive of program success; for each 1-point increase on the PSS-4 scale, study contributors had a 21% reduced odds of program success (OR, 0.79; CI, 0.71–0.88) and depressed individuals had a



**FIG. 2.** Correlations of score changes from post- to pre-resilience training between depression and related outcome measures grouped by baseline depression status. Plot of correlations between score change in perceived stress (Perceived Stress Scale [PSS-4]), state and trait anxiety (State Trait Anxiety Inventory), and average pain with change in depression (Center for Epidemiologic Studies Depression Scale –10). Participants are grouped by baseline depression status, where open circles indicate depressed participants and solid circles indicate not depressed participants.

22% reduced odds of program success (OR, 0.78; CI, 0.69–0.89).

## Discussion

This outcomes study found statistically significant improvements in the PGIHH RT program from pre-RT to post-RT in depression, stress, state and trait anxiety, pain, quality of sleep, and fatigue measures among 371 program contributors, suggesting that RT may improve symptoms. Among participants with high levels of depressive symptoms at baseline, CESD-10 depression scores decreased a mean of 44.0%,

TABLE 2. EFFECT OF RESILIENCE TRAINING ON VARIOUS OUTCOME MEASURES COMPARING DEPRESSED AND NON-DEPRESSED PARTICIPANTS UPON STUDY ENROLLMENT

| Outcome measure                       | All contributors (n = 371) |                 |                              |            | Pre-RT CESD-10 $\geq 10$ (n = 299) |                 |                              |            | Pre-RT CESD-10 < 10 (n = 67) |                |                              |            | Between-group p-value |
|---------------------------------------|----------------------------|-----------------|------------------------------|------------|------------------------------------|-----------------|------------------------------|------------|------------------------------|----------------|------------------------------|------------|-----------------------|
|                                       | Participants (n)           | Pre-RT          | Post-RT                      | Change (%) | Participants (n)                   | Pre-RT          | Post-RT                      | Change (%) | Participants (n)             | Pre-RT         | Post-RT                      | Change (%) |                       |
| CESD-10 (0 <sup>a</sup> –30)          | 364                        | 15.5 $\pm$ 6.3  | 8.9 $\pm$ 5.7 <sup>b</sup>   | –36.9      | 297                                | 17.5 $\pm$ 4.9  | 9.8 $\pm$ 5.9 <sup>b</sup>   | –42.4      | 67                           | 6.4 $\pm$ 2.3  | 5.1 $\pm$ 4.1 <sup>b</sup>   | –12.5      | <0.01                 |
| PSS-4 (0 <sup>a</sup> –16)            | 366                        | 8.7 $\pm$ 3.0   | 5.8 $\pm$ 2.8 <sup>b</sup>   | –28.5      | 297                                | 9.4 $\pm$ 3.0   | 6.2 $\pm$ 2.8 <sup>b</sup>   | –31.9      | 65                           | 5.3 $\pm$ 2.3  | 3.8 $\pm$ 2.0 <sup>b</sup>   | –13.0      | <0.01                 |
| STAI (20 <sup>a</sup> –80)            |                            |                 |                              |            |                                    |                 |                              |            |                              |                |                              |            |                       |
| State                                 | 368                        | 47.9 $\pm$ 12.2 | 36.8 $\pm$ 11.5 <sup>b</sup> | –19.6      | 297                                | 51.0 $\pm$ 10.8 | 36.8 $\pm$ 11.5 <sup>b</sup> | –23.6      | 67                           | 34.4 $\pm$ 8.2 | 31.0 $\pm$ 10.4 <sup>b</sup> | –6.0       | <0.01                 |
| Trait                                 | 366                        | 53.1 $\pm$ 11.5 | 41.9 $\pm$ 11.5 <sup>b</sup> | –20.5      | 295                                | 56.3 $\pm$ 9.8  | 43.9 $\pm$ 11.6 <sup>b</sup> | –21.3      | 67                           | 39.2 $\pm$ 7.6 | 34.0 $\pm$ 9.0 <sup>b</sup>  | –11.4      | <0.01                 |
| Pain (0 <sup>a</sup> –10)             |                            |                 |                              |            |                                    |                 |                              |            |                              |                |                              |            |                       |
| Average                               | 366                        | 2.8 $\pm$ 2.0   | 2.2 $\pm$ 1.8 <sup>b</sup>   | –19.8      | 296                                | 3.0 $\pm$ 2.1   | 2.3 $\pm$ 1.9 <sup>b</sup>   | –8.8       | 66                           | 2.0 $\pm$ 1.4  | 1.6 $\pm$ 1.4                | –11.2      | 0.29                  |
| Worst                                 | 368                        | 4.5 $\pm$ 2.6   | 3.8 $\pm$ 2.6 <sup>b</sup>   | –9.1       | 297                                | 4.7 $\pm$ 2.7   | 4.0 $\pm$ 2.6 <sup>b</sup>   | –14.9      | 66                           | 3.7 $\pm$ 2.1  | 3.1 $\pm$ 2.4                | –10.8      | 0.64                  |
| Quality of sleep (0–10 <sup>a</sup> ) | 370                        | 5.1 $\pm$ 2.3   | 6.6 $\pm$ 2.0 <sup>b</sup>   | 56.5       | 298                                | 4.6 $\pm$ 2.2   | 6.4 $\pm$ 2.0 <sup>b</sup>   | 65.8       | 67                           | 7.0 $\pm$ 1.8  | 7.7 $\pm$ 1.8 <sup>b</sup>   | 18.1       | <0.01                 |
| Fatigue (0 <sup>a</sup> –10)          | 369                        | 5.6 $\pm$ 2.0   | 4.2 $\pm$ 2.0 <sup>b</sup>   | –19.8      | 297                                | 6.0 $\pm$ 1.8   | 4.4 $\pm$ 2.0 <sup>b</sup>   | –21.8      | 67                           | 4.0 $\pm$ 1.8  | 3.4 $\pm$ 2.1 <sup>b</sup>   | –11.3      | <0.01                 |

Pre- and post-RT values are displayed as mean  $\pm$  standard deviation. The *p*-values for within-subject changes were calculated by a two-tailed paired *t*-test for normally distributed data and a Wilcoxon signed rank-sum test for non-normally distributed data. The *p*-values for between-group changes (pre-RT CESD-10  $\geq 10$  versus CESD-10 < 10) were calculated by using a two-sample *t*-test.

<sup>a</sup>Indicates better health.

<sup>b</sup>Indicates significant within-subject change from pre-RT (*p* < 0.05).

RT, resilience training; CESD-10, Center for Epidemiologic Studies Depression Scale; PSS-4, Perceived Stress Scale; STAI, State-Trait Anxiety Inventory.

TABLE 3. LOGISTIC REGRESSION MODELS OF FACTORS ASSOCIATED WITH A NON-DEPRESSED STATE AFTER RESILIENCE TRAINING

| Variable                | <i>All contributors (n = 371)</i> |                | <i>Pre-RT CESD-10 ≥ 10 (n = 299)</i> |                |
|-------------------------|-----------------------------------|----------------|--------------------------------------|----------------|
|                         | <i>OR (95% CI)</i>                | <i>p-value</i> | <i>OR (95% CI)</i>                   | <i>p-value</i> |
| Demographic variables   |                                   |                |                                      |                |
| Age                     | 1.04 (1.01–1.06)                  | < 0.01         | 1.02 (1.00–1.05)                     | 0.07           |
| Sex                     |                                   |                |                                      |                |
| Female                  | 1.00                              |                | 1.00                                 |                |
| Male                    | 0.26 (0.14–0.46)                  | < 0.01         | 0.26 (0.14–0.50)                     | < 0.01         |
| Unknown                 | 0.74 (0.42–1.31)                  | 0.30           | 0.82 (0.46–1.49)                     | 0.52           |
| Race                    |                                   |                |                                      |                |
| White                   | 1.00                              |                | 1.00                                 |                |
| Other/unknown           | 1.10 (0.58–2.08)                  | 0.78           | 0.91 (0.44–1.88)                     | 0.80           |
| Pre-RT outcome measures |                                   |                |                                      |                |
| CESD-10                 | 0.89 (0.84–0.93)                  | < 0.01         | 0.88 (0.83–0.95)                     | < 0.01         |
| PSS-4                   | 0.79 (0.71–0.88)                  | < 0.01         | 0.78 (0.69–0.89)                     | < 0.01         |
| STAI                    |                                   |                |                                      |                |
| State                   | 0.95 (0.93–0.98)                  | < 0.01         | 0.95 (0.92–0.98)                     | < 0.01         |
| Trait                   | 0.93 (0.91–0.96)                  | < 0.01         | 0.93 (0.90–0.97)                     | < 0.01         |
| Pain                    |                                   |                |                                      |                |
| Average                 | 0.97 (0.85–1.11)                  | 0.65           | 0.98 (0.86–1.13)                     | 0.81           |
| Worst                   | 0.97 (0.88–1.08)                  | 0.59           | 0.97 (0.87–1.08)                     | 0.62           |
| Quality of sleep        | 1.25 (1.10–1.41)                  | < 0.01         | 1.17 (1.02–1.35)                     | 0.03           |
| Fatigue                 | 0.86 (0.75–0.99)                  | 0.04           | 0.88 (0.74–1.04)                     | 0.13           |

OR, odds ratio; CI, confidence interval.

changing from 17.5 to 9.8; the latter score is below the CESD cutoff indicating depressive symptoms. Perceived stress scores at baseline were the most predictive of program success on depression outcomes.

The current study builds on previous research with the added advantage of being a practice-based study with a larger sample size. The larger population and observational design simultaneously strengthen and challenge our work. On the one hand, this study was not a randomized clinical trial and, as such, lacked a comparison group. On the other hand, the practice-based observational approach allowed understanding of the program's effectiveness and clinical practice implications rather than its efficacy.

This study addresses several gaps in the evidence base. To date, only a few effectiveness studies have reported on the positive effects of mind/body, mindfulness-based, or resilience-focused programs for heterogeneous populations of patients.<sup>16,34–36</sup> A recent effectiveness study of MBSR reported post-program reductions in depressive symptoms of 24.6% but did not include exercise or nutritional components.<sup>16</sup> Few studies have reported on programs that combine mindfulness and meditation principles with diet and exercise components.<sup>37–41</sup> All but one of these<sup>38</sup> focused on a specific population or medical condition, and while one examined depression and anxiety as secondary measures,<sup>40</sup> the others did not measure psychological outcomes.

Studies aimed to promote resilience in individuals are numerous and have been recently evaluated in a meta-analysis.<sup>42</sup> That analysis of 25 randomized trials of resiliency training programs reported a consistent benefit of these programs in improving mental health outcomes within 3 months of follow-up. Similar to current results, the meta-analysis reported improvements in depression, stress, and anxiety among generalized stress-directed

training programs. However, these findings were non-significant and the authors note several limitations of their meta-analysis, including widely ranging study settings and populations (e.g., workplace, community, and clinical settings). Approximately half the studies in the meta-analysis did not measure resilience as an outcome, and instruments varied among those that did measure it. Despite challenges in measuring a concept as variably defined as resilience, assessing changes in resilience would be an important next step for studies of resilience training programs such as RT, and several instruments now exist for assessing this outcome.<sup>43</sup>

Limitations to this study include its setting at one integrative medicine clinic and its primarily female and white participant population. Additionally, this effectiveness evaluation did not measure compliance with regard to class attendance, at-home meditation, exercise practice, and nutrition recommendations. Homework compliance has been cited as a challenge in other behavioral interventions with depressed groups.<sup>44,45</sup> Future studies involving at-home components may benefit from using more convenient and easily tracked interfaces; recent studies have begun taking advantage of such options.<sup>46,47</sup>

Because this study was conducted in a real-world clinical setting, it contains a large amount of randomized, imputed, and missing data. While common in such studies, use of electronic data collection in the future should minimize this limitation. The possibility exists that the results found in this study are due to attrition bias. Only 371 (51%) were considered study contributors and completed at least one questionnaire both before and after RT. However, the completion rate and results are similar to those of other similar studies of real-world mind/body interventions.<sup>16,35,36</sup> Because of the low proportion of program participants who

were considered study contributors, generalizing these results to all RT program participants or to other similar programs must be made with caution.

Finally, the three components of the RT program cannot yet be separated to determine which of the components was primarily responsible for the outcome. It is possible that the combination of the meditation, nutrition, and exercise components were synergistically responsible for the enhanced effect.<sup>48</sup> Despite the challenges of separating the parts of a multimodal behavioral intervention,<sup>49</sup> future work could be undertaken to evaluate the effects of the various components to ensure the program is appropriately designed and delivered.

Although observational studies in real-world settings are well suited to investigating effectiveness, the potential for bias and confounding mean that designs such as that used for this study do not provide a complete understanding of how programs work. The present analysis is of an uncontrolled study with multiple potential sources of bias, building upon results of one non-randomized trial. Additional research should also include a more definitive set of studies, including a randomized controlled trial that minimizes bias and is adequately powered.

Limitations of this study notwithstanding, there is unique benefit in the opportunity to examine the challenges and outcomes of a mindfulness-based program delivered in clinical practice. Participants of this study included patients with depression, anxiety, and other stress-related conditions who chose to undertake RT. Furthermore, the effectiveness nature of the study design removes potential bias associated with participant selection and randomization. The reporting of both the measured changes from and drawbacks of this program may be valuable to other organizations for the current or planned implementation of similar programs.

Many individuals seek out mindfulness and meditation-based programs to help manage stress, depressive symptoms, and anxiety and to promote well-being. This effectiveness study of a multimodal RT program found that there may be improvements in these psychological outcomes, as well as in fatigue and quality of sleep, and found baseline perceived stress scores were the most predictive of program success on decreased depressive symptoms. This investigation is the first to study the effectiveness of the RT program using a large sample of individuals from a real-world clinical setting. The results of this study have the potential to provide a framework for future RT program implementation.

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(Appendix follows →)

APPENDIX A. COMPONENTS OF THE RESILIENCE TRAINING PROGRAM

| <i>Program specifics</i>                    | <i>Week 1</i> | <i>Week 2</i>                           | <i>Week 3</i>                              | <i>Week 4</i>                 | <i>Week 5</i>              | <i>Week 6</i>             | <i>Week 7</i>                               | <i>Week 8</i>                  |
|---------------------------------------------|---------------|-----------------------------------------|--------------------------------------------|-------------------------------|----------------------------|---------------------------|---------------------------------------------|--------------------------------|
| <b>Improving Skills: Difficult Emotions</b> |               |                                         |                                            |                               |                            |                           |                                             |                                |
| <b>Meditation</b>                           |               |                                         |                                            |                               |                            |                           |                                             |                                |
| Awareness of breath                         | x             | x                                       | x                                          | x                             | x                          | x                         | x                                           | x                              |
| Sitting                                     | x             | x                                       | x                                          | x                             | x                          | x                         | x                                           | x                              |
| Psychology of mindfulness                   | x             | x                                       | x                                          | x                             | x                          | x                         | x                                           | x                              |
| Seven aspects of resilience                 |               | Power of the mind: biochemistry of mood | Dealing skillfully with difficult emotions | Reducing emotional reactivity | Practicing self-acceptance | Loving/ kindness practice | Creating connection: positive relationships | Dialogue with your inner voice |
| <b>Group-based accountability of goals</b>  | x             | x                                       | x                                          | x                             | x                          | x                         | x                                           | x                              |
| <b>Diet/Nutrition follow-up</b>             | x             | x                                       | x                                          | x                             | x                          | x                         | x                                           | x                              |
| <b>Exercise follow-up</b>                   | x             | x                                       | x                                          | x                             | x                          | x                         | x                                           | x                              |

APPENDIX B. NUMBER OF RANDOMIZED  
AND IMPUTED ANSWERS AND MISSING  
QUESTIONNAIRES FOR STUDY CONTRIBUTORS

| <i>Outcome Measure</i> | <i>Type</i> | <i>Time point</i> |                |
|------------------------|-------------|-------------------|----------------|
|                        |             | <i>Pre-RT</i>     | <i>Post-RT</i> |
| CESD-10                | Randomized  | 2                 | 4              |
|                        | Imputed     | 10                | 10             |
|                        | Missing     | 5                 | 2              |
| PSS-4                  | Randomized  | 4                 | 4              |
|                        | Imputed     | NA                | NA             |
|                        | Missing     | 3                 | 2              |
| State anxiety          | Randomized  | 3                 | 4              |
|                        | Imputed     | 14                | 9              |
|                        | Missing     | 1                 | 3              |
| Trait anxiety          | Randomized  | 5                 | 10             |
|                        | Imputed     | 52                | 42             |
|                        | Missing     | 2                 | 4              |
| Pain average           | Randomized  | 2                 | 1              |
|                        | Imputed     | NA                | NA             |
|                        | Missing     | 5                 | 0              |
| Pain worst             | Randomized  | 0                 | 1              |
|                        | Imputed     | NA                | NA             |
|                        | Missing     | 3                 | 0              |
| Sleep                  | Randomized  | 1                 | 3              |
|                        | Imputed     | NA                | NA             |
|                        | Missing     | 0                 | 1              |
| Fatigue                | Randomized  | 1                 | 0              |
|                        | Imputed     | NA                | NA             |
|                        | Missing     | 1                 | 1              |

RT, resilience training; CESD-10, Center for Epidemiologic Studies Depression Scale; PSS-4, Perceived Stress Scale; NA, not applicable.