

## RESILIENCE TRAINING: A PILOT STUDY OF A MINDFULNESS-BASED PROGRAM WITH DEPRESSED HEALTHCARE PROFESSIONALS

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**Context:** Mindfulness-based programs have been primarily used to target anxiety or the prevention of relapse in recurrent depression; however, limited research has been conducted on the use of mindfulness programs for relief of current depressive symptoms.

**Objective:** To investigate the potential effect of resilience training (RT) on symptom relief for current or recurrent depression, and other psychological/behavioral outcomes.

**Design:** Wait-list comparison pilot study.

**Setting:** Penny George Institute for Health and Healing, Allina Health, Minneapolis, MN.

**Participants:** A total of 40 actively working healthcare professionals age 18–65 years.

**Intervention:** RT is an eight-week mindfulness-based program that synergizes elements of mindfulness meditation with nutrition and exercise. The first 20 consecutive individuals meeting all eligibility criteria were assigned to the RT group. The next 20 consecutive eligible individuals were placed into the wait-list control group and

had an eight-week waiting period before starting the RT program.

**Outcome Measures:** Psychological/behavioral outcomes were measured before and after completion of the RT program and two months after completion. Wait-list participants also had measures taken just before starting on the wait-list.

**Results:** The RT group exhibited a 63–70% ( $P \leq .01$ ) reduction in depression, a 48% ( $P \leq .01$ ) reduction in stress, a 23% ( $P \leq .01$ ) reduction in trait anxiety, and a 52% ( $P \leq .01$ ) reduction in presenteeism (a per-employee savings of \$1846 over the eight-week program). All outcomes were statistically significantly different from the wait-list group. Most improvements persisted up to two months after completion of the RT program.

**Conclusions:** Further replication with a larger sample size, and enhanced control group is warranted.

**Key words:** Anxiety/anxiety disorders, Depression, Stress, Mindfulness/meditation

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### INTRODUCTION

Mindfulness-based programs are growing in popularity and have been associated with improvements in anxiety, stress, and other symptoms (e.g., quality of life measures and sleep) in a variety of populations.<sup>1–5</sup> Mindfulness interventions are intended to support cultivation of awareness and focus on the reality of the present moment with acceptance and acknowledgment and without interpretation or emotional reaction.<sup>6</sup>

The popular mindfulness-based stress reduction (MBSR) program developed by Jon Kabat-Zinn<sup>6</sup> has been recommended as either a stand-alone or adjunctive intervention for a variety of medical conditions, including depressive symptomatology.<sup>3</sup> However, MBSR was not developed specifically to target active depression,<sup>6–8</sup> and one review

did not report evidence for MBSR's efficacy for depression and anxiety.<sup>9</sup> Another program, mindfulness-based cognitive therapy (MBCT), has been reported by several systematic reviews to alleviate depression under specific circumstances, notably prevention of relapse in recurrent depression.<sup>3,10,11</sup> A 2014 meta-analysis was the first to examine the effects of mindfulness-based interventions on individuals with a diagnosis of current depressive disorder, with findings of significant benefits of MBCT and another program, person-based cognitive therapy, on 160 participants with current depression in four studies.<sup>12</sup>

Despite this small body of evidence for benefits of mindfulness-based interventions in treating current depression, MBSR has primarily been used to treat anxiety disorders, while MBCT has a specific role in preventing and mitigating relapse in recurrent depression,<sup>6,12,13</sup> leaving a gap in how mindfulness-based interventions may be most appropriately and deliberately delivered to participants with current depression. Based on the work of Dr. Henry Emmons,<sup>14</sup> an eight-week group program called resilience training (RT) was developed at the Penny George Institute for Health and

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Healing specifically for the treatment of current depression. RT shares common elements with, but is distinct from, other popular mindfulness-based interventions because RT synergizes key elements of mindfulness meditation along with nutrition and exercise into a cohesive, accessible intervention. While RT incorporates elements of MBSR, it is not based upon MBCT, and any similarities are due to their common rootedness in MBSR.

The RT program encourages natural resilience to stressors, an approach predicated on the possibility that depressed participants can increase their ability to respond to and manage stress. Historically, resilience has commonly been treated as a relatively stable trait.<sup>15</sup> However, a framework of resilience recently described by Waugh and Koster<sup>15</sup> is consistent with the aims and foci of the RT program, proposing that resilience among people with depression may be deficient but can be developed. The authors describe individuals with recurrent depression—even during periods of remission—as particularly sensitive to small stressors, and they suggest the promotion of coping with minor stressors, promoting positive emotions, and cultivating awareness of various environmental demands in order to respond to these demands with more flexibility.<sup>15</sup> These approaches to improving resilience share common ground with the central activities of mindfulness training. We hypothesize that the multi-modal RT program, which combines mindfulness training with exercise and nutritional strategies, may have the potential to benefit participants with current depressive symptoms.

Reviews and meta-analyses suggest that nutrition<sup>16,17</sup> and exercise<sup>18,19</sup> can positively affect depression levels. While evidence for the effects of nutritional elements on depression is mixed, there are review articles and studies suggesting omega-3 fatty acids,<sup>20,21</sup> dietary and supplemental folate,<sup>22,23</sup> B12,<sup>23</sup> and vitamin D<sup>24,25</sup> may positively influence depressive symptoms. Support for exercise includes a 2013 Cochrane report summarizing data from 35 trials that compared exercise with no treatment or a control intervention for depression, finding exercise to have a moderate clinical effect on depression symptoms.<sup>18</sup> Additional reviews and randomized trials have found protective effects against depression with even low doses (20–60 minutes per week) of exercise,<sup>26</sup> and effects comparable to antidepressant medication.<sup>27</sup> Exercise has been suggested as adjuvant treatment for many or most patients with depressive disorder.<sup>28</sup>

In the present wait-list comparison pilot investigation, we explore whether RT fills a gap in available mindfulness-based interventions by using similar, but additional, components to target major depressive disorders in a group of currently depressed healthcare professionals. Healthcare professionals, subject to a great deal of work-related stress,<sup>29,30</sup> frequently feel overworked and understaffed, and several studies report lower quality of life and high stress in physicians<sup>31,32</sup> and in nurses.<sup>33,34</sup> Depression, which has been associated with job stress,<sup>35,36</sup> is a costly health condition among employees in the United States, particularly with regard to presenteeism, or loss of on-the-job work productivity.<sup>37</sup> Severity of depression and work productivity loss have been found to have a strong linear relationship.<sup>38</sup>

In this study, we investigate the potential effect of the RT program on immediate and two-month post-intervention symptom relief for current or recurrent depression, as well as other psychological and behavioral outcomes including stress, anxiety, workplace productivity, and health-promoting behavior.

## MATERIALS AND METHODS

### Study Population

A total of 40 clinically depressed healthcare professionals working for Allina Health participated in a wait-list comparison pilot study. Recruitment took place between August and November 2008 through electronic and print advertising at Abbott Northwestern Hospital, Allina Commons (the Allina Health headquarters), and the Allina Health employee website. Participants were eligible if they were between the age of 18 and 65 years and were an actively working healthcare professional employed by Allina Health (50% or higher employee status). Participants needed a documented clinical diagnosis according to the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision)<sup>39</sup> meeting criteria 296.2x Major Depressive Disorder (MDD), Single Episode, or 296.3x Major Depressive Disorder, Recurrent, as confirmed by the Mini International Neuropsychiatric Interview (MINI).<sup>40</sup> A trained MINI assessor conducted the MINI evaluations. Participants also had to present with a score on the Center for Epidemiologic Studies Depression (CESD-10) scale of greater than or equal to 10. Subjects were excluded for presence of any of the following: Axis I disorder other than MDD, current episode of depression which began less than four weeks from screening, or a history of inadequate response to adequate treatment (six weeks) with two or more classes of anti-depressants during the current depressive episode.

The first 20 consecutive individuals who met all eligibility criteria were assigned to the RT group and immediately started the RT program. The next 20 consecutive eligible individuals were placed into the wait-list comparison (WL) group. At the end of eight weeks, after the intervention group had completed the RT program, the WL participants began the RT program.

The Allina Health Institutional Review Board approved this study and all participants provided written informed consent.

### Study Intervention

RT is a manualized eight-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 practice, (2) nutrition, and (3) exercise recommendations. The RT program consists of 2.5-hour group mindfulness sessions for eight consecutive weeks with a trained facilitator. Individualized guidance from a psychiatrist, an exercise physiologist, and a clinical nutritionist are also provided to all participants at or near the beginning of the program, depending on participants' schedules. Individual sessions are each one-hour long.

Mindfulness has been defined as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally”<sup>41</sup> and the technique is conceptualized as a cognitive stance that allows a more accurate apperception of the nature of mental events. The group mindfulness meditation component of the RT program seeks to integrate this capacity into everyday life as a coping resource for dealing with intensive physical symptoms, chronic medical conditions, and difficult emotional situations. RT incorporates aspects of lifestyle medicine, including nutritional and physical therapy assessments and recommendations. Participants are often given specific, individualized suggestions for diet and exercise that can reduce physical symptoms and improve some aspects of their medical conditions. Dietary changes and added movement frequently support participants emotionally by improving mood, self-esteem, and self-efficacy. And while the mindfulness techniques taught during the eight-week group program are directly intended to improve depression, the emotional skills that they develop also help them face the impacts of their health challenges, whether those are primarily psychological in nature or include physical symptoms.

Group sessions are led by either a psychiatrist or a master's trained facilitator (licensed social worker) with extensive experience in leading mindfulness courses (e.g., mindfulness-based stress reduction). Each 2.5-hour RT session contains didactic teaching (Table 1), experiential mindfulness practices, as well as group discussions. Interactions between participants are allowed.

One-on-one exercise and nutrition sessions are guided by a facilitator's manual, with content used as appropriate for each participant's knowledge and needs. The focus of the 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 for all participants consists of an initial consultation, individualized dietary recommendations, and follow-up sessions if needed. During the exercise component, participants receive customized training and activity recommendations, including a demonstration of recommended exercises with or without exercise equipment. For all participants, this component consists of an individual intake session, fitness assessment, results consultation, and an exercise prescription including mode(s) of exercise, frequency, duration, intensity, and techniques for adherence.

In addition to weekly group sessions, participants are provided with a pre-recorded, guided meditation CD, created by Dr. Emmons, to use at home each day for approximately 20 minutes. The CD introduces a meditation sequence to help participants elicit mindfulness, including some of the key elements such as breath awareness. Compliance in the present study was monitored by having participants complete a daily diary, which was collected and reviewed by facilitators in each weekly meeting.

### Outcome Measures

A maximum of four data collection timepoints occurred, depending on group assignment. The first, timepoint one,

**Table 1.** Components of the Resilience Training Program

Program Specifics	Improving Skills: Difficult Emotions				Cultivating Skills: Positive Emotions				
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	
Meditation									
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	
Group-based accountability of goals		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	Dialog with your inner voice
Diet/nutrition follow-up	x	x	x	x	x	x	x	x	
Exercise follow-up	x	x	x	x	x	x	x	x	

occurred prior to resilience training or the waiting period and the second, timepoint two, occurred eight weeks later at the conclusion of resilience training or the waiting period. The third, timepoint three, occurred at eight weeks follow-up for the RT group and post-RT for the WL group. The WL group had an additional timepoint, timepoint four, at eight weeks follow-up. See [Figure 1](#) for a depiction of timepoints.

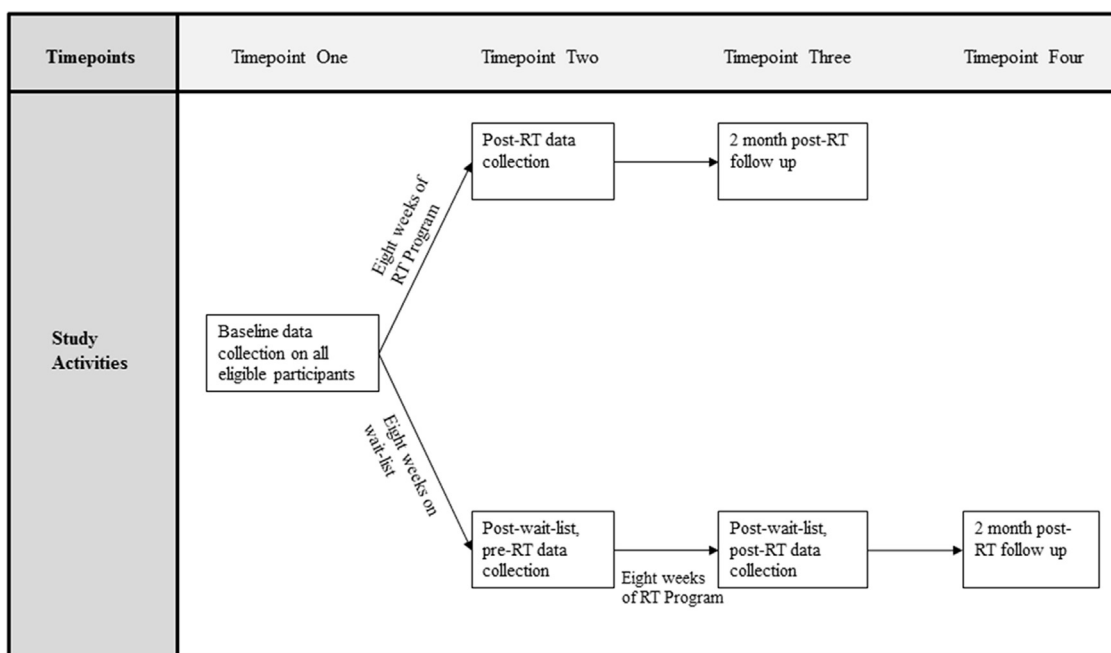
A self-administered questionnaire ascertained information on demographics at timepoint one. Demographic elements included self-reported race and ethnicity, gender, marital and working status, changes in marital and working status within the past 12 months, education level, and number of people living in their household.

Multiple standardized self-administered questionnaires ascertained outcome measures of depression, stress, anxiety, workplace productivity, and health-promoting behavior. These questionnaires were administered at all timepoints.

- Depression was measured through the CESD-10<sup>42,43</sup> scale and the Patient Health Questionnaire (PHQ-9).<sup>44</sup> These instruments measure different depression constructs<sup>45,46</sup> and are typically used by distinct, but overlapping, audiences.
  - The CESD-10 comprises 10 multiple-choice questions and scores range from 0 to 30; a cutoff score of 10 is indicative of “significant” or “mild” depressive symptomatology. The CESD-10 is a standard depression measure in research.
  - The PHQ-9 comprises nine multiple-choice questions and a total score of 1–4 indicates minimal depression; 5–9, mild depression; 10–14, moderate depression; 15–19, moderately severe depression; and 20–27, severe depression. The PHQ-9 is prevalent in clinical settings.

- Stress was ascertained via the Perceived Stress Scale-4 (PSS-4).<sup>47</sup> 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 State Trait Anxiety Inventory (STAI).<sup>48</sup> The 20 items were rated on a four-point Likert scale ranging from 1 (not anxious) to 4 (highly anxious), with overall scores varying from 20 to 80.
- Workplace productivity was assessed through the Workplace Productivity and Impairment General Health (WPAI:GH)<sup>49</sup> questionnaire, a six-item questionnaire asking about the effect of health problems on ability to work and perform regular activities. Four types of scores are produced: (1) absenteeism (work time missed), (2) presenteeism (impairment at work/reduced on-the-job effectiveness), (3) work productivity loss (overall work impairment/absenteeism plus presenteeism), and (4) activity impairment. Outcomes are expressed as percentages, with higher numbers indicating greater impairment and less productivity.
- Health-promoting behavior was measured through the 52-item Health Promoting Lifestyle Profile (HPLP)<sup>50</sup> questionnaire. Questions are worded as desirable or positive actions or perceptions and all items are scored on a scale from 1 to 4 (1 = never, 2 = sometimes, 3 = often, and 4 = routinely). Scores range from 52 to 208; a higher score indicates a more health-promoting level of behavior.

Finally, daily diaries collected from each participant by study facilitators at weekly meetings included spaces for participants to self-report minutes of meditation and minutes of exercise per day.



**Figure 1.** Schedule of the four data collection timepoints for the RT and WL groups.

## Statistical Analysis

Three participants (two RT, one WL) did not complete any follow-up questionnaires at the second timepoint, six participants (two RT, four WL) at the third timepoint, and one WL participant at the fourth timepoint. In addition, one person of the RT group left a completely unanswered WPAI questionnaire at the first timepoint and one person of the WL group left a completely unanswered PHQ-9 questionnaire at the third timepoint. For partially completed questionnaires, imputations were calculated according to standard methodologies unique to each questionnaire. Single items that were left unanswered in the CESD-10 and PHQ-9 were imputed as equivalent to the average calculated from the remaining questions. 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. Any number of missing items on the WPAI and the HPLP resulted in the relevant subscale(s) being eliminated from analyses at that timepoint. The Appendix describes the number of imputed and eliminated subscales due to partially completed questionnaires.

Mean demographic measures were compared between RT and WL groups using *t*-test and Fisher's exact test. The *t*-test to compare continuous age (years) was unpaired and two-sided. To assess the effect of RT versus no RT on psychological and behavioral outcomes, we compared mean change scores of outcome measures between the RT and WL groups. Change scores were calculated by subtracting pre-RT from eight-week post-RT values (RT group) or pre-waiting period from eight-week post-waiting period values (WL group). Mean differences from timepoint one *within* each group were assessed using paired, two-sided Student's *t*-tests. *Between* group differences in means were assessed using unpaired, two-sided Student's *t*-tests. Tests of equal variances were performed and *P*-values for statistical differences between the groups were adjusted by pooled or Satterthwaite methods for equal or unequal variances, respectively. Plots with 95% confidence limits were created to depict the relation between mean psychological outcome values and time by group. No standard adjustments for multiple comparisons were made; however, all tests of statistical significance were designated at  $P \leq .01$ .

Cost savings based on change in presenteeism was calculated using the human capital approach<sup>51,52</sup> with results from the WPAI. Average self-reported work decrement was multiplied by an estimated average salary plus benefits. All other analyses were performed using SAS statistical software (version 9.3; SAS Institute, Inc., Cary, NC, USA).

## RESULTS

### Characteristics of the Study Population

The mean age at study entry was 45.30 and 49.30 years for the RT and WL groups, respectively (Table 2). Most participants in this pilot study were female, white, and married. All participants in the RT and WL groups were currently

**Table 2.** Participant Characteristics at Study Entry

	RT ( <i>n</i> = 20)	WL ( <i>n</i> = 20)	<i>P</i> value
Age (year ± SD)	45.30 ± 11.06	49.30 ± 10.60	0.250
Sex (%)			
Female	18 (90)	16 (80)	0.342
Male	1 (5)	4 (20)	
Unknown	1 (5)	0 (0)	
Race/ethnicity (%)			
White	18 (90)	17 (85)	1.000
Other/unknown	2 (10)	3 (15)	
Education (%)			
≤ High school	2 (10)	1 (5)	0.509
Some college/ associate's degree	4 (20)	8 (40)	
Completed college	6 (30)	7 (35)	
Attended/completed graduate school	7 (35)	4 (20)	
Unknown	1 (5)	0 (0)	
Unknown	1 (5)	0 (0)	
Marital status (%)			
Never married	5 (25)	4 (20)	0.778
Married	10 (50)	8 (40)	
Widowed	0 (0)	1 (5)	
Divorced/separated	4 (20)	6 (30)	
Living as married	0 (0)	1 (5)	
Unknown	1 (5)	0 (0)	
Depression medication use			
Past (% yes)	15 (75)	14 (70)	1.000
Current (% yes)	4 (20)	3 (15)	1.000
Depression status			
Current (% yes)	20 (100)	20 (100)	1.000
Recurrent (% yes)	12 (60)	12 (60)	1.000

RT: resilience training; WL: wait-list comparison.

depressed, as confirmed by the MINI, and four participants in the RT group and three in the WL group were currently taking depression medication(s). There were no statistically significant differences between the RT and WL groups for any participant characteristic variable at study entry.

### Resilience Training Intervention

Table 3 shows means and standard deviations at timepoint one and the eight-week change from timepoint one for the various outcome measures. Between group *P*-values indicate that RT and WL groups were not significantly different with regard to any outcome measure at timepoint one.

Depression scores decreased on both the CESD-10 and PHQ-9 instruments (Table 3). CESD-10 mean depression scores decreased 63% from 15.80 to 5.81 in RT (within group  $P \leq .01$ ), and there was a statistically non-significant 18%

**Table 3.** The Effect of Resilience Training on Various Outcome Measures Among RT and WL Participants

Outcome Measure	Group	Timepoint One			Eight-Week Change from Timepoint One		
		<i>N</i>	Mean ± SD	Between Group <i>P</i> -Value	<i>N</i>	Mean Change ± SD	Between Group <i>P</i> -Value
CESD-10	RT	20	15.80 ± 5.01	0.116	18	-9.99 ± 5.96 <sup>a</sup>	0.002
	WL	20	18.35 ± 5.02		19	-3.32 ± 6.03	
PHQ-9	RT	20	12.35 ± 5.71	0.280	18	-8.67 ± 4.63 <sup>a</sup>	0.001
	WL	20	14.35 ± 5.82		19	-2.21 ± 5.87	
PSS-4	RT	20	9.60 ± 2.48	0.463	18	-4.61 ± 2.91 <sup>a</sup>	0.002
	WL	20	10.25 ± 3.04		19	-1.42 ± 2.87	
STAI-Y1, -Y2	State	RT	20	0.108	18	-11.44 ± 9.70 <sup>a</sup>	0.068
		WL	20		52.15 ± 11.14	19	
	Trait	RT	20	0.104	18	-12.06 ± 8.13 <sup>a</sup>	0.008
		WL	20		56.50 ± 10.71	19	
WPAI	Absenteeism	RT	18	0.254	16	0.29 ± 2.54	0.414
		WL	20		5.43 ± 11.95	19	
	Activity impairment	RT	19	0.770	18	-16.11 ± 25.24 <sup>a</sup>	0.001
		WL	20		39.50 ± 28.56	19	
	Presenteeism	RT	19	0.928	18	-17.78 ± 15.92 <sup>a</sup>	<0.001
		WL	20		33.50 ± 26.61	19	
	Work productivity loss	RT	18	0.777	16	-19.01 ± 15.60 <sup>a</sup>	0.001
		WL	20		37.56 ± 25.76	19	
HPLP	Health responsibility	RT	20	0.084	18	0.23 ± 0.45	0.716
		WL	18		2.09 ± 0.51	16	
	Interpersonal relations	RT	20	0.142	18	0.18 ± 0.37	0.043
		WL	20		2.44 ± 0.56	19	
	Nutrition	RT	20	0.690	18	0.22 ± 0.38	0.522
		WL	20		2.46 ± 0.54	18	
	Physical activity	RT	20	0.565	18	0.40 ± 0.54 <sup>a</sup>	0.089
		WL	20		1.78 ± 0.57	19	
	Spiritual growth	RT	19	0.283	17	0.42 ± 0.46 <sup>a</sup>	0.064
		WL	20		2.16 ± 0.54	19	
	Stress management	RT	19	0.784	17	0.70 ± 0.49 <sup>a</sup>	0.002
		WL	20		1.90 ± 0.49	19	

SD: standard deviation; RT: resilience training; WL: wait-list comparison; HPLP: health promoting lifestyle profile.

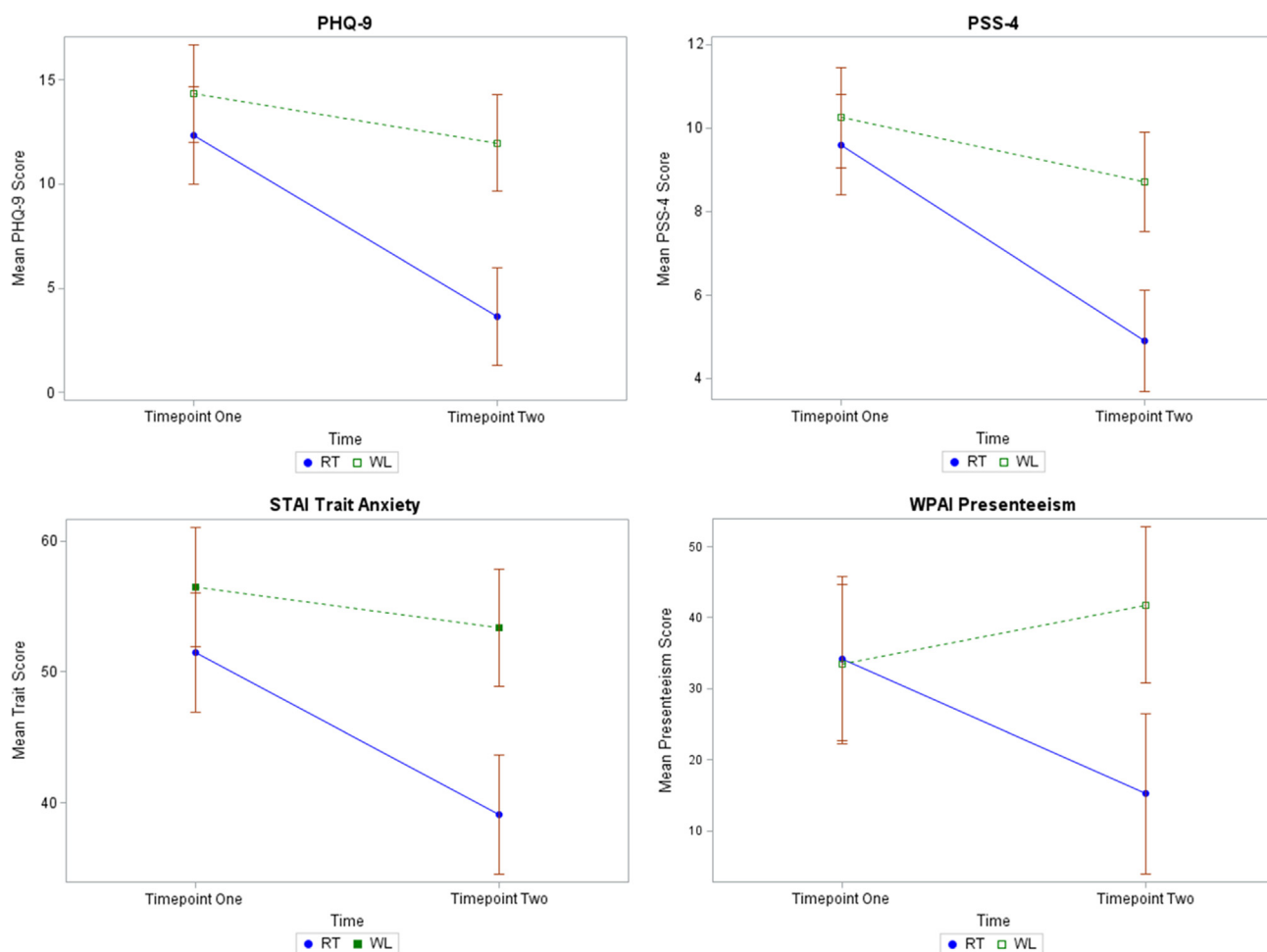
<sup>a</sup>Within group change from baseline is statistically significant at  $P \leq .01$ .

reduction in WL from 18.35 to 15.03 (between group  $P = .002$ ). PHQ-9 mean depression scores decreased 70% from 12.35 to 3.68 in RT (within group  $P \leq .01$ ), with a statistically non-significant 15% reduction in WL from 14.35 to 12.14 (between group  $P = .001$ ) (Figure 2). As expected, a correlation analysis on all participants at baseline found a strong relationship between the CESD-10 and PHQ-9 instruments ( $\rho = 0.773$ ).

The PHQ-9 is used as a continuous measure of depression severity, with scores of 5, 10, 15, and 20 indicating lower limits of mild, moderate, moderately severe, and severe depression<sup>44</sup>. In the RT group, 18 participants had both

timepoint one and timepoint two PHQ-9 scores and all 18 had timepoint one scores above five (lower limit of mild depression). Eleven (61.1%) of those participants had timepoint two scores below five, indicating their depression went into remission while participating in the RT program (data not shown). In comparison, of the 19 WL participants who had both timepoint one and timepoint two scores, 18 of them had timepoint one scores above five. Only one (5.56%) of these 18 participants had a timepoint two score below 5 (between group  $P < .001$ ) (data not shown).

Additional outcomes included perceived stress, which decreased 48% in RT from 9.60 to 4.99 (within group  $P \leq .01$ ) and a



**Figure 2.** Mean score of PHQ-9, PSS-4, trait anxiety, and presenteeism at timepoints one and two for RT (blue solid line) and WL (green dashed line) groups with 95% confidence limits.

statistically non-significant 14% in WL from 10.25 to 8.83 (between group  $P = .002$ ) (Table 3 and Figure 2). Both state and trait anxiety scores decreased among participants of the RT group. State anxiety decreased 25% in RT from 46.65 to 35.21 (within group  $P \leq .01$ ) and a non-significant 7% in WL from 52.15 to 48.68 (between group  $P = .068$ ). Trait anxiety decreased 23% in RT from 51.45 to 39.39 (within group  $P \leq .01$ ) and a non-significant 5% in WL from 56.50 to 53.55 (between group  $P = .008$ ) (Figure 2).

Workplace productivity results from the WPAI questionnaire indicate a statistically significant 21% decrease in activity impairment ( $P < .001$ ) among the RT group from 36.84 to 20.73 and a non-significant 36% increase in activity impairment among the WL group from 39.50 to 53.71 (between group  $P = .001$ ). RT had a 52% decrease in presenteeism from 34.21 to 16.43 (within group  $P \leq .01$ ) compared to a statistically non-significant 27% increase in presenteeism in WL from 33.50 to 42.45 (between group  $P < .001$ ) (Table 3 and Figure 2). The reduction in presenteeism in the RT group was calculated as a per-employee cost reduction of \$1846 versus a \$929 cost increase per employee in the WL

group (data not shown). Work productivity loss had a 54% decrease in RT from 35.31 to 16.30 (within group  $P \leq .01$ ) while WL had a non-significant 20% increase from 37.56 to 44.94 (between group  $P < .001$ ) (Table 3).

Results from the HPLP questionnaire indicate statistically significant improvements from timepoint one with regard to physical activity, spiritual growth, and stress management among RT participants (Table 3). After the eight-week RT intervention, the RT and WL groups were statistically significantly different from each other with regard to stress management ( $P = .002$ ).

Based on self-report from daily diaries, RT group participants practiced meditation for an average of 61.00 minutes per week, and exercised an average of 226.38 minutes per week. Due to lack of compliance with completing and turning in diaries, data were insufficient for conducting further analyses.

WL participants completed the RT program after an eight-week waiting period and exhibited comparable results to the RT participants. The WL group had a 52–56% ( $P \leq .01$ ) reduction in depression, a 38% ( $P \leq .01$ ) reduction in stress,

a 24% ( $P \leq .01$ ) reduction in trait anxiety, and a 48% ( $P = .012$ ) reduction in presenteeism (data not shown).

### Sustained Impact of the RT Program

Across all participants, PHQ-9 pre-RT to two-month follow-up mean depression scores changed from 12.86 to 4.69 to 5.46 (Table 4). The CES-D measure of depression showed a similar pattern of score change from baseline, changing from 15.47 to 6.01 to 7.85 for each consecutive timepoint (Table 4). Perceived stress scores changed from 9.13 to 4.87 to 5.34 for pre-RT to two-month follow-up timepoints and state anxiety mean scores changed from 47.31 to 33.00 to 35.55 for each consecutive timepoint. Despite an increase in mean scores at the two-month follow-up timepoint for each of these measures, results remained statistically significantly different from pre-RT scores ( $P \leq .01$ ).

Scores from several outcome measures showed a continuous improvement over the two months of follow-up. In particular, presenteeism scores decreased from 36.26 at the pre-RT timepoint to 16.88 to 12.43 at the post-RT and two-month follow-up timepoints, respectively (Table 4). Trait anxiety scores decreased from 52.27 to 38.89 to 37.44 for pre-RT, post-RT, and two-month follow-up timepoints, respectively (Table 4).

### DISCUSSION

Results from this wait-list comparison pilot study of depressed healthcare professionals suggest that the RT program—which combines key elements of mindfulness

meditation, nutrition, and exercise—improved symptoms of depression, stress, and anxiety as well as improved workplace productivity and health-promoting behavior. Upon completion of the eight-week RT program, participants showed statistically significant improvements in many psychological and behavioral outcomes, including a 63–70% reduction in depression, a 48% reduction in stress, a 23% reduction in trait anxiety, and a 52% reduction in presenteeism. The outcomes were also statistically significantly different from participants of the WL group. Furthermore, 11 participants (61.1%) in the RT group had changes in PHQ-9 scores that indicate clinical remission of depression at the end of the eight-week study, compared with only one participant (5.56%) in the WL group. WL group participants exhibited similar changes in outcome measures after completing the RT program, indicating reproducibility of the program. Furthermore, among all participants combined, reductions in outcome measures were mostly sustained at follow-up two months after the program concluded.

Our finding of reduced presenteeism is of particular note. A 2011 study of depression severity and work productivity, also using the PHQ-9 and the WPAI scales, found a strong relationship between depression severity and loss of productivity.<sup>38</sup> A 52% reduction in presenteeism on the WPAI from beginning to end of the RT program translates to an estimated per-employee cost reduction of \$1846 due to presenteeism.<sup>52</sup> Taking into account total program costs, a conservative estimate for return on investment for the eight-week RT intervention is 2.05. Others have noted the challenge in assigning dollar amounts to presenteeism due to lack

**Table 4.** Effect of Resilience Training Program at Two Months Follow-Up Among all Study Participants

Outcome Measure	N	Pre-RT LSMean ± SE <sup>a</sup>	N	Post-RT LSMean ± SE <sup>a</sup>	N	Two-Month Follow-Up LSMean ± SE <sup>a</sup>
CES-D	39	15.47 ± 1.12	34	6.01 ± 0.95 <sup>b</sup>	37	7.85 ± 1.15 <sup>b</sup>
PHQ-9	39	12.86 ± 1.04	33	4.69 ± 0.81 <sup>b</sup>	37	5.46 ± 0.88 <sup>b</sup>
PSS-4	39	9.13 ± 0.44	34	4.87 ± 0.35 <sup>b</sup>	37	5.34 ± 0.43 <sup>b</sup>
STAI-Y1, -Y2						
State	39	47.31 ± 2.07	34	33.00 ± 1.59 <sup>b</sup>	37	35.55 ± 2.02 <sup>b</sup>
Trait	39	52.27 ± 1.71	34	38.89 ± 1.36 <sup>b</sup>	37	37.44 ± 1.67 <sup>b</sup>
WPAI						
Absenteeism	37	5.71 ± 1.90	31	2.12 ± 0.88	33	2.64 ± 1.44
Activity impairment	38	42.61 ± 5.66	34	14.84 ± 3.84 <sup>b</sup>	37	18.66 ± 4.28 <sup>b</sup>
Presenteeism	38	36.26 ± 4.87	34	16.88 ± 4.00 <sup>b</sup>	36	12.43 ± 3.69 <sup>b</sup>
Work productivity loss	37	38.14 ± 5.12	31	18.92 ± 4.37 <sup>b</sup>	33	14.74 ± 4.27 <sup>b</sup>
HPLP						
Health responsibility	38	2.26 ± 0.14	33	2.61 ± 0.14 <sup>b</sup>	35	2.68 ± 0.16 <sup>b</sup>
Interpersonal relationships	39	2.63 ± 0.13	34	2.94 ± 0.12 <sup>b</sup>	36	2.97 ± 0.13 <sup>b</sup>
Nutrition	38	2.73 ± 0.10	33	3.08 ± 0.11 <sup>b</sup>	37	3.10 ± 0.11 <sup>b</sup>
Physical activity	39	2.02 ± 0.13	33	2.63 ± 0.15 <sup>b</sup>	36	2.55 ± 0.15 <sup>b</sup>
Spiritual growth	38	2.42 ± 0.11	34	2.98 ± 0.13 <sup>b</sup>	36	3.01 ± 0.13 <sup>b</sup>
Stress management	38	2.19 ± 0.10	32	2.93 ± 0.11 <sup>b</sup>	36	2.88 ± 0.12 <sup>b</sup>

RT: resilience training; SE: standard error; HPLP: health promoting lifestyle profile.

<sup>a</sup>LSMeans adjusted for age and gender.

<sup>b</sup>Significantly different from pre-RT;  $P \leq .01$  (paired two-sided *t*-test).



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of consensus on the most appropriate calculation methods, so this cost savings estimate should be interpreted with caution.<sup>37,51,53</sup> Nonetheless, our consideration of presenteeism and the costly nature of depression in the workforce distinguishes this study from previous studies of mindfulness-based interventions for depressed individuals, with the exception of a 2008 study that measured lost work productivity from absenteeism.<sup>54</sup> Attention should be given to the economic value of mindfulness-based interventions for depression in future studies.

Our findings of significantly reduced depressive symptoms in a group of currently depressed individuals participating in the RT program are consistent with a small body of evidence on mindfulness-based interventions for depressed participants. Two studies summarized in a meta-analysis by Chiesa and Serretti<sup>11</sup> found significant short-term reductions in current or residual depressive symptoms using MBCT in conjunction with usual treatment versus usual treatment alone. The other studies in that review, as well as in another review and meta-analysis,<sup>10</sup> focused on anxiety symptoms or depression relapse, rather than depressive symptoms, as short- and long-term outcomes. Furthermore, studies reviewed included some individuals in full or partial remission from major depression.<sup>11</sup> A meta-analysis by Hofmann et al.<sup>1</sup> reported moderate effects of MBSR and similarly structured programs on patients with elevated pre-intervention depressive symptoms. Finally, a 2014 meta-analysis reported significant effects of mindfulness-based interventions on participants diagnosed with current depressive disorder, compared with control groups.<sup>12</sup> While our results cannot be directly compared to those of MBSR and MBCT programs, our data on the short-term effects of RT complement findings from those programs with encouraging support for the impact of mindfulness-based RT on depressive symptomology among participants with current depression.

We did not measure resilience as an outcome of the RT intervention, as resilience scales were not commonly used measurements in mindfulness-based interventions during the time frame of the study. Waugh and Koster<sup>15</sup>, in the resilience framework described previously, point out that resilience scales have yet to be validated for prediction of recovery from depression. Alternatively, they suggest measuring changes in resilient behavior and other measures that take into account their more dynamic and complex definition of resilience. Measuring resilience will be an important consideration for future studies of the RT program.

Dismantling the effects of the three components of the RT program was beyond the scope of the present study, but such investigations merit future research. The combination of mindfulness meditation, nutrition, and exercise components may be of particular advantage for currently depressed individuals. Furthermore, the benefits of group-based interventions for a variety of target groups have been found to include improved psychological and physical outcomes as well as participant engagement and perceived social support.<sup>55–60</sup> A 2012 review by Marchand provides a detailed summary of multiple studies indicating that meditation and

mindfulness-based therapies can impact the neuropsychological underpinnings of depression, affecting brain function and structure.<sup>61</sup> Nutritional and exercise-based approaches to mitigating depressive symptoms have also been described.<sup>16,18</sup> In the present study, participants of the RT program did not show statistically significant improvements in nutrition, as measured by the HPLP questionnaire, and these participants were not statistically different from those in the WL group after the RT program, despite meeting with a nutritionist for a diet and nutrition consultation and receiving individualized dietary recommendations and follow-up session(s) as necessary. In contrast, participants of the RT program had statistically significant improvements in physical activity, according to the HPLP questionnaire; however, these participants were not statistically significantly different from WL participants with regard to physical activity after the eight-week program. Subsequent research aimed at understanding the unique contributions of the RT components should include the assessment of diet/nutrition and physical activity changes using tools designed to measure these outcomes separately. Furthermore, participant diaries did not provide sufficient data for analysis of at-home meditation and exercise practice. Homework compliance is a common challenge in behavioral interventions with depressed groups.<sup>62,63</sup> Future studies of this or similar multi-modal programs may consider more rigorous approaches to ensuring and measuring compliance with the at-home, self-reported data collection on all components or may incorporate additional group components in nutrition and exercise. Additionally, long-term follow-up of participants would allow for identification of any possible delayed effects of diet and physical activity intervention components.

Other limitations of this study must be considered. First, our ability to generalize the findings of this study to any broader population may be limited. Mindfulness-based interventions have been provided to groups of stressed healthcare professionals,<sup>64–71</sup> but the outcomes associated with RT for individuals of other professions is unknown. Furthermore, of the 40 healthcare professional participants of the study, 34 (85%) were female and 35 (88%) were white. Second, this was a small pilot study of 40 participants. This investigation cannot accommodate comparisons between outcomes of RT and related mindfulness-based programs; larger investigations are needed to address these important questions. Third, this study was a non-randomized design comprised of a wait-list comparison group. This design does not adequately control for time and attention, in addition to other important considerations like depression medication use. Although characteristics were largely comparable between the RT and WL groups at study entry, a controlled trial in which participants are randomly assigned to RT is warranted.

## CONCLUSIONS

This study provides early evidence that RT—an eight-week long group program which synergizes key elements of mindfulness meditation, diet and nutrition, and exercise into a cohesive, accessible intervention—reduces depressive

symptoms among participants with current depression. The results of this pilot study indicate statistically significant improvements in depression, stress, anxiety, and other psychological and behavioral outcomes immediately after the end of the RT program compared with individuals in the WL group. The 52% reduction in presenteeism resulted in a per-employee savings of \$1846 over the eight-week program. WL participants completed the RT program after an eight-week waiting period and exhibited comparable results to the RT participants. Among all study participants combined, outcome improvements from the RT program were mostly sustained at follow-up two months after the program concluded. Additional investigations into the

relation between RT and psychological and behavioral outcomes must be considered and should include randomized studies of greater sample size, tools designed to measure nutrition and exercise outcomes separately, and more diverse participant populations.

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### APPENDIX. NUMBER OF IMPUTED AND ELIMINATED SUBSCALES DUE TO PARTIALLY COMPLETED QUESTIONNAIRES.

Outcome Measure	Group	Timepoint				
		1 N	2 N	3 N	4 N	
CESD-10	RT	...	1 (I)	...	N/A	
	WL	...	...	...	...	
PHQ-9	RT	...	...	...	N/A	
	WL	...	1 (I)	...	...	
PSS-4	RT	...	...	...	N/A	
	WL	...	...	...	...	
STAI-Y1, -Y2	RT	...	...	1 (I)	N/A	
	WL	3 (I)	2 (I)	2 (I)	1 (I)	
WPAI	Absenteeism	RT	1 (E)	1 (E)	1 (E)	N/A
		WL	...	...	2 (E)	3 (E)
	Activity impairment	RT	...	...	...	N/A
		WL	...	...	...	...
	Presenteeism	RT	...	...	1 (E)	N/A
		WL	...	...	...	...
	Work productivity loss	RT	1 (E)	1 (E)	1 (E)	N/A
		WL	...	...	2 (E)	3 (E)
HPLP	Health responsibility	RT	...	...	...	N/A
		WL	2 (E)	1 (E)	1 (E)	2 (E)
	Interpersonal relations	RT	...	...	...	N/A
		WL	...	...	...	1 (E)
	Nutrition	RT	...	...	...	N/A
		WL	...	1 (E)	1 (E)	...
	Physical activity	RT	...	...	...	N/A
		WL	...	...	1 (E)	1 (E)
	Spiritual growth	RT	1 (E)	...	1 (E)	N/A
		WL	...	...	...	...
	Stress management	RT	1 (E)	1 (E)	...	N/A
		WL	...	...	1 (E)	1 (E)

N/A indicates timepoint not applicable; ... indicates no imputation or exclusion. I: imputed; E: excluded.

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