

**Online Training in Mind-Body Therapies: Different Doses,
Long-term Outcomes**

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Abstract:	<p>Is there a dose-response relationship between the dose of online mind-body skills training and outcomes 1 year later?</p> <p>In an online survey, we assessed the "dose" of training, frequency of mind-body practice, whether the online training had any impact on personal or professional behavior, and qualities associated with good care-giving. Respondents completed training on average 14 months previously. Most (79% and 71% respectively) reported changes in self-care and the care of others. Increasing training "doses" were associated with more mind-body practice. Increasing practice frequency was associated with less stress, burnout, and thereby missing less work; it was also associated with better mindfulness and resilience, which were associated with increased confidence in compassionate care.</p> <p>Online training in mind-body therapies is associated with improved professional and personal behavior. More frequent mind-body practice is associated with less stress, burnout, and missing work, and more mindfulness, resilience and confidence in providing compassionate care.</p>

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3 **1 Online Training in Mind-Body Therapies: Different Doses, Long-term Outcomes**

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3 **Abstract**
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5 *Background:* Is there a dose-response relationship between the number of hours of online mind-
6
7 body skills training for health professionals and relevant outcomes a year following training?
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10 *Methods:* Among 1438 registrants for online training (including up to 12 hours of training on
11
12 mind-body practices) between December, 2013 and December, 2015, we analyzed responses
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14 from the first 10% who responded to an anonymous online survey by February 1, 2016.
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16 Questions included the type and frequency of mind-body practice in the past 30 days and
17
18 whether the online training had any impact on personal life or professional practice.
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20 Standardized measures were used to assess stress, mindfulness, confidence in providing
21
22 compassionate care, and burnout.
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25 *Results:* The 149 respondents represented a variety of ages and health professions; 55%
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27 completed one or more mind-body training modules an average of 14 months previously. Most
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29 (78%) engaged in one or more mind-body practices in the 30 days before the survey; 79%
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31 reported changes in self-care and 71% reported changes in the care of others as a result of
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33 participating. Increasing “doses” of training were significantly associated with practicing mind-
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35 body skills more frequently; increasing practice frequency was associated with less stress and
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37 burnout, which were in turn associated with missing less work. Greater practice frequency was
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39 also associated with better scores on stress, mindfulness, and resilience scales, which in turn
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41 were associated with greater confidence in providing compassionate care.
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45 *Conclusion:* Online training in mind-body therapies is associated with changes in self-reported
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47 behavior; increasing doses of training are associated with more frequent practice which is
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49 associated with less stress, burnout, and missing work, and higher levels of mindfulness,
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51 resilience and confidence in providing compassionate care. Additional prospective, controlled
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53 studies are needed to compare mind-body skills training with other interventions designed to
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55 improve resilience and compassion while decreasing burnout in health professionals.
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1 Background

2 Stress, burnout, and depression are increasingly reported by health professionals.^{1,2}

3 Burnout is associated with significant personal morbidity (such as substance abuse, suicide,
4 and symptoms such as headache and insomnia), impaired professional behavior (poor
5 communication, higher error rates), and unacceptable overall costs to employers and society.³⁻⁷

6 Despite numerous attempts to address stress by offering on-site counseling services, support
7 groups, retreats, and education about the importance of sleep and other self-care behaviors,
8 rates of burnout and depression continue to rise.^{1,2} Several professional groups, including the
9 American Academy of Pediatrics and the Accreditation Council for Graduate Medical Education
10 have called for more systematic approaches to addressing stress and burnout.^{8,9} A 2016
11 systematic review and meta-analysis of interventions aimed at preventing and reducing
12 physician burnout by West and colleagues at Mayo Clinic suggests that both organizational
13 strategies (such as reducing duty hours) and individual-focused strategies (such as stress
14 management and mindfulness training) can effectively address this problem.¹⁰

15 General training in mind-body practices offers a broad, personalized approach to
16 reducing burnout and building resilience. Research in medical trainees supports a conceptual
17 model linking higher mindfulness and self-compassion with higher levels of resilience and lower
18 rates of burnout.^{11,12} Several studies suggest that training in mind-body practices offers promise
19 for reducing burnout.¹³⁻¹⁵

20 Because in-person training is costly and inconvenient, we previously assessed the
21 immediate and 12-week impact of online training in mind-body practices for diverse health
22 professionals, finding that such training is both feasible and associated with improved stress,
23 mindfulness, and resilience.¹⁶⁻¹⁹ However, questions remain about the longer-term impact of
24 online training in mind-body skills. We wished to answer three questions in a long-term follow-up

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3 1 of a cohort of participants enrolled in our online training programs: 1) Do participants in online
4
5 2 mind-body skills training report any changes in their personal self-care or professional behavior
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7 3 as a result of the training? 2) Is there a dose-response relationship between the dose (number
8
9 4 of hours) of training and subsequent frequency of mind-body practice year later? 3) Is there a
10
11 5 dose-response relationship between the frequency of mind-body practice and stress, burnout,
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13 6 and missing work on one hand, and mindfulness, resilience, and confidence in providing
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15 7 compassionate care on the other hand? We also wanted to test and expand our conceptual
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17 8 model for training, i.e., that stress is a risk factor for burnout, which in turn, is associated with an
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19 9 increased risk of missing work and that mindfulness and resilience promote confidence in
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21 10 compassionate care.
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29 **Methods:**

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32 *Design:*

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34 14 To answer these questions, we took advantage of a natural experiment at the Ohio State
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36 15 University (OSU) as we offered free, elective online training in integrative therapies to students,
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38 16 faculty, and staff between December 1, 2013 and November 30, 2015.

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40 *Participants:*

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42 18 Participants were eligible if they enrolled in and completed one or more online modules in an
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44 19 elective online course for health professionals offered through the Ohio State University's
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46 20 Center for Integrative Health and Wellness. For this study, the analysis was restricted to the first
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48 21 10% who completed the anonymous online post-training survey between December 1, 2015
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50 22 and January 31, 2016.

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53 *Interventions:*
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3 1 The online courses during this period were: a) Herbs and Dietary Supplements (HDS) Across
4 the Lifespan or b) Mind-Body Skills Training for Resilience, Effectiveness, and Mindfulness
5 (MBST). As per institutional policy, both courses were offered free of charge to health
6 professionals and trainees at our University; others were charged a nominal fee. There was no
7 course credit, no required minimum number of units, and no deadline for completing either
8 course.^{16,20} The HDS course opened for enrollment in December, 2013 and offered up to 14
9 hours of online training; the MBST course opened in May, 2014 and offered up to 12 hours of
10 online training. Course content and format have been described previously.^{16,20-24}

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21 *Dose:*

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23 10 Doses were calculated based on the number of modules the courses' websites recorded for
24 each participant rather than relying on participants' memories about module completion. Each
25 module was approved for one hour of Continuing Medical Education (CME) credit. Among those
26 who **only** completed modules for the Herbs and Dietary supplements course, the number of
27 Mind-Body modules was counted as 0. For those who completed modules in both courses, the
28 dose for this study was counted only as the number of modules completed in the MBST course
29 (up to a total of 12).

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38 *Measures:*

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40 18 Information regarding participant gender, trainee status, university affiliation, and health
41 profession was collected at registration. Data on age, ethnicity, and race was collected in the
42 survey. The survey was initially sent in December, 2015 with reminder requests sent every two
43 weeks through mid-January. For ease of calculation, the time since completing the course was
44 arbitrarily set as the registration date; the vast majority of participants completed all the modules
45 they ever completed within 8 weeks of the time they registered.

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53 24 *Mind-Body Practice.* The questionnaire included three questions on mind-body practices
54 in the past 30 days: 1) type and number of mind-body practices used; 2) frequency of mind-
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3 1 body practice (from never to daily); and 3) length of practice (from 0 to more than 60 minutes
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5 2 daily). The primary outcome was considered frequency of practice.
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9 3 The three specific negative outcomes were stress, burnout, and days missed from work
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11 4 in the 30 days prior to the survey.
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14 5 *Stress* was measured with Cohen's 10-item Perceived Stress Scale (PSS) which has
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16 6 been used in multiple studies of health professionals, the general population, and clinical
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18 7 samples. It has good internal reliability and external validity; scores improve with mindfulness
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20 8 training.²⁵⁻³¹
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24 9 *Burnout* was assessed using the 7-item Mayo Clinic Physician Well-Being Index (PWBI);
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26 10 answers are simple yes (=1) and no (=0) in which scores of four or higher are associated with
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28 11 physician distress and have significant correlations with fatigue, poor mental quality of life,
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30 12 career satisfaction, and self-reported medical errors.^{32,33}
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34 13 *Absenteeism*. We also asked about how many non-holiday, non-vacation days had been
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36 14 missed from work in the past 30 days.
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39 15 The three specific positive study outcomes were mindfulness, resilience, and confidence
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41 16 in providing compassionate care to others.
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44 17 *Mindfulness* was assessed using the 10-item Cognitive and Affective Mindfulness Scale,
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46 18 Revised (CAMS-R); the CAMS-R has good internal consistency and scores are significantly
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48 19 correlated with longer measures of mindfulness, well-being, clarity of feelings, adaptive
49
50 20 regulation, and cognitive flexibility.³⁴⁻³⁶
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54 21 *Resilience* was assessed using Smith's 6-item Brief Resilience Scale (BRS); this scale
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56 22 has been tested in both student and clinical populations and measures a unitary factor
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3 1 correlated with coping and health, and is inversely related to anxiety, depression, negative
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5 2 affect, and physical symptoms.³⁷
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9 3 *Compassion* was assessed using the Confidence in providing Compassionate Care
10 4 scale (CCCS, 10 items, maximum score 100); the CCCS has good internal reliability and
11 5 correlates in expected directions with standardized measures of mindfulness, empathy, and
12 6 resilience.³⁸
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18 7 *Statistical Analysis:*

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20 8 Survey data were downloaded from SurveyMonkey into a Microsoft Excel (Office 365, Version
21 9 15.0.4753.1003) and exported to R (Version 3.2.2; The R Foundation for Statistical Computing)
22 10 for analysis. Using email addresses, survey data was matched to previously collected
23 11 registration data about module completion, profession, and trainee status. Identifiers were
24 12 discarded prior to subsequent analysis. Descriptive statistics were used to characterize
25 13 participants. Fisher's exact tests were used to determine whether demographic or professional
26 14 characteristics were associated with study outcomes. Because several variables, including dose
27 15 of training, were not normally distributed, Spearman's rank order test was used to calculate
28 16 correlations for the conceptual models. To simplify the analysis, we tested two conceptual
29 17 models – one focusing on negative outcomes (stress, burnout, and missing work) and one
30 18 focusing on positive outcomes (mindfulness, resilience, and confidence in providing
31 19 compassionate care). These relationships are displayed in the Figures.
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50 21 *Ethical Approval:*

51 22 The Ohio State University Office of Research Institutional Review Board approved this as study
52 23 number 2013B0611.
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3 **1 Results:**
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5 2 Of the 149 participants who completed the survey by February 1, 2016, most (81%) were
6 3 affiliated with our academic health center. Participants included a variety of health professionals
7 4 including nurses (38%), physicians (21%), and others (30%) such as radiology and laboratory
8 5 technicians, occupational, physical, and respiratory therapists, unit clerks, and others (Table 1).
9 6 An average of 14 months had elapsed between dates for course registration and survey
10 7 completion. Respondents completed an average of 5 modules (Table 1). There were no
11 8 significant differences in the number of modules completed by age, gender, race, ethnicity, or
12 9 affiliation with OSU.
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24 10 Most participants reported changes in personal or professional behavior as a result of
25 11 taking the training. For example, 79% reported that they had made changes in their self-care as,
26 12 and 71% reported that they had made changes in caring for others as a result of their online
27 13 training (Table 1).
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33 14 Most participants (78%) reported engaging in one or more mind-body practices in the 30
34 15 days prior to the follow-up survey (Table 2). The most common type of mind-body practice was
35 16 a heart-centered practice such as meditation focusing on gratitude, loving-kindness, or
36 17 compassion (46% of participants). Participants reported engaging in an average of two mind-
37 18 body practices in the 30 days prior to the survey, and while 44% reported practicing less than
38 19 weekly, about 40% reported practicing ten or more days in the previous month (Table 2).
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47 20 Table 3 shows correlations between study variables. As expected, mindfulness and
48 21 resilience were strongly correlated with each other. Both were strongly negatively correlated to
49 22 perceived stress. Higher levels of both resilience and mindfulness were also associated with
50 23 lower levels of burnout.
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3 1 Furthermore, the dose of training was significantly associated with the recent frequency
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5 2 of engaging in mind-body practices. In turn, the frequency of mind-body practice was negatively
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7 3 associated with perceived stress, which was strongly correlated with burnout. Both stress and
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9 4 burnout were significantly associated with the number of days of work missed. On the positive
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11 5 side, the frequency of engaging in mind-body practices was significantly associated with both
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13 6 resilience and mindfulness, both of which were strongly associated with confidence in providing
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15 7 compassionate care. These relationships are illustrated in the Figures.
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22 9 **Discussion**

25 10 This study evaluated the dose-effect relationship of online training in mind-body skills for diverse
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27 11 health professionals. At an average of more than one year after completing an average of 5
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29 12 hours of online training, most participants reported that the training **was associated with**
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31 13 behavior change affecting their self-care (79%) and care of others (71%). Most (78%) reported
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33 14 engaging in one or more mind-body practices in the 30 days prior to the survey, most often
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35 15 those practices that intentionally generate a positive emotion such as gratitude or compassion.
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37 16 Higher doses of training **were associated with** greater frequency of engaging in mind-body
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39 17 practices which in turn were associated with lower negative outcomes and higher positive
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41 18 outcomes.
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46 19 These findings both confirm and extend our previous findings. We confirmed our earlier
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48 20 observation that mindfulness and resilience are strongly correlated with each other, positively
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50 21 associated with confidence in providing compassionate care, and protective against burnout in a
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52 22 variety of health professionals.^{11,12,39} In fact, these earlier observations led us to evaluate a
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54 23 practical intervention aimed at improving mindfulness and resilience, online mind-body skills
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56 24 training, which our subsequent work suggested can lead to short-term improvements in stress
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1 and confidence in providing compassionate care in health care students, residents, and
2 practicing clinicians.¹⁶⁻¹⁹ This has important implications for patient care since more mindful
3 clinicians provide more patient-centered care; Dobkin, et al. showed that mindfulness training
4 improved clinician's mindfulness and well-being, and that patients perceived that more mindful
5 clinicians provided more patient-centered care.⁴⁰

6 The results of this study extend earlier research in three ways. First, we now
7 demonstrate that the relationship between mind-body skills training and variables of interest
8 appears to be stable for at least 12 months after training. This is consistent with the study by
9 Amutio and colleagues who reported in their 10 month follow-up study after 8 weeks of
10 mindfulness training that effect sizes for improvements in mindfulness and burnout increased
11 over time, suggesting continued and increasing improvements as physicians persistently
12 practiced their new mindfulness skills.⁴¹ Second, we were able to take advantage of a natural
13 experiment of an ongoing cohort of health professionals engaged in elective online training to
14 begin to examine the dose-effect relationships between training and important variables.
15 Although little research has evaluated the dose-response effect of mind-body training, a growing
16 body of research suggests both psychological and physiological differences between novice and
17 experienced meditators;⁴²⁻⁴⁴ therefore, studies on different doses and types of training may yield
18 important, clinically relevant information for advice about personalized training programs. Future
19 studies can also explore how to encourage those who practice infrequently to practice more
20 frequently. Third, we evaluated new variables in our models, frequency of mind-body practice
21 and amount of work missed. Previous research has linked greater mindfulness to less burnout
22 in health professionals,^{15,31,41,45,46} and other studies have demonstrated a relationship between
23 burnout and absenteeism,⁴⁷ but to our knowledge, this is the first report linking dose of mind-
24 body training to frequency of mind-body practice, stress, burnout, and missing work, i.e.,
25 connecting the dots between mind-body skills training and downstream effects mediated by

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3 1 practice, such as burnout, missing work, and confidence in providing compassionate care. As
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5 2 the costs of burnout, including absenteeism, rise, employers, training programs, and
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7 3 professionals are likely to seek cost-effective approaches like online mind-body skills training to
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9 4 address this challenge.⁴⁸
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12 13 5 *Limitations* 14

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16 6 This study was conducted in one academic institution in the Midwest; additional studies
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18 7 are needed in community samples in other locations to enhance generalizability. This study was
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20 8 conducted as an educational evaluation and did not routinely collect survey data at baseline, so
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22 9 we could not examine changes over time that might inform inferences about the impact of the
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24 10 curriculum itself. It is possible that there was self-selection in the dose of training (“preaching to
25
26 11 the choir”, i.e., that clinicians who were more mindful and less stressed engaged in more
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28 12 training modules and practiced mind-body skills more frequently even before the training). Our
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30 13 earlier pilot study found that those who enrolled in a mind-body skills training program were
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32 14 similar to those who enrolled in a similar course about herbs and dietary supplements.²¹
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34 15 However, self-selection, particularly with regard to the self-selected ‘dose’ of training remains a
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36 16 source of potential bias in a non-randomized study. Although we collected outcome data
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38 17 immediately after training and 12 weeks after training, we do not have intermediate data from 6
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40 18 and 9 months after training to determine the trajectory of the training’s impact on learners.¹⁶⁻¹⁸
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42 19 We observed statistically significant correlations in expected directions, but correlations do not
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44 20 prove causation; it is possible that those who were less stressed, more confident, and less
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46 21 burned out were more prone to engage in mind-body practices. Future studies should collect
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48 22 baseline data and randomly allocate learners to different doses of training to reduce the risk of
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50 23 bias and increase rigor. Prospective studies including an “intention to treat” analysis are
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52 24 necessary to address questions about the impact of mind-body training on downstream
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54 25 outcomes such as the quality of care. We used some self-report measures such as self-reported
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1 behavior change and absenteeism in the past 30 days; future studies will benefit from use of
2 objective measures of absenteeism from Human Resources databases.

3 **Conclusion**

4 Despite these limitations, this study suggests that online mind-body skills training affect self-
5 reported personal and professional behavior that persist for at least one year after training.
6 Increasing doses of training are associated with increased frequency of mind-body practice,
7 which in turn are associated with decreased levels of negative outcomes such as stress,
8 burnout, and missing work, and increased levels of positive outcomes such as mindfulness,
9 resilience, and confidence in providing compassionate care. Future prospective, controlled
10 randomized trials are needed to compare the cost-effectiveness of online training with other
11 interventions to improve clinicians' compassion, decrease burnout, and improve the quality of
12 care.

13 **Acknowledgements:** Data collection for this project occurred at the Ohio State University, and
14 data analysis was conducted at the Center for Integrative Health and Wellness at the Ohio State
15 University.

16 **Author Contributions:**

17 Kathi J. Kemper, MD MPH conceptualized the study, the intervention, and the analysis, drafted
18 the manuscript, revised the manuscript, and approved the final manuscript.

19 Nisha Rao, BA, conducted data analysis, drafted the figures and tables, edited and approved
20 the final manuscript.

21 Gregg Gascon, PhD advised on data analysis, drafted the figures, and approved the final
22 manuscript.

23 John D. Mahan, MD assisted in participant recruitment, reviewed and edited the manuscript,
24 and approved the final version.

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3 1 **Declaration of Conflicting Interests:** The authors have no conflicts of interest relevant to this
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5 2 study.

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7 3 **Funding:** No extramural funding

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9 4 **Ethical Approval:** This project was approved by the Ohio State University Office of Research
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11 5 Institutional Review Board (approval number 2013 B0611).

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Table 1. Online Training: Participant characteristics

Characteristic	N = 149 (%)
Age	
18-34	30 (20)
35-54	66 (44)
55-74	52 (35)
Sex	
Male	30 (20)
Race	
Caucasian/White	119 (80)
Ethnicity	
Hispanic or Latino	5 (3)
OSU Affiliated	
Yes	121 (81)
Trainee	
Yes	17 (11)
Months since Registration: Mean \pm Standard deviation (Median, 16; IQR, 9-21)	14 \pm 7
Health Profession	
Nurses	56 (38)
Physicians (MD/ DO/ PA)	31 (21)
Social Workers and Psychologists	7 (5)
Dietitians	6 (4)
Researcher	5 (3)
Other	44 (30)
Dose (Modules Completed)	
Mean (SD) ^a	5 (5)
Median (Interquartile range) ^a	2 (1, 12)
Made behavior changes as a result of training	
Self-care	109 (79)
Care of others	97 (71)

a: among participants who completed ≥ 1 module; 45% completed 0 modules

Table 2. Participants' Mind-Body Practices in 30 Days Prior to Survey

	N = 149 (%)^a
Type of Mind Body Practice	
None	33 (22)
Gratitude, Loving-Kindness, Compassion, Positive or Sacred Word Meditation	68 (46)
Mindfulness Meditation	66 (44)
Focused-attention Meditation or Relaxation Response	46 (40)
Tai Chi, Yoga, or Walking Meditation	45 (30)
Number of Mind-Body Practices	
Mean (SD)	2 (1)
Median (IQR)	2 (1, 3)
Frequency of Mind-Body Practice^b	
0 days	25 (17)
1 to 5 days	40 (27)
6 to 10 days	23 (15)
11 to 15 days	17 (11)
16 to 20 days	11 (7)
21 to 25 days	7 (5)
26 to 30 days	26 (17)

a: participants could specify more than one MBS practice; percentages may total more than 100.

b: refers to frequency in the last 30 days

Table 3. Correlations between measures of resilience, mindfulness, confidence in providing compassionate care, stress, and burnout (rho values, Spearman Rank-order correlation)

	Dose of Mind-Body Training	Freq. of Pract.	Mindfulness	Resilience	Compassionate Care	Stress	Burnout	Work Missed
Dose of Training (# Modules)	--	0.21*	0.10	0.08	0.17	-0.20*	-0.15	-0.16
Freq of Practice	0.21*	--	0.24*	0.25*	0.28*	-0.18*	-0.03	0.20*
Mindfulness (CAMS-R)	0.10	0.24*	---	0.73*	0.54*	-0.67*	-0.37*	-0.11
Resilience (BRS)	0.08	0.25*	0.73*	---	0.52*	-0.70*	-0.42*	-0.10
Confidence in Compassionate Care Scale (CCCS)	0.17	0.28*	0.54*	0.52*	---	-0.50*	-0.22*	0.01
Perceived Stress Scale (PSS)	-0.20*	-0.18*	-0.67*	-0.70*	-0.50*	---	0.60*	0.26*
Burnout/Physicians Well-Being Scale (PWBI)	-0.15	-0.03	-0.37*	-0.42*	-0.22*	0.60*	---	0.37*
Work Missed (WM)	-0.16	0.20*	-0.11	-0.10	0.01	0.26*	0.37*	---

* p < 0.05 (all correlations in bold are P<0.05)

BRS, Brief Resilience Scale

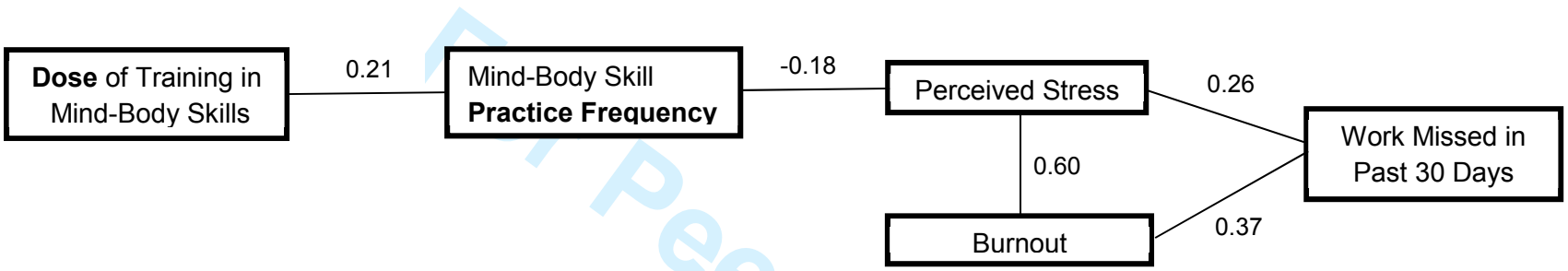
CAMS-R, Cognitive and Affective Mindfulness Scale, Revised

Freq, frequency

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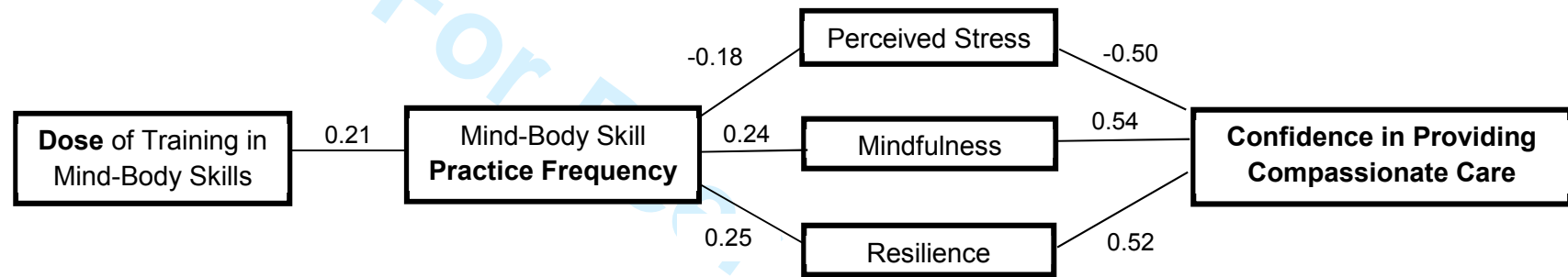
Figures

Figure 1 – Logic Model Showing Correlations between Dose of Training and Work Missed



All numbers represent Spearman rank-order rho values, and all are significant at P<0.05.

Figure 2 – Logic Model Showing Correlations between Dose of Training and Confidence in Providing Compassionate Care



All numbers represent Spearman rank-order rho values, and all are significant at $P < 0.05$.