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Mind–Body Skills Training to Improve Distress Tolerance in Medical Students: A Pilot Study

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ABSTRACT

Problem: Medical students face rigorous and stressful work environments, resulting in high rates of psychological distress. However, there has been a dearth of empirical work aimed at modifying risk factors for psychopathology among this at-risk group. Distress tolerance, defined as the ability to withstand emotional distress, is one factor that may be important in promoting psychological well-being in medical students. Thus, the aim of the current mixed-methods study was (a) to describe changes in facets of distress tolerance (i.e., emotional tolerance, absorption, appraisal, regulation) for medical students who completed a mind–body skills training group, and a no-intervention control group of students; (b) to examine the relationship between changes in psychological variables and changes in distress tolerance; and (c) to report students' perceptions of the mind–body group, with an emphasis on how the group may have affected personal and professional functioning due to improvements in distress tolerance. **Intervention:** The mind–body program was an 11-week, 2-hour skills training group that focused on introducing, practicing, and processing mind–body skills such as biofeedback, guided imagery, relaxation, several forms of meditation (e.g., mindfulness), breathing exercises, and autogenic training. **Context:** Participants were 52 first- and second-year medical students (62.7% female, $M_{age} = 23.45$, $SD = 1.51$) who participated in a mind–body group or a no-intervention control group and completed self-report measures before and after the 11-week period. **Outcome:** Students in the mind–body group showed a modest improvement in all distress tolerance subscales over time ($\Delta M = .42-.53$, $p = .01-.03$, $d = .44-.53$), whereas the control group showed less consistent changes across most subscales ($\Delta M = .11-.42$, $p = .10-.65$, $d = .01-.42$). Students in the mind–body group qualitatively reported an improved ability to tolerate affective distress. Overall, improvements in psychological symptoms were associated with improvements in distress tolerance in the mind–body group but not in the control group. **Lessons Learned:** These preliminary findings provide support for the notion that improving distress tolerance through mind–body skills training might serve to protect medical students from becoming functionally impaired by psychological distress. Thus, implementing mind–body skills training into medical school education may help to improve the psychological well-being of medical students. Future studies utilizing more methodologically rigorous designs are warranted.

KEYWORDS

mind–body; medical students; stress tolerance

Medical students are faced with unique challenges and stressors as a result of the demands of medical school. For example, they are exposed to ethical conflicts, death, and suffering, and they work in competitive academic environments.¹ These challenges have been shown to lead to greater psychological distress and higher rates of mental health problems (e.g., anxiety, depression) as compared to age-matched peers.^{2–8} Distress in medical students has been associated with poor academic performance, poor professionalism, substance use, and reduced empathy and compassion.¹ Moreover, approximately 50% of medical students report burnout, which is prospectively associated with depression and suicidality.⁹

Not only are these negative outcomes problematic for medical students' well-being, but they may lead to a reduced quality of patient care and increased medical errors.^{10,11} Thus, there is a critical need to identify methods for helping medical students effectively manage distress during medical school.

Distress tolerance, defined as the ability to withstand negative emotional states, is therefore an important psychological outcome for medical students.¹² Low distress tolerance is a traitlike transdiagnostic risk factor, that is, it is a variable that is applicable across psychiatric diagnoses and increases an individual's risk for developing and maintaining a wide range of psychopathological

problems (e.g., anxiety, depression, substance use). Distress tolerance has been measured via self-report and behavioral tasks (e.g., breath holding), with each measure capturing a unique facet of distress tolerance (i.e., emotional distress tolerance, physical distress tolerance, frustration tolerance).¹³ Emotional distress tolerance, which is the focus of the current study, is widely measured via self-report and encompasses an individual's capacity to tolerate, decenter from (i.e., approach emotional experiences with objectivity, without becoming absorbed in them), accept, and regulate negative emotions in an adaptive way.^{12,13}

Recent conceptualizations of psychopathology emphasize the role of transdiagnostic risk factors in the development of psychological disorders, and increased research attention has focused on identifying, elucidating, and targeting these risk factors.^{13,14} Theoretically, individuals low in distress tolerance experience negative emotions as all-encompassing and unbearable and, as a result, engage in emotion regulation strategies to reduce or eliminate the distress (e.g., avoidance, suppression).¹² These avoidant-oriented strategies (e.g., denial, substance use) are negatively reinforced because they reduce distress in the moment, but consistent emotional avoidance perpetuates negative emotional states and impairs functioning over time.^{15,16} Indeed, medical students who engage in avoidant or disengagement-related regulation strategies when upset are more likely to experience heightened levels of depression and anxiety.^{6,17} Thus, increasing distress tolerance might be particularly beneficial for not only helping medical students manage current distress but also for preventing the development of psychological problems over time. Indeed, treatments designed to modify distress tolerance and other transdiagnostic risk factors (in populations other than medical students) have been successful in reducing symptomatology and improving psychological well-being.^{18,19}

The fastest growing area of integrative health and medicine approaches, mind-body medicine, offers several techniques that may be effective for increasing distress tolerance.²⁰ Mind-body medicine is an approach to healing that emphasizes the interaction between the mind and body, and the mind's ability to affect bodily functioning and symptomatology.²¹ Mind-body therapies, which include relaxation, meditation (e.g., mindfulness meditation, transcendental meditation), biofeedback, and guided imagery, are shown to be effective for reducing symptomatology, increasing well-being, and improving distress tolerance across a wide range of medical and psychiatric conditions.²¹⁻²³ As a result, mind-body therapies

have been integrated into clinical care, and more recently medical school education.²⁴⁻²⁶ Medical students who participate in mind-body therapies or skills trainings have shown improvements in depression, anxiety, empathy, spirituality, and cortisol levels,²⁴⁻³¹ as well as greater self-efficacy for stress management and self-care.²⁵ No research to date, however, has examined the effects of mind-body skills training on distress tolerance among medical students.

Therefore, the aim of the current pilot study was to utilize both quantitative and qualitative techniques (a) to describe changes across specific aspects of distress tolerance (i.e., tolerance, absorption, appraisal, regulation) for medical students who completed an 11-week mind-body skills training, and a no-intervention control group of students; (b) to examine psychological variables (i.e., perceived stress, negative affect, positive affect, mindfulness) associated with changes in distress tolerance; and (c) to report students' perceptions of the mind-body group, with a particular emphasis on how the group may have affected personal and professional functioning. It was hypothesized that medical students who participated in a mind-body skills training would report increases across all four subscales of distress tolerance, whereas the control group would exhibit no changes in distress tolerance. Moreover, it was hypothesized that increases in distress tolerance would be associated with improvements in other important psychological outcomes that have previously shown improvements with mind-body skills training in medical students,²³⁻²⁵ namely, perceived stress, negative affect, positive affect, and mindfulness. Last, it was hypothesized that qualitative results would support these findings, as indicated by students' reports that the program was helpful and provided them with effective coping skills for enhancing personal and professional functioning. It is important to note that, as is common for educational research,³² the current pilot study is an exploratory rather than confirmatory study, intended to provide descriptive data and generate hypotheses for future research, rather than establish causal inferences.³³

Method

Participants

The sample included 52 first- and second-year medical students at a large midwestern university (62.7% female, $M_{age} = 23.45$, $SD = 1.51$). Ethnically, 65.4% identified as Caucasian, 15.4% as Asian, 7.7% as biracial or

multiracial, 5.8% as Black or African American, and 5.8% as Other. Twenty-eight students participated in the mind–body skills training group, and 24 participants served as the no-intervention control group (see Table 1).

Procedure

The present study was part of an ongoing educational initiative examining the effects of mind–body skills training for medical students. No other data have been published from these groups. Data for the current study were collected across two different sets of mind–body and control groups, with the first set of groups completed in spring of 2014 and the second set completed in fall of 2014. For both groups, students were recruited via e-mail advertisements through the College of Medicine at the university. They were provided with information about the mind–body skills training (see further details next) and were able to voluntarily choose to participate in this group. They were also given the option to not participate in the mind–body group but complete the same self-report measures before and after the duration of the group for a small financial incentive (i.e., \$5 Starbucks gift card), thus forming the no-intervention control group. Students in the control group volunteered under the condition that they would not participate in the mind–body group. Thus, students self-selected into either the mind–body or control group, and all students interested in the mind–body group were accepted. Students in both groups were sent a SurveyMonkey link via e-mail to complete the self-report measures online, and students in the mind–body skills training group were sent a SurveyMonkey link via e-mail to complete an after-group questionnaire after the completion of the group. There was no monetary incentive for participating in the mind–body group. The Institutional Review

Board reviewed all study procedures and deemed the study to be exempt.

Mind–body skills training. The mind–body program was an 11-week skills training group that aimed to improve self-knowledge, reflection, self-care, and work–life balance. The program was developed at Georgetown University and has been studied in previous work.²⁴ Each weekly 2-hour session was led by two M.D.- or Ph.D.-level faculty members, who were trained through a 3-day workshop, during which they experientially learned the mind–body skills. Sessions began with an opening ritual (e.g., meditation) followed by a “check-in” period during which participants and facilitators shared personal experiences and insights related to their skills practice. The remainder of the session focused on introducing, practicing, and processing one new mind–body skill each week. Specific mind–body skills taught during the program included biofeedback, guided imagery, relaxation, several forms of meditation (e.g., mindfulness, forgiveness), breathing exercises, and autogenic training. Between each session, participants were given weekly home-practice assignments related to the concepts taught during the group that week (e.g., meditation, journal writing). Participants were asked to practice the skills they learned each week in the group for 20 minutes per day, 5 days out of the week. For a more detailed description of the mind-body skills training, see Saunders et al.²⁵

Measures

Distress tolerance scale (DTS). The DTS¹² is a 14-item self-report measure that evaluates one’s perceived capacity to withstand negative affective states. Items are rated on a 5-point Likert-type scale from 1 (*strongly agree*) to 5 (*strongly disagree*), with higher scores indicating a greater ability to tolerate emotional distress. The DTS consists of a higher order general distress tolerance factor comprising four lower order factors: (a) tolerance (e.g., “Feeling distressed or upset is unbearable to me”), (b) absorption (e.g., “My feelings of distress are so intense that they completely take over”), (c) appraisal (e.g., “My feelings of distress or being upset are not acceptable”), and (d) regulation (e.g., “I will do anything to avoid feeling distressed or upset”). The DTS shows strong psychometric properties, including acceptable test–retest reliability (ICC = .61).¹² The DTS has also been successfully used in previous work to assess changes over time.³⁴ The current study used the original 14-item version of the DTS, which excludes the 15th item (i.e., “When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels”). The

Table 1. Baseline characteristic comparisons.

Variable	Mind-Body ^a	Control ^b	<i>p</i>	<i>d</i>
Age, <i>M</i> (<i>SD</i>)	23.63 (1.76)	23.25 (1.19)	.38	—
Sex (% Female)	63.47	60.90	.80	—
Year in School (% 1st Year)	53.57	62.50		
DTS Subscales, <i>M</i> (<i>SD</i>)				
Tolerance	3.47 (1.20)	3.78 (.95)	.32	.29
Absorption	3.34 (1.24)	3.67 (1.17)	.33	.28
Appraisal	3.50 (.92)	3.77 (.90)	.31	.30
Regulation	3.36 (.97)	3.58 (.96)	.40	.23
Mindfulness, <i>M</i> (<i>SD</i>)	29.89 (6.12)	31.57 (5.25)	.31	.30
Perceived Stress, <i>M</i> (<i>SD</i>)	27.89 (8.27)	26.96 (6.20)	.66	.13
Positive Affect, <i>M</i> (<i>SD</i>)	34.36 (6.79)	35.39 (7.21)	.60	.15
Negative Affect, <i>M</i> (<i>SD</i>)	23.61 (8.63)	23.35 (7.35)	.91	.03

Note. *p* and *d* values refer to the results of independent-samples *t* tests and chi-square tests. DTS = Distress Tolerance Scale.

^a*n* = 28. ^b*n* = 24.

psychometric properties of the 14- and 15-item scales are very similar,¹² and the 14-item version has been successfully used in previous work.³⁵ In the current study each of the DTS subscales were used as separate outcomes, and internal consistency reliability was good (range $\alpha = .72$ to $.87$).

Cognitive and affective mindfulness scale-revised (CAMS-R). The CAMS-R³⁶ is a 12-item self-report measure of mindfulness. Items are designed to assess (a) the regulation of attention (e.g., “I am able to pay close attention to one thing for a long period of time”), (b) present-moment focus (e.g., “I am able to focus on the present moment”), (c) awareness of experience (e.g., “I can usually describe how I feel at the moment in considerable detail”), and (d) acceptance and nonjudgment of experience (e.g., “I am able to accept the thoughts and feelings I have”). Items are rated on a 4-point Likert-type scale from 1 (*rarely/not at all*) to 4 (*almost always*), such that higher scores indicate greater mindfulness. The CAMS-R yields a total score that demonstrates good psychometric properties.³⁶ The CAMS-R has been used in previous work to examine changes in mindfulness before and after an intervention.³⁷ Internal consistency for the CAMS-R in the current sample was good ($\alpha = .81$).

Perceived stress scale-10 (PSS-10). The PSS-10 is a 10-item measure assessing the tendency to appraise life events as stressful within the past month (e.g., “In the past month, how often have you been upset because something happened unexpectedly?”).³⁸ Items are rated on a 5-point Likert-type scale from 0 (*never*) to 4 (*very often*), with higher scores indicating greater levels of perceived stress. A recent review of psychometric support for the PSS-10 indicated good internal consistency and test-retest reliability ($r = .85$).^{38,39} Internal consistency reliability for the current sample was good ($\alpha = .89$).

Positive affect negative affect schedule (PANAS). The PANAS is a 20-item mood measure that assesses both positive and negative dimensions of affect and is highly utilized in psychopathology research.⁴⁰ Both the positive affect (PANAS-PA; e.g., “Enthusiastic”) and negative affect (PANAS-NA; e.g., “Distressed”) subscales were used in the present study. Items are rated on a 5-point Likert-type scale from 1 (*very slightly to not at all*) to 5 (*extremely*), with higher scores reflecting higher levels of affectivity within each domain. Participants were asked to rate the degree to which they experienced each mood state over the past week. The PANAS demonstrates good psychometric properties, including test-retest reliability ($r = .79$ – $.81$).⁴⁰ Internal consistency in

the current study was good for the PANAS-PA ($\alpha = .87$) as well as for the PANAS-NA ($\alpha = .89$).

After-group questionnaire

At the completion of the 11-week mind–body skills group, an after-group questionnaire was administered to students in the mind–body group to assess perceptions of the program and perceived efficacy of the group for improving personal and professional functioning. The survey consisted of five open-ended questions: (a) What did this course mean to you? (b) How has this course helped you as a medical student and as a person, if at all? (c) Do you believe this course will contribute to your work as a physician? If so, how? (d) How has this course changed your attitude toward medical school, if at all? (e) If you could tell another medical student one thing about this experience, what would it be?

Data analytic approach

Quantitative analysis. Given the small, exploratory nature of the current pilot study, our aim was to provide a descriptive examination of levels of distress tolerance for each group over time. For reference and completeness, we report the p values for inferential statistics, though the intended focus is on descriptive statistics and estimates of effect sizes. We examined means and standard deviations for demographic variables and distress tolerance scores. We used independent samples t tests or chi-square tests, as appropriate, to examine group differences in key variables at baseline. Changes in distress tolerance subscales (i.e., tolerance, absorption, appraisal, regulation) were examined within each group separately using a paired-samples t test. Cohen’s d served as an estimate of effect size and was interpreted as follows: $.2 =$ small effect, $.5 =$ moderate effect, $.7 =$ large effect.⁴¹ As a preliminary examination of potential mechanisms associated with changes in distress tolerance, we computed change scores (Time 2 – Time 1) and examined bivariate correlations between changes in psychological variables (i.e., perceived stress, negative affect, positive affect, mindfulness) and changes in each facet of distress tolerance for participants in the mind–body and control groups.

Qualitative analysis. The content of each of the five open-ended questions was examined by three of the authors to identify consistent themes across mind–body group participants. Specifically, comments were examined for their relevance to perceived improvements in distress tolerance and stress management, and how these improvements were perceived to impact improvements

in personal and professional functioning. We also report the percent of students who expressed each dominant theme.

Results

Baseline characteristics

See Table 1 for a summary of baseline characteristics. The mind–body and control groups were similar in terms of age, $t(49) = .89, p = .38$, and sex ($\chi^2 = .06, p = .80$). The control group reported slightly higher, albeit nonsignificant, levels of emotional regulation, $t(50) = -.84, p = .40$; tolerance, $t(49) = -1.01, p = .32$; absorption, $t(50) = -.98, p = .33$; and appraisal, $t(48) = -1.02, p = .32$, as well as slightly higher levels of mindfulness, $t(49) = -1.04, p = .31$, as compared to the mind–body group at baseline. The groups were most similar in terms of baseline levels perceived stress, $t(49) = .45, p = .66$; positive affect, $t(49) = -.53, p = .60$; and negative affect, $t(49) = .11, p = .91$.

Quantitative results: Changes in distress tolerance

See Table 2 for a summary of results regarding distress tolerance changes in each group. The mind–body group reported a medium increase over time for emotional tolerance ($d = .55$), whereas the control group reported a small increase over time ($d = .29$). The mind–body group reported a medium increase in absorption over time ($d = .44$), whereas the control group reported no change over time ($d = .01$). In terms of appraisal, the mind–body group reported a medium increase over time ($d = .47$), whereas the control group reported a small increase over time ($d = .24$). For regulation, the mind–body group reported a moderate increase over time ($d = .49$), whereas the control group also reported a moderate increase over time ($d = .42$).

See Table 3 for bivariate correlations between change scores. In the mind–body group, there were significant associations between improvements in tolerance and improvements in perceived stress and negative affect but not positive affect or mindfulness. Improvements in absorption were significantly associated with improvements in perceived stress and negative affect but not with positive affect or mindfulness. Appraisal was significantly associated with improvements in mindfulness, positive affect, perceived stress, and negative affect. Last, there were significant associations between improvements in regulation and improvements in perceived stress, negative affect and mindfulness, but not positive affect. In the control group, the only significant correlations were between changes in appraisal and mindfulness and changes in absorption and negative affect.

Qualitative results: Students' perceptions of the mind–body group

See Table 4 for a summary of qualitative results. The response rate for the after-group questionnaire was 85.7% ($n = 24$). In terms of general perceptions of the course, all of the students (100%) who completed the questionnaire reported that the group was valuable and meaningful in some way. Specifically, more than half of students (66.7%) expressed that the group improved their stress and overall well-being, and more than half of the students (54.1%) described learning specific stress reduction skills and techniques that they utilized effectively in their daily lives. Further, more than half of the students (54.1%) believed that the group provided a sense of support and a “safe place” for them to discuss their experiences without judgment.

In terms of how the group helped students personally and as medical students, more than half of students (62.5%) reported that the group was effective for improving the ability to manage and respond to the stress,

Table 2. Changes in distress tolerance in mind–body participants versus no-intervention control group.

	M_{pre} (SD)	M_{post} (SD)	t	95% CI	p	d
DTS–Tolerance						
Mind–Body	3.47 (1.20)	4.00 (.99)	–2.81	[–.92, –.14]	.01**	.55
Control	3.74 (.95)	3.99 (.83)	–1.66	[–.55, .06]	.11	.29
DTS–Absorption						
Mind–Body	3.34 (1.24)	3.84 (1.02)	–2.38	[–.93, –.07]	.03**	.44
Control	3.63 (1.18)	3.74 (1.14)	–.47	[–.59, .37]	.65	.01
DTS–Appraisal						
Mind–Body	3.57 (.87)	3.99 (.69)	–2.44	[–.78, –.07]	.02**	.47
Control	3.77 (.93)	4.02 (.67)	–1.06	[–.73, .24]	.30	.24
DTS–Regulation						
Mind–Body	3.36 (.97)	3.82 (.77)	–2.57	[–.84, –.09]	.02**	.49
Control	3.52 (.98)	3.95 (.94)	–1.72	[–.93, .09]	.10	.42

Note. p , d , and t values refer to the results of paired-samples t tests conducted within each group. CI = confidence interval; DTS = Distress Tolerance Scale.
* $p < .05$. ** $p < .01$.

Table 3. Zero-order correlations between change variables in the mind-body group (above the diagonal) and the control group (below the diagonal).

	1	2	3	4	5	6	7	8	<i>M</i>	<i>SD</i>	Range	
1. Δ Mindfulness	—	—	-.51**	.56**	-.55**	.25	.65**	.32	.47*	1.15	6.19	-9.00, 16.00
2. Δ Stress	-.59**	—	—	-.52**	.80**	-.54**	-.60**	-.57**	-.52**	-3.33	7.10	-20.00, 9.00
3. Δ Positive Affect	.52*	-.57**	—	—	-.52**	.36	.52**	.32	.24	-0.67	7.27	-11.00, 13.00
4. Δ Negative Affect	-.17 ^a	.38 ^a	-.34 ^a	—	—	-.57**	-.60**	-.62**	-.59**	-4.63	8.47	-27.00, 20.00
5. Δ DT – Tolerance	.02	.05	-.04	-.08 ^a	—	.37	.66**	.45*	.45*	0.53	0.98	-1.33, 2.33
6. Δ DT – Appraisal	.45 ^{a,*}	-.37 ^a	.32 ^a	-.34 ^a	—	.53 ^{a,*}	—	.52**	.55**	0.43	0.91	-1.50, 2.83
7. Δ DT – Absorption	.29 ^a	-.00 ^a	-.02 ^a	-.44 ^{a,*}	—	.19 ^a	.46 ^{a,*}	—	.44*	0.50	1.11	-2.50, 2.50
8. Δ DT – Regulation	.31	-.08	.14	-.02 ^a	—	.37	.26 ^a	.41 ^a	—	0.46	0.96	-1.33, 2.33

Note. Positive change scores for distress tolerance, positive affect and mindfulness indicate improvement over time while negative change scores for negative affect and perceived stress indicate improvement over time. DT = distress tolerance.

^aSpearman's rank correlation coefficient (ρ).

* $p < .05$. ** $p < .01$.

Table 4. Sample student quotes from the mind-body groups.

Question	Identified Theme(s)	Illustrative Quotes
What did this course mean to you?	Improved stress and well-being	"This course was the first time since I started medical school that I took time to worry about my own mental health and response to stress. It helped me to better focus during class and exams, while also learning to better deal with stressors outside of medical school as well. It has been an invaluable experience." "This was a great course and was an important opportunity for me to take a step back from medical school and learn some new skills that will enable me to take better care of myself moving forward."
	Enhanced social support	"The Mind Body Skills course was an invaluable resource and 'safe space' for me this semester. This group put my mind at ease, as I was under an enormous amount of stress this year." "I really appreciated the group experience as well as the skills I learned. It was a rare place for students to really open up to reach other without fear of judgment and talk about what was really going on in their lives. Very valuable."
How has this course helped you as a medical student and as a person, if at all?	Effective management of medical school stressors	"This course has helped me become more aware of moments when I am stressed or upset, and it has equipped me with tools to handle these stressors."
	Improved academic and professional functioning	"I feel better focused and better able to respond to stress. This has helped me to better deal with difficult scenarios while working with patients and studying."
Do you believe that this course will contribute to your work as a physician? If so, how?	Comfort teaching techniques to patients	"This course completely changed my way of thinking for the better. I hope to help some patients with what I've learned in this course, but regardless, I know I've improved myself, which will help me be a better physician."
	Improved patient care	"I will be better equipped to take care of myself, which will translate into better care for patients. Additionally, I can now recommend certain techniques to patients as a form of complementary/alternative medicine."
How has this course changed your attitude toward medical school, if at all?	Improved work-life balance	"This course has reminded me that I need to take more time to take care of myself as I navigate medical school."
	Sense of an academic community	"I feel much happier in medical school and much more connected to the group of people in my group whom I otherwise likely would not have met. The class also showed me that although we are all coming from different backgrounds and experiences, we share very similar feelings regarding the stress of medical school."
If you could tell another medical student one thing about this experience, what would it be?	Highly recommended	"If you have the opportunity to be part of this group, do it! It will change your perspective on other students, on alternative medicine practices, and healthcare in general. You will walk away feeling so much more prepared for the daily stress of school and more confident about your own abilities."

rigors, and challenges of medical school, resulting in improved academic functioning. Moreover, approximately half of the students (45.8%) described feeling more aware of their experiences and that they were able to respond more effectively to distressing affective states, which positively affected their academic and personal functioning.

In terms of how the group would contribute to the students' work as physicians, all of the students (100%) believed that the group would positively contribute to their professional career. More than half of students (66.7%) reported that they would be open to teaching their patients the skills and techniques they learned from the group, and more than half of the students (62.5%) expressed that the group would help them provide effective and empathic patient care in the future.

When asked if the group has changed the students' attitude toward medical school, approximately half of the students (45.8%) believed that they have gained an enhanced perspective on work–life balance and now value the importance of self-care. Further, some students (37.5%) expressed that they feel more supported by their peers and part of a community in medical school as a result of the group.

Last, when asked what the students would tell a fellow medical student about the group, all of the students (100%) reported that they would highly recommend enrolling in the group due to an enhanced ability to manage their emotions and, as a result, improved personal, academic, and professional functioning.

Discussion

The primary goal of the current study was to generate hypotheses for future research by describing changes in distress tolerance for medical students who participated in a mind–body skills training group and students who did not participate in the group. Consistent with our hypothesis, students in the mind–body group evidenced a modest improvement in all distress tolerance subscales. Contrary to prediction, the control group also showed some improvement in distress tolerance, though these changes were generally less substantive and less consistent. These findings suggest that mind–body skills training may be helpful for improving levels of distress tolerance in medical students and are consistent with previous findings that suggest that mind–body training, particularly mindfulness-based approaches, enhance one's ability to withstand affective distress.^{23,42}

Qualitative findings were consistent with quantitative results and supported the overall acceptability of the mind–body program. Taken together, students in the mind–body group described improved stress and

well-being; an enhanced sense of social support; and, as a result, improved personal, academic, and professional functioning. It is particularly noteworthy that most students reported an enhanced ability to respond adaptively to affective distress (i.e., improvements in distress tolerance). Of importance, all of the students who completed the questionnaire reported that they would highly recommend the mind–body skills training to fellow medical students due to the beneficial effects in terms of improved stress and general well-being. Overall, these qualitative themes are consistent with themes identified in previous work following a similar mind–body skills training group.²⁵

Inconsistent with prediction, there were modest improvements in the Tolerance and Appraisal subscales of distress tolerance for the control group and comparable changes for the Regulation subscale across groups. One possible explanation for this finding is that the non-randomized design resulted in a self-selected group of control group students who were more resilient and psychologically healthy, as evidenced by slightly better baseline functioning than the mind–body group. As such, control group students may have been equipped with the skills needed to adapt to the rigors of medical school, thereby increasing their ability to cope with distress as they learn to adjust to the demands of medical school. Second, recent factor analytic results have shown that although the Tolerance, Appraisal, and Absorption subscales load strongly onto an overall distress tolerance factor, the Regulation subscale is less strongly associated with global distress tolerance.⁴³ If this factor structure were consistent across this nonclinical group of medical students, it might suggest that the Regulation subscale did not differentially improve in the mind–body group because it is a somewhat unique process, reflecting emotional regulation more than tolerance. However, it is important to note that the underlying mechanism for changes in the control group remains unclear and that, despite improvements across some subscales, the mind–body group consistently demonstrated moderate improvements in each aspect of distress tolerance.

It will be important for future confirmatory studies to establish whether observed differences between groups were due to active treatment components or nonspecific treatment factors. It is possible that improvements in the mind–body group were partially due to nonspecific factors such as contact with researchers or social support, due to the fact that the current study did not utilize an active control group matched for time and attention. Results from a recent randomized controlled trial, however, suggest that a distress tolerance skills intervention, but not a supportive counseling intervention, produced psychological improvements among substance users,

suggesting that active treatment components are responsible for improving distress tolerance.⁴⁴

Overall, improvements in psychological symptoms were associated with improvements in distress tolerance in the mind–body group but not in the control group. These findings are important and highlight that despite small improvements in distress tolerance in the control group, only students in the mind–body group demonstrated psychological benefits associated with improved distress tolerance. Most important, these findings increase our confidence that improvements in distress tolerance (rather than nonspecific treatment factors such as group support) may serve as a mechanism through which mind–body skills training exerts its effects on improved psychological outcomes. Thus, increasing the ability to tolerate, decenter from, accept, and regulate negative emotional states may be the process through which students in the mind–body group improved their psychological functioning. These findings are consistent with theoretical accounts that improved distress tolerance could protect against functionally impairing psychological symptoms,^{13,34,45} as well as with recent findings indicating that medical students who struggle with, become consumed with, and avoid negative emotions experience adverse psychological outcomes.^{6,17}

These findings have a number of clinical implications for medical students. First, there appears to be a need and interest among medical students for skills training related to stress reduction.¹ Indeed, this was highlighted by the fact that students with relatively lower levels of distress tolerance self-selected into the mind–body skills training group, a finding that is similar to the results of previous studies indicating that medical students with greater anxiety symptoms self-selected into a mind–body intervention.²⁸ After participating in the mind–body group, these students reported several benefits, including an increase in distress tolerance, which in turn was associated with improvements in psychological symptoms. Given that psychological functioning is directly linked with academic and professional performance in medical students,^{1,10} improving psychological distress may bolster academic performance, empathy and compassion, and patient care. Thus, these findings provide further support for the integration of mind–body skills training, whether this particular intervention or an intervention that incorporates these specific mind–body skills into medical student education in order to enhance medical students' functioning and well-being.^{24–27,29–31}

Although promising, there are several limitations that warrant consideration, many of which are inherent to exploratory research. First, assignment into the mind–body and control group was not randomized, resulting

in students who self-selected into the mind–body group and limiting the ability to infer causal relationships. Thus, it will be important for future studies to utilize larger methodologically rigorous designs to examine the causal effects of mind–body training on distress tolerance and to increase confidence that findings were due to the mind–body skills training as opposed to group differences or other factors (e.g., attention, group support). Future studies might also more rigorously assess changes in academic and professional performance, as well as measure any potential downstream effects on patient outcomes (e.g., patient satisfaction, patient–provider communication, quality of care, etc.). Second, the sample is relatively homogenous in terms of age, race and ethnicity, and year in medical school. Therefore, it remains unclear whether these results would generalize across a more diverse, representative sample of medical students and whether mind–body skills training would affect psychological functioning among more advanced medical students or differentially among 1st- and 2nd-year medical students. Further, we did not assess students for current psychiatric diagnoses; future work should examine whether these findings generalize to medical students with clinical levels of psychopathology. In addition, it is also possible that there was a ceiling effect (i.e., participants had high distress tolerance scores before the start of the mind–body group), particularly for the control group, leaving little room for improvement over time. Fourth, the current study did not include a long-term follow-up period. Future work would benefit from continuing to include long-term follow-up in order to determine whether improvements in psychological functioning are maintained following the conclusion of the group.²⁸ Last, as mentioned above, different measures of distress tolerance (e.g., self-report vs. behavioral tasks) may capture different aspects of distress tolerance, and the current study focused only on self-reported perceptions of distress tolerance.⁴⁶ Given that different measures are differentially associated with specific clinical outcomes, employing a multimethod approach, incorporating both self-report and behavioral measures of distress tolerance, is an important next step in order to examine differential improvements over time.

Despite these limitations, results from the current pilot study suggest that mind–body skills training may be useful for improving levels of distress tolerance in medical students and that these changes are associated with improvements in psychological functioning. These findings suggest that integrating mind–body skills training into medical school education may help to improve the psychological well-being of medical students. Future studies examining how changes in distress tolerance causally affect academic or professional performance

and what “dose” of mind–body skills training would be optimal for medical student improvement are warranted.

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