



The Effects of Teaching Mindfulness on Stress in Physical Therapy Students — A Randomized Controlled Trial

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Abstract

Purpose: High stress levels among doctor of physical therapy (DPT) students have been reported consistently in the literature. Training in mindfulness has been shown to reduce stress. The purpose of this research study was to investigate the impact of teaching a mindfulness curriculum to DPT students on stress levels and mindfulness scores following training and 8 weeks later.

Methods: This was a mixed methods, randomized controlled study design conducted with 32 DPT students, who were divided into experimental and control groups. The experimental group received course instruction, plus a mindfulness curriculum over a 6-week period, and the control group received only the course instruction. The Five Factor Mindfulness Questionnaire (FFMQ) and Perceived Stress Scale (PSS) were administered as pre- and post-tests (immediately after and again 8 weeks after) to both groups. Qualitative interviews were conducted following the intervention.

Results: Repeated measures MANOVA revealed statistically significant interaction for PSS between time and group ($P = .022$). Pairwise comparisons revealed statistically significant differences on posttests one ($P = .008$) and two ($P = .029$), with PSS scores being higher in the control group. FFMQ results showed a statistically significant interaction between time and group ($P = .016$). Pairwise comparisons showed a statistically significant difference ($P = .032$) at the first posttest time point, with the control group scores being lower, but no statistically significant difference for posttest two. Qualitative analysis showed Prior Experience, Perception, Mindfulness Tools, Challenges, Stress Management, Self-Regulation, Continued Application, and Feedback on Course as categories, each containing subcategories and themes.

Discussion: The results showed a statistically significant improvement in students' perceived stress and mindfulness, and a favorable learning experience for most students. These results suggest that incorporating short segments of mindfulness training into DPT education may decrease student stress and increase mindfulness.

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1. Introduction

Higher education, specifically in healthcare majors, places a large demand on students' performance, which leads to increased stress for the individual, negatively affecting academic success and individual welfare.^{1,2} Stress is an ever-increasing reality for clinicians as well, and contributes to occupational burnout and compassion fatigue.^{3–6} Mindfulness has been shown to decrease stress,^{7–12} anxiety, and depression¹³; foster emotional resilience¹¹; enhance coping strategies and self-care^{5,14}; and improve quality of life.¹⁰ Kabat-Zinn teaches, "When we are more in touch with our body as a result of paying attention to it systematically, we will be far more attuned to what it is telling us and better equipped to respond appropriately (p.13)."¹⁵

This study used an educational curriculum to teach mindfulness to one cohort of doctor of physical therapy (DPT) students who were in their second year of graduate school. We assessed the effect of this training on their stress levels as well as their level of mindfulness. Specifically, this study explored the following research questions: 1) How does training DPT graduate students in mindfulness strategies affect stress and mindfulness in personal and professional life immediately following training and 8 weeks post-training? and 2) What is the experience of DPT students being trained in mindfulness in personal and professional life related to stress management and mindfulness?

1.1. Review of literature

Healthcare students have been shown to have higher incidences of stress than non-healthcare peers.^{16,17} Commonly identified sources of stress for healthcare students include high stakes examinations, large amounts of content to remember and apply, lack of free time, perfectionism, imposter syndrome, and financial challenges.^{16,17} Stress in healthcare students has been associated with depression,^{18,19} irresponsible drug and alcohol use,²⁰ attrition from the program,²¹ and suicide.^{2,22} An analysis of 381,614 medical residents between the years of 2000 and 2014 revealed suicide as the second cause of death, next to malignancy.²²

Times of transition, as well as the cumulative effect of healthcare programs create stress for students.^{2,22,23} Williams et al.² studied 163 first and second-year physical therapy students and found burnout and academic fatigue increased throughout the semester and years, while coping strategies decreased. Likewise, Sen, et al.²³ found the rate of depression increased from 3.9% to 25.7% in the transition from medical

school to the first three months of internship. Yagmour et al. reported that the majority of suicides in medical residents occurred in years one and two of residency.²²

Specific challenges of DPT school include meeting pre-requisites to get into the graduate program, competency demonstrations, rigorous examinations, and clinical education experiences.²⁴ During clinical education, student stress may be attributed to: changes in living situations and social support systems, uncertainty of clinical skills, and dissonance between what is taught as best practice versus what is observed in the clinic.^{24,25} Students must possess the ability to manage their personal stress before they will be able to deal with the pressures of being a care provider.¹⁶ Developing strong coping strategies to deal with, and even reduce, the perception of stressors is imperative for future healthcare providers and may be facilitated with mindfulness training.^{1,12,24,26–30}

Mindfulness is based on Eastern teachings and Buddhist philosophy.⁵ Mindfulness teaching focuses on the breath, and trains a person to give full attention to the present moment, freeing the individual of worry about the future or rumination about the past.³¹ Kabat-Zinn (2013) emphasizes the necessity to approach mindfulness practice with a certain state of mind.¹⁵ He posits seven factors as providing the foundation to mindfulness: non-judging, patience, beginner's mind, trust, non-striving, acceptance, and letting go.

Research has shown that mindfulness can be developed with education and practice.^{12,20,27,28,32–36} Epstein (2003) described how medical instructors can facilitate the development of mindfulness in their students by employing eight practices.³³ One of the examples he cites is priming the student by setting the expectation of self-observation, and asking reflective questions to invite curiosity, such as, "What are you assuming about this patient that might not be true?" Another mindfulness study delivered meditation to healthcare students at the beginning and end of class and measured results.¹ Students reported increased peace, decreased anxiety, and increased ability to deal with disappointing news as a result of the classroom meditation. A number of studies on teaching mindfulness utilize mindfulness based stress reduction (MBSR), a structured, eight week course, and have shown significant improvement in stress and stress management.^{12,27,28,30,35} While most studies use a pre, post-test design immediately following intervention,^{12,20,27,28,30,32–34,36} de Vibe et al. (2018) investigated the effects of a seven week MBSR program on medical and psychology students'

dispositional mindfulness, coping, and well-being across six years.³⁵ At six-year follow-up, students who received mindfulness training reported increased well-being, greater increases in dispositional mindfulness and problem-focused coping, and greater decreases in the trajectory of avoidance-focused coping as compared to those who did not receive mindfulness training.

The use of mindfulness in DPT education has limited research.^{5,29,36,37} Willgens & Sharf³⁷ conducted a qualitative, retrospective analysis of physical therapists who had failed a clinical education experience and remediated successfully when in DPT school. They found themes consistent with mindlessness behaviors prior to remediation and mindful behaviors after remediation, suggesting that mindfulness training may help prevent failure, assist in healing after failure, and contribute to successful remediation after failure. Willgens and Hummel³⁶ developed a mindfulness model of self-care for pediatric DPTs to be taught in DPT education, which provided the basis for the curriculum used in this research study. Chambers et al.²⁹ taught meditation, a component of mindfulness, to a group of 24 DPT students and found a significant improvement in their Perceived Stress Scale (PSS) scores following the intervention ($p < .001$). There remain gaps in the DPT literature regarding the effect of mindfulness on self-regulation in students, the best way to impart mindfulness across the curriculum, the effects of mindfulness training on stress levels, and the carryover or lack thereof of mindfulness training after the training has concluded. All DPT studies cited utilized a pre-test, immediate post-test design to determine the level of significance on the desired measure,^{5,29,36,37} however do not measure long-term effects of mindfulness training.

Teaching healthcare students to manage stress through mindfulness training may positively affect their ability to stay in school and improve quality of life.^{1,12,27,38} Although several studies have examined the effects of mindfulness training on stress levels of students in healthcare disciplines,^{1,12,27–30,39–41} only a

few have involved DPT students.^{5,37} The study at hand was designed to evaluate the use of mindfulness training as a way to assist DPT students in acquiring effective stress management skills, and also adds a novel component for DPT educational research by assessing the carryover of mindfulness effects at the end of the semester (eight weeks post-training).

2. Methods

2.1. Design

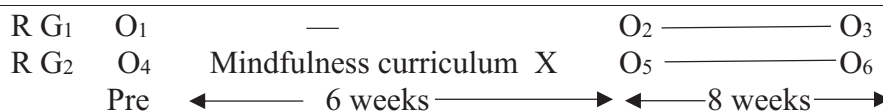
A mixed methods, two group, repeated measures prospective cohort research design was used to compare outcomes of DPT students who were taught a six week mindfulness curriculum on their perceived stress and level of mindfulness immediately following intervention, and eight weeks later. Students in one DPT class, PHTH 554: Psychosocial Aspects of Patient Care, were randomized by use of a random number generator into an experimental or control group, and stratified by gender to control for gender effect.^{42–44} The comparison group had ($n = 15$ with 7 males, 8 females) and the intervention group had ($n = 17$ with 7 males and 10 females). The experimental group received course instruction, plus a mindfulness curriculum over a 6-week period, and the control group received only the course instruction (see Table 1). Independent variables were group and time, and dependent variables were stress, measured by the Perceived Stress Scale (PSS), and mindfulness, measured by the Five Factor Mindfulness Questionnaire (FFMQ).

2.2. Subjects

The sample for this study was one cohort of graduate DPT students ($n = 32$, 14 males, 18 females) in the second year of their Doctor of Physical degree program at a small, private institution. Students were 22–28 years old, with thirty Caucasian students, one African American student, and one student of Cuban descent.

Table 1

Quantitative research design. RG₁ = control, RG₂ = intervention. Objective measures PSS and FFMQ will be administered each time at O₁, O₂, O₃, O₄, O₅, and O₆.



2.3. Curriculum

We developed an educational model adapted from the mindfulness curriculum by Willgens and Hummel,³⁶ mindfulness principles explained by Kabat-Zinn in *Full Catastrophe Living*,^{15,45} and information learned during the MBSR online course by Santorelli and Meleo-Meyer (www.soundstrue.com).⁴⁶ The mindfulness curriculum contained a combination of theory and experiential-based learning, including videos, short stories, poems, meditation, focused breathing, relaxation, and body scanning to expose the students to the seven facets of mindfulness and multiple practice tools. Carmody and Baer conducted a systematic review of MBSR course hours and found no correlation between the number of course hours and the mean effect size.⁷

The instructor did not make mindfulness the focus of the class, but rather an add-on, similar to the methods used by Schwind et al.¹ The mindfulness content was not linked to the course topic for the class and was only referred to in the course during the first 15 min of class, for the first six weeks. Group 1 was the control group, and had class from 10:45–12:15 pm on Monday and Wednesdays for 6 weeks. Group 2 was the intervention group, and had class on Tuesdays and Thursdays from 8:00–9:30 a.m. Both sections were presented the same lectures and class assignments relative to PHTH 554, but the intervention group was also taught 15 min of mindfulness content each class. The nature of the course content taught in PHTH 554 allowed for a flexible timeframe during class, which gave the researcher the ability to expand content in the control group through additional class discussion, while keeping class length the same. After the six weeks of mindfulness training ended, the group came back together as one section due to space and scheduling constraints within the DPT department.

As per department policy, class attendance was mandatory. In the event of an absence in the intervention group, the student was to report to the instructor to be taught the missed content. An absence in the control group was handled per departmental policy.

Students in the intervention group were encouraged to practice mindfulness skills outside of class time, and were asked to keep a log of any out of class practice during the full 14 weeks of the study. The log was referred to as the Mindfulness Practice Log, and was collected with the eight week post-tests.

2.4. Instruments

Mindfulness was assessed using the FFMQ (Baer et al., 2006),⁴⁷ due to its inclusion of five components of mindfulness and strong research backing. Baer et al.^{47,48} found that the FFMQ showed adequate to good internal consistency, with alpha coefficients ranging from 0.75 (non-reactivity) to 0.91 (describing). The FFMQ is currently the only questionnaire that assesses all five of the mindfulness facets (observing, describing, acting with awareness, nonreactivity to inner experience, nonjudging of inner experience).

Stress was assessed using the PSS by Cohen et al. (1983).⁴⁹ This scale is a highly researched stress assessment tool, and the ten questions made it quick and easy to use. The tool instructs the user to refer to their feelings and thoughts during the last month when answering the questions, which captures their overall stress rating, rather than stress at a single point in time, falling in line with the purpose of the study. The scale was originally validated with two groups of college students, $n = 332$ and $n = 114$ and one group of smoking-cessation subjects $n = 64$. Coefficient alpha reliability was 0.84, 0.85, and 0.86 for each sample, respectively.

Qualitative data was gathered through a semi-structured interview protocol (see Table 2) that the researchers developed to solicit rich data regarding students' experiences in learning mindfulness, implications on their personal and professional lives in the area of stress, and overall perceptions of value. The interview protocol was developed with transferability in mind, keeping questions general enough that they could be utilized in other research studies designed around a classroom educational experience. A focus group of college students in their third year of DPT school piloted the protocol. The researcher documented her thoughts throughout the experience in order to describe and disclose bias.

2.5. Procedures

Prior to beginning the study, Institutional Review Board (IRB) approval was granted from the IRB committee at the university where the study occurred. Prior to the first day of class, students were emailed to inform them which section they were in and the days/times it would be meeting. On the first day of class, all students were informed that participation was in no way attached to a grade, and were given the opportunity to opt out as a participant. Both groups were provided informed

Table 2
Qualitative interview question protocol.

Question	Number of participants ^a
1. Tell me about your experience with mindfulness before.	15/15
2. What did you think mindfulness was?	9/15
3. What is your perception of mindfulness now, as compared to what you thought of it beforehand? How has your perception changed, if at all?	12/15
4. What challenges and benefits did you face as you attempted to implement this into your daily life?	12/15
5. Discuss how your ability to manage stress in the classroom or your personal life was affected as you progressed through the mindfulness course.	13/15
6. Do you plan to continue with any of the mindfulness tools now that class is over? If so, which ones?	14/15
7. Do you think there is value in this being more widely distributed to students? Should all DPT students be exposed to it, whether they want to or not?	10/15

^a Number of participants who were asked the question. Due to the open, semi-structured nature of the interviews, each participant was not asked each question.

consent for the pre- and post-test measures, and a separate informed consent for the interview.

Data were kept confidential, with all identifying student information removed. Each student was assigned a number that was placed on each pre- and post-test by the researcher. A master copy containing student name and research number was compiled and saved by the researcher. The data were entered electronically onto a password protected computer, and saved without identifying numbers on the researcher's university-issued hard drive.

The same DPT course content was delivered to the comparison and intervention groups, however the experimental group also received 15 min of mindfulness training at the start of each class twice a week for six weeks (12 sessions). Pre-tests for PSS and FFMQ were performed immediately prior to the first session and post-tests completed immediately following the final session (week 7), as well as eight weeks later (week 15) for both groups.

Each student in the intervention group was given the opportunity to participate in an individual 15 min semi-structured interview about their mindfulness experience. The interviews occurred the week following completion of the intervention (week 7) by the primary researcher.

2.6. Analysis

Quantitative data was analyzed using IBM® SPSS Statistics by using a repeated measures MANOVA to compare pre-and post-tests (at seven and 15 weeks) results for the PSS and FFMQ for significant changes across group and time, as well as to evaluate for interactions between groups.

Qualitative data was gathered through the use of one on one, semi-structured interviews with the

participants in the intervention group. As the primary researcher, I audiotaped, transcribed and coded interviews by hand, using in vivo coding. In vivo coding is also known as literal coding and uses exact phrases from the participants to capture their perspective on the experience.⁵⁰ This fit our goal of capturing the student's experience related to mindfulness training. In vivo coding was used for first, second, and third cycle coding, until categories, subcategories and themes emerged.

The qualitative rigor of the study was strengthened by addressing credibility, transferability, dependability, and confirmability.⁵¹ Credibility was improved by reflexivity and disclosure throughout the process. Each process of coding was reviewed by two education faculty members for accuracy. Member checking occurred through restatement and clarification of points with the participant after the interview concluded. Transferability was addressed by providing a dense description of the research setting, and design dependability was ensured by carrying out the research plan with careful documentation, questions and artifacts designed to address the qualitative research question.

3. Results

3.1. Quantitative

PSS results showed a statistically significant effect of time across both groups ($P = .014$), statistically significant effect of group across time ($P = .036$), and statistically significant interaction between time and group ($P = .022$; Table 3). Pairwise comparisons reveal statistically significant differences at both post-test time points (Table 4). At the first posttest time point,

Table 3
PSS between and within effects.

Effect	Variable	Df	F	Sig.	part. η^2
Within Subjects					
Interaction	Time	2, 60	4.619	0.014	0.133
	Time & Group	2, 60	4.086	0.022	0.120
Between Effects					
Group	Outcome-PSS	1, 30	4.793	0.036	0.138

PSS = Perceived stress scale.

Values given in bold denote statistically significant results ($p < .05$).

the comparison group averaged 6.31 points higher on their PSS scores than the intervention group ($P = .008$). At the second posttest time point, PSS scores remained an average of 5.18 points higher among comparison subjects ($P = .029$).

FFMQ results showed statistically significant effect of time across groups ($P = .002$; Table 5), no significant effect of group across time ($P = .079$; Table 5), and statistically significant interaction between time and group ($P = .016$; Table 5). Pairwise comparisons (Table 6), show a statistically significant difference at the first post-test time point ($P = 0.032$), with the comparison group averaging 15.05 points lower on the FFMQ scores than the intervention group. At the second posttest time point, there was no statistically significant difference between the groups ($P = 0.061$), however, the results were approaching significance and would possibly reach significance with a larger sample size.

3.2. Qualitative

Fifteen of the 17 participants from the intervention group consented to be interviewed. Interview times ranged from 8 to 15 min, and followed a semi-structured interview protocol (Table 1). After reviewing questions and codes, the following five categories emerged: Prior Experience, Perception, Stress Management, Challenges, and Continued Application, each with subcategories and themes.

3.3. Prior experience

Three themes of *no idea*, *doing without knowing*, and *exposed before* emerged under the category of prior experience. Seven students out of 15 had *no idea* what mindfulness was prior to the course. Four of 15 students said they had been *doing* components of mindfulness *without knowing* what it was called. Participant 6 said, “No, I didn't have any idea of it, but it was more like I was doing it without knowing I was doing it.” Eight of 15 students reported being *exposed* to mindfulness *before*, from their mom, a fraternity activity, or in an undergraduate class.

3.4. Perception

Perception was divided into three subcategories: Prior Perception, Current Perception, and Change in Perception. Three themes emerged under Prior Perception: *narrow view*, *meditation-type things*, and *weird*. Three of twelve students stated they had a *narrow view*, illustrated by Participant 10's comment, “I think my idea of mindfulness was accurate, but very narrow.” Three of twelve students thought of it as *meditation*, and three assumed it dealt with mindset. Participant 30 said, “It was defined as being where you are and being content with that.” An additional three of twelve students thought it was *weird*. “And I think that's where a lot of the problem comes in; I think that

Table 4
Pairwise comparisons for PSS.

Time	(I) Group	(J) Group	M Diff.	SE	df	F	Sig.	part. η^2
Pre	Control	Intervention	0.835	2.128	1, 30	0.154	0.697	0.005
	Intervention	Control	-0.835	2.128				
Post 1	Control	Intervention	6.310	2.239	1, 30	7.944	0.008	0.209
	Intervention	Control	-6.310	2.239				
Post 2	Control	Intervention	5.184	2.263	1, 30	5.246	0.029	0.149
	Intervention	Control	-5.184	2.263				

PSS = Perceived stress scale.

Values given in bold denote statistically significant results ($p < .05$).

Table 5
FFMQ between and within effects.

Effect	Variable	Df	F	Sig.	part. η^2
Within Subjects					
Interaction	Time	2, 60	7.105	0.002	0.191
	Time & Group	2, 60	4.432	0.016	0.129
Between Effects					
Group	Outcome-FFMQ	1, 30	3.315	0.079	0.100

FFMQ = Five Factor Mindfulness Questionnaire.

Values given in bold denote statistically significant results ($p < .05$).

people just take it too far and that's where they push people away from it.” (Participant 17).

The themes under Current Perception were: *helpful with school*, and *helpful with stress*. Six of twelve students reported it was helpful with school. Participant six said, “Before it was like you were so worried about all the tests and stuff it was tough to differentiate times and understand that this time is meant for studying. Participant 26 said, “It helped me with the recent test we had. I did two feet, one breath.” In describing how it helped with stress, Participant 26 said, “I feel like I'm always going, going, going, and then it kind of stops everything and is like, ‘this is what you need to focus on,’ so put everything else aside. Calm down.”

The subcategory Change in Perception had three themes: *better understanding of what to do*, *broadened view*, and *more open to it*. *Better understanding of what to do* was mentioned by seven of 12. Participant 30 said, “I definitely learned a lot more, different types, and different points of view.” A *broadened view* was described by nine out of 12. The following quotes support the theme. “I went from thinking it was meditation stuff to being aware of your environment and can be used with all kinds of stuff throughout the day.” (Participant 20) “I feel like beforehand I applied it to hiking and walking, being outside, but now I think it's important even during class.” (Participant 21) The theme *more open to it* was developed from five

participant's comments. Participant 18 said, “We wanted to be nice and participate in the study, but I do think it did have an impact on me and could be used going forward.”

3.5. Stress management

Students discussed how mindfulness helped them with stress management, and three themes emerged: *helped sleep*, *calmed anxiety*, and *increased loving-kindness*. Four of thirteen students discussed how it helped them get to sleep. Ten of thirteen students reported it *calmed anxiety*. “I'm not saying that it took my stress level completely away, but I think it definitely helped me with it” (Participant 15). Participant 29 said, “It's helpful because I'm constantly worrying, ‘Am I going to fail; am I going to not do this; am I going to do this wrong?’” Two of thirteen students reported it increased their loving-kindness, or the ability to offer love to themselves or others.

3.6. Challenges

The category Challenges emerged with three themes: *hard*, *distraction*, and *time*. This category described the areas students had difficulty with while learning to practice mindfulness. Six of 12 students discussed how *hard* it was to learn something new. Participant 10 said, “I know you have to practice it to

Table 6
Pairwise comparisons for FFMQ.

Time	(I) group	(J) group	M Diff.	SE	df	F	Sig.	part. η^2
Pre	Control	Intervention	-4.592	5.704	1, 30	0.648	0.427	0.021
	Intervention	Control	4.592	5.704				
Post 1	Control	Intervention	-15.047	6.677	1, 30	5.078	0.032	0.145
	Intervention	Control	15.047	6.677				
Post 2	Control	Intervention	-14.235	7.315	1, 30	3.787	0.061	0.112
	Intervention	Control	14.235	7.315				

FFMQ = Five Factor Mindfulness Questionnaire.

Values given in bold denote statistically significant results ($p < 0.05$).

be good at it, but I don't even want to practice it because I know I'm going to be bad at it." *Distraction* was discussed by five of 12 students, and is supported by the following quote: "I'm thinking about 1000 different things so it's just hard to completely block everything out. I feel like with the stress of school it's hard to always just try and live in the moment; you do have to think ahead" (Participant 21). *Time* to practice mindfulness was described by 7/12 students as a struggle. Participant 17 said, "With school, you just have so much to do. With mindfulness, you're just like, 'I don't have time for that.'"

3.7. Continued application

Four themes emerged under the category Continued Application: *plan to continue*, *variety of tools*, *distributed to everyone*, and *depends on openness*. Eleven of fourteen students reported that they *plan to continue* mindfulness practice, and identified a *variety of tools* that they planned to use, such as meditation, mindful walking, mindful eating, mindful pause focused breathing, and application programs (apps). Participant 6 said, "I'll definitely continue to use meditation before I study, or go into an exam. Something to press a reset button to square away time and focus on whatever is present."

Ten of ten students agreed it was important for the content to be *distributed to everyone*. Participant 21 said, "I think that a lot of people can benefit from it." Five of ten students commented that distribution *depends on openness*. "If you're not open to it, I don't think it's going to work for you," said Participant 15. One student reported dislike for the entire experience, quoting, "It's probably my personality more than anything. I hate being calm; it's not me! I hated it." (Participant 27).

4. Discussion

4.1. Research question 1

How does training DPT graduate students in mindfulness strategies affect stress and mindfulness in personal and professional life immediately following training and 8 weeks post-training? Results showed a statistically significant improvement in perceived stress scores in the intervention group immediately following the mindfulness training. This finding was consistent with prior studies,^{27,28,30,41} and indicates that mindfulness training had a positive effect on stress levels of participants. Perceived stress scores remained

statistically significantly lower in the intervention group at the end of the semester as well, demonstrating that students who learned mindfulness felt less stress than their peers in the comparison group, even after the mindfulness training had concluded.

Mindfulness level scores increased significantly across the intervention group as compared to the comparison group for the first posttest, demonstrating that the mindfulness course did cause an increase in mindfulness. The results did not remain statistically significantly higher than the comparison group eight weeks later. This result could be due to a number of factors. First, time constraints did not allow us to send weekly emails to students as planned to remind them to practice mindfulness skills after the course had concluded. Several students seemed concerned that they would not be as faithful with mindfulness practice without a class to remind them and keep it in the forefront of their mind (Participants 15, 19, 26, and 26). Second, most mindfulness courses in the research were eight to 16 weeks in length,^{27–30,38,41} so perhaps six weeks was not long enough to create a lasting change in students' behavior. Finally, the previous studies^{23,24,27–29,38} did not track mindfulness scores over an extended period of time after training concluded, and the literature is inconclusive as to the duration of mindfulness practice necessary to create lasting change.⁷ Results of this study indicate a need to continue investigating the long-term effects of mindfulness training in the absence of guided instruction. Because most DPT programs do not have time to include an extended course on mindfulness, the six-week time frame used in this study showed that effective results can be achieved when a shorter training period is integrated into an existing course in the curriculum, although follow-up may be needed for skill maintenance.

4.2. Research question 2

What is the experience of DPT students being trained in mindfulness in personal and professional life related to stress management and mindfulness? Five categories emerged relative to the lived experience of DPT students who received mindfulness training: Prior Experience, Perception, Stress Management, Challenges, and Continued Application. The majority of students reported significant help with managing stress and anxiety as a result of the mindfulness content, while one student reported dislike for the content. These positive results align with prior research and demonstrate the value of using mindfulness as a tool for improving stress management.^{1,39}

The themes and codes that emerged regarding Prior Experience and Perception suggest that even though mindfulness seems to be a popular concept in current culture, some students may still have limited or no exposure to it, and/or a very limited view of what it is. This finding was consistent with prior research.^{27,28,30}

A student's perception of the value of course content will affect their motivation to participate,⁵² therefore, knowledge of the full scope of mindfulness and its multiple tools may help create buy-in among students.

The themes that emerged with Stress Management, *helped sleep, calmed anxiety, and increased loving-kindness*, are important components of managing the performance anxiety that is a major source of stress for healthcare students.¹ Anxiety is created when a person ruminates on what has happened, or worries about what may happen, therefore, mindfulness is effective by training a person to stay centered in the present moment.^{13,15}

The Challenges students experienced in this study, *hard, distraction and time*, were echoed in the literature.^{1,16,17} Sears, Kraus, Carlough, and Treat⁵³ found that college students experience difficulties with time constraints, the belief in the efficacy of meditation, and a lack of motivation to participate. Student comments revealed they found mindfulness to be hard because they felt like they were not good at it. It is imperative to emphasize that progress, not perfection is the goal with mindfulness. Managing distractions is another common struggle for college students, therefore it was not surprising that it emerged as a theme in this study. Ironically, mindfulness teaches students to manage distraction, yet distraction was shown to inhibit them from mindfulness practice.

Regarding Continued Application, students reported a desire to continue with different types of mindfulness practices, emphasizing the individualized nature of mindfulness practice. The participants of this study, including the one who did not like the mindfulness content, posit that all students should be exposed to mindfulness content in order to get a complete picture of it before they assess its usefulness. In the words of Participant 15, "You don't know what you don't know. You don't know what you haven't been taught."

4.3. Conclusion

This study investigated the effects of teaching a mindfulness curriculum to graduate DPT students on their perceived stress and mindfulness. The results showed a statistically significant improvement in each of these areas immediately following a six week

mindfulness curriculum, and continued improvement eight weeks later for perceived stress, but not for mindfulness. Generalizability is limited due to the small sample size and implementation at only one university, however the study adds value by contributing to the limited body of evidence regarding the use of mindfulness in DPT education. Additional research needs to be done on the long-term effects of mindfulness training. DPT educators could consider incorporating mindfulness into the curriculum as a way to decrease student stress and increase mindfulness.

Disclosure

Ethical approval

Ethical approval has been granted from the Robert Morris University Institutional Review Board (IRB) for research involving human subjects (24 September 2017, 201708221453). The Saint Francis University IRB (the institution where the research was conducted) reviewed the IRB approval from RMU and declared it adequate to begin the study.

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Other disclosure

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