JOURNAL OF WELLNESS ORIGINAL RESEARCH

Assessing the Efficacy of a Meditation Intervention on Dispositional Mindfulness Among Medical Students and Resident Physicians

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ABSTRACT

Introduction: Dispositional mindfulness is the act of paying attention to one's thoughts and feelings with an open and non-judgemental attitude. Medical students and resident physicians are under immense pressure and stress daily, and they need effective tools to help increase their dispositional mindfulness. This project examined the impact of a meditation intervention on medical students' dispositional mindfulness.

Methods: In 2020, medical students and resident physicians at the University of South Florida were given the option to practice daily meditation for thirty days; time spent on the practice varied depending on comfort with the practice. Dispositional mindfulness levels were assessed using the Mindfulness Attention Awareness Scale (MAAS) before and after the thirty-day intervention.

Results: Eighty-three students, residents, and fellows completed the 30-day program, including the baseline and follow-up measures. Overall levels of mindfulness significantly increased among medical students ($p < 0.001$). Higher MAAS scores were associated with a longer duration of meditation (10-20 days: $p = 0.046$, >20 days: $p = 0.006$). MAAS scores also significantly increased in female participants ($p < 0.001$).

Conclusion: Our intervention demonstrates that a 30-day meditation program may aid in fostering dispositional mindfulness among medical students while potentially promoting better wellness outcomes amongst physician learners.

https://doi.org/10.55504/2578-9333.1130

Received Date: Mar 09, 2022
Revised Date: Aug 22, 2022
Accepted Date: Sept 28, 2022
Publication Date: Jan 19, 2023

Website: https://ir.library.louisville.edu/jwellness/

Recommended Citation: Stefan, Kelsey A.; Villeneuve, Michael; Konanki, Varun; Rarity, Erica; Mhaskar, Rahul; Chen, Liwei; and Phillips, Amelia (2023) "Assessing the Efficacy of a Meditation Intervention on Dispositional Mindfulness Among Medical Students and Resident Physicians," Journal of Wellness: Vol. 4: Iss. 2, Article 4.

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INTRODUCTION

Medical students and resident physicians are under enormous stress and pressure. Students and providers have been shown to be at a higher risk for psychological problems (e.g., burnout, anxiety, and depression) that affect up to 50% of all healthcare students [1]. Both medical students and interns demonstrate elevated rates of depression and burnout that progresses and intensify throughout medical education [2]. It is estimated that nearly three-quarters of interns experience burnout and one in five residents may be clinically depressed [2]. Up to 27.2% of medical students may experience depression and as many as 12% will not seek treatment, indicating a stress/burnout related issue that is present in medical school [2].

Research has also demonstrated that physicians have an increased risk of suicide and depression relative to the general population [3]. Female physicians are at particularly increased risk [3]. Major contributors to physician suicide are feelings of hopelessness and lack of support [3]. Given the strain on healthcare professionals during the COVID-19 pandemic, the need for sustainable and widespread support is more crucial than ever [3].

Studies have shown that meditation and mindfulness practices have therapeutic effects on anxiety and stress reactivity [4]. A systematic review of mindfulness studies specifically in healthcare professional students found that mindfulness-based interventions reduced stress, anxiety, and depression among students while also improving mindfulness, self-efficacy, empathy, and mood [4]. Mindfulness practice benefited those directly experiencing stressful circumstances, indicating a potential therapeutic role. Mindfulness interventions can decrease anxiety, increase empathy, and improve aspects of personal well-being, such as self-confidence [5, 6, 7]. A 2013 study by Palladino et al. evaluated medical students' psychological flexibility through the use of the Mindfulness Attention Awareness Scale (MAAS), shown in Appendix A, along with the Acceptance and Action Questionnaire-II and the Cognitive Fusion Questionnaire [8]. They found that medical students and residents were highly self-aware with a higher degree of psychological flexibility than those in other professions, potentially leading to greater potential for response to mindfulness techniques in this population [8].

Although previous research has shown that mindfulness-training techniques may reduce stress and benefit overall

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well-being in medical students, the current research has not evaluated the effectiveness of a meditation program that allows students and residents to practice meditation in a flexible manner that allows them to choose how long they participate in the practice each day. Dispositional mindfulness is the act of paying attention to one's thoughts and feelings with an open and non-judgemental attitude [9]. The Mindfulness Attention Awareness Scale (MAAS) has been used to assess individuals' attention awareness in a given moment, indicating potential as a reliable tool to assess dispositional mindfulness [10]. This study evaluated the efficacy of a 30-day mindfulness meditation intervention on dispositional mindfulness among medical students and resident physicians using the MAAS questionnaire.

METHODS

Participants

Approximately 600 University of South Florida (USF) medical students and 700 resident physicians were invited to participate in a 30-day voluntary wellness program that challenged them to practice 30 days of meditation. All medical students and resident physicians who were enrolled at USF Health were included. They received an email invitation in Spring of 2020. There were no exclusion criteria. Interested individuals could select a link in the email to receive more information and to enroll. During enrollment in the 30-day wellness challenge, learners were given the option to consent to be involved in the research study associated with the program. Of the approximately 1300 invited, 142 medical students and resident physicians enrolled in the program with 83 completing it. Those who did not complete the program attributed their reasons to examples such as having too little time, forgetting to meditate, forgetting to log meditation in a place where it could be dutifully tracked, or not enjoying the practice.

Procedure

Participants were instructed to engage in daily meditation for 30 consecutive days with the participants choosing how much time they wanted to spend on meditation. Each participant consented to being a part of the study at the start. Participants could choose a meditation software application of their choice, such as Headspace or Calm, that allowed them to track their meditation history over a period of 30 days. Participants were not required to pay for access to any meditation application in order to participate. At the end of the 30-day program, participants received an email instructing them to upload screenshots from their meditation mobile application. The program administrator reviewed these screenshots to confirm challenge completion. All study participants who signed up for and completed the meditation challenge remained in the study unless they requested to no longer participate. The consent form and surveys were provided to subjects electronically via a Qualtrics online survey platform. Participants were notified that they could reach out to the Prinicipal Investigator (PI) at any time with questions. This study was reviewed and approved by the University's Institutional Review Board (IRB).

Measures

The trait MAAS is a 15-item scale designed to assess a core characteristic of mindfulness, namely, a receptive state of mind in which attention, informed by a sensitive awareness of what is occurring in the present, simply observes what is taking place. It takes approximately ten minutes to complete. Participants indicated their agreement with statements such as "very frequently" and "somewhat infrequently" using a 6-point scale from 1 = almost always to 6 = almost never. This study's primary outcome was the participant's pre- versus post-intervention MAAS scores. Other variables include affiliation, gender, race, meditation frequency, and amount of days meditation occurred.

Participants had two weeks prior to the start of the meditation program to complete the baseline MAAS survey. We chose to give medical students and resident physicians this amount of time to complete the survey because lack of time is one of the largest reported reasons hindering participation in wellness programs in this population. The scoring range was 1–6 (determined by the mean score for items in the scale), with a higher score corresponding to a higher level of mindful attention awareness. When the meditation program was complete (30-days), participants had two weeks to complete the follow-up MAAS survey. The post-survey also includes two questions using the traditional five-point Likert scale, "This program motivated me to practice meditation" and "How likely are you to continue engaging in meditation practice?" These two questions gathered information about respondents' opinions regarding the intervention.

Statistical Analyses

The differences between pre- and post-intervention MAAS scores for each survey question were evaluated using the non-parametric Wilcoxon signed-rank test. The repeated measurement analysis was used to analyze the data and measure the change between pre-and post-intervention. Data analyses were performed using SAS version 9.4 (SAS Institute, Inc, Cary, NC, USA).

RESULTS

Study Participants

One hundred and forty-two students, residents, and fellows enrolled in the wellness program. Eighty-three students, residents, and fellows completed the 30-day program, including the baseline and follow-up measures. Sixty-eight medical students (81.9%) and fifteen residents/fellows (18.1%) participated, with most of the medical students being first-year students (57.4%). Sixty-six females (79.5%) and seventeen males (20.5%) participated. Only eight students (9.6%) indicated a regular meditation practice in place prior to enrollment.

MAAS Scores at Baseline and Follow-up

All participant demographics are outlined in **Table 1** and all pre- and post- MAAS scores are outlined in **Table 2** (next page).

Table 1: Participant Demographics

Affiliation	N	Percent
Medical Student	68	81.9
Resident/Fellow	15	18.1
Cohort	**N**	**Percent**
Class of 2020	5	7.4
Class of 2021	7	10.3
Class of 2022	17	25.00
Class of 2023	39	57.4
Gender	**N**	**Percent**
Female	66	79.5
Male	17	20.5
Race	**N**	**Percent**
Asian	21	25.3
More than one race	12	14.5
Other	13	15.7
White	37	44.6
Meditation frequency	**N**	**Percent**
Frequently	8	9.6
Never	25	30.1
Occasionally	27	32.5
Rarely	23	27.7

Table 2: Distribution of MAAS scores across participants' characteristics between pre- and post-intervention

Characteristics	Pre-intervention Mean (SD)	Post-intervention Mean (SD)	p-value[a]
Affiliation			
Medical student	3.5 (0.9)	3.9 (0.7)	**<0.001**
Resident/Fellow	3.6 (0.7)	3.7 (0.5)	0.578
Race			
White	3.3 (0.8)	3.7 (0.6)	**0.003**
Asian	3.8 (0.9)	4.0 (0.7)	**0.019**
More than one race	3.3 (0.8)	3.7 (0.6)	0.134
Other	4.1 (0.7)	4.1 (0.9)	0.838
Gender			
Female	3.5 (0.9)	3.9 (0.7)	**<0.001**
Male	3.7 (0.7)	3.7 (0.5)	0.849
Meditation frequency			
Frequently or above	3.4 (0.8)	3.9 (0.4)	0.117
Occasionally	3.6 (0.9)	4.0 (0.6)	**0.020**
Rarely	3.4 (0.9)	3.9 (0.7)	**<0.001**
Never	3.6 (0.9)	3.6 (0.8)	1.000
Days of meditation			
Low (<10)	2.7 (0.6)	3.5 (0.6)	0.188
Medium (10 – 20)	3.5 (1.0)	3.9 (0.9)	**0.046**
High (>20)	3.6 (0.8)	3.9 (0.7)	**0.006**
Tracking Apps			
10% Happier	3.6 (0.8)	3.8 (0.8)	0.095
Calm	3.6 (0.9)	3.8 (0.5)	0.934
Headspace	3.5 (0.8)	3.8 (0.7)	**<0.001**
Other	4.2 (1.5)	4.3 (0.8)	1.000

p-value[a]: comparison between pre- and post-intervention group (Wilcoxon signed rank test). Race: "Other", 'American Indian or Alaska Native', 'Black or African American', 'Middle Eastern or North African', 'Hispanic' are combined together.

Affiliation

Medical students were found to have significantly higher MAAS scores (mean: 3.5, standard deviation (SD): 0.9) following the intervention compared to their MAAS score before the intervention (mean: 3.9, SD: 0.7) ($p < 0.01$). Residents and fellows were found to have a non-significant increase in mean MAAS score from pre-intervention (mean: 3.6, SD: 0.7) to post-intervention (mean: 3.7, SD: 0.5) ($p = 0.57$).

Race

A significant increase in MAAS scores from baseline to follow-up was also present among white and Asian participants. White participants were found to significantly increase MAAS scores from pre-intervention (mean: 3.3, SD: 0.8) to post-intervention (mean: 3.7, SD: 0.6) ($p = 0.003$). Asian participants also increased their MAAS scores from pre-intervention (mean: 3.8, SD: 0.9) to post-intervention (mean: 4.0, SD 0.7) ($p = 0.019$). No significant difference was found in participants who indicated more than one race or those who indicated other with other consisting of American Indian or Alaska Native, Black or African American, Middle Eastern or North African, and Hispanic.

Gender

For individuals who identified as female, MAAS score was significantly higher from pre-intervention (mean: 3.5, SD: 0.9) to post-intervention (mean: 3.9, SD: 0.7) ($p < 0.001$). This indicates that mindful attention awareness in female participants improved following the intervention. No significant difference was found in participants who identified as male.

Meditation Frequency

There was a strong relationship between meditation frequency and likelihood to continue the practice ($p < 0.0001$). The more frequently participants practiced meditation during the 30 days, the higher MAAS score they achieved (**Figure 1**). The two middle groups showed the most significant increase in MAAS scores. "Rarely" significantly increased from pre-intervention (mean: 3.4, SD: 0.9) to post-intervention (mean: 3.9, SD: 0.7 ($p < 0.001$). "Occasionally" also significantly increased from pre-intervention (mean: 3.6, SD: 0.9) to post-intervention (mean: 4.0, SD: 0.6) ($p = 0.020$). This indicates that individuals who are not on extreme ends of the spectrum showed higher mindful attention awareness increases.

Days of Meditation

Individuals who practiced meditation for less than ten days showed no significant difference. However, individuals who practiced meditation for 10-20 days showed significant MAAS score increases from pre-intervention (mean: 3.5, SD: 1.0) to post-intervention (mean: 3.5, SD: 0.9) ($p = 0.046$). Those who practiced meditation for more than 20 days also showed higher MAAS scores from pre-intervention (mean: 3.6, SD: 0.8) to post-intervention (mean: 3.9, SD: 0.7) ($p = 0.006$).

Tracking Application

Individuals who used any other tracking application besides Headspace showed no significant improvement in their MAAS scores following the intervention. However, individuals who did use Headspace showed a high increase in MAAS score from pre-intervention (mean: 3.5, SD: 0.8) to post-intervention (mean: 3.8, SD: 0.7) ($p < 0.001$).

Descriptive Statistics Questions

After the intervention, the mean agreement score for "This program motivated me to practice meditation" (Q16) was 4.2 (SD: 0.7), meaning a little above "agree"; the mean agreement score for "How likely are you to continue engaging in meditation practice?" (Q17) was 4.0 (SD: 1.0), meaning "Moderate likely". Both are positive feedback from participants regarding the intervention, with 3.5 being the neutral score.

DISCUSSION

Our intervention suggests that a 30-day meditation program may improve dispositional mindfulness among medical students. Levels of mindfulness in medical students increased significantly following the 30-day period of practicing meditation. This program's results are consistent with previous findings that wellness and meditation programs can increase levels of mindfulness in health students [4, 11, 12]. Brief and regular mindfulness practice may help medical professionals better allocate cognitive and attentional resources. It is possible that brief, longitudinal training of mindfulness habits at the level of medical school through residency could provide the foundation for coping with the intrinsic stress and workload of ever-evolving healthcare [13].

Implementation of protective practices in healthcare professional students may lay the groundwork for a future group of medical professionals that are able to perform their duties without burning themselves into the ground and pondering suicide as a solution to stress [2]. Our intervention also aligns with previous studies showing an overall increase in mental health upon completion of such programs [4, 14, 15]. Prior work indicates a link between mindfulness practice and stress reduction in medical students and residents, a finding corroborated by our intervention [16, 17]. Furthermore, burnout decreases among resident physicians who practice mindfulness-based techniques [17]. While this work did not explicitly study burnout, previous literature supports the idea that meditation interventions like the one described in this study may positively impact student mental health.

It was also shown that the more participants meditated in the 30-days, the more significant their MAAS score change. Thus, students, residents, and fellows who meditate more days would potentially benefit the most from this practice. Participants who used the application Headspace showed a significant difference between pre-and post-MAAS scores, while other tracking applications did not show significant results. This indicates that Headspace could potentially be a more useful tool to increase an individual's mindful attention awareness. This may be because the majority of students used Headspace when compared to other tracking applications. The potential confounder of which application participants use must be considered when designing future studies.

LIMITATIONS

The small sample size of residents and fellows who participated is noted as a limitation and may have affected the results. The same effect may have occurred with the small subset identifying as male. Additionally, this evaluation used self-reported data, which represents a limitation as participants may have selected responses they saw as socially acceptable. In addition, while the different mobile applications utilized were similar, allowing participants to choose their own app for meditation could potentially impact the results. The time participants spent in each meditation was not measured; inaccuracies in reporting could contribute to error in assessing the effect of meditation practice and associated outcomes.

It should also be noted that mindfulness only significantly increased in those who were in the "middle" groups of meditation frequency: "occasionally" and "rarely." Those on higher ends of the spectrum ("frequently or above" and "never") may already have had a strong opinion on meditation that influenced their practice. This intervention only focused on one university health system and may not be generalizable to other health systems. The lack of a control group is also recognized as a study limitation, thus causation cannot be asserted. Despite these limitations, this evaluation suggests that a mindfulness-based intervention could positively affect medical student well-being.

CONCLUSION

The wellness of medical trainees at various program levels (e.g., medical students and resident physicians) continues to receive greater attention. Wellness interventions, such as the 30-day mindfulness meditation program described in this paper, should be considered for improving student wellbeing. Future studies could utilize a longer mindfulness-meditation program with longer-term follow up data. Investigators could strive to increase participation amongst groups with low representation in prior studies, such as resident populations and those historically underrepresented in medicine (African American, Indigenous, Hispanic ethnicity). Future trials could also measure stress levels more directly and objectively (validated stress scales, laboratory tests such as cortisol levels, etc.).

Funding Source: The author(s) received no specific funding for this work.

Conflict of Interest: The author(s) have no conflict of interest to declare for this work.

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Appendix A

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

1	2	3	4	5	6
almost always	very frequently	somewhat frequently	somewhat infrequently	very infrequently	almost never

_____ 1. I could be experiencing some emotion and not be conscious of it until some time later.
_____ 2. I break or spill things because of carelessness, not paying attention, or thinking of something else.
_____ 3. I find it difficult to stay focused on what's happening in the present.
_____ 4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.
_____ 5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention.
_____ 6. I forget a person's name almost as soon as I've been told it for the first time.
_____ 7. It seems I am "running on automatic," without much awareness of what I'm doing.
_____ 8. I rush through activities without being really attentive to them.
_____ 9. I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.
_____ 10. I do jobs or tasks automatically, without being aware of what I'm doing.
_____ 11. I find myself listening to someone with one ear, doing something else at the same time.
_____ 12. I drive places on 'automatic pilot' and then wonder why I went there.
_____ 13. I find myself preoccupied with the future or the past.
_____ 14. I find myself doing things without paying attention.
_____ 15. I snack without being aware that I'm eating.

Scoring: To score the scale, simply compute a mean (average) of the 15 items.