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Brief Reports

The feasibility of an innovative online mind-body wellness program for medical students

Christina Ray,[1] Shankar Jha,[1] Makayla Watt,[2] Ashley Hyde,[3] Kendra McGowan,[4] Sarah Tymchuk,[5] Puneeta Tandon[5]

[1]Internal Medicine Resident, University of Calgary, Alberta, Canada; [2]Faculty of Medicine, University of Alberta, Alberta, Canada; [3]Faculty of Nursing, University of Alberta, Alberta; [4]Family Medicine Resident, University of Alberta, Alberta, Canada; [5]Department of Medicine, University of Alberta, Alberta, Canada

Correspondence to: Dr. Puneeta Tandon, Department of Medicine, University of Alberta, 1-28A Zeidler Ledcor Centre, 8540 112 St NW, Edmonton, AB T6G 2P8 telephone: 780-492-9844; e-mail: ptandon@ualberta.ca; X: @PTBCN

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Abstract

Purpose: Medical students have higher stress levels than their age-matched peers; however, few online wellness interventions have been trialed in this population. This pilot study examined the feasibility of an online wellness program for medical students.

Method: This was a pilot feasibility, mixed-methods study with a pre-post design. From September to October 2020, medical students from a large Canadian medical school were introduced to a 12-week online program with weekly sessions on yoga, breathwork, meditation, and nutrition. Feasibility measures included adherence, satisfaction, and retention, with secondary outcome measures including stress, anxiety, quality of life, and mindfulness. Post-program qualitative interviews explored participant experience.

Results: Of 74 participants, 64 completed the program. Twenty-one achieved the program goal of participating at least two days per week. While 74.8% of participants found the program accessible and satisfying, some students reported challenges with adherence. Exploratory analysis indicated there are signals for reduced stress (11%, p = 0.005), anxiety (14%, p = 0.001), and improved mindfulness (5.6%, p = 0.001). Qualitative analysis revealed themes of participants experiencing an increased sense of balance and mindfulness.

Conclusion: A 12-week online wellness intervention appears feasible for medical students, showing potential benefits for stress, anxiety, and mindfulness.

Résumé

Résumé français à venir.

Introduction

Medical school is often characterized by high stress due to its rigorous academic and clinical demands.[1,2] Although medical students initially have mental health scores similar to those of their age-matched peers, these scores often decline during their training.[2-4] This decline is associated with increased levels of distress, which can manifest as anxiety, depression, suicidal ideation, and burnout.[2,5-7] Several reviews report that a significant proportion of medical students face mental health challenges, with 27% experiencing depression, 34% experiencing anxiety, and 11% reporting suicidal ideation.[8,9]

Recent studies have explored the impacts of mind-body interventions that include yoga, breathwork, and mindfulness-based meditation on participant stress, mindfulness and quality of life. While these studies have shown promise in reducing perceived stress and increasing mindfulness,[10-13] there is little consensus on incorporating these within a rigorous training schedule[10] or implementing them into the medical curriculum.[14] The primary objective of this study was to assess the feasibility and acceptability of a 12-week online wellness program for medical students, with a secondary objective of exploring pre-post changes in perceived stress, mindfulness, and quality of life.

Methods

Study design

This was a single-group, pre-post pilot feasibility study to assess adherence, satisfaction, and retention to inform potential use in future trials. Ethics approval was received from the Health Research Ethics Board at the University of Alberta (Pro00082125). The study was registered at www.clinicaltrials.gov (NCT04612387). Informed consent was obtained from each participant before enrollment.

Recruitment and participants

We invited all students enrolled in the Doctor of Medicine program at the University of Alberta to participate in the study. Potential participants were informed of the study through announcements during lectures and newsletters from the Undergraduate Medical Education Office. Participants were excluded if they had significant medical comorbidities, a history of psychosis, post-traumatic stress disorder, or were at risk of severe depression. Those excluded were provided with contact information for local mental health services.

Intervention

Medical student leads (CR, SJ, KM) modified the 12-week program, initially tested in a randomized controlled trial (RCT) for individuals living with inflammatory bowel disease (IBD)[15] for the current context. Intervention components included weekly: (1) themed introductory videos; (2) videos of yoga postures and breathing techniques; (3) guided mindfulness meditation recordings (e.g. grounding, personal power, letting go); and (4) optional written nutrition tips and recipes (e.g. healthy snacks, meal prepping, bone health).

Data Collection and Outcome Measures

Quantitative. The primary outcome was feasibility, which included adherence (≥ 50% of participants accessing at least one component of the routine twice weekly, i.e. themed introductory videos, yoga postures and breathing techniques, guided mindfulness meditation, or nutrition tips), satisfaction (assessed via a survey at completion of week 12), and retention (≥ 80% completing initial and final surveys). Exploratory effectiveness measures to assess potential benefits and support sample size calculations for a future RCT included baseline and 12-week changes in stress (PSS-10),[16] anxiety and depression (Hospital Anxiety and Depression Scale (HADS)[17], depression (PHQ-9),[18] wellbeing (Psychological Well Being Scale (PWB[19,20]), quality of life (1-100 self-assessment scale),[21] and mindfulness (Five Facet Mindfulness Questionnaire (FFMQ).[22] Participant demographic characteristics were collected at the study's outset (Table 1).

Table 1. Participant demographics

Baseline Characteristics	n(%)
Year of training	
1	24 (32.4)
2	25 (33.8)
3	16 (21.6)
4	9 (12.2)
Gender	
Male	19 (25.7)
Female	54 (73.0)
Non-Binary	1 (1.4)
Smoking Status	
Non-smoker	73 (8.6)
Former Smoker	1 (1.4)
Current smoker	0 (0)
Average Age (Years)	25±3

Qualitative. End-of-study semi-structured interviews were conducted by MW using a qualitative descriptive approach[23] to explore participants' experiences with the program, including their perceptions of the intervention and its impacts on their health and well-being. Interviews were conducted by phone in January-February 2021, with all interviews recorded and transcribed verbatim. Data collection followed convenience sampling and saturation principles, focusing on participant availability and data quality.[24] We used a thematic approach for analysis, with data inductively coded and codes grouped into larger categories then themes.[25] Analysis was completed by two members of the study team (MW, AH) who developed a coding framework, with disagreements resolved through consensus. Quirkos (version 2) was used for data management.[26]

Statistical analysis

As this was a pilot feasibility study with the primary aim of analyzing process outcomes (i.e. participant adherence, satisfaction, and retention), we did not calculate the sample size a priori. We estimated the sample size from existing studies in the literature (ranging from 30 to 200 participants).[27,28] Feasibility and demographic characteristics are presented using descriptive statistics (mean ± standard deviation), with exploratory effectiveness outcomes analyzed using paired sample t-tests. All statistical analyses were performed using SPSS,[29] with alpha set to 0.05.

Results

Participants

Ninety-eight individuals were screened, and 74 met eligibility criteria and completed baseline surveys, with 64 participants completing the 12-week study. Twenty-four participants were excluded for significant medical comorbidities, including a history of psychosis, post-traumatic stress disorder, or if they had severe depression. The mean age of participants was 25 ± 3 years, and 54 participants (73%) identified as female. Most participants were in their first (n = 24) or second (n = 25) years of medical school, with the remainder (n = 25) in their clinical years (years 3 and 4).

Feasibility: retention, adherence, and program satisfaction

Of the 74 participants enrolled in the program, 86.5% (n = 64) completed both the baseline and end-of-study surveys; 10 were lost to follow-up, and one completed the questionnaire but did not report a scheduled practice. This met our retention target, with 80-85% of participants completing baseline and end-of-study surveys. Thirty-five percent of participants met the pre-specified adherence target, with 40 (63.5%) participants carrying out the routine one time per week, 21 (33.3%) participants 2-3 times per week, and one (1.6%) participant daily. Participant satisfaction with different aspects of the study is presented in Figure 1. Overall satisfaction with the program was rated as a mean of 74.8 ± 12.9 on a scale of 0-100, with the likelihood of continuing these techniques after cessation of the program scored at 68.9.

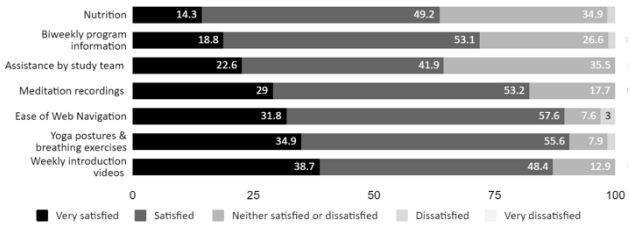

Figure 1. Participant satisfaction with different aspects of the study

Exploratory outcomes

From baseline to 12 weeks, the PSS-10 stress score decreased by 11.0% (p = 0.005), and the HADS-anxiety domain improved by 14.0% (p = 0.001). The HADS-depression domain did not change significantly (p = 0.27). A significant reduction (20%, p = 0.002) was noted in the depression score measured by the PHQ-9. Psychological well-being measured by the PWB scale did not change over the program, but there was a modest improvement in quality of life by 5.4% (p = 0.014). Significant improvements in the FFMQ mindfulness score were noted (5.6%, p = 0.001), particularly amongst the subcomponents: ability to observe (p = 0.004), be non-judgemental (p < 0.001) and non-reacting (p = 0.001). Additional exploratory measures are presented in Table 2.

Qualitative findings

Five students participated in end-of-study interviews. We identified three themes related to the program experience: (i) perceptions of stress & wellness in medical school, (ii) program impacts on stress and mindfulness, and (iii) challenges to program adherence. A summary of themes and example quotes are reported in Table 3.

Table 2. Paired t-test comparison of outcome variables; baseline to end of study

	Baseline (*n* = 64) Mean ± SD	End-of-study (*n* = 64) Mean ± SD	Percent improvement Mean	P value for the paired t-test
Hospital anxiety and depression scale	14.4 ± 5.2	12.6 ± 4.8	12.5%	0.008
• Anxiety subcomponent	10.0 ± 3.7	8.6 ± 3.1	14.0%	0.001
• Depression subcomponent	4.4 ± 2.7	4.0 ± 2.6	9.1%	0.27
PHQ-9	7.0 ± 4.0	5.6 ± 3.2	20.0%	0.002
Perceived stress scale	18.1 ± 5.2	16.1 ± 5.0	11.0%	0.005
Psychological well-being	99.6 ± 12.2	101.3 ± 11.3	1.7%	0.074
Five facet mindfulness total (*n* = 59)	120.9 ± 16.5	127.7 ± 17.7	5.6%	<0.001
• Observing	25.1 ± 4.1	26.5 ± 4.5	5.6%	0.004
• Describing	27.2 ± 6.0	27.7 ± 5.9	1.8%	0.439
• Awareness	24.6 ± 4.6	24.9 ± 4.6	1.2%	0.617
• Non-judging	24.2 ± 7.3	27.2 ± 7.0	12.4%	<0.001
• Non-reacting	19.9 ± 4.1	21.5 ± 4.0	8.0%	0.001
Quality of Life	79.3 ± 12.5	83.6 ± 12.1	5.4%	0.014

Table 3. Qualitative themes & exemplar quotes

Theme	Description	Exemplar Quotes
Perceptions of stress & wellness in medical school	Participants described the stresses they encountered as medical students and the importance of maintaining wellness.	*I think sometimes when we get caught up in sort of like a hamster wheel continuously doing things and just being productive, everything becomes a lot more mechanical. I lose the actual experience of that activity or the tasks that I'm doing [Participant 16, Year 2].* *A lot of the habits we develop as medical students will carry through with us when...we are part of the workplace environment. I think developing those habits early is really important in preventing physician burnout and other mental health stressors and emergencies [Participant 71, Year 1].* *There are so many things that contribute to wellness, from how well you sleep, to your outlook on life, to what you're eating in your day, or how much you're moving around. And I think because of that . . . it's really important to develop habits that are versatile and can get at all the different facets that wellness represents [Participant 60, Year 4]*
Program impacts on stress & mindfulness	Participants described the impact the program had on their wellness and ability to manage stress in medical school.	*I keep coming back to the word mindful. Just being able to take a step back, and then be productive when I need to be productive, and then take a break when I need to, instead of kind of just spending a long time on something, but not really doing it. I think being more purposeful [Participant 14, Year 1]* *Something that I'll take from [the program] . . . is to learn how to go with the flow and just accept things as they come, which of course, in medicine, I think is going to be really important, because you don't always have control over your day, but you do a lot of control over how you react to it [Participant 71, Year 1].*
Challenges to program adherence	Participants noted challenges to participating in the mental wellness programming.	*The thing that was more difficult for me was going back to [the program] regularly. There were some weeks where I went to it most of the week, and there were some weeks where I was just like, "nope, things are a little too crazy. I should be making time for it, but I just can't" [Participant 60, Year 4].* *[The Peace Power Pack program] reinforced that I care about these kinds of things and want to incorporate more wellness activities into my life. But then, I also learned that I really need some sort of external accountability [Participant 43, Year 1]*

Discussion

The findings of this study suggest that participation in our 12-week online mindfulness program was feasible for medical students, potentially addressing a crucial need for wellness initiatives for this vulnerable group. The intervention showed high rates of adherence, satisfaction and retention, with promising impacts on secondary measures of well-being, including anxiety and depression, stress, mindfulness and quality of life immediately following completion of the 12-week program for those participants that were included in the study and completed follow-up surveys. While other studies have examined the impact of mindfulness programs on medical students, our study assessed the feasibility of an online program using a mixed-methods approach. This allowed us to capture valuable participant input, which may improve future

iterations of online wellness programming for medical students.

While this study had high retention rates (86.5%), only 34.6% of participants met adherence targets of participating in programming at least two days per week. Our qualitative analysis reflected these findings, where participants suggested a lack of external accountability may have contributed to the low adherence. This is congruent with other research that noted poor adherence without accountability measures like email reminders and online discussion groups.[30,31] Participants in our study also noted that while the online wellness program was accessible, refinements to enhance adherence could include self-monitoring features (progress tracking), rewards (badges), participation prompts, and social comparison (leaderboard). These features have been recognized as effective means of changing behavior by the Behavior Change Technique (BCT) taxonomy[32]-and would hopefully improve program engagement across different genders and academic years

Our exploratory analysis revealed that participants experienced improvements in stress, anxiety, mindfulness, and quality of life immediately following the completion of the program. Significant improvements were observed in anxiety (HADS) and depression (PHQ-9), echoing other studies of mind-body interventions in similar populations.[8,33-35] Participants also experienced significant reductions in stress, as reported in both our quantitative and qualitative findings. Though studies with similar interventions and participants have reported similar findings,[10-12,27,33,36,37] it should be noted that the baseline PSS score of our participants (18.1 ± 5.2) was lower than that of other studies, potentially due to the nature of our sample (i.e. more students in pre-clinical years, familiarity with and past engagement in mind-body wellness activity, and self-selection bias), and timing of stress measurement within the pre-clinical curriculum schedule. Therefore, these changes should be generalized with caution. Participants experienced improvements in the FFMQ mindfulness score, particularly their ability to observe their experience and be non-judgemental and non-reacting. Vinothkumar et al. suggest that the ability to be an observer allows students to create a mental space where they can respond to intrusive thoughts rather than react impulsively.[38] Future research should explore the longitudinal effects of these mindfulness techniques and their impacts beyond medical school into residency.

Limitations

This study has several limitations that need to be acknowledged. The authors recognize that the data collection period spanned the height of the COVID-19 pandemic in Canada. This may have affected baseline reports of wellness and participant adherence, as many students were likely pulled from clinical duties or attending school exclusively online during their participation. Subsequent studies must be carried out to assess the magnitude of these effects. Additionally, most participants were female (73%). Though this is similar to other studies examining wellness interventions,[12,27,34,39] it is not representative of the general population of Canadian medical schools, where approximately 41% of first-year medical students are male.[40] Including features suggested in our qualitative analysis, such as self-monitoring, rewards, and social comparison, could improve uptake across genders and reduce the proportion of participants who drop out from the intervention.

At the outset of the study, we excluded participants (*n* = 24) who reported having significant mental health concerns, which may have both selection bias implications and inflated efficacy of our intervention. Moreover, many of our study measures, including those related to our primary outcome measure, like adherence, were self-reported at the end of the study and thus potentially subject to overestimation bias. Implementing software to track participant use of the program may solve this problem in future studies. Lastly, given that the study aimed to primarily explore the feasibility of our online intervention, it was not designed nor adequately powered to evaluate the efficacy or longer-term program benefits. This makes the application of our findings to other contexts difficult.

Conclusion and future directions

Our results highlight the stressful nature of undergraduate medical education, emphasizing the need for a response that may include wellness programming integrated throughout medical school curricula. This study indicates that our online wellness intervention is feasible and acceptable for medical students, and it shows promise in reducing stress and anxiety, enhancing mindfulness, and improving quality of life in the short term. Programs such as these may be implemented easily as the landscape of undergraduate medical training becomes increasingly digital. Future studies should explore intervention efficacy through an RCT with an increased sample size. Any such

study would benefit from longer follow-up intervals post-intervention to examine the persistence of program effects. It may also be interesting to explore the effects of a similar program on the post-graduate population, including medical residents and staff.

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References

1. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Acad Med.* 2006;81(4):354-73. https://doi.org/10.1097/00001888-200604000-00009.
2. Brazeau CM, Shanafelt T, Durning SJ, et al. Distress among matriculating medical students relative to the general population. *Acad Med.* 2014;89(11):1520-5. https://doi.org/10.1097/acm.0000000000000482.
3. Stirparo G, Pireddu R, D'Angelo M, Bottignole D, Mazzoli R, Gambolò L. Is mental health worse in medical students than in the general population? a cross-sectional study. *Medicina* 2024;60(6):863. Available from https://www.mdpi.com/1648-9144/60/6/863
4. Maser B, Danilewitz M, Guérin E, Findlay L, Frank E. Medical Student psychological distress and mental illness relative to the general population: a canadian cross-sectional survey. *Acad Med.* 2019;94(11). https://doi.org/10.1097/ACM.0000000000002958
5. Dyrbye LN, West CP, Satele D, et al. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. *Acad Med.* 2014;89(3):443-51. https://doi.org/10.1097/acm.0000000000000134.
6. Dyrbye L, Shanafelt T. A narrative review on burnout experienced by medical students and residents. *Med Educ* 2016;50(1):132-49. https://doi.org/10.1111/medu.12927.
7. van der Heijden F, Dillingh G, Bakker A, Prins J. Suicidal thoughts among medical residents with burnout. *Arch Suicide Res*. 2008;12(4):344-6. https://doi.org/10.1080/13811110802325349.
8. Rotenstein LS, Ramos MA, Torre M, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. *Jama* 2016;316(21):2214-2236. https://doi.org/10.1001/jama.2016.17324.
9. Quek TT, Tam WW, Tran BX, et al. The global prevalence of anxiety among medical students: a meta-analysis. *Int J Environ Res Public Health.* 2019;16(15) https://doi.org/10.3390/ijerph16152735.
10. Greeson JM, Toohey MJ, Pearce MJ. An adapted, four-week mind-body skills group for medical students: reducing stress, increasing mindfulness, and enhancing self-care. *Explore (NY)* 2015;11(3):186-92. https://doi.org/10.1016/j.explore.2015.02.003.
11. Prasad L, Varrey A, Sisti G. medical students' stress levels and sense of well being after six weeks of yoga and meditation. *Evid Based Complement Alternat Med* 2016;2016:9251849. https://doi.org/10.1155/2016/9251849.
12. Barbosa P, Raymond G, Zlotnick C, Wilk J, Toomey R, 3rd, Mitchell J, 3rd. Mindfulness-based stress reduction training is associated with greater empathy and reduced anxiety for graduate healthcare students. *Educ Health* (Abingdon) 2013;26(1):9-14. https://doi.org/10.4103/1357-6283.112794.
13. Peterson CT, Bauer SM, Chopra D, Mills PJ, Maturi RK. Effects of Shambhavi Mahamudra Kriya, a multicomponent breath-based yogic practice (Pranayama), on perceived stress and general well-being. *J Evid Based Complementary Altern Med* 2017;22(4):788-797. https://doi.org/10.1177/2156587217730934.
14. Noori S, Blood A, Meleca J, Kennedy V, Sengupta D. Current directions in medical student wellbeing: a primer for students. association of American medical colleges: organization of student representatives, 2017. Available from https://www.aamc.org/media/24821/download. [Accessed Jan 10, 2024]
15. Peerani F, Watt M, Ismond KP, et al. A randomized controlled trial of a multicomponent online stress reduction intervention in inflammatory bowel disease. *Therap Adv Gastroenterol* 2022;15:17562848221127238. https://doi.org/10.1177/17562848221127238.
16. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. journal of health and social behavior 1983;24(4):385-396. https://doi.org/10.2307/2136404.
17. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67(6):361-70. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x.
18. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001;16(9):606-13. https://doi.org/10.1046/j.1525-1497.2001.016009606.x.
19. Ryff CD. Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *J Personal Soc Psychol.* 1989;57(6):1069-1081. https://doi.org/https://doi.org/10.1037/0022-3514.57.6.1069.
20. Ryff CD, Keyes CLM. The structure of psychological well-being revisited. *J Personal Soc Psychol.* 1995;69(4):719-727. https://doi.org/https://doi.org/10.1037/0022-3514.69.4.719.
21. de Boer AG, van Lanschot JJ, Stalmeier PF, et al. Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Qual Life Res* 2004;13(2):311-20. https://doi.org/10.1023/B:QURE.0000018499.64574.1f.
22. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment* 2006;13(1):27-45. https://doi.org/10.1177/1073191105283504.
23. Bradshaw C, Atkinson S, Doody O. Employing a qualitative description approach in health care research. *Glob Qual Nurs*

Res. 2017;4:2333393617742282. https://doi.org/10.1177/2333393617742282.
24. Mayan MJ. *Essentials of qualitative inquiry*. Second edition. ed: Routledge, 2023. https://doi.org/10.4324/b23331
25. Braun V. Thematic analysis: a practical guide: SAGE Publications Ltd, 2022. https://doi.org/10.53841/bpsqmip.2022.1.33.46
26. Quirkos. *Quirkos.*
27. Yang E, Schamber E, Meyer RML, Gold JI. Happier healers: randomized controlled trial of mobile mindfulness for stress management. *J Altern Complement Med* 2018;24(5):505-513. https://doi.org/10.1089/acm.2015.0301.
28. Bansal R, Gupta M, Agarwal B, Sharma S. Impact of short term yoga intervention on mental well being of medical students posted in community medicine: a pilot study. *Indian J Community Med.* 2013;38(2):105-8. https://doi.org/10.4103/0970-0218.112445.
29. Corp I. SPSS. 27 ed.
30. Boettcher J, Aström V, Påhlsson D, Schenström O, Andersson G, Carlbring P. Internet-based mindfulness treatment for anxiety disorders: a randomized controlled trial. *Behav Ther* 2014;45(2):241-53. https://doi.org/10.1016/j.beth.2013.11.003.
31. Forbes L, Gutierrez D, Johnson SK. Investigating adherence to an online introductory mindfulness program. *Mindfulness* 2018;9(1):271-282. https://doi.org/10.1007/s12671-017-0772-4.
32. Michie S, Richardson M, Johnston M, et al. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013;46(1):81-95. https://doi.org/10.1007/s12160-013-9486-6.
33. Lemay V, Hoolahan J, Buchanan A. Impact of a yoga and meditation intervention on students' stress and anxiety levels. *Am J Pharm Educ* 2019;83(5):7001. https://doi.org/10.5688/ajpe7001.
34. Warnecke E, Quinn S, Ogden K, Towle N, Nelson MR. A randomised controlled trial of the effects of mindfulness practice on medical student stress levels. *Med Educ* 2011;45(4):381-8. https://doi.org/10.1111/j.1365-2923.2010.03877.x.
35. McGrady A, Brennan J, Lynch D, Whearty K. A wellness program for first year medical students. *Appl Psychophysiol Biofeedback* 2012;37(4):253-60. https://doi.org/10.1007/s10484-012-9198-x.
36. Sharma VK, Trakroo M, Subramaniam V, Rajajeyakumar M, Bhavanani AB, Sahai A. Effect of fast and slow pranayama on perceived stress and cardiovascular parameters in young health-care students. *Int J Yoga* 2013;6(2):104-10. https://doi.org/10.4103/0973-6131.113400.
37. Ireland MJ, Clough B, Gill K, Langan F, O'Connor A, Spencer L. A randomized controlled trial of mindfulness to reduce stress and burnout among intern medical practitioners. *Med Teach* 2017;39(4):409-414. https://doi.org/10.1080/0142159x.2017.1294749.
38. Vinothkumar M, Arathi A, Joseph M, Nayana P, Jishma EJ, Sahana U. Coping, perceived stress, and job satisfaction among medical interns: the mediating effect of mindfulness. *Ind Psychiatry J* 2016;25(2):195-201. https://doi.org/10.4103/ipj.ipj_98_14.
39. Wen L, Sweeney TE, Welton L, Trockel M, Katznelson L. Encouraging mindfulness in medical house staff via smartphone app: a pilot study. *Acad Psychiatry* 2017;41(5):646-650. https://doi.org/10.1007/s40596-017-0768-3.
40. Canada. TAoFoMo. *Canadian medical education statistics*. 2020. Available from https://www.afmc.ca/wp-content/uploads/2022/10/CMES2020-Complete_EN.pdf [Accessed on Jan 10, 2024].