

A SYSTEMATIC ANALYSIS ON HOW ASANA AND PRANAYAMA YOGA AFFECTS STRESS LEVELS IN MEDICAL STUDENTS

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ABSTRACT

Background: Medical students are susceptible to mental illnesses that are brought on by expectations for exceeding academic success. To avoid more serious risks in the future, medical students must manage their stress because it contributes to anxiety, depression, sleep issues, and decreased academic success. Regular yoga practice is one effective and efficient lifestyle modification that can be used to handle stress. This systematic review shows how yoga can help medical students feel less stressed. This study aims to determine the effect between the duration and frequency of Asana and Pranayama Yoga on stress levels in medical students.

Methods: Studies till 2022 are used in this systematic review. Articles were accumulated using PubMed, ProQuest, and EBSCOhost. Each search engine has its own designated keywords. Studies were assessed using the NHLBI Study Quality Assessment Tools. Ten studies met the criteria for this study and were all used and analyzed.

Results: There were ten studies that met this systematic review criteria and were rated as having good quality by the NHLBI quality assessment tool. All studies showed an association between the frequency of yoga sessions and reduced stress in medical students. Some studies had shorter yoga sessions than others, so the duration of each session did not affect the results as much as the frequency.

Conclusion: This study shows that the frequency of yoga sessions has an impact, resulting in lower stress levels in medical students. The impact of yoga duration is minimal when compared to yoga frequency. Yoga should be applied as an intervention to increase the quality of life of medical students.

Keywords: stress, medical student, yoga

PRACTICE POINTS

- This study is the first to analyze specifically on medical students.
- Through this study, we can see how little yoga is applied to medical students, given the results.
- Yoga helps medical students feel less stressed. Yet none of the ones we've seen addressed how lifestyle plays a part in these yoga research or how it might influence the findings. This systematic review was done with that in mind

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INTRODUCTION

Stress is highly recognizable in the medical industry. Stress begins on the first day of medical school, it can either increase or reduce depending on the year of study.¹ According to one research 184 out of 356 medical students experience stress related to their major.^{2,3} Stress has a detrimental overall impact on medical students. For example, emotional stress might interfere with extracurricular activities and jeopardize the students' work ethics.⁴ Several factors, including having a low-grade point average (GPA) of <3.75 out of 5.00 in foreign countries outside of Indonesia, living with their families², and their year of study, might contribute to stress among medical students. Stress can lead to be permanent due to emotional exhaustion and that can interfere with the student's personal life.⁵ Because of this, medical students cope with stress in different ways.

There are many ways to reduce stress, some of which are healthier than others. Some medical students use drugs and alcohol as coping mechanisms.⁴ Yoga is one of several physical exercises that are a healthy way to handle stress. Among female medical students, yoga is popular.⁶ Yoga has a beneficial impact on stress, allowing one to reduce it appropriately. Yoga has long been used as a stress reliever and has been shown to be successful. To put it another way, yoga can also make you feel better by reducing the activity of your sympathetic nervous system.⁶ Being a non-pharmacological technique that encourages internal and external relaxation.⁷

Suppression of the hypothalamus-pituitary axis (HPA) at the level of the hypothalamus is highly the main effect of yoga in cases of perceived stress.⁸ The hormone used by several studies to link stress with yoga is cortisol as measured in serum and urine.⁹⁻¹¹ Cortisol is an accepted objective stress-related biological marker because dysregulation of cortisol levels is associated with pathologies associated with stress symptoms, such as anxiety, depression, and negative effects.¹¹ Potey GG et al⁹, studied the effect of yoga on serum cortisol levels in medical students and they found that regular yoga practice for 3 months significantly reduced cortisol levels.⁹

A study was conducted by Zivdar Z. et al, the results of this study showed that yoga training significantly reduced plasma cortisol levels.¹¹ Thirthalli J. et al¹⁰ concluded that yoga lowered cortisol levels in depressed patients.¹⁰

Yoga has a positive effect on stress in medical students. The use of yoga as a stress treatment for medical students is often applied and proven effective. Yoga can reduce sympathetic activity and increase feelings of well-being. These nonpharmacological efforts have a positive relationship with physical and mental or can produce physical relaxation which includes serenity and low stress levels. Yoga's ability to reduce stress must be understood in order to fully comprehend its potential benefits for the medical industry. Five mechanisms are proposed to explain how yoga reduces stress: improved interoceptive awareness, spiritual well being, self-compassion, and self-control. According to research by Park et al¹² on the five psychosocial mechanisms' impact on perceived stress and stress reactivity, all of the mechanisms considerably reduced stress reactivity. The study also showed that all psychosocial mechanisms, with the exception of self-compassion, increased from baseline to post intervention, suggesting that yoga can be used as a psychosocial spiritual resource for resiliency and stress reduction. Although yoga is being used more and more in the medical field, there aren't many medical schools that provide it.¹²

This yoga method provides an active manner to apply medical education through an alternative viewpoint outside of the classroom while taking use of yoga's health benefits. It's crucial for medical students to study medicine from many angles and learning philosophies. It is equally necessary to practise resilience-building techniques, yoga being one of them. The educational model, according to Horiuchi et al, it is a strategy for delivering both. Nevertheless, this model may have flaws such as a lack of resources, teachers, school support, and the requirement for an established supporting department or organisation. The educational approach is the best model for fusing the advantages of yoga with the goals of medical education.¹³

Compared with previous studies, this study focuses solely on medical students. From the description above medical students are enduring an enormous amount of stress, thus affecting their workflow. Yoga can help ease the stress. This study shows how easily accessible yoga is to medical students, and the results of the included studies show that this is an effective and reliable method. Yoga should be implemented throughout medical schools.

The purpose of this study is to get a full picture of the effect of the duration and frequency of Yoga Asana and Pranayama sessions on medical students. This study can be used as a reference for coping with stress towards policymakers and the general public. Medical students can find out the relationship between the duration and frequency of Yoga Asana and Pranayama as a way of dealing with stress and can use this study as a reference for future studies.

METHODS

The method of choice for this study is a systematic review,¹⁴ which has been ethically approved. The studies must be full texts and written in English or Bahasa Indonesia. The study’s respondents must be medical students. The studies were gathered in three distinct databases: EBSCOhost, ProQuest, and PubMed. Studies were searched with keywords according to its database and the studies that were included in this systematic review were assessed with a quality assessment tool. This systematic review used the National Heart, Lung, and Blood Institute (NHLBI) Quality Assessment Tools.¹⁵

The search for research was carried out over many months, from April 2022 to June 2022, and in the end, 10 papers were selected for the quality evaluation stage. The reason why there is no minimum publication date is that there are minimal publications using medical students as their subjects, this systematic review is the first one that focuses on that specified subject.

Search Strategy

A computerized search was conducted on three databases, including PubMed, ProQuest, and EBSCOHost. Studies from 1998 until 2022 were collected (Table 1). The reason why such an extended publishing period is determined was the limited number of studies that matched the criteria of this systematic review. Malathi et al⁴ did a pilot study on how Yoga Asana and Pranayama affects stress levels in medical students in 1998 and that study became a backbone to all studies that came after.

Eligibility Criteria

Studies need to be acquired using the three pre-determined databases using designated keywords. Studies can originate from wherever in the world as long as it is written in Bahasa Indonesia or English, in the end all English written studies were included. The most challenging part of accumulating articles for this study is finding the right research subjects and yoga methods, because all studies need to use medical students as its subjects and both Asana and Pranayama Yoga needs to be used in the studies.

Table 1. Keywords and Number of Studies for Each Database

Database	Keywords	Studies
Pubmed	((yoga[MeSH Terms]) OR (yoga[Title/Abstract])) AND ((((((Medical Students[MeSH Terms]) OR (Medical Students[Title/Abstract])) OR (student, medical[MeSH Terms])) OR (Student, Medical[Title/Abstract])) OR (Medical Student[MeSH Terms])) OR (Medical Student[Title/Abstract])) AND (stress)	23
ProQuest	(ti(students, medical) OR ti(medical students) OR ti(medical student) OR ab(students, medical) OR ab(medical students) OR ab(medical student)) AND (ti(yoga) OR ab(yoga)) AND (ti(stress) OR ab(stress))	21
EBSCOhost	(ti(students, medical) OR ti(medical students) OR ti(medical student) OR ab(students, medical) OR ab(medical students) OR ab(medical student)) AND (ti(yoga) OR ab(yoga)) AND (ti(stress) OR ab(stress))	1.356

Study Selection and Data Extraction

One reviewer read titles and abstracts for eligibility for inclusion and reviews. The selected studies were assessed using the National Heart, Lung, and Blood Institute (NHLBI) Quality Assessment Tool.¹⁵ Since there were two types of intervention studies, with and without controlled groups, two types of quality assessment tools were used.

Of all the included studies, the reviewers collected the authors, location, published year, number of respondents, stress evaluation tool, study design, results and pvalue.

RESULTS AND DISCUSSION

Out of 1,400 research, 10 studies ultimately advanced to the quality evaluation stage (Figure 1). This systematic review includes all ten studies. All studies were interventions, but some had control

groups and some did not (Table 2 and 3). All the studies were filtered and then assessed using the NHLBI Quality Assessment Tool.¹⁵ Two types of the quality assessment tools were used given the two types of research that were included in this systematic review. Nine studies showed good results in the quality of bias, only one showed fair results in the quality assessment (Table 2 and 3).

Table 2. Results for Quality Assessment for Before-After (Pre-Post) Studies with No Control Group*

First author (year)	Score	Summary quality
Simrad et al ¹⁶ (2009)	8	Good
Prasad et al ¹⁸ (2016)	8	Good
Bond et al ¹⁹ (2013)	8	Good
Bansal et al ²⁰ (2013)	7	Fair

*Maximum score is 12

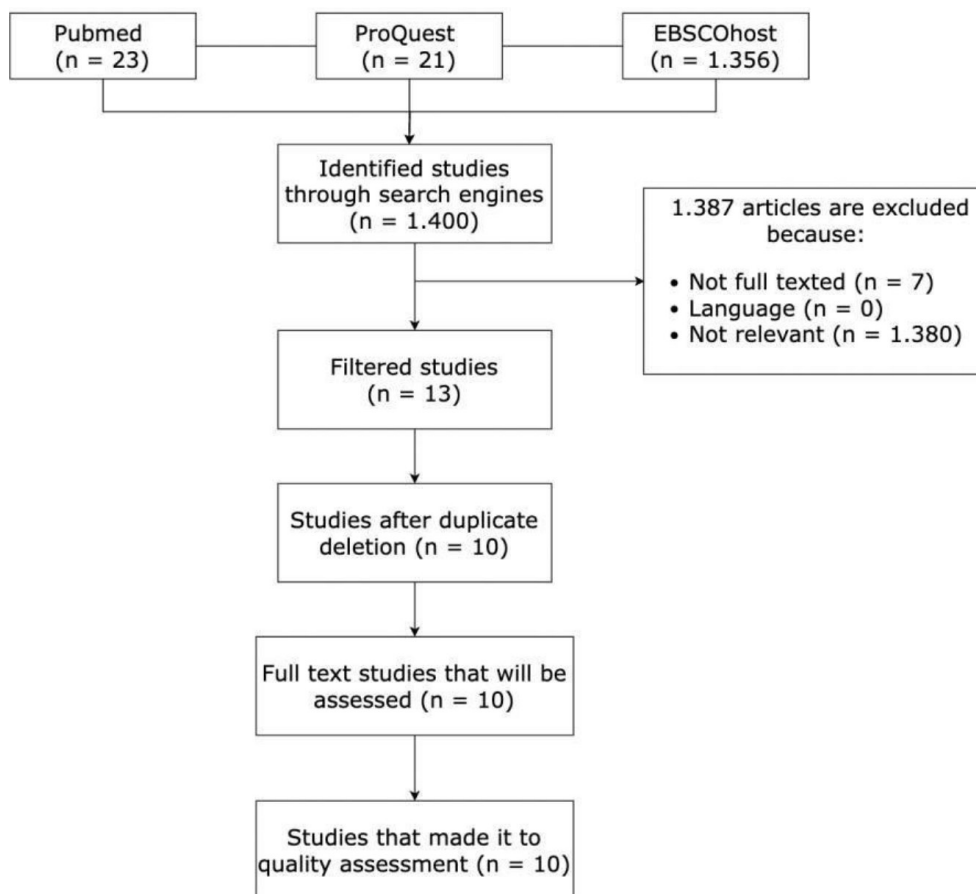


Figure 1. Search Flow Diagram

Table 3. Results for Quality Assessment of Controlled Intervention Studies

First author (year)	Score	Summary quality
Waechter et al ¹⁷ (2021)	11	Good
Lee et al ²¹ (2022)	11	Good
Sunita et al ²² (2022)	11	Good
Gopal et al ²³ (2011)	11	Good
Malathi et al ²⁴ (1998)	11	Good
Malathi et al ²⁵ (1999)	11	Good

*Maximum score is 14

Table 4 summarizes the findings of each study. Simrad et al's¹⁶ research from 2009 was an intervention study. A total of 14 medical students made up the sample for this investigation. Prior to and following the 16 week intervention, student stress levels were measured. In this study, the Yoga Asana and Pranayama intervention was performed twice weekly, and each yoga session lasted an hour. With that, 32 yoga sessions were completed over the course of 16 weeks. The stress level of medical students decreased because of this study ($p < 0.008$), which is a significant finding.¹⁶

Research by Waechter et al¹⁷ from 2021 is an RCT study. Participants were divided into intervention and control groups. A total of 45 medical students makes up the sample for this study. Prior to and throughout the 12-week long intervention, student stress levels were measured. In this study, Asana and Pranayama yoga interventions were performed twice per week for an hour each. With that, they completed 12 yoga classes in 12 weeks. The stress level of medical students decreased because of this study ($p = 0.011$), which is a significant finding.¹⁷

Prasad et al¹⁸ conducted an intervention study in 2016. A total of 27 medical students made up the sample for this study. Student stress levels were measured before and after the 6-week long intervention. One yoga session lasted an hour. The Asana and Pranayama yoga interventions in this study were done twice weekly. Total performance was 12 yoga sessions over the course of six weeks. The stress level of medical students decreased because of this study ($p = 0.004$), which is a significant finding.¹⁸

Bond et al¹⁹ conducted an intervention study in 2013. A total of 27 medical students made up the sample for this investigation. Before and after the 11-week intervention, which measured students' levels of stress, the intervention was conducted. In this study, Asana and Pranayama yoga interventions were performed once per week for an hour each. Total completion of 11 yoga classes over the course of 11 weeks. In this study, participants had to practice yoga on their own at least three times each week. Although the study's findings were insignificant, medical students' stress levels did decrease ($p = 0.70$).¹⁹

Bansal et al²⁰ conducted an intervention study without a control group in 2013. This study includes a sample of a total of 82 medical students. Students' stress levels were measured before and after the intervention, which lasted for 4 weeks. The Asana and Pranayama Yoga interventions in this study were performed daily and the yoga sessions lasted 45 minutes. This means 28 yoga sessions were performed in 4 weeks. The study showed significant results in improving physical symptoms, social dysfunction, anxiety/insomnia, and depression. Results show that medical students' stress levels were reduced ($p < 0.001$).²⁰

Recently, in 2022, Lee et al²¹ also conducted a controlled intervention study. This study includes a total sample of 64 medical students divided into a control group (N=32) and an intervention group (N=32). Measurement of the student's stress level was taken before the start of each yoga session, and there were eight anatomy lessons for him following his schedule. Researchers performed DASS-21 to measure stress levels and showed significant results in reducing stress levels in medical students ($p < 0.05$). Originally, Asana and Pranayama Yoga were performed to improve students' understanding of anatomy, but this method did not yield significant results.²¹

Sunita et al²² also conducted a controlled intervention study in 2022. This study includes a total sample of 105 medical students divided into a control group (N=27) and an intervention group (N=78). The student's stress level measurements were taken before, 6 weeks after, and at the end of the 12-week intervention, so data collection

was done for him in triplicate. Yoga sessions were held 6 days a week for 12 weeks and each session lasted 40 minutes. Anger and health were measured because anger is a mediator of stress and improved health is a sign of stress reduction. This study showed significant results in reducing stress levels in medical students ($p < 0.0001$).²²

Gopal et al²³ also conducted a controlled intervention study in 2022. This study included a total of 60 medical students divided into a control group ($N=30$) and an intervention group ($N=30$). Measurements of students' stress levels were performed before and after the 12-week intervention. Yoga sessions were held 6 days a week for 12 weeks and each session lasted 35 minutes. Cortisol levels were significantly reduced in the intervention group but not in the control group. This study showed significant results in reducing stress in medical students ($p=0.008$).²³

Malathi et al,²⁴ conducted two studies in this systematic review. The first study was in 1998 and it was a controlled intervention study. This study included a total sample of 75 medical students divided into a control group ($N=25$), a yoga intervention group ($N=25$), and a relaxation intervention group ($N=25$). Measurements of students' stress levels were performed before and after the 12-week intervention. Yoga sessions were her 3 times a week for 12 weeks, each session was an hour, for a total of 36 sessions. Heart rate and blood pressure were significantly reduced in the yoga intervention group ($p < 0.05$ [blood pressure] and $p < 0.001$ [heart rate]).²⁴

Second study by Malathi et al²⁵ was conducted a year later in 1999 with the same research methodology as the previous one. Fifty students were divided into his two control groups ($N = 50$) and an intervention group ($N = 50$). Measurements of students' stress levels were performed before and after the 12-week intervention. Yoga sessions were her 3 times a week for 12 weeks, each session was an hour, for a total of 36 sessions. Anxiety levels were measured one month before her exam and on the day of the exam (the yoga intervention intentionally overlapped with the exam). A decrease in anxiety levels was seen in the yoga group. Since anxiety can cause or an affect due to stress, we can conclude that stress levels in students also decreased significantly ($p < 0.001$).²⁵

In their 11-week study, Bond et al used one yoga session per week of Yoga Asana and Pranayama therapies. Even though the study's findings were not statistically significant, respondents who were medical students reported less stress overall. Before and after yoga average Perceived Stress Scale (PSS) scores dropped from 1.55 to 1.48 ($p = 0.70$).¹⁹

Bond et al's findings can be related to Waechter et al's findings. Two yoga sessions per week were held over the 12-week trial period by Waechter et al. The findings of this investigation were noteworthy ($p = 0.011$).¹⁷ We can infer from this that the week-length of the yoga intervention has a significant impact; in other words, yoga needs to become a regular part of our lives if we want to see more noticeable improvements.

Simrad et al held two yoga sessions every week for the course of the study's 16week yoga intervention. The findings of this investigation are also noteworthy ($p = 0.008$).¹⁶ The respondents' yoga lifestyle factor increased when they attended two weekly yoga sessions, and the outcomes were highly encouraging. Prasad et al also did research with two yoga sessions per week. This study's findings are also noteworthy ($p = 0.004$). In the study by Prasad et al, yoga was practiced for 6 weeks. Lifestyle factors are very important, just like they were in the study by Simrad et al.¹⁶ All four studies that are mentioned before used the same questionnaire, PSS, to assess the student's stress levels, hence the discussion of these four studies are more comprehensive.

The Depression, Anxiety and Stress Scale 21-Item (DASS-21) is another tool that can be used to gauge stress. Lee et al used this survey. Their initial research goal was to use yoga to ease anatomical concepts for medical students, but this was ultimately insignificant. Despite there being only 8 lessons in total, the DASS-21 results show a depletion in stress.²¹

Stress levels can also be determined using cortisol levels. This approach was used by Gopal et al. The frequent yoga sessions in that research led to a significant reduction in cortisol levels. Despite only having sessions that lasted 35 minutes each, Gopal et al's research produced better results because yoga was practiced daily for 12 weeks ($p=0.008$).²³

Table 2. Respondents Interests Towards the Ethics and Medico-legal Teaching Methods (n=54)

First author (published year)	Location	Number of respondents	Stress measurement tool	Result	P-value	Elaboration
Simrad et al ¹⁶ (2009)	Canada	14	PSS (Perceived Stress Scale)	The stress level of medical students decreased significantly	< 0.008	Yoga intervention 2 times a week for 16 weeks. Each session is 1 hour long.
Wachter et al ¹⁷ (2021)	Grenada	45	PSS (Perceived Stress Scale)	The stress level of medical students decreased significantly	0.011	Yoga intervention twice a week for 12 weeks. Each session is 1 hour long.
Prasad et al ¹⁸ (2016)	United States of America	27	PSS (Perceived Stress Scale)	The stress level of medical students decreased significantly	0.004	Yoga intervention 2 times a week for 6 weeks. Each session is 1 hour long.
Bond et al ¹⁹ (2013)	United States of America	27	PSS (Perceived Stress Scale)	The stress level of medical students decreased, but not significantly	0.70	Yoga intervention once a week for 11 weeks with independent yoga practice at least 3 times a week. Each session is 1 hour long.
Lee et al ²¹ (2022)	United States of America	64	DASS-21 (Depression, Anxiety and Stress Scale 21-item)	The stress level of medical students decreased significantly	<0.05	Yoga intervention 8 times that were adjusted to the anatomy class schedule.
Bansal et al ²⁰ (2013)	India	82	GHQ-28 (General Health Questionnaire 28-Item)	The stress level of medical students decreased significantly	<0.001	Yoga intervention every day for 4 weeks. Each session is 45 minutes long.
Sunita et al ²² (2022)	India	105	Anger and wellbeing	The stress level of medical students decreased significantly	<0.0001	Yoga intervention 6 times a week for 12 weeks. Each session is 40 minutes long.
Gopal et al ²³ (2011)	India	60	Cortisol serum levels	The stress level of medical students decreased significantly	0.008	Yoga intervention every day for 12 weeks. Each session is 35 minutes long.
Malathi et al ²⁴ (1998)	India	75	Blood pressure and heart rate	The stress level of medical students decreased significantly	<0.05 and <0.001	Yoga intervention 3 times a week for 12 weeks. Each session is an hour long.
Malathi et al ²⁵ (1999)	India	50	Spielberger's Anxiety Sale	The stress level of medical students decreased significantly	<0.001	Yoga intervention 3 times a week for 12 weeks. Each session is an hour long.

Stress parameters can also include sympathetic nervous system reactions like elevated blood pressure and heart rate. This physiological component was used by Malathi et al (1998) to evaluate the impact of yoga on the stress of medical students. In this 12-week study, there were three one-hour yoga lessons per week. With a significant decline of $p < 0.001$ for heart rate and $p < 0.05$ for blood pressure. In this study, lifestyle factors, such as a high frequency of yoga sessions, play a significant part in the decrease of medical students' stress levels.¹⁹

Other mental emotions like rage, sadness, and anxiety can either act as a mediator or have an impact on stress. That was the subject of studies conducted by Bansal et al, Sunita et al, and Malathi et al (1999). Every day for 4 weeks, Bansal et al conducted a 45-minute yoga intervention, and the outcomes were encouraging ($p < 0.001$).²⁰ Sunita et al had even significant results due to the longer research period of 12 weeks and the fact that yoga was only practiced six times per week, despite its shorter 40-minute duration ($p < 0.0001$).²²

The only differences between Malathi et al's second research (1999) from and the first (1998) were the stress measurement method and sample size. The second research was conducted for a period of 12 weeks, yoga was practiced three times per week for an hour each time. When students' anxiety levels were measured a month before and the day of a test, those who received the intervention experienced a significant reduction of stress ($p < 0.001$).^{24,25}

All ten research revealed a strong connection between way of life and yoga's ability to reduce stress. Its importance was more influenced by frequency of yoga sessions. The duration of each yoga session is not a significant influence, due to the various duration conducted in each included study. Better outcomes were guaranteed by high frequency of yoga sessions. Another thing that makes this study so unique is the cultural differences. Most of the included studies are from India. This paradigm enables us to draw lessons from one nation's success in incorporating yoga into their contemporary medical system. Because yoga offers a biopsychosocial viewpoint to support the whole person. Medical schools in other nations may

not be aware of how yoga creates such a difference in wellbeing. That is why this research is crucial, to spread awareness that there is a viable method to increase the wellbeing of its future physicians.

Future research may concentrate on assessing how well such programmes perform over the long run. More specifically, extensive quantitative research on medical student burnout and quality of life may reveal whether expanding yoga programmes through the educational model is beneficial. This study emphasises the necessity of increased institutional support in order to set up a formal yoga programme for students. Surveying medical colleges and institutions to learn how they feel about yoga could help us better grasp the environment for its development.

The issue of fostering yoga to medical students is resilience, expanding access to yoga, and educating about the therapeutic uses of yoga might be addressed by a thorough elective course. The authors advise medical schools to expand opportunities for yoga through the educational model since it combines the wellness advantages of yoga for students with stimulating learning and exposure. This is from the standpoint of medical students. More chances should be created for yoga to be incorporated into the formal medical curriculum from the perspective of student wellbeing or anatomy education, such as in the form of elective coursework.

CONCLUSIONS

Based on all the explanations above, the conclusions reached in this research are the number of yoga sessions, the frequency, is more influential than the duration of the yoga sessions. High frequency of yoga sessions can give significant results compared to the duration of yoga sessions. This systematic review shows that there is a relationship between frequencies yoga with stress levels and there is a significant level of correlation in each study between lifestyle and yoga. The studies that had a higher frequency of yoga sessions gave a lot of significant results. Stress prevention can be done by doing Asana and Pranayama Yoga when incorporated into the lifestyle of the medical students.

There should be more chances to introduce yoga to medical students through the educational model. The educational approach is the perfect one for fusing the advantages of yoga with the academic goals of medical school. Future doctors have an advantage when it comes to promoting yoga treatment and educating others thanks to experiential learning. In other words, the educational approach enhances learning by allowing students to put what they learn into practice. In the end, teaching yoga to medical students is a means of promoting wellness during the years of training and of developing aware, resilient doctors who have the ability to offer higher-quality patient care. According to the authors, yoga can be a significant wellness tool for developing future clinicians' resilience, lowering the risk of physician burnout, and assisting in the transition of the health care system to a whole person health paradigm.

RECOMMENDATIONS

Policy makers or members of faculty should work on programs and spread information from this systematic review to the whole public so that it can be implemented as a method of reducing stress levels. Indonesian researchers should increase studies on Yoga Asana and Pranayama in Indonesia because there is still little research on this topic in Indonesia, despite the promising results from this systematic review. Researchers from this study hope that by carrying out this research, it can add insight into Yoga Asana and Pranayama with stress levels of medical students.

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COMPETING INTEREST

There are no conflict of interests from the authors of this systematic review.

LIST OF ABBREVIATIONS

NHLBI : National Heart, Lung, and Blood Institute
 HPA : Hypothalamus-Pituitary Axis
 GPA : Grade Point Average

DASS-21 : Depression, Anxiety and Stress Scale 21-Item

PSS : Perceived Stress Scale

GHQ-28 : General Health Questionnaire 28-Item.

AUTHORS' CONTRIBUTION

Nabila Adithya Putri – developing research proposal, collecting data, data analysis, and publication manuscript.

Nawanto Agung Prastowo – developing research proposal and data analysis. *Eva Eva Suryani* – developing research proposal and data analysis.

Angela Shinta Dewi Amita – developing research proposal and data analysis.

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