

Effect of Asana Pranayama Yoga on Sleep Quality: Implications for Stress Management and Healthy Lifestyle in Young Adults

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Abstract

Background: Sleep is a fundamental humans' need. Young adults, including medical students, are particularly vulnerable to poor sleep quality due to the academic pressures. Yoga has a relaxing effect that may help improve sleep quality. This study aimed to evaluate the effects of Asana Pranayama yoga on sleep quality among female medical students.

Methods: This quasi-experimental and case-control study was conducted in September 2023, including preclinical female medical students from the Atma Jaya Catholic University of Indonesia. Sleep quality was assessed using the Indonesian version of the Pittsburgh Sleep Quality Index (PSQI-I). The intervention group (n=24) had performed yoga Asana Pranayama six times per week for four weeks, with each session lasting 45 minutes, whereas the control group had received no intervention. Data were analyzed using the Wilcoxon signed-rank test to compare pre- and post-intervention PSQI scores, and Spearman's correlation to examine the relationship between yoga frequency and PSQI scores ($p < 0.05$).

Results: The intervention group showed a significant improvement in sleep quality ($p = 0.002$). A significant negative correlation was found between yoga practice frequency and post-test PSQI scores ($r = -0.607$), indicating that higher consistency in yoga practice was associated with better sleep quality.

Conclusions: Regular practice of asana pranayama yoga can improve sleep quality among female medical students. Incorporating yoga into daily routines may serve as a practical, non-pharmacological approach to promote wellness in young adults.

Keywords: Asana pranayama, sleep quality, yoga.

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Introduction

Sleep is a fundamental humans' need.¹ Good sleep quality is evaluated based on sleep duration and the sleep disturbances experienced.² Recent trends show a shift towards later bedtimes, while wake-up times remain the same or even earlier.³ Inadequate sleep duration and poor sleep quality can

lead to multiple consequences, including difficulty maintaining focus, forgetfulness, increased susceptibility to illness due to a weakened immune system, and a higher risk of mental health disorders such as anxiety and depression.⁴

The productive-age population, including university students, is considered more vulnerable to poor sleep quality due to

factors such as academic stress, inadequate relaxation, and insufficient physical activity.⁵ A study conducted at a university in Bali, Indonesia reported poor sleep quality in 66.7% of female students and 19.4% of male students, highlighting a substantial burden of sleep-related problems among young adults.⁶ Medical students are especially prone to sleep disturbances due to heavy academic workloads and high cognitive demands, which may negatively affect sleep pattern and overall wellness compared to students in other disciplines. Previous research has also shown that female students are more likely to experience impaired sleep quality, which has been linked to lower levels of physical activity compared to male students.⁷

Within the framework of wellness and healthy lifestyle promotion, non-pharmacological interventions that integrate physical activity and stress reduction are increasingly emphasized. Yoga is a non-pharmacological intervention representing a holistic lifestyle practice that combines physical postures (Asana), breathing techniques (Pranayama) and meditative practices, and has been widely studied for its potential to improve physical, emotional, and mental health.⁸ Regular yoga practice has been associated with improved sleep quality, reduced stress, enhance physical fitness, and better psychological well-being. Among the various yoga modalities examined in research setting, combination of Asana and Pranayama are the most frequently implemented.⁹

The beneficial effects of yoga on sleep are believed to be mediated through modulation of the autonomic nervous system. Asana and Pranayama techniques reduce physiological stress responses by suppressing sympathetic activity and enhancing parasympathetic dominance, leading to bodily relaxation, lower blood pressure, reduced heart rate, and optimize physiological recovery processes.⁹⁻¹⁰

A study conducted at a university in India showed that yoga practice enhanced sleep quality among adolescents aged 18–23 years.¹¹ Although numerous studies have explored the relationship between yoga and sleep quality using various types of yoga exercises and intervention durations, most have focused on mixed-gender populations. Data specifically addressing the combined effects of Asana and Pranayama techniques on sleep quality among female medical students, a group particularly vulnerable to stress-related sleep disturbance, remain limited. Therefore, this study aimed to evaluate the effect of asana and pranayama

yoga exercises on sleep quality in female medical students, as a modifiable lifestyle intervention to support wellness and healthy living.

Methods

This study employed a quasi-experimental study design. Female undergraduate students from the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, were recruited and then divided into two groups: an intervention and a control group, with 24 students in each group.

Sleep quality was assessed using the Indonesian version of Pittsburgh Sleep Quality Index (PSQI-I). Data collection was carried out by administering a standardized questionnaire consisting of 19 items, including four open-ended questions and 15 questions rated on an ordinal scale. The PSQI evaluates sleep quality based on seven core components: sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The global PSQI score was calculated as the sum of the seven component scores. Sleep quality was categorized according to the total PSQI score as normal (score 0); mild (1–7), moderate (8–14), and severe (15–21).

The inclusion criteria were female undergraduate medical students with active academic status, poor sleep quality based on PSQI-I, willingness to actively participate in the exercises, and commitment to completing the logbook. Exclusion criteria included refusal to participate, practicing yoga outside the provided module, having physical limitations, regular caffeine consumption exceeding 32 mg per day, smoking, being diagnosed with anxiety or depression by a doctor, and taking sleep medications. Ethical approval was obtained from the Ethics Commission of the School of Medicine and Health Sciences at Atma Jaya Catholic University of Indonesia (30/06/KEP-FKIKUAI/2023).

Initially, the PSQ-I questionnaire was distributed to 273 female students in September 2023, of whom 104 met the eligibility criteria. From these eligible participants, 48 students were randomly selected and evenly assigned to intervention and control groups using a randomizer application, allowing optimal monitoring of the yoga movements. The intervention group performed yoga exercise six times per week for four consecutive weeks. Each session lasted approximately 45 minutes and consisted of

breathing exercises (Pranayama), warm-up movements, Asana (physical posture), and cool-down phases (Figure 1 and 2). Yoga exercises were performed independently at home. Adherence was monitored through weekly online meetings and daily logbook completion using Google Forms. The control group did not receive any intervention during the study period.

Prior to initiating independent yoga practice, participants in the intervention group received a structured orientation on the yoga exercise module. During this session, participants were guided through the complete series of asana and pranayama exercises as outlined in the module. To support home-based independent practice, participants were provided with written modules and instructional yoga videos, ensuring that they had consistent access to the correct techniques and sequences for daily practice. After four weeks intervention, the PSQI-I questionnaire was redistributed to both groups obtain post-intervention sleep quality data.

A Shapiro-Wilk test was conducted to assess data normality and indicated a non-normal distribution. Therefore, the Wilcoxon

signed-rank test was used to analyze changes in PSQI scores before and after the intervention. The relationship between yoga practice frequency and PSQI scores was assessed using Spearman's correlation test. A p-value of <0.05 was considered statistically significant.

Results

A total of 48 female medical students were recruited and equally assigned into intervention ($n=24$) and control groups ($n=24$). The effectiveness of the yoga intervention was evaluated by comparing pre-intervention (pretest) and post-intervention (posttest) PSQI scores within and between groups.

Prior to the intervention, all participants in both groups (100%) were classified as having poor sleep quality based on the global PSQI score. After four weeks of asana-pranayama yoga practice, substantial improvements were observed in the intervention group, with nineteen participants (79%) transitioned from poor to the good sleep quality, while five participants (21%) remained in the poor sleep category. In contrast, no improvement in sleep quality was observed in the control

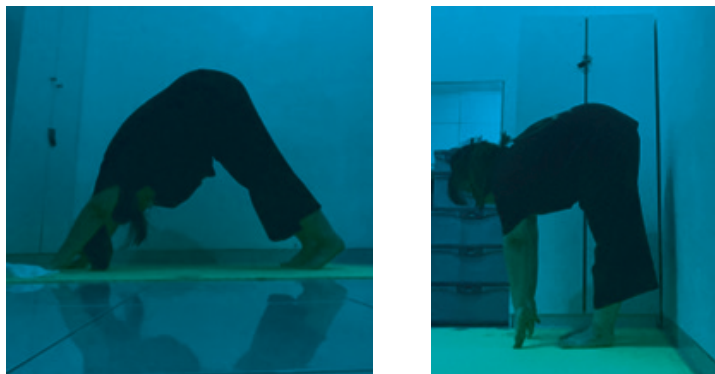


Figure 1 Asana Movement Performed during the Yoga Intervention

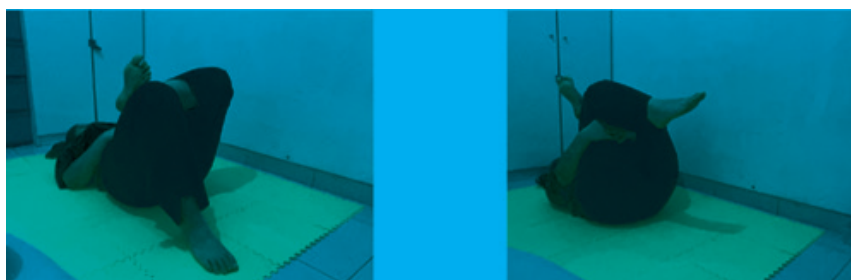


Figure 2 Cooling-down Positions Performed during the Yoga Intervention

Table 1 Comparison of PSQI Scores Before and After the Intervention

Group	Sleep Quality								Mean		z	p
	Poor				Good							
	Pretest		Posttest		Pretest		Posttest		Pre-	Post-		
	n	%	n	%	n	%	n	%	test	test		
Intervention	24	100	5	21	-	-	19	79	5.33	2.88	-3.956	0.001
Control	24	100	24	100	-	-	-	-	5.17	7.54	-4.319	0.001

Note: Analysis was performed using the Wilcoxon signed-rank test. $p < 0.05$ was considered statistically significant., PSQI = Pittsburgh Sleep Quality Index

group, in which all participants continued to report poor sleep quality at post-test. Within-group analysis demonstrated a significant improvement in PSQI scores in the intervention group after the yoga intervention ($p=0.001$). Conversely, no meaningful improvement in sleep quality was observed in the control group over the same period (Table 1).

Logbook monitoring revealed variability in yoga practice frequency among participants in the intervention group, ranging from a minimum of two sessions to a maximum of six sessions per week. The majority of participants adhered to the recommended frequency of six sessions per week. A significant improvement in sleep quality was observed among the intervention group ($p=0.002$). Furthermore, Spearman's rank correlation analysis demonstrated a strong negative correlation between the frequency of yoga practice and post-intervention PSQI scores ($r=-0.607$), suggesting that higher frequency of yoga practice was associated with better sleep quality outcomes.

Discussion

In this study, most of female students experienced sleep disturbances, which is consistent with findings from other regions in Indonesia. Studies conducted in Bali similarly reported a higher prevalence of sleep disturbances among female students.^{6,9} Interestingly, a study in Semarang has documented an even higher prevalence of female students with poor sleep quality.¹⁰ Such disparities could be attributed to different categorizations of PSQI scores. Some studies used original 4-point Likert scale, while others applied a 3-point Likert scale.¹¹ In our study, PSQI scores have been grouped into two categories which are score lower than 5 and score 5 or higher, indicating good sleep quality and poor sleep quality, respectively. To date, no sensitivity or specificity validation of the four-category classification has been reported.

The majority of respondents in the intervention group experienced an improvement in sleep quality, consistent with findings from Lampung¹³ and Palangkaraya¹⁴ where yoga practice has been proven to enhance sleep quality. Conversely, no significant improvement has been observed in the control group, as aligned with studies in Semarang¹⁵ and Surakarta.¹⁶ Yoga may improve sleep quality by reducing sympathetic nervous system activity and modulating hormonal function, including lowering norepinephrine, catecholamine, and adrenaline which contribute to stress reduction.¹⁷ Several studies support these findings, showing an improved sleep quality following yoga asana practice.^{8,18,19} Improving sleep quality after yoga pranayama also shown in previous studies from Turkey and India.^{20,21} In this study, the intervention group that has been proven consistent in performing Asana Pranayama yoga contribute significantly to improvements in sleep quality. Other factors may also influence sleep quality, such as caffeine intake, social relationships, organizational activities, changes in class schedules, alterations in sleep patterns, varying levels of emotional stress, and lack of physical activity and relaxation.

The primary purpose of this study was to assess the impact of Asana Pranayama yoga on sleep quality among female medical students. The findings demonstrated a statistically significant improvement in sleep quality following a four-week yoga intervention. Notably, most of participants in the intervention group transitioned from poor to good sleep quality, while no improvement was observed in the control group. These results support the hypothesis that regular yoga practice contributes positively to sleep regulation. Several mechanisms may explain the observed improvements. Yoga, particularly when combining Asana (physical postures) and Pranayama (controlled breathing techniques), is known to modulate autonomic nervous system activity, shifting

balance toward parasympathetic dominance. This shift promotes relaxation, reduces physiological arousal, and facilitates the onset and maintenance of sleep.¹⁰

The improvements in PSQI scores observed in this study align with the neurophysiological theories, suggesting that regular yoga practice may raise gamma-aminobutyric acid (GABA) levels in the brain. GABA is a neurotransmitter linked to lower anxiety and better sleep regulation.¹⁰ In addition, the strong negative correlation between how often participants practiced yoga and their PSQI scores after the intervention points to a dose-response effect, indicating that practicing yoga more often leads to greater benefits, which supports behavioural intervention models that rely on consistency and reinforcement.

These findings have important implications for health promotion within university settings, especially among populations vulnerable to stress-related disorders such as medical students. The observed benefits were achieved through a low-cost, non-invasive, and non-pharmacological intervention, highlighting yoga as a feasible strategy for large-scale implementation in academic institutions. Importantly, the use of home-based practiced supported by structured module and instructional video demonstrates the scalability and accessibility of remote or semi-structured wellness programs. Such interventions could be integrated into student health services, wellness curricula, or orientation programs to promote sleep hygiene and mental well-being.

Despite these promising outcomes, this study has certain limitations. The study population was limited to female medical students from a single institution, which may affect the generalizability of the results. Although participants in the intervention group were instructed to practice Asana Pranayama yoga six times per week for four consecutive weeks, adherence varied. Some participants did not consistently complete the full recommended schedule, potentially due to the relatively long session duration (approximately 45 minute) and competing academic demands. These finding suggests opportunities for refinement in future interventions. Yoga modules could be adapted to offer greater flexibility, such as shorter sessions (for example, 20–30 minutes), alternate-day schedules, or tiered intensity levels, without compromising therapeutic effectiveness Incorporating, optional audio-guided sessions, progress tracking tools,

and adptive scheduling may further enhance adherence and engagement.

In conclusion, regular practice of Asana Pranayama yoga, ideally performed multiple times per week, can meaningfully improve sleep quality among young adult females. Integrating yoga into daily routines may serve as a practical, accessible, lifestyle-based approach to enhancing sleep health, managing stress, and promoting overall well-being in academic and other high-stress populations. Future studies should focus on optimizing intervention design and evaluating long-term effectiveness across more diverse populations.

Author's Contributions

ASA conducted the study, performed data collection and data analysis, and drafted the manuscript. LL conceived and designed the study and contributed to data interpretation and manuscript drafting. NS, AC, and IG contributed to data analysis and manuscript review. All authors approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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