

## Effect of Yoga on Anxiety Levels among Medical Students During COVID-19 Pandemic

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### Abstract

**Background:** The COVID-19 pandemic became one of the factors that caused anxiety among medical students. Anxiety needs to be managed before it develops into a disorder. Yoga as a complementary therapy can reduce anxiety. This study aimed to determine the effectiveness of yoga on anxiety levels among medical students.

**Methods:** This was a quasi-experimental study conducted in February–September 2022, including medical students of the Atma Jaya Catholic University of Indonesia experienced anxiety. Anxiety levels were measured using the Depression Anxiety Stress Scale 42 (DASS-42) questionnaire. The subset of those experienced anxiety was further divided into two groups; intervention group and control group. The intervention provided was the Atma Jaya Yoga Intervention Studies (AJYOGIS) procedure for nine weeks. Yoga practices were performed online via Zoom and offline on campus. The Shapiro-Wilk test was used to test data distribution, Paired Sample T-Test and Wilcoxon Signed-Rank test to observe changes within groups. Changes between groups were analyzed using Unpaired Sample T-Test and Mann-Whitney test. A p-value of <0.05 was considered statistically significant.

**Results:** Of the total 515 students, 185 (35.9%) experienced anxiety, of which 36 students selected to participate had anxiety levels mostly in the moderate category (41.7%). There was a significant decrease in anxiety scores after practicing yoga ( $p=0.000$ ) compared to the control group ( $p=0.037$ ). However, there was no significant comparison of anxiety categories between groups ( $p=0.691$ ).

**Conclusions:** Healthy lifestyle including yoga can reduce anxiety levels, especially during the COVID-19 pandemic. Further more detailed analysis with a larger sample size is needed to strengthen these findings.

**Keywords:** Anxiety levels, COVID-19, medical student, yoga

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### Introduction

Anxiety is an alertness or anticipation of future threats, often characterized by diffuse, unpleasant, and unclear feelings of fear and worry. It might be accompanied by motor tension, such as shaking and soreness.<sup>1</sup> In addition, there is also autonomic hyperactivation, such as headaches, hyperhidrosis, palpitations, hyperventilation, tightness in the chest, abdominal discomfort,

and restlessness indicated by the inability to sit or stand still.<sup>1</sup> The prevalence of mental disorders in Indonesia, including anxiety, in the population aged 15 years increased from 6% in 2013 to 9.8% in 2018.<sup>2</sup> Likewise for medical students, it is possible to experience poor mental health, including anxiety. A meta-analysis discovered that 1 in 3 medical students worldwide experience anxiety symptoms.<sup>3</sup> The COVID-19 pandemic became one of the factors that caused concern among medical students,

including those in medical-related majors.<sup>4,5</sup>

Anxiety affects medical students' quality of life and can also have an impact on reducing academic performance and professional development, such as empathy.<sup>6</sup> Hence, it is essential to manage, especially during the COVID-19 pandemic, which has caused a change in learning methods to digital learning, difficulties in discussing learning materials, and the inability to take part in practicums and learning using mannequins. Anxiety can be treated with medication, psychotherapy, and complementary therapies.<sup>7</sup>

Several previous studies have discovered that yoga has been suggested as a complementary therapy to reduce anxiety.<sup>8-10</sup> This is associated with the effect of yoga on neurotransmitters, the autonomic nervous system, the hypothalamic pituitary adrenal (HPA) axis response, and amygdala activity which plays a role in the manifestation of anxiety.<sup>11-13</sup> Studies on complementary therapies to reduce anxiety, especially among Indonesian medical students, are still scarce. This study aimed to assess the effect of yoga on anxiety levels in medical students which was expected to be used as a recommendation for yoga practice and as preliminary research in assessing the effectiveness of yoga in reducing anxiety levels, especially among medical students in Indonesia.

## Methods

This study used a quasi-experimental study design, conducted in February–September 2022. The participants were preclinical medical students at the Atma Jaya Catholic University of Indonesia who experienced anxiety, selected by purposive sampling technique and met the inclusion criteria.

After consent, preclinical medical students (n=515) filled in the Depression Anxiety Stress Scale 42 (DASS-42) questionnaire. For purposive sampling calculated using the Federer formula, only 36 students were selected to participate further in the study. Participants were divided into two groups, those who exercising Yoga as an intervention group and the control group who did not have Yoga exercise. The study was granted by ethical approval from the Ethics Committee of the Atma Jaya Catholic University of Indonesia (20/01/KEP-FKIKUAI/2022).

The Depression Anxiety Stress Scale 42 (DASS-42) questionnaire were distributed via Google Forms in February 2022 to all students to obtain the distribution of anxiety. The DASS-

42 was a set of three self-report scales designed to measure negative emotional states such as anxiety, depression and stress. For the anxiety scale on DASS-42 contained 14 items that assessed autonomic arousal, musculoskeletal effects, situational anxiety, and the subjective experience of anxious affect. Participants were asked to use a 4-point severity scale to rate the extent to which they experienced each state over the past week. The questionnaire was distributed again for the subset of the samples for the second time in September 2022 as a pre-test.

The Atma Jaya Yoga Intervention Studies (AJYOGIS) procedure was a guide that contained movements, duration, and preparation before practice. The procedure included four steps, which were centering with equal breathing for 5 minutes in a sitting cross-legged pose (*sukhasana*), followed by 5 minutes warm-up for the neck, shoulder, torso, and hips; body posture (*asana*) for 20 minutes with each pose held for 5–10 breath counts; and breathing exercise (*pranayama*) for 15 minutes. Asana included standing, sitting, and lying postures with modified twisting, side bend, forward bend, and back bend. The asana consisted of mountain pose (*tadasana*), half-standing forward bend (*ardha Uttanasana*), tree pose (*vrikshasana*), triangle pose (*trikonasana*), low lunges (*ashwa sancalanasana*), resting pigeon (*kapotasana* variation), and widely child pose (*balasana*). The cool-down asana was carried out for 5 minutes in a reclined butterfly (*supta badha konasana*), reclined twist (*supta matsyendrasana*), and corpse pose (*savasana*). The final step of the procedure was *pranayama* in the form of alternate nostril breathing (*nadi shodhana*) for 5–10 minutes, done while sitting cross-legged (*sukhasana*).

The intervention group did yoga for 45 minutes for each practice, which was carried out thrice a week for nine weeks. Yoga practices were performed independently, and there were joint practices once every two weeks to monitor movement progress and motivate each other. Due to the pandemic, joint yoga practice was hybrid online via Zoom and offline on campus. The control group did not receive special treatment. After nine weeks, the DASS-42 questionnaire was distributed to all participants as a post-test.

Anxiety levels were measured using the DASS-42 questionnaire based on scores and categories. Yoga was measured using a journal in the form of a logbook, which the participants filled out as a sign of having done yoga. Longer duration yoga interventions yielded better



Figure 1 Atma Jaya Yoga Intervention Studies (AJYOGIS) Procedure (45 minutes)



**Table 1 Characteristic and Anxiety Levels of Medical Students at Atma Jaya Catholic University of Indonesia (n=515)**

Characteristics	Anxiety Levels Category					Total n (%)
	Normal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Very Severe n (%)	
Gender						
Male	116 (77.3)	10 (6.7)	13 (8.7)	5 (3.3)	6 (4)	150 (29.1)
Female	214 (58.6)	28 (7.7)	64 (17.5)	33 (9%)	26 (7.1)	365 (70.9)
Year of study						
3 <sup>rd</sup> year (2019)	112 (69.6)	85 (5)	21 (13)	9 (5.6)	11 (6.8)	161 (31.3)
2 <sup>nd</sup> year (2020)	124 (66.7)	15 (8.1)	25 (13.4)	16 (8.6)	6 (3.2)	186 (36.1)
1 <sup>st</sup> year (2021)	94 (56)	15 (8.9)	31 (18.5)	13 (7.7)	15 (8.9)	168 (32.6)
Total	330 (64.1)	38 (7.4)	77 (15)	38 (7.4)	32 (6.2)	515 (100)

**Table 2 Characteristics of Medical Students Experiencing Anxiety in the Intervention and Control group (n=36)**

Characteristics	Intervention Group		Control Group		Total	
	n	%	n	%	n	%
Gender						
Male	0	0	1	5.6	1	2.8
Female	18	100	17	94.4	35	97.2
Year of study						
3 <sup>rd</sup> year (2019)	5	27.8	5	27.8	10	27.8
2 <sup>nd</sup> year (2020)	11	61.1	11	61.1	22	61.1
1 <sup>st</sup> year (2021)	2	11.1	2	11.1	4	11.1

results. Yoga was considered to produce benefit when practicing for more than 1,000 minutes.<sup>14</sup>

Data from the pre-test and post-test were used to determine changes in anxiety levels within each group and to compare the decrease in anxiety between groups. The level of anxiety within the group was analysed using the paired sample t-test for scores and the Wilcoxon Signed-Rank test for categories; whereas comparisons of anxiety levels between groups were analysed using the unpaired sample t-test for scores and the Mann-Whitney test for categories.

## Results

A total of 515 students had filled out the questionnaire in the study and 185 (35.9%) students had anxiety, of whom female (41.4%) was significantly more prevalent than male (22.7%) as shown in Table 1. The highest level of anxiety was being in the 1<sup>st</sup> year.

A subset of the students in the anxiety (n=36) were further described (Table 2). There were changes in the distribution of

anxiety levels in within group on the pre and post-test (Table 3).

In the yoga group, there was a significant decrease in anxiety scores after performing yoga ( $p=0.000$ ), in contrast to the control group ( $p=0.965$ ) (Table 3). Furthermore, there was a significant comparison ( $p=0.037$ ) in the decrease in anxiety scores between the intervention and control groups, however, not all participants experienced a decrease. Therefore, data from participants who experienced increased scores were not included in this test.

Moreover, there was a significant change in the anxiety categories in the intervention group ( $p=0.001$ ), compared to the control group ( $p=0.231$ ); nonetheless, there was no significant decrease in the anxiety categories between the yoga and control group ( $p=0.691$ ).

The duration of the yoga practices carried out by the intervention group for nine weeks varied from one to another, as shown in Table 4. The average total duration of yoga performed by participants was 857.79 minutes (500–1,260 minutes), however, 55.6% participants practiced yoga below the average duration,

**Table 3 Anxiety Level Before and After Intervention (n=36)**

Anxiety Level	Intervention Group				Control Group			
	Pre-test		Post-test		Pre-test		Post-test	
	n	%	n	%	n	%	n	%
Normal	0	0	12	66.7	0	0	6	33.3
Mild	4	66.7	1	50	2	33.3	1	50
Moderate	6	40.0	2	66.7	9	60.0	1	33.3
Severe	6	54.5	3	33.3	5	45.5	6	66.7
Very severe	2	50	0	0	2	50	4	100
p-value	0.000				0.965			

Note. \*The DASS-42 scores pre-test and post-test in within group were compared (paired Sample T-Test).

**Table 4 Yoga Duration and Post-test Anxiety Levels in the Intervention Group (n=18)**

Anxiety Level	Yoga Duration		Total n (%)
	Below Average n (%)	Above Average n (%)	
Normal	7 (58.3)	5 (41.7)	12 (66.7)
Mild	0 (0)	1 (100)	1 (5.5)
Moderate	1 (50)	1 (50)	2 (11.1)
Severe	2 (66.7)	1 (33.3)	3 (16.7)
Total	10 (55.6)	8 (44.4)	18 (100)

Note: The average total duration of yoga performed by participants was 857.79 minutes (500–1,260 minutes)

indicating a difficulty to achieve a total practice duration of 1,000 minutes within the specified timeframe. Interestingly, most participants who had DASS-42 post-test scores in the normal category had practiced yoga for a duration either below or above the average, hence, there was still a decrease in anxiety levels even though participants practiced yoga with a total duration of less than 1,000 minutes.

## Discussion

Data from this study demonstrates that 35.9% of preclinical medical students have anxiety. The highest level of anxiety is in the 1<sup>st</sup> year, similar to study in Germany and the US.<sup>15,16</sup> Moreover, female in our study has more anxiety, as supported by various studies showing that females are more likely to have anxiety disorders than males.<sup>17-19</sup>

The Indonesian Mental Medicine Specialists Association has conducted an online mental health self-examination and reported that 64.3% of the 1,522 participants experienced anxiety during the COVID-19 pandemic.<sup>20</sup> Anxiety among medical students during COVID-19 has increased by around 60%.<sup>21</sup>

Besides concern about the risk of being exposed to the virus, medical students also

encounter changes in teaching methods to distance learning, lack of access to the tools and equipment needed to accommodate digital learning, and uncertainty about their academic future during the pandemic. These changes compel students to adapt to situations such as limiting direct social interaction and excessive boredom. All of the changes have an impact on putting the students under psychological pressure.<sup>22</sup>

Yoga sequences, by the AJYOGIS procedure, managed to decrease anxiety levels in terms of scores and categories based on the DASS-42 questionnaire. Thus, it is by the hypotheses set and also corresponds with previous studies that yoga has an effect of decreasing anxiety despite various types and different time schedules.<sup>8,9,23,24</sup>

Yoga affects changes in anxiety by being associated with changes in connectivity between the ventrolateral prefrontal cortex and right anterior insula.<sup>9</sup> Nevertheless, a decrease in anxiety levels was still obtained with an average duration of yoga practice for participants of 857.79 minutes. One of the factors that caused this result was that the participants practice consistently. A study on students supports the evidence for this statement who have practiced vinyasa yoga for 60 minutes once a week, followed by

meditation, showing a decrease in anxiety and stress scores, as well as a significant increase in awareness based on three different types of questionnaires, namely the Beck Anxiety Inventory (BAI), Perceived Stress Scale (PSS), and Five Facet Mindfulness Questionnaire (FFMQ).<sup>26</sup> Practicing *bhastrika pranayama* for four weeks significantly reduced levels of anxiety and negative affect. These changes are related to the modulation of activity and connectivity in the brain with areas involved in emotional processing, attention, and awareness.<sup>9</sup>

There was a change in the level of anxiety to normal in 12 participants after accomplishing a sequence of yoga for nine weeks, according to the procedures given. In addition to the intervention group, there was a change in the number of participants in each anxiety category level: mild from 4 to 1, moderate from 6 to 2, severe from 6 to 5, and no participant left in the very severe category, which previously had two. Yoga practice can have a calming effect and emotional stability that helps to overcome autonomic symptoms experienced due to anxiety.<sup>25</sup> This is due to a decrease in the activity of the sympathetic nervous system and an increase in the parasympathetic nervous system.<sup>8,11,26</sup>

Certain limitations must be considered in this study, such as the participants' busy activities, which could be improved in managing time in practicing yoga independently and jointly. Several other factors occurred during the nine weeks of study, such as changes in sleeping hours, social relationships, class, and exam schedules, which could influence the condition of the participants when filling out the pre-test and post-test. It is hoped that future studies will be able to consider some of these factors and examine the effectiveness of practicing yoga online classes compared to offline classes.

In conclusion, yoga has reduced anxiety levels among preclinical medical students during the COVID-19 pandemic after practicing a yoga sequence according to the AJYOGIS procedure for nine weeks. These findings underscore the potential of yoga not only as a mental-relieving practice but also as a valuable component of a holistic approach to promoting mental health and well-being. Incorporating yoga into a daily routine can contribute significantly to a healthy lifestyle, offering benefits that extend beyond anxiety reduction, including improved flexibility, strength, and overall mindfulness, especially during challenging times.

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