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Original Research Article

EFFECT OF PRANAYAMA ON STRESS LEVEL AND VO $_{2MAX}$ IN FIRST MBBS STUDENTS

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Abstract

Background: The increasing demand for medical education and the pressure to perform well academically can lead to high levels of stress among students. Pranayama is a breathing technique that is an integral part of yoga practice. It has been shown to have a positive impact on various physiological and psychological parameters. However, there is limited research on the effect of pranayama on stress levels and VO2 max in medical students. With this background we have decided to study the effect of Pranayama on stress level in first year MBBS students during exam and effect of short-term pranayama on VO_2 Max.

Objectives: To assess and Compare stress level between control group and pranayama group. To assess and compare VO_2 MAX in control and pranayama group.

Material and Methods: At the end of 3 months of pranayama training, VO_2 max was determined by Queen's College Step Test and Stress level was evaluated by Perceived Stress Scale (PSS). comparison between two quantitative variable is done using unpaired t-test. The significance is considered if p-value is less than 0.05.

Results: The mean PSS was found to be significantly lower in the pranayama group compared to the control group after the training (17.25 ± 5.50 vs. 19.60 ± 5.32, $p = 0.049$) and just before the exam. (17.39 ± 6.72 vs. 23.75 ± 5.57, $p < 0.001$). However, the mean VO_{2max} was found to be higher in the pranayama group compared to the control group. The mean height, weight, BMI, and recovery pulse did not differ significantly between the study group and the control group (p values > 0.05).

Conclusion: The study found that pranayama training for 3 months was associated with a decrease in perceived stress scores and an increase in VO2 max among first-year MBBS students. These results suggest that pranayama may be a useful tool for managing stress and improving cardiovascular fitness in medical students.

Keywords: PSS, VO_{2max}, Pranayama

Introduction

Stress is a common problem among medical students, with a high prevalence of mental health issues such as depression and anxiety. The increasing demand for medical education and the pressure to perform well academically can lead to high levels of stress among students [(1).] The practice of yoga and pranayama has been shown to have a positive impact on stress levels and mental health [(2,3)] . The purpose of this study is to investigate the effect of pranayama on stress levels and VO_2max in first-year of MBBS students. Pranayama is a breathing technique that is an integral part of yoga practice. It has been shown to have a positive impact on

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various physiological and psychological parameters [4,5]. Several studies have shown that pranayama can reduce stress levels , improve cardiovascular function [6,7] and increase lung capacity. However, there is limited research on the effect of pranayama on stress levels and VO2 max in medical students. The neurological benefits of pranayam have interested scientists all over the world and studies have reported beneficial effect in both peripheral and central neuronal processing. Though; there are still many lacunae in our understanding of the neurophysiological basis of yogic techniques and the mechanism of their action. With this background we have decided to study the effect of Pranayam on stress level in first year MBBS students during exam and effect of short term pranayam on VO_2 Max. Our study also aimed to increase awareness of yogic exercise in medical students to improve physical and mental well-being for better quality of life.

MATERIAL AND METHODS:

Study design- Present study was a cross sectional comparative study. The synopsis of study protocol was submitted to the Institutional Ethics Committee and approval was obtained. Study was conducted at department of Physiology, Government Medical College,Kolhapur.

Inclusion criteria:

1) First MBBS students in the age group of 17-20 years voluntarily involved for this project
2) Students without history of major illness in past.

Exclusion criteria:

1) Subjects who participated yogic exercise in past 1 year.
2) Subjects were unable to practice pranayam due to physical abnormalities.
3) Subjects with any cardiopulmonary disease.
4) Medical students doing regular exercise.
5) History of major trauma, cardiothoracic surgery.

All the volunteers were fully informed about the study and written informed consent was obtained. Out of 150 students, 30 students voluntarily involved in pranayama group. Remaining students were participated as control group.After being selected in the study, detail history was noted from each volunteer. All the participants were instructed not to do any other physical exercises like sports, athletics or resistance training during the present study.

Pranayama training: Pranayama group students performed the Pranayama in the evening for one hour, six days in a week, for 12 weeks under expert's observation. It consisted of - Prayer & Omkar Recitation and Surynamskar then breathing exercises like Kapalbhati and Yogic Shwasan (for next 20minutes), then followed by Pranayama like Nadi Shuddhi, Bhastrika and Bhramari (for last 20 minutes).

]Perceived Stress Scale (PSS): Stress score will be evaluated by Perceived Stress Scale (PSS)[8]. PSS is the most widely used psychological instrument for measuring the perception of stress. The questions in the PSS are of general nature, relatively free of content specific to any sub-population group and enquire about feelings and thoughts to measure the "degree to which situations in one's life is appraised as stressful" especially, over last 1 month. The items are easy to understand and response alternatives are simple to grasp. Items are designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. It comprises of 10 items, four of which are reverse-scored, measured on a 5-point scale from 0 to 4. PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0)

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to the four positively stated items (items 4, 5, 7, and 8) and then summing across all scale items. Total score ranges from 0 to 40.
Pranayama training will be given at physiology department in the evening session. After completion of training of 3 months and 4-5 days before the exam again stress score will be evaluated.

Determination of Maximal oxygen consumption (VO2 max): [9]
Queen College Step test (QCT) was used to predict maximal oxygen uptake. It is a standard method to measure one's maximal oxygen uptake using sub maximal exercise in the form of bench stepping, suitable for adults.
1. A wooden stepping bench of 16.25 inch was used along with metronome and stop watch.
2. Step test began after a brief demonstration and practice period.
3. The subjects were asked to perform each stepping cycle to four-step condense, up-up-down-down continuously for 3 minute.
4. Frequency of stepping was 22 stepping cycle per minute so metronome was set at 88 beats per minute.
5. After completion of test, subject remained standing while recovery pulse rate (radial pulse) was measured for 15 seconds, starting from 5 th to 20 th second of recovery period.
6. 15 seconds recovery heart rate was converted to be expressed as beats per minute (15 second heart rate x 4). Following equation was used to calculate VO_{2max},

VO2max (ml/min/kg) = 65.81- (0.1847 x HR)
(Where, HR is full one minute recovery heart rate)
All the parameters will be recorded during afternoon session 2 hrs after lunch at department of physiology. Body mass index (BMI) and Waist to Hip ratio will be measured.

Statistical analysis: Analysis was done using SPSS 20.0. The quantitative variables presented using frequency tables and quantitative variables presented in the form of mean and standard deviation. For comparison between two quantitative variable is done using unpaired t-test. The significance is considered if p-value is less than 0.05.

RESULTS:
Analysis was done using SPSS 20.0 software. The quantitative variables presented using frequency tables and quantitative variables presented in the form of mean and standard deviation. For comparison between two quantitative variable is done using unpaired t-test. The significance is considered if p-value is less than 0.05.

The mean height, weight, BMI, and recovery pulse did not differ significantly between the study group and the control group (p values > 0.05). However, the mean VO2 max was found to be higher in the study group compared to the control group (52.64 ± 11.32 ml/min/kg vs. 50.12 ± 10.98 ml/min/kg, p = 0.314). The perceived stress score (PSS) was also evaluated after the 3-month period of pranayama training and just before the exam. The mean PSS was found to be lower in the study group compared to the control group after the training (17.25 ± 5.50 vs. 19.60 ± 5.32, p = 0.049) and before the exam. (17.39 ± 6.72 vs. 23.75 ± 5.57, p < 0.001). In conclusion, the study found that pranayama training for 3 months was associated with a decrease in perceived stress scores and an increase in VO2 max among first-year MBBS students. These results suggest that pranayama may be a useful tool for managing stress and improving cardiovascular fitness in medical students.

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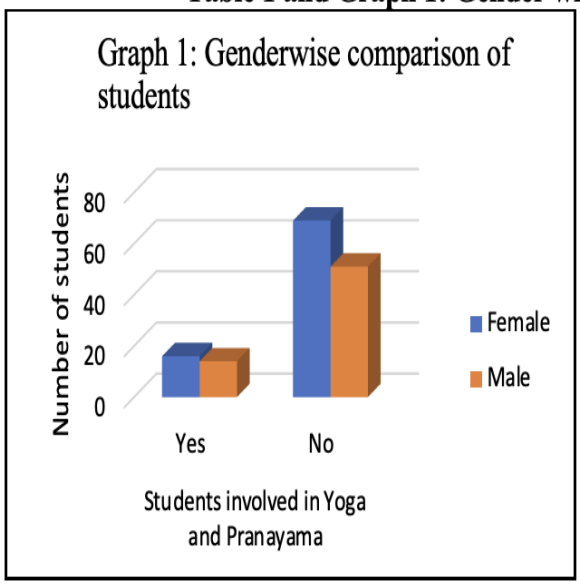
Table 1 and Graph 1: Gender wise comparison of students



Gender	Number of students involved in Yoga and Pranayama		Total
	Yes	No	
Female	16	69	85
Male	14	51	65
Total	30	120	150

Table 2: Comparison of VO_{2max}, BMI between pranayama group and control group

Parameters	Students involved in Yoga and Pranayama	Mean ∓ SD	P value
Height	Yes	163.20 ∓ 10.91	0.682
	No	162.31∓10.17	
Weight	Yes	57.63∓10.29	0.453
	No	56.03∓9.39	
BMI	Yes	21.57∓2.43	0.949
	No	21.53∓2.93	
Recovery pulse	Yes	114.11∓18.49	0.119
	No	120.88∓21.61	
VO_{2max}	Yes	52.64∓11.32	0.314
	No	50.12∓10.98	

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Graph 2: Comparision of VO2max, BMI and other parmeters

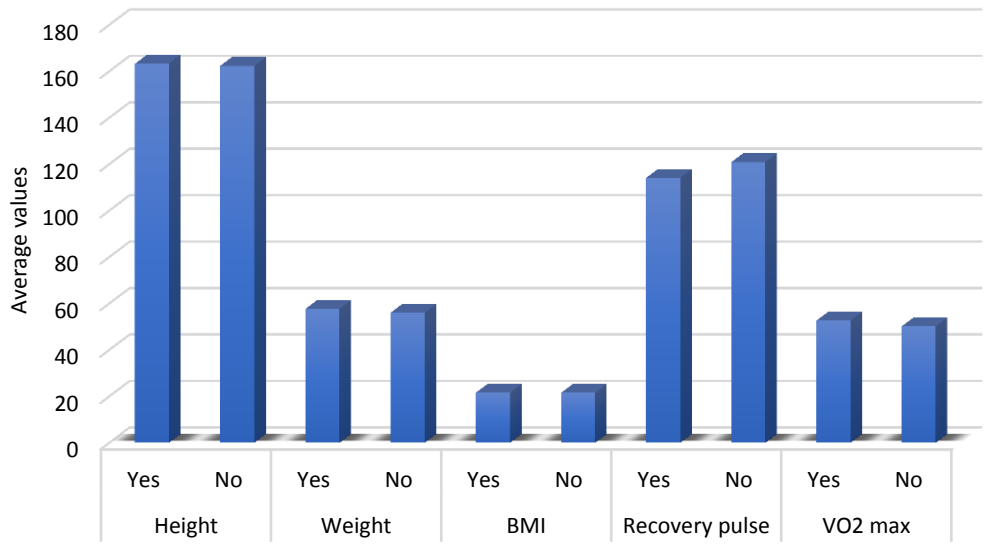
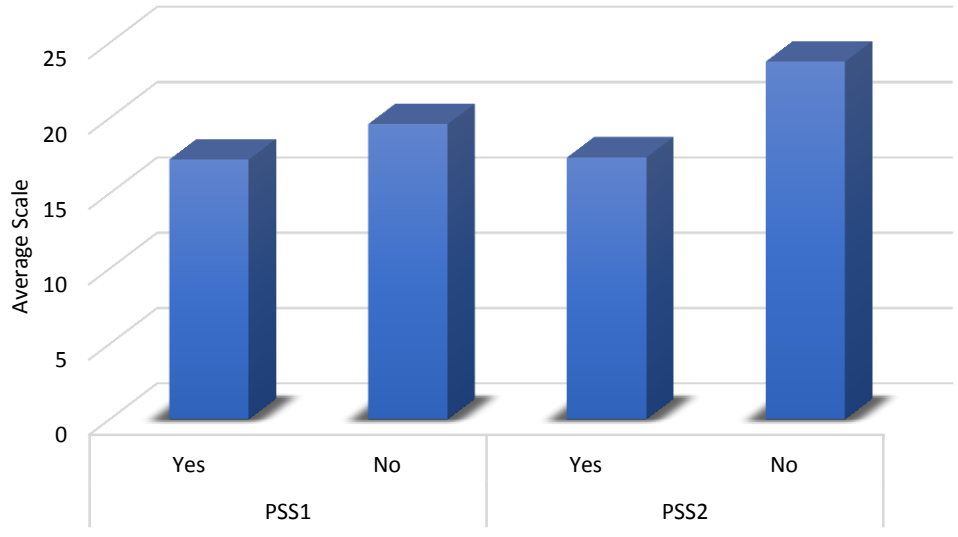


Table 3: Comparison of PSS after Pranayama training(PSS1) and Just Before the Exam period(PSS2) between Pranayama group and Control Group

Perceived stress score	Students involved in Yoga and Pranayama	Mean ∓ SD	P value
PSS1	Yes	17.25 ∓ 5.50	**0.049**
	No	19.60∓ 5.32	
PSS2	Yes	17.39∓ 6.72	**<0.001**
	No	23.75∓5.57	

Graph 3:Comparison of PSS scale in students



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DISCUSSION:

The study aimed to investigate the effect of pranayama on stress levels and VO_2 max in first-year MBBS students. The results of the study indicate that pranayama training for 3 months was associated with a decrease in perceived stress scores and an increase in VO_2 max. The finding of decreased stress levels in the study group compared to the control group is in line with previous research on the effects of yoga and pranayama on stress. Several studies have shown that yoga and pranayama practices can reduce stress levels and improve mental health [1, 2]. Vivek Kumar Sharma, Madanmohan Trakroo et al observed significant reduction in PSS scores in both fast and slow pranayama groups.[10] The mechanism by which pranayama reduces stress is thought to be through the modulation of the autonomic nervous system and the release of stress-related hormones [3, 4]. Reduction in stress may have occurred due to better autonomic tone (higher parasympathetic and lesser sympathetic tone) and reduced stress may have resulted in improved cardiovascular functions.[11] The increase in VO2 max in the study group compared to the control group is also in line with previous research on the effects of yoga and pranayama on cardiovascular fitness. Ray U.S. et al (2001)[12] observed significant improvement in VO2 max after Yogic training. Raju P.S. et al (1997)[13] have found a significant increase in oxygen consumption per unit work after yoga training. Several studies have shown that yoga and pranayama practices can improve cardiovascular function and increase lung capacity [5, 6]. The mechanism by which pranayama improves cardiovascular fitness is thought to be through the improvement of lung function, the increase in blood flow to the heart, and the modulation of heart rate variability [7]. Improvement in lung functions and better utilization of oxygen at cellular level. Improvement in both lung functions as well as cellular machinery explain raised VO2 max after regular practice of yoga.[14] It is important to note that this study has some limitations. The sample size is small, and the study is conducted on a homogeneous population of medical students in a single location, which may limit the generalise ability of the findings. Additionally, the study has a short follow-up period of three months, and longer-term studies are needed.

CONCLUSION:

In conclusion, the study found that pranayama training for 3 months was associated with a decrease in perceived stress scores and an increase in VO2 max among first-year MBBS students. These results suggest that pranayama may be a useful tool for managing stress and improving cardiovascular fitness in medical students. However, it is important to note that the study has some limitations, including a small sample size and a short follow-up period. Further research with larger sample sizes and longer follow-up periods is needed to confirm the findings of this study. Overall, this study provides important insights into the potential benefits of pranayama in reducing stress levels and improving cardiovascular fitness among medical students.

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