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Effect of yogic practices on psycho-physiological characteristics of college male students

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Abstract
Environmental pollution, rapid industrialization, overcrowding, sedentary lifestyle due to massive use of software technology, situational stress and anxiety are main responsible factors for deterioration of human physical health. Also prevalence of obesity in developing countries is believed to be on the rise. This requires special and specific techniques to transcend the limits of our physical and mental abilities experienced in everyday life. With increased awareness and interest in health and natural remedies, breathing techniques are gaining importance and becoming acceptable throughout the world. A total of forty two (42) undergraduate male college students were purposively selected as subjects in this study from Garhbeta College of Paschim Medinipur district affiliated under Vidyasagar University of West Bengal. They were divided into equal two groups namely experimental group and control group; each group consisted of twenty (21) subjects. To investigated the effect of selected yogic practices only the experimental group was asked to perform selected asana, pranayama and meditation for the duration of twelve weeks as per practice schedule. The selected psycho-physiological characteristics were trait anxiety, state anxiety, resting respiratory rate, vital capacity, resting heart rate, systolic blood pressure, diastolic blood pressure and body fat percent. Selected parameters were measured through their respective standard tests. Data was analyzed using SPSS, (Version 19.0) software. The level of significance chosen was 0.05. To compare between the mean scores of pre and post-test of the both groups Paired-Sample T-test was applied. From the findings of the study it may be concluded that the experimental group has significantly improved in state anxiety, resting respiratory rate, vital capacity and resting heart rate. From the findings of the study it is concluded that regular yogic practices may be recommended to improve the selected psycho-physiological characteristics of male college students for their progressive and prospective student's life.

Keywords: Asana, pranayama, meditation, trait anxiety, state anxiety, vital capacity.

Introduction

Yoga appears to provide a comparable improvement in stress, anxiety and health status (Caroline *et al.* 2007) [3]. Yogic practices can be used as psycho-physiologic stimuli to increase endogenous secretion of melatonin, which in turn, might be responsible for improved sense of well-being (Harinath *et al.* 2004) [5]. Today yoga being an academic as well as professional subject of varied interests, has gained worldwide popularity. Recent research treads have shown that it can serve as an applied science in a number of fields such as education, physical education and sports, health and family welfare, medical field and also one of the valuable means for the development of human resources for better performance and productivity of life. It has generally been believed that yoga is a spiritual science having emancipation as its goals and hence cannot be treated only as a therapy (Sachan *et al.* 2015) [8]. Pranayama involves systemic and disciplined inspiration and expiration with retention or holding of breathe in specific proportion or specific manner. Pranayama is the first step towards reorienting and improving the functioning of mind and body by learning to utilize the air we breathe. Pranayama (breathing exercise), one of the yogic techniques can produce different physiological responses in healthy individuals (Upadhyay *et al.* 2008) [13].
Due to gradual enhancement of population, pollution and demands of personal need of the individuals, peoples are facing so many psycho-physiological problems in their daily life, mainly mental stress, anxiety, hypertension, obesity and problems of cardio-respiratory system too. Mainly air pollution gradually deteriorates the ventilatory efficiency of our lungs which

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reducing our functional capacity. This deteriorating ventilator function of lungs may lead to chronic respiratory diseases like bronchial asthma, chronic bronchitis and bronchiectasis. Breathing exercises improve the functions of respiratory apparatus and improve lung functions. Pranayama, the controlled and conscious breathing exercise not only improves the psycho-physiological functions, but also improves the general wellbeing of the individuals. It helps maintain a better homeostasis and prevents body from degeneration and dysfunctions.

Yogic practices in its true essence helps the individual to imbibe the higher universal energies and grow him spiritually. Pranayama is ventilatory function improving technique. Due to proper working of these organs, vital energy flows to maintain the normal homeostasis of the body and thus it helps for prevention, control and rehabilitation of many mental and respiratory diseases. Pranayama is a type of yogic practice which produces many systemic psycho-physical effects in the body, besides its specific effects on the respiratory functions. So, it has become a standard fare at health clubs and community recreation programmes (Mishra 1997) [7]. Hence, in the present study the investigator made an attempt to investigate the beneficial effects if any, of selected yogic practices in those subjects with reference to psycho-physiological characteristics.

Materials and Methods
Subjects
Total forty two (N=42) undergraduate college male students were selected purposively in this study from Garhbeta College of Paschim Medinipur district affiliated under Vidyasagar University of West Bengal. The subjects were equally divided into two groups' i.e. experimental group and control group. The experimental group was consisted of twenty one (N_1=21) Physical Education general subjects and control group consisted of twenty one (N_2=21) subjects from History, Bengali and Philosophy departments. The age of the subjects were ranged from 18 to 20 years. Subjects who were trained in yoga before, subjects with history of previous surgery, recent cardio-respiratory diseases, diabetes, asthma and any chronic illness were excluded from the study. The health status of the subject was assessed by history taking and thorough general and systemic examination. The subjects were explained about the procedure and importance of the study. All selected yogic practices were adopted in experimental group. But control group could not take part any kinds of yogic practices or physical activity. The selected psycho-physiological characteristics were recorded in the subjects just before and after completion of twelve weeks of selected yogic practice of experimental group and the findings were compared. All tests were done at the same time of the

day i.e. between 10.30 a.m. to 12.30 p.m. to avoid diurnal variation in the department of Physical Education of Garhbeta College. Subjects of experimental group used to perform yogic practices for one hour fifteen minutes per day for six days per week. The yogic practices included prayers followed by 'om' pranayama, kapalbhati, anuloma viloma and bhramari, meditation and different asanas. The different asanas performed in practice schedule were Sukhasana, Padmasana, Bhujangasana, Chakrasana, Matsyasana, Makarasana, Sarbangasana and Shavasana.

Measurement of Psycho-physiological Characteristics
The psychological characteristics of trait and state anxiety were measured by State and Trait Anxiety Inventory (STAI) Questionnaires. This Inventory was design and developed by Spielberger, Gorsuch and Lushane (1970) [11]. The forms of this Inventory have been adopted in Bengali Version by Chattopadhyay and Mallick (1986) [4]. All physiological characteristics were measured by the following methods:
Resting respiratory rate (RRR) was measured in number/minute by palpation of chest movements; vital capacity (VC) in liter by Dry Spirometer. Resting heart rate (RHR) was measured in beat/minute by counting the radial pulse; systolic and diastolic blood pressure (SBP and DBP) in mm. of Hg. by Doctor Mercury Sphygmomanometer and Stethoscope. Body fat percent (BFP) was measured in percentage by Karada Scan; Body Composition Monitor; OMRAN, Japan. The first phase of the recording of the parameters was done at the beginning of their course and the last phase of the recording was done after twelve weeks of the regular yogic practices.

Statistical analysis
For the purpose of analysis of data descriptive statistics the mean, standard deviation and mean difference were obtained through the software of SPSS, (Version 19.0) software. To check the difference of mean scores between pre-test and post-test of experimental and control groups the Paired-Sample T-test were applied. The level of significance was set at 0.05.

Results
The research that was conducted aimed to determine the effect of selected yogic practices on psycho-physiological characteristics of male college students. Table-1 shows the mean value (±SD), mean difference and Paired-Sample T-test of psycho-physiological characteristics of experimental and control groups (N=21 each) before (Pre) and after (Post) twelve weeks selected yogic practices (experimental group only).

Table 1: Mean, SD, mean difference & Paired-Sample T-test of Pre and Post-test score of Experimental and Control groups on selected Psycho-physiological characteristics of male college students

Psycho-physiological Characteristics	Group	Pre-Test (N_1=21)	Post-Test (N_2=21)	t-value	p-value	S/NS
Trait Anxiety	Experimental	35.52±2.35	35.09±2.27	0.60	0.55	NS
	Control	35.47±1.94	35.57±2.08	-0.69	0.49	NS
State Anxiety	Experimental	42.19±1.88	40.42±1.88	2.97	0.00	S
	Control	42.19±2.11	42.09±2.16	0.81	0.42	NS
Resting Respiratory Rate (No./min.)	Experimental	19.42±1.32	18.38±1.07	5.96	0.00	S
	Control	19.28±1.38	19.38±1.07	-0.62	0.54	NS
Vital Capacity (Liter)	Experimental	3.01±0.20	3.12±0.19	-5.91	0.00	S
	Control	3.00±0.18	3.01±0.19	-0.56	0.57	NS
Resting Heart Rate (bpm)	Experimental	77.33±2.22	76.71±2.28	1.93	0.06	NS

	Control	77.38±2.23	77.19±2.22	0.72	0.47	NS
Systolic Blood Pressure (mm. Hg.)	Experimental	120.28±3.66	118.95±3.61	7.13	0.00	S
	Control	119.95±3.36	120.4±2.93	-0.62	0.54	NS
Diastolic Blood Pressure (mm. Hg.)	Experimental	78.95±3.13	78.76±2.89	0.69	0.49	NS
	Control	78.99±3.12	79.33±3.22	-1.00	0.32	NS
Body Fat Percent (%)	Experimental	9.80±1.10	9.73±0.99	1.93	0.06	NS
	Control	9.77±1.14	9.79±1.17	-0.74	0.51	NS

*Significant at 0.05 level. Tabulated $t_{0.05}$ (20) = 2.086.

Fig 1: Graphical representation of Pretest and Post-test score of Experimental and Control groups of Trait Anxiety and State Anxiety of college male student.
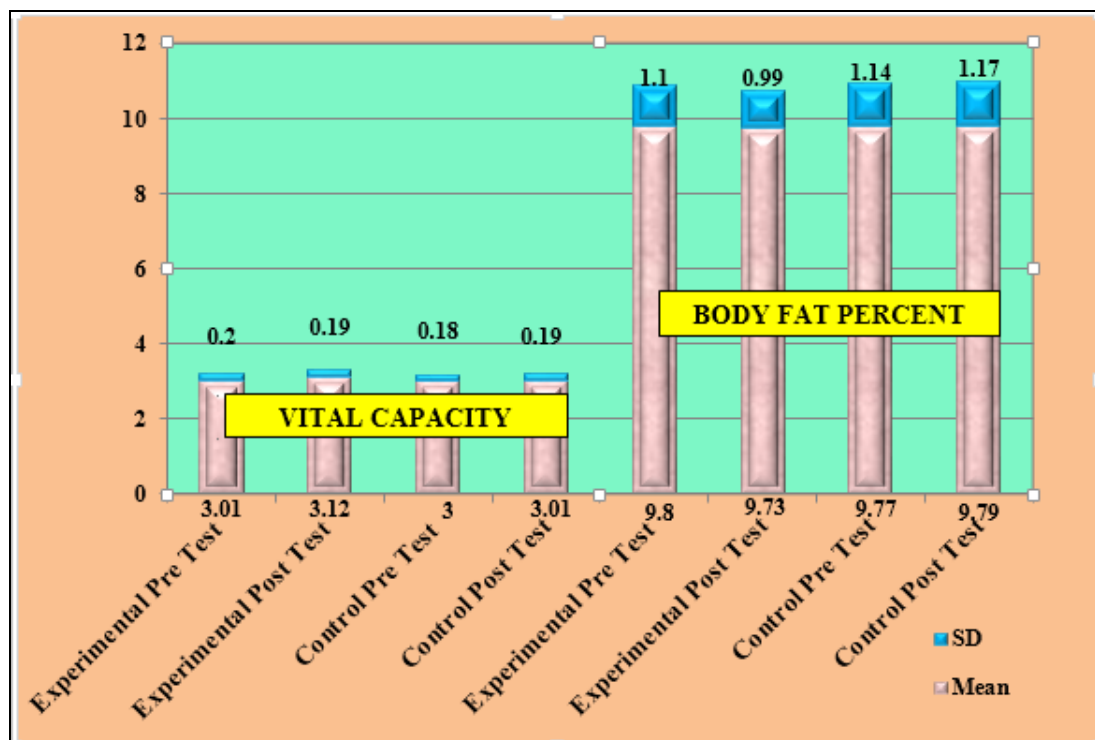
Fig 2: Graphical representation of Pretest and Post-test score of Experimental and Control groups of Vital Capacity and Body Fat Percent of college male student.
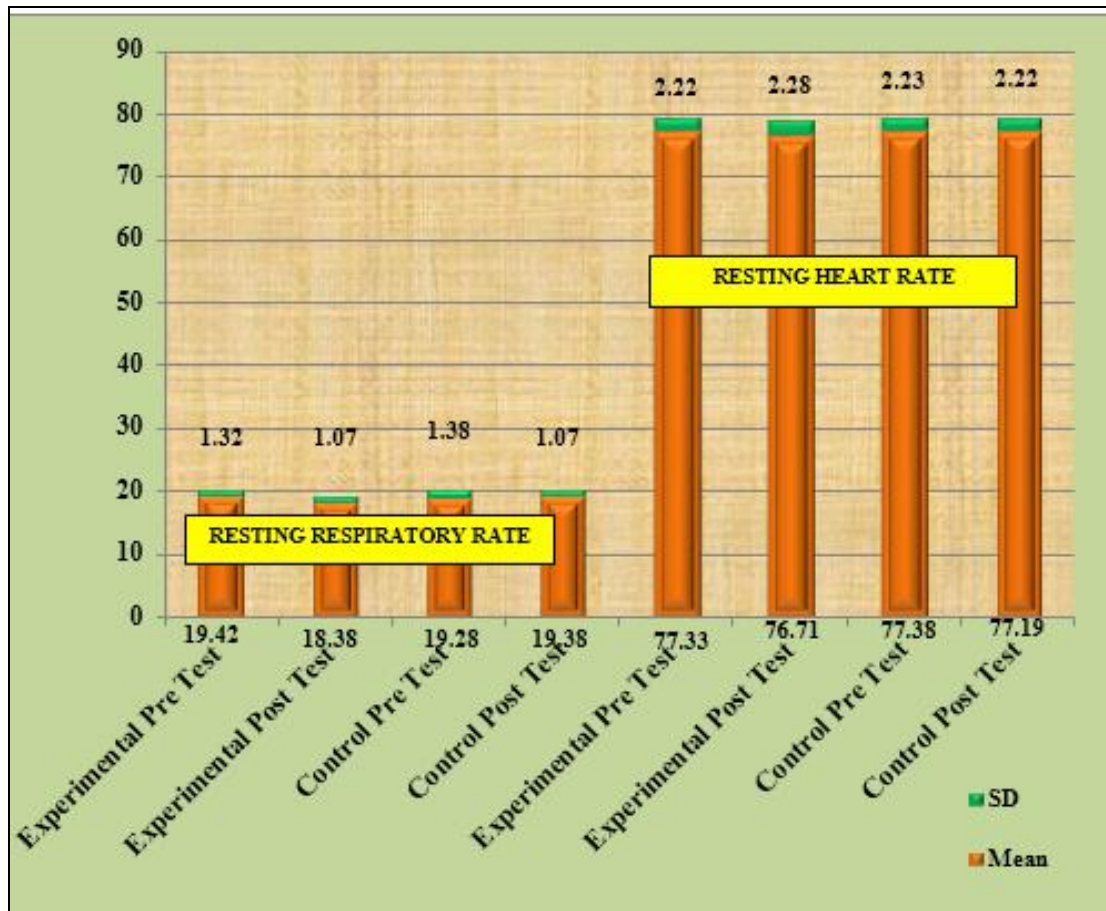
Fig 3: Graphical representation of Pretest and Post-test score of Experimental and Control groups of Resting Respiratory Rate and Resting Heart Rate of college male student
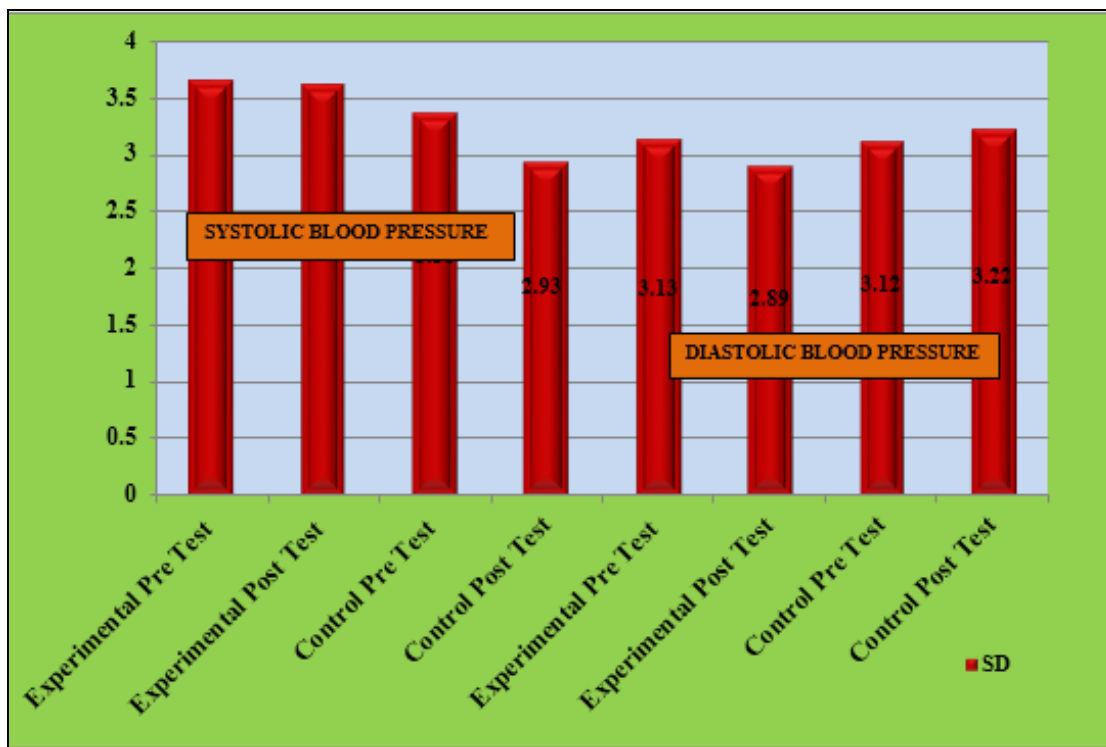

Fig 4: Graphical representation of Pretest and Post-test score of Experimental and Control groups of Systolic and Diastolic Blood Pressure of college male student.

Table-1 depicts the effect of selected yogic practices on psycho-physiological characteristics on experimental group and control of college male students. Results of the findings revealed that twelve weeks selected yogic practices significantly improved the state anxiety ($p < 0.05$), resting respiratory rate ($p < 0.05$), vital capacity ($p < 0.05$), and systolic blood pressure ($p < 0.05$) as compared to pre-test and post-test scores of experimental group but insignificant differences were noted between the test scores (pre-test and post-test) of experimental group in trait anxiety, resting heart rate, diastolic

blood pressure and body fat percent of college male students. In control group no significant differences were exist in all the psycho-physiological characteristics between pre-test and post-test scores of college male students.

Discussion of Findings
Mathur (1983) [6]. Reported that, anxiety is considered as a block to an activity. A person who suffers from anxiety may not be able to devote his full energy in the performance of a task. Anxiety can be classified in two ways; trait and state anxiety. State anxiety is situational stress induced by situations in the games. A sports person's autonomic nervous system is aroused in this state which is the natural reaction of any individual. On the other hand, trait anxiety can be thought of as a world view that an individual uses when coping with stress. In sports, individuals who are state anxious and low on the trait anxiety in tough situations, often deliver good performances consistently. Whereas, athletes who have higher levels of trait anxiety, added with the state anxiety, tend to perform below expectations. Yogic exercises and pranayama are known to significantly improve health status and reduce stress and anxiety in our daily life. From the findings it was evident that the twelve weeks of selected yogic practices statistically improved the state anxiety, resting respiratory rate, vital capacity and systolic blood pressure as compared to pre and post test scores of experimental groups and insignificant differences found in trait anxiety, resting heart rate, diastolic blood pressure and body fat percent between the experimental group of undergraduate college male students. No significant differences were found in all the selected psycho-physiological parameters between pre-test and post-test scores of control group. The discussion of findings have been made according to their psycho-physiological characteristics.

Regarding Trait Anxiety
The results of trait anxiety in experimental and control groups are shown in Table 1. The mean and standard deviation (±SD) values of trait anxiety of pre-test and post-test of experimental group were 35.52±2.35 and 35.09±2.27 respectively. However, the mean and standard deviation (±SD) values of trait anxiety of pre-test and post-test of control group were 35.47±1.94 and 35.57±2.08 respectively. The t-values of experimental and control groups were 0.60 and -0.69 respectively. Insignificant between-group differences were noted in trait anxiety in the experimental group before (Pre) and after (Post) subjected to practices of twelve weeks selected yogic practices since, the calculated value of (t=0.60) is less than tabulated value of $t_{.05}$ (20) = 2.086 for the selected degree of freedom and 0.05 level of significance for undergraduate male college students. However, no significant changes over that twelve weeks period were noted in the control group of college male students. Spielberger (1966) [4, 10]. Identified two kinds of anxiety, and differentiated state anxiety and trait anxiety. State anxiety reflects a transient emotional state or a condition that is characterized by subjective conscious perceived feelings of tension and apprehension, and gives rise to autonomic nervous system activity simultaneously. It may fluctuate and can vary in intensity. In contrast, trait anxiety refers to a general tendency to respond with anxiety to perceived threats in the environment. It is a relatively stable characteristic of individuals. Individuals with higher trait anxiety feel more threats in many situations than someone with lower trait anxiety.

Regarding State Anxiety
The mean and standard deviation (±SD) values of state anxiety of pre-test and post-test of experimental group were 42.19±1.88 and 40.42±1.88 respectively. However, the mean and standard deviation (±SD) values of state anxiety of pre-test and post-test of control group were 42.19±2.11 and 42.09±2.16 respectively. The t-values for experimental and control groups were 2.97 and 0.81 respectively. Significant between-group differences were noted in state anxiety in the experimental group before (Pre) and after (Post) subjected to practices of twelve weeks selected yogic practices since, the calculated value of (t=2.97) is higher than tabulated value of $t_{.05}$ (20) = 2.086 for the selected degree of freedom and 0.05 level of significance for undergraduate male college students. State anxiety is considered as situational as well as competitive anxiety that's why it activated the autonomic nervous system. May be due to this reason significant changes were found after twelve weeks period were noted in the experimental group of male college students.

Regarding Resting Respiratory Rate
The resting respiratory rate is one of the most important physiological parameter of this investigation. The mean and standard deviation (±SD) of pre-test and post-test scores of resting respiratory rate were 19.42±1.32 and 18.38±1.07 in number per minute respectively in favour of experimental group. The calculated value of (t=5.96) is greater than tabulated value of $t_{.05}$ (20) = 2.086 for the selected degree of freedom and significance level of experimental group had clearly indicated that statistically significant difference exist in resting respiratory rate of college male students. However, no significant changes over that twelve weeks period were noted in the control group of college male students. A group of physical educationist also reported that after regular practice of yogic exercises and pranayama techniques reduced significantly in resting respiratory rate and it may be due to increased vagal tone and decreased in sympathetic activity (Subbalakshmi et al. 2005 and Singh et al. 2011) [12, 9].

Regarding Vital Capacity
Table 1 shows that the mean and standard deviation (±SD) scores of vital capacity of pre-test and post-test of experimental groups were 3.01±0.20 and 3.12±0.19 liter respectively, whereas the mean and standard deviation (±SD) scores of vital capacity of pre-test and post-test of control groups were 3.00±0.18 and 3.01±0.19 liter respectively. The "t" value in case of experimental group was -5.91 and for control group it was -0.56. Since the calculated value of (t= -5.91) is greater than tabulated value of $t_{.05}$(20) = 2.086, thus it clearly indicated that statistically significant difference exist in vital capacity between pre-test and post-test scores of experimental group of college male students. The t-value of pre-test and post-test scores of control group showed insignificant difference was found in vital capacity. There might be a few possible reasons for the significant improvement in vital capacity. The effects can be explained on the following basis that, increased power of respiratory muscles that is due to work hypertrophy of the muscles during selected yogic practices mainly in pranayama by which the chest and lungs inflate and deflate to the fullest possible extent. The maximum inflation and deflation near to total lung capacity is an important physiological stimulus for the release of lung surfactant and prostaglandins increasing the alveolar spaces thereby increasing lungs capacity. Stimulation of pulmonary stretch receptors by inflation of slow and deep

inhalation and prolonged exhalation as in pranayama techniques causes efficient use of intercostals and diaphragmatic muscle. This trains the respiratory apparatus to get emptied and filled more completely. In breathing exercises of pranayama mainly kapalbhati powerful strokes of exhalation in quick succession with contraction of abdominal and diaphragmatic muscles trains the subject to make full use of diaphragm and abdominal muscles in breathing. This result is in line with that of the study earlier conducted by Bal B. S. (2010) [1].

Regarding body fat percent
The mean and standard deviation (±SD) values of body fat percent of pre-test and post-test of experimental group were 9.80±1.10 and 9.73±0.99 percent respectively. However, the mean and standard deviation (±SD) values of body fat percent of pre-test and post-test of control group were 9.77±1.14 and 9.79±1.17 percent respectively. The t-value in case of experimental group was 1.93 and for control group it was --0.74. Insignificant between-group differences were noted in body fat percent in the experimental group before (Pre) and after (Post) subjected to practices of twelve week selected yogic practices since, the calculated value of (t=1.93) is less than tabulated value of $t_{.05}$ (20) = 2.086 for the selected degree of freedom and level of significance of undergraduate male college students.

Regarding Resting Heart Rate
The mean and standard deviation (±SD) score of resting heart rate of pre-test of experimental group was 77.33±2.22 beat per minute as compared to 76.71±2.28 beat per minute after practices of twelve weeks yogic practices showed statistically insignificant at 0.05 level of confidence. In control group the pre-test and post-test mean and standard deviation (±SD) scores of resting heart rate were 77.38±2.23 and 77.19±2.22 beat per minute respectively indicated that no significant changes found over the twelve weeks period were noted in the control group. This finding is consonance with the study of Biswas *et al*. (2014) [2].

Regarding Blood Pressure (Systolic and Diastolic)
The mean and standard deviation (±SD) values of systolic blood pressure of pre-test and post-test of experimental group were 120.28±3.66 and 118.95±3.61 mm. of Hg. respectively. However, the mean and standard deviation (±SD) values of systolic blood pressure of pre-test and post-test of control group were 119.95±3.36 and 120.4±2.93 mm. of Hg. The t-value in case of experimental group was 7.13 and for control group it was -0.62. Significant between-group differences were noted in systolic blood pressure in favour of experimental group before (Pre) and after (Post) subjected to practices of twelve weeks yogic practices since, the calculated value of (t=7.13) is greater than tabulated value of $t_{.05}$ (20) = 2.086 for the selected degree of freedom and level of significance. However, no significant changes occurred over the twelve weeks period in the control group.
The mean and standard deviation (±SD) values of diastolic blood pressure of pre-test and post-test of experimental group were 78.95±3.13 and 78.76±2.89 mm. of Hg. respectively. However, the mean and standard deviation (±SD) values of diastolic blood pressure of pre-test and post-test of control group were 78.99±3.12 and 79.33±3.22 mm. of Hg. respectively. The t-values of experimental and control group were 0.69 and -1.00 respectively. Significant between-group differences were noted in systolic blood pressure in the

experimental group before (Pre) and after (Post) subjected to practices twelve weeks yogic practices. The probable causes that the yogic practices may increases frequency and duration of inhibitory neural impulses by activating pulmonary stretch receptors during above tidal volume inhalation as in Hering Bruer reflex which bring about withdrawal of sympathetic tone in the skeletal muscle blood vessels, leading to widespread vasodilatation, thus causing decrease in peripheral resistance and decreasing the diastolic blood pressure (Pramanik *et al*., 2009). However, no significant changes occurred over twelve week period in the control group. In this study the finding of systolic and diastolic blood is consonance with the study of Biswas *et al*. (2014) [2].

Conclusion
Based on the analysis of the results obtained, we concluded that the significant differences were found in state anxiety, resting respiratory rate, vital capacity, and systolic blood pressure as compared to pre-test and post-test scores of experimental group and insignificant between the group differences were noted in trait anxiety, resting heart rate, diastolic blood pressure and body fat percent of undergraduate male college students. It revealed that regular practice of systematic yogic practices decreased the risk factors of cardio-respiratory system, maintain to moderate level arousal level and reduce the state anxiety directly or indirectly by promoting our health and wellbeing. Pranayama and meditation can be used effectively for improvement of concentration, mental stability, preventive and therapeutic purposes of cardio-vascular diseases too. It may obviate the need of drug therapy or may decrease the dosage or reduce the number of drugs needed mainly in hypertension and obese of middle aged sedentary women. Making of pranayama practice is a part and parcel of our daily life. In light of these facts, it can be said that regular practice of systematic pranayama programme can be adopted as a potent way of maintaining health as well as economic and productive life.

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