COMPARATIVE STUDY OF EFFECT OF YOGA AND MEDITATION ON CARDIO-RESPIRATORY EFFICIENCY AND MENTAL WELL-BEING

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Abstracts: Background and Objectives: There is a significant increase in casualties due to cardio-pulmonary diseases globally. As it is assuming epidemic proportions, there is an urgent need to develop strategies to effectively manage it. Regular practice of yoga and meditation is reported to promote positive health and improve cardio-respiratory performance. Therefore, in the present study efforts are made to assess the effect of Yoga and Meditation on Cardiac-respiratory efficiency and mental well-being. **Methods:** The study was conducted on 30 subjects performing regular *Yogasanas and Meditation* at Sri SriRavishankar Yoga Mandir, Ahmedabad under the guidance of a qualified Yoga instructor. 30 subjects of same age group, selected as control group, were not performing Yoga exercises. Two phases of reading were taken. In study groups, 1st phase of reading was taken before commencement of Yoga practice and 2nd phase of reading at the cessation of Yoga practice that is after 12 weeks. Similarly, readings of two phases were taken in control group.The examination included physical examination, cardiac efficiency tests, respiratory efficiency tests and mental well-being assessment. **Results:** The statistical analysis was done using paired *t* test in GraphPad software. The observations suggest that regular practice of Yoga and Meditation can significantly improvethe autonomic balance, cardio-respiratory performance and mental well-being. **Conclusion:** Study concludes that yogic practices can improve general health and physical efficiency. Its role in prevention, control and rehabilitation of many diseases is also beyond doubts. Yoga should be popularized amongst masses as a health promoting measure.

Key words: Cardiac efficiency tests, Meditation, Mental well-being assessment, Respiratory efficiency tests, Yoga.

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Introduction:

A 3,000 year old tradition, yoga, is now regarded in the world as a holistic approach to health and is classified by the National Institutes of Health as a form of Complementary and Alternative Medicine (CAM)[1]. Its significance is corroborated by the fact that United Nations has declared to celebrate 21st June as International Day of Yoga annually. The draft resolution for the same was introduced by India and it was co-sponsored by 177 nations, highest ever in the history of United Nations.

Yoga philosophy and practice, in the first instance, were described by Patanjali in the classic text, *Yoga Sutras*, which is widely acknowledged as the authoritative text on yoga[2,3,4,5]. Today, many people identify yoga only with asana, the physical part of yoga, but asana is just one of the many tools used for healing the individual.

Meditation, in simple lexicon terms, is thinking deeply or spiritually about a subject. It is a complex cognitive task. It is more than relaxation, concentration, contemplation or posturing. According to some neuroscientists Meditation is a spiritual ecstasy with neurological manifestations.

Regular practice of yoga and meditation has been reported to promote positive health along with improvement in cardio respiratory performance. Further, no much work has been done on this topic so far at our institution. The aim of this study is to fill this lacuna as we feel Yoga and Meditation courses should be included in hospitals as part of the treatment of patients. It can also endow the medical

students to cope with stress or burn out while pursuing their studies.

Materials and Methods:

Present study was conducted on 30 subjects performing regular *Yogasanas and Meditation* at Sri Sri Ravishankar Yoga Mandir, Ahmedabad under the guidance of a qualified Yoga instructor. All selected subjects were between the age ranging from 20 to 50 years. 30 subjects having same age span between 20 to 50 years, selected as control group, were not performing Yoga exercises.

Inclusion criteria:

The Study group comprised of healthy adults of age group 20 to 50 years,males and females inclusive, were motivated to undergo yoga training for 12weeks and were considered for the study with their consent. While the Control group comprised of Males and females between the age group 20 to 50 years, not practicing Yoga and Meditation.

Exclusion criteria:

Smokers, Alcoholics and Subjects reportedly on treatment for hypertension, bronchial asthma or any cardiovascular, respiratory and psychiatric illness were excluded from this study.

Detailed historyincluding history of any disease, dietary habits, addiction type and exercise routine (if any) of each subject in both the groups was noted.Height and Chest circumference was measured by a measuring tape after chest expansion.Common WeighingScale was used for measurement of weight.

For the assessment of Cardiac Efficiency, Pulse rate was done by “three finger palpatory method”, Blood Pressure was measured by mercury sphygmomanometer by “auscultatory method” and Mean Arterial Pressure (MAP) was derivedusing the formula, diastolic pressure plus one third of pulsepressure from individual systolic and diastolic BP values.

For the assessment of Respiratory Efficiency, respiratory rate was counted while the subjects were lying in the supine position and pulmonary function test was carried out by SPIROEXCEL, a computerized instrument which is self calibrating & fulfils the criteria for standardized lung function test. Following parameters were recorded: Forced vital capacity (FVC), Forced Expiratory Volumein 1 second (FEV_1), Forced Expiratory Volume Percentage(FEV_1%), Peak Expiratory Flow Rate (PEFR) andMaximum Voluntary Ventilation (MVV).

Mental well-being assessmentwas done by using WHO (Five) Well-Being Index (1998 version). A percentage score of 0 represents worst possible, whereas a score of 100 represents best possible quality of life.

The statistical analysis was done using paired *t* test for comparing two different sets of data. GraphPad software was used for statistical analysis. A result was considered significant if *p* value is < 0.05.

Results:

TABLE - 1: Cardiovascular parameters in Control group and Study group

	Control group		Study group	
	I	II	I	II
PR (beats per min)	67.63 ±1.83	67.87 ± 1.96	69.07 ± 2.03	58.10 ± 0.85*
SBP (mmHg)	116.0 ±1.58	115.93 ± 1.62	117.33 ± 1.52	107.67 ± 1.58*
DBP (mmHg)	75.8 ±1.69	76.28 ± 1.64	75.80 ± 1.61	66.27 ± 1.64*
MAP (mmHg)	89.1 ± 1.9	88.9 ± 2.1	90.5 ± 1.7	87.6 ± 1.7*

TABLE - 2: Respiratory parameters in Control group and Study group

	Control group		Study group	
	I	II	I	II
RR (cycles / min)	15.8 ± 0.76	15.9 ± 0.71	15.70 ± 0.84	15.87 ± 0.82
FVC (L)	3.41 ± 0.11	3.44 ± 0.14	3.49 ± 0.08	4.79 ± 0.08*
FEV_1 (L)	3.39 ± 0.1	3.40 ± 0.12	3.20 ± 0.08	3.79 ± 0.08*
FEV_1%	85.2 ± 0.89	85.33 ± 0.96	86.90 ± 0.80	92.87 ± 0.86*
PEFR	543.5	544.57	552.83	584.33

(L/min)	±19.39	±19.31	±24.41	±25.04*
MVV (L/min)	120.33 ± 2.02	120.07 ± 2.65	118.90 ± 2.56	133.53 ± 5.05*

TABLE - 3: Mental Well-being Index in Control group and Study group

	Control group		Study group	
	I	II	I	II
Mental Well-being Index	13.67 ± 1.75	13.83 ± 1.39	15.43 ± 1.83	22.13 ± 1.38*

In all the tables, values are in Mean ± Standard Deviation (SD); * indicates that value *p*is less than 0.05; Column I and II denotes First Examination and Follow-up Examination after 12 weeks respectively.

Discussion:

In Table 1, in the control group, the mean PR, SBP, DBP and MAP after 12 weeks of follow-up were not significantly different ($p > 0.05$) than the initial basal values whereas in the study group, after 12 weeks of yogic practices, mean PR , systolic, diastolic, and mean arterial BP showed a significant reduction ($p < 0.05$) after the yogic practices.

In Table2, the RR in study group tended to decline but the change was not statistically significant ($p > 0.05$). The FVC, FEV_1 and FEV_1% in the control group did not show any appreciable change but showed a significant increase ($p < 0.05$) in the study group. The PEFR and MVV also showed a significant increase ($p<0.05$) after yogic practices but did not show any significant change ($p > 0.05$) in the control group.

In Table3, the control group did not show any significant change, but showed a significant increase ($p < 0.05$) in the study group after 12 weeks of yogic practices.

This study demonstrates that regular practice of Yoga and Meditation causes alterations in autonomic balance, respiratory performance and mental well being. It also reported significant reduction in systolic, diastolic and mean arterial pressure indicates a trend of gradual shift of autonomic equilibrium toward relative parasympathodominance due to reduction in sympathetic activity. This modulation of autonomic nervous system activity might have been brought about through the conditioning effects of Yoga on autonomic function, mediated through limbic system and higher areas of the central nervous system. The Yoga practitioners have been demonstrated to develop some degree of resistance against physical stress[6].

The Pranayama, an integral part of yogic practices, is reported to improve respiration rate and ventilatory functioning of the lung [7, 8]. Significant improvement in FVC, FEV_1, FEV_1%, PEFR and MVV in our study indicates that it might have been caused by fortification of respiratory musculature incidental to regular practice of pranayamic breathing.

Meditation, essentially a part of yogic schedule, is characterized physiologically as a wakeful hypometabolic state of parasympathetic dominance. During meditation the practitioner remains awake and vigilant but the physical body goes into a state of deep muscle relaxation[9]. The exact significance and mechanisms responsible for increase in melatonin levels after yoga and meditation remains speculative, but higher melatonin levels during night after yoga and meditation showed a positive correlation with well-being. The increase in melatonin secretion after the yogic practices may either be caused by increased secretion of hormone by the pineal gland or decreased clearance from the circulation. Walton et al. have reported that yogic practices increase serotonin, which in turn might be acting as a precursor for increasing melatonin synthesis during yogic practices[10].

These observations suggest that regular practice of Yoga and Meditation can bring substantial improvement in the autonomic balance, cardio-respiratory performance and mental well-being. Secretion of melatonin from the pineal gland, which may be acting as a

psychosensitive hormone, is also facilitated by it. It is possible that if yoga and meditation are practiced along with routine exercises, both physical and mental performance can be improved.

Conclusion: It is concluded by this study that yogic practices have a great value in improving general health and physical efficiency of the practitioners. The role played by it in prevention, control and rehabilitation of many diseases is beyond doubts. It is logical that Yoga should be promoted to the masses as a health improvement tool. Moreover, there remains so much scope for further study to evaluate the linkage between specific *Asanas* for improving specific parameters.

Limitations of this study and Future recommendations: As present study was conducted on healthy volunteers only, future studies should be conducted on patients suffering from for hypertension, bronchial asthma or any cardiovascular, respiratory and psychiatric illness with a larger sample size and longer training periods.Moreover, Yoga should be compared to other forms of exercise.The variety of yoga styles that exist and how these styles should be uniquely defined is a major obstacle needed to address.Professionals in the medical, health and fitness industry need more information regarding yoga, its varied practices and the inherent risks and benefits associated with each style.

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