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# EFFECT OF YOGA ON CARDIORESPIRATORY PARAMETERSIN MEDICAL STUDENTS

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## ABSTRACT

In the changing scenario, stress is the part of human life. To this, medical students are no exception. Now a days, medical curriculum, is designed for examinations. Stress results from imbalance in the components of autonomic nervous system. *Yoga* is known to induce beneficial effects on physiological, biochemical and mental functions in man. Present study was undertaken to evaluate the physiological effects of *yoga* on the cardiorespiratory system.34 medical students were selected to undergo the session of yoga one hour per day to find out the effect of *yoga* on cardiorespiratory parameters. *Yoga* includes various *asanas, suryanamaskar* and *pranayam*. The parameters studied were pulse rate, blood pressure, respiratory rate, forced expiratory volume at the end of one second(FEV1), forced vital capacity (FVC), maximum ventillatory volume (MVV) and peak expiratory flow rate (PEFR). The results of this study showed marked improvement in cardio respiratory parameters after *yoga* session.

**KEYWORDS:** ***Yoga, Pranayam, Suryanamaskar*, FEV1, FVC**

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## INTRODUCTION

In the changing scenario, stress is the part of human life. To this, medical students are no exception. Now a days, medical curriculum, is designed for examinations. Stress results from imbalance in the components of autonomic nervous system. *Yoga* is known to induce beneficial effects on physiological, biochemical and mental functions in man. It is claimed that yoga practices improve general health and fitness. *Yoga* is a science practiced in India over thousands of years. In recent times medical fraternity is much attracted towards yoga. Yoga practice mainly consist of *Asana* (posture- a particular position of the body which contributes to steadiness of body and mind) and *Pranayama* (to control the breathing in a superior and extra-ordinary way to get maximum benefits.), and meditation. It produces consistent physiological changes and have sound scientific basis [1]. Yogic exercises have been found to be beneficial for better maintenance of bodily functions, even in normal healthy subjects. In view of this we planned to undertake a study on effects of yoga training on various cardio-respiratory parameters[1].*Surya Namaskar* (SN), a popular traditional Indian yogic practice, includes practicing 12 physical postures with alternate forward and backward bending movement of the body along with deep breathing maneuvers. The practice of SN has become popular among yoga practitioners and other fitness conscious people[2].

## MATERIALS AND METHODS

The undertaken study was a controlled trial study. The study was approved by IEC (ECR/472/Inst/MH/2013 dated 22/1/2015).34 final MBBS medical students 22 males and 12 females were selected for one month *yoga* session for 1 hr day which includes various *yogasanas viz. Suryanamaskar, Trikonasan, Matsyasan, Shavasan, Pranayam, Omkar* etc.All these students were examined clinically to rule out any systemic disease or disorder. All were non smokers. Pulmonary function tests were performed in sitting position using Medspiror electronic PFT machine. The parameters considered were forced expiratory volume at the end of one second(FEV1), forced vital capacity(FVC), maximum ventillatory volume(MVV) and peak expiratory flow rate(PEFR).Cardiovascular parameters: Pulse rate and blood pressure were recorded before and after *yoga* session.Statistical analysis was done by SPSS 10 software for windows.

## RESULTS

**Table 1**
***Statistical analysis of PFT parameters expressed in terms of percentage predicted values***

| Sr No. | PFT Parameters | Mean | | Standard Deviation | | Standard Error of Means | |
|---|---|---|---|---|---|---|---|
| | | Before Yoga Session | After Yoga Session | Before Yoga Session | After Yoga Session | Before Yoga Session | After Yoga Session |
| 1 | FVC | 75.78 | 96.51 | 26.35 | 13.33 | 4.58 | 2.32 |
| 2 | FEV1 | 98.81 | 107.28 | 17.35 | 12.33 | 3.02 | 2.14 |
| 3 | FEV1/FVC | 99.97 | 103.67 | 22.79 | 9.11 | 5.44 | 4.02 |
| 4 | MVV | 89.27 | 100.81 | 21.07 | 14.72 | 3.66 | 2.56 |
| 5 | PEFR | 81.69 | 102.12 | 12.59 | 16.92 | 2.19 | 2.94 |

***The results of present study showed marked improvement in respiratory functions. Statistically significant (p<0.05) improvement was observed in FVC, FEV1, PEFR, MVV and FEV1/FVC ratio. The actual values of PFT parameters were converted to percentage of predicted values to rule out the effect of age, height and weight. FVC, FEV1 and FEV1/FVC ratio showed statistically significant improvement. The changes in MVV and PEFR also statistically significant.***

**Table2**
***Statistical analysis of Cardio-respiratory parameters***

| Sr No. | Cardio-respiratory parameters | Mean | | Standard Deviation | | Standard Error of Means | |
|---|---|---|---|---|---|---|---|
| | | Before Yoga Session | After Yoga Session | Before Yoga Session | After Yoga Session | Before Yoga Session | After Yoga Session |
| 1 | Pulse rate | 82.29 | 73.50 | 7.53 | 6.88 | 1.31 | 2.95 |
| 2 | Systolic blood pressure | 117.65 | 114.33 | 10.42 | 6.33 | 1.97 | 1.15 |
| 3 | Diastolic blood pressure | 77.71 | 77.67 | 6.21 | 6.93 | 1.13 | 1.26 |
| 4 | Respiratory rate | 17.50 | 12.47 | 3.16 | 3.08 | 0.60 | 0.56 |

***Significant improvement observed in cardiovascular functions viz. pulse rate and blood pressure. The respiratory rate also showed marked improvement.***

## DISCUSSION

In yogic practices, the rate of metabolism is slowed down which slows down the breathing.In *pranayama* prolonged exhalation (rechak) and prolonged inhalation (*purak*) is advocated. Increased amount of inhaled air is used for the oxygenation of blood, i. e. circulated in entire body.1.Pulse Rate : A. A. Khanam et al (1996)[3], Kaviraja Udupa et al (2002)[4] Jyotsna Bharashankar et al (2003)[5] observed statistically significant reduction in heart rate after short term *Yoga* training . Our study also showed significant reduction in pulse rate after regular practice of *yoga* and it is attributed to increased vagal tone and decreased sympathetic activity [6,7]. Decreased

sympathetic activity in turn reduces catecholamine secretion and also leads to vasodilation leading to improvement in peripheral circulation. It is also observed that regular yogic practices reduce basal metabolic rate and resting oxygen consumption [8]. All these may be responsible for reduction in resting pulse rate.2.Blood Pressure : Jyotsna Bharshankar et al (2003)[5], Gandhi et al (2006)[9]found statistically significant decrease in both SBP and DBP after Yoga training. Kalwale P.K., Shete A.N. et al (2006)[10] observed significant decrease in SBP after one month of *pranayama* training, but no change in DBP.3.PFT parameters**:** L.N. Joshi et al (1992)[11]observed significant improvement in FVC, FEV1 and PEFR after 6 weeks Pranayama practice. Raj Kumar Yadav et al (2001)[12]found significant increase in FVC, FEV1 and PEFR in young females after 12 wks Yoga practice which included *prayer, asans, pranayama and meditation* .Ritu Soni, Manisha Gupta et al(2006) [13]found significant improvement in FVC, FEV1, MVV and PEFR after *Pranayama* practice in asthmatic patients .Chhibber R., Mondal S. et al (2006)[14], found a significant increase in FVC, FEV1%, and PEFR at 6 th and 12 th week of *Pranayama* practice in healthy females.I. *Yoga* postures (asanas) involve isometric contraction which is known to increase skeletal muscle strength. Yoga training improves the strength of expiratory as well as inspiratory muscles[15]. II. *Bhastrika Pranayama* is a bellows type breathing in which one breaths forcefully and rapidly and thus, exercises inspiratory as well as expiratory muscles[15].III. In breathing exercises like *Kapalbhati*, short powerful strokes of exhalation in quick succession with contraction of abdominal and diaphragmatic muscles trains the subject to make full use of the diaphragm and abdominal muscles in breathing. It also helps in removal of secretions from bronchial tree, clearing up respiratory passages and the alveoli making room for more air[16]. IV*. Pranayama* is characterized by slow and deep inhalation and prolonged exhalation. The stress is on more prolonged expiration and efficient use of abdominal and diaphragmatic muscles. This act trains the respiratory apparatus to get emptied and filled more completely and efficiently[16].V. Removal of undue tension rom the skeletal muscles in *yogasana*s help the thorax to relax better than before[16]. VI. *Yoga* strengthens the respiratory musculature due to which chest and lungs inflate and deflate to fullest possible extent and muscles are made to work to maximal extent[17]. VII. Yogic breathing raises the diaphragm at a higher level than its normal excursion. This helps in efficient movement of diaphragm[16]. VIII. Lung inflation near to total lung capacity is a major physiological stimulus for the release of lung surfactant into alveolar spaces which increases the lung compliance 2. During *pranayama,* there is slow and prolonged inspiration as well as expiration. This stretches elastin and collagen fibres interwoven among the lung parenchyma. Hence, these fibres can elongate to a greater extent, thus, increasing the compliance of lungs[18]. IX. It is suggested that the lung inflation near to total lung capacity is also major physiological stimulus for the release of prostaglandins which decreases bronchial smooth muscle tone[19]. X. Yoga with its calming effect on the mind can reduce and release emotional stresses thereby withdrawing the bronchoconstrictor effect.ncreased vagal tone decreases the work load on heart leading to decrease in cardiac output and hence systolic blood pressure. Yogic practices alter the hypothalamic discharges[8] leading to decrease in sympathetic tone and peripheral resistance and hence the diastolic blood pressure.Resultantly, oxidative metabolism is the main stay for strengthening the body.\similar study by, Bowman et al[20] and Blackwell et al[21] showed marked improvement in cardiovascular functions.

## CONCLUSION

We conclude that *yoga* improves cardio respiratory parameters.

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