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## PEAK EXPIRATORY FLOW RATE (PEFR) AMONG FEMALE POPULATION UNDERGOING SIX WEEKS YOGA V/S AEROBICS TRAINING INDIVIDUALLY – A CROSS SECTIONAL STUDY.

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### Abstract :

**BACKGROUND:** Exercises in the form of sports, Yoga, Aerobics, or workout, if performed regularly, have a beneficial effect on the various systems of the body. The major advantage of such exercises is that the increase in blood flow to the various organs results in distribution of more nutrients, thereby enhancing their functioning. Yoga and Aerobic training are considered to be more effective than other method of training in developing physical fitness. It is long lasting and can be performed at different stations without apparatus.

**AIM AND OBJECTIVE:** To study Peak expiratory flow rate among female population undergoing six weeks yoga & aerobics training individually.

**MATERIALS AND METHODS:** A total of 50 female healthy subjects aged between 19-35 years doing respective exercise regularly for six weeks, 5 days/week; without any comorbid respiratory or cardiovascular ailments such as ischemic heart disease/diabetes mellitus/asthma/chronic obstructive pulmonary disease were enrolled in this cross-sectional study. Demographic details such as age, gender, and history of respiratory or cardiac symptoms were taken by detailed medical history and physical examination. PEFR of subjects of both the groups were measured and evaluated. PEFR was measured using Wrights handheld peak flow meter.

**RESULTS:** Statistically significant ( $P < 0.05$ ) difference was seen in PEFR of subjects doing yoga versus aerobics. group A (yoga) mean value of PEFR is 406.4 with SD 75.79, and in group B(aerobics) value of PEFR is 363.6 with SD 55.74.

**CONCLUSION:** As the study concludes that the subject of both, Yoga & Aerobics group improved their pulmonary function in female population. But yoga is seen highly significant as compare to aerobics in female population.

**KEY WORDS:** Aerobic Exercise; Peak Expiratory Flow Rate; Yoga.

### I. INTRODUCTION

Relationship between physical inactivity and cardiovascular (CV) diseases started getting acceptance in the medical community in 1996 when the American Heart Association published information Advocating the benefits of physical exercise for improvements in metabolic, hemodynamic, hormonal, neurological and respiratory function<sup>1</sup>. Imbalance or improper functioning of the physical or mental bodies results in serious repercussion on wellbeing of a person, which would necessitate medical attention<sup>2</sup>. Exercises in the form of sports, Yoga, Aerobics, or workout, if performed regularly, have a beneficial effect on

the various systems of the body. The major advantage of such exercises is that the increase in blood flow to the various organs results in distribution of more nutrients, thereby enhancing their functioning<sup>3</sup>

Yoga and Aerobic training are considered to be more effective than other method of training in developing physical fitness4. It is long lasting and can be performed at different stations without apparatus4. Yoga practice includes Asanas and Pranayama and Aerobic exercises includes running, walking, swimming, bicycling and aerobic dance that improve physical fitness4. Peak expiratory flow rate (PEFR) is a objectively measurable quantitative parameters of respiratory health5.

The American College of Sports Medicine [ACSM] defines aerobics exercise as “any activity that uses large muscles group, can be maintained continuously, and is rhythmic in nature”1 Aerobic is the form of exercise that increases the burden of the heart and lungs, making them to exert greater efforts than at rest3. Yoga is the form of exercise that gives you everything: strength, endurance, balance, flexibility, and relaxation6.

According to Patanjali’s Yoga sutras, there is an eight-fold path leading to liberation, known as the “Ashtanga Yoga System” or “Eight Limb of Yoga” the “word ashta” means “eight” and ‘anga’ means limb. There are eight stages of yoga:

1. YAMA- refers to vows, disciplines or practices that are primarily concerned with the world around us. There are five yamas:

- a)Ahimsa(non-violence)
- b)Satya(truthfulness)
- c)asteya(non-stealing)
- d)brahmacharya(right use of energy)
- e)aparigraha(non-greed or non-hoarding)

2. NIYAMA- refers to duties directed towards ourselves, but can also be considered with our actions towards the outside world.

There are five NIYAMAS:

- a)saucha(cleanliness)
- b)santosha(contentment)
- c)tapas(burning of desire)
- d)svadhyaya(selfstudy)
- e)isvarapranidaha(surrender to a higher power)

3.ASANA- refers to the ability to perform a handstand or an aesthetically impressive backbend, it means ‘seat’- specifically the seat you would take for the practice of meditation.

4.PRANAYAMA- refers to breathing technique or it could be say “freedom to breath”.

5.PRATYAHARA-Sense withdrawal, praty means to “withdraw” and the second part ahara refers to anything we “take in” by ourselves, such as the various sights, sound and smells our senses take in continuously.

6.DHARANA-Focused Concentration, Dha means ‘holding’ or maintaining and ‘Ana’ means “other” or “something else”.

7.DHYANA- Meditative Absorption, when we become completely absorbed in the focus of our meditation, and this is when we are really meditating.

8.SAMADHI- refers to ‘bliss’ or ‘enlightenment’ and this is the final step of Patanjali’s yoga sutras.6

Dr. Dean Ornish, the renowned American physician and best selling author who has shown that a yogic lifestyle can reverse heart disease, says, “Yoga is a system of perfect tools for achieving union as well as healing.”6 Practicing yoga contributes in the enhancement of pulmonary ventilation and higher oxygen absorption and thereby improves lung capacity1

In this study PEFR is taken as outcome measure which was expressed in litres/min5. The normal range for males and females is 450-550 L/min and 320-470 L/min, respectively5. PEFR is the volume of air forcefully expelled from the lungs in one quick exhalation, and is a reliable indicator of ventilation adequacy as well as airflow obstruction. It can help you to prevent symptoms from worsening before a full blown asthma attack. PEFR test can help to discover, when it need to adjust medication and to determine whether environmental factor/ pollutant are affecting the breathing.6

## **AIM:**

To study Peak expiratory flow rate among female population undergoing six weeks yoga & aerobics training individually.

## **OBJECTIVE:**

- 1.To assess the peak expiratory flow rate in female population undergoing yoga for six weeks.
- 2.To assess the peak expiratory flow rate in female population undergoing aerobics for six weeks.
- 3.To compare the peak expiratory flow rate in female population undergoing yoga and aerobics for six weeks.

## MATERIAL AND METHODOLOGY

### ➤ MATERIAL

- Pen
- Paper
- Patient evaluation sheet
- Peak flow meter device and disposal mouthpiece.
- Weighing machine

### ➤ OUTCOME MEASURES

#### 1. PEAK EXPIRATORY FLOW RATE

### ➤ METHODOLOGY

#### 1. Sample size- 50

$$\text{Sample size calculation} - n = \frac{2 z^1 s^2}{d^2}$$

n = 47 minimum sample size is 47

2. Study design- cross sectional Study

3. Method of sampling- Simple random sampling

4. Study setting- a) Dr. Vispute's Shatayu Clinic & Yog Centre, Jalgaon.

b) Chatrapati Shivaji Maharaj stadium, Jalgaon

5. Duration of Study- six weeks

6. Selection Criteria:

#### A. Inclusion Criteria-

- Age group of 19-35
- Subject practicing yoga and aerobics regularly for 6 months, 5 days/ week.
- Subjects willing to participate.

#### B. Exclusion Criteria-

- Subjects with history of respiratory, cardiac illness/neurological disorder.
- History of thyroid.
- History of severe chest trauma.
- Subject consuming alcohol.
- Smokers.
- Subject of anti-hypertensive drugs.
- Subjects with class I, II, III Obesity

## PROCEDURE

To conduct the study permission was taken from the ethical committee of the institution., subjects were taken according to inclusion and exclusion criteria. The demographic information of each participant was taken, and the purpose of the study was explained to them. The pre reading of PEFR was taken before 6 weeks and the follow up of subjects were taken every end of week. The subjects were introduced to Peak expiratory flow device. A small demo was given by my side for how to use peak expiratory flow device. A comfortable sitting position on chair with chin slightly lifted was given to the subject. keeping this position for the entire time. The marker on peak expiratory flow device was moved to 0 before placing in subject mouth. A disposal mouthpiece was used for each and every subject after every individual reading. Instructed the subject to blow out and empty the lung as much as possible, take a deep breath to completely fill the lungs with air and then put the mouthpiece between the teeth and close the lips tightly. Instructed the subject do not put your tongue on the mouthpiece, then blow out as hard and fast as you can through the mouthpiece. The readings seen according to sliding marker on device were noted down. Three reading were taken and sliding marker were set to 0 in every next reading and the highest reading were noted for the study. Various forms of yoga and asanas were performed in yoga centre by the yoga group. The schedule of yoga center was for approx. 60 minutes

- 1.Warm up- 5 mins
- 2.Suryanamaskar-15 mins
- 3.Shravasan-1 mins
- 4.Asans-25 mins
5. Pranayama -10 mins
6. Cool down- 5 mins

Some of the ASANA'S were Bhujangasana (cobra pose), Setu bandha sarvangasana (bridge pose), Shashank asana (child pose), Ustrasana (camel pose), Pranayama – deep breathing, anulom vilom, bhramari , OM chanting.

In aerobics, running, cycling, jogging, brisk walking, burpee, lunges, stair climbing was done by aerobic group. Warm up -10 minutes, exercises 45-50 minutes, cool down- 10 minutes

### BHUJANGASANA



### USTRASANA



### CYCLING



## STATISTICAL ANALYSIS & RESULT

- 1) The data was collected, analysed and was entered in excel sheet and statistical analysis was done using SPSS Statistical package of social sciences version 28.0.0.1 software. Test of normality was applied to check for the normal distribution of data (Shapiro– Wilk test). Data were normally distributed. The statistical analysis was done paired and unpaired t-test. The paired t-test was done within the group. The unpaired t-test was used for between group statistical analysis to compare the values of outcome measures of both the group. Statistical significance was set at  $p<0.005$
- 1) The present study includes 50 subjects practising yoga and aerobics since from six weeks who met the inclusion criteria. The subjects were equally divided in to two groups by simple random sampling method. Group A and Group B both consist of 25 subjects. Group A practising yoga and Group B practising aerobics.

TABLE NO. 1

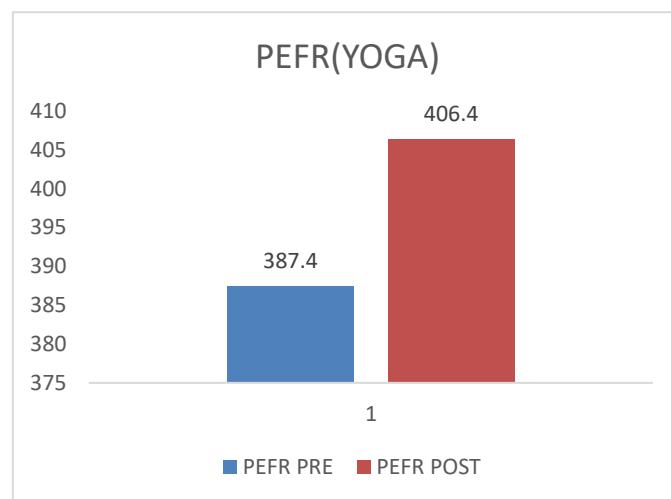
Variables	Yoga (group A)	Aerobics (Group B)	p-value
Age	$27.12 \pm 3.43$	$25.24 \pm 3.35$	0.061
BMI	$24.64 \pm 1.80$	$22.79 \pm 2.95$	0.011

Baseline characteristics of both groups



TABLE NO. 2

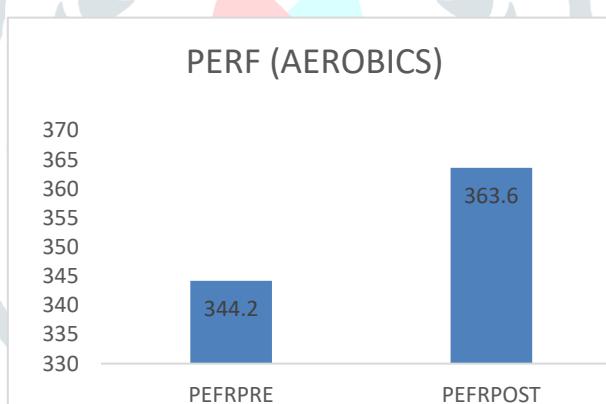
YOGA	Mean	N	Std. Deviation	P value
PEFR PRE	387.4	25	76.364	<0.001
PEFR POST	406.4	25	75.795	<0.001



According to table no. 2 the mean value of PEFR in pre yoga is 387.4 with SD 76.36 and post yoga is 406.4 with SD 75.79 which shows statically difference in p-value within the group.

TABLE NO. 3

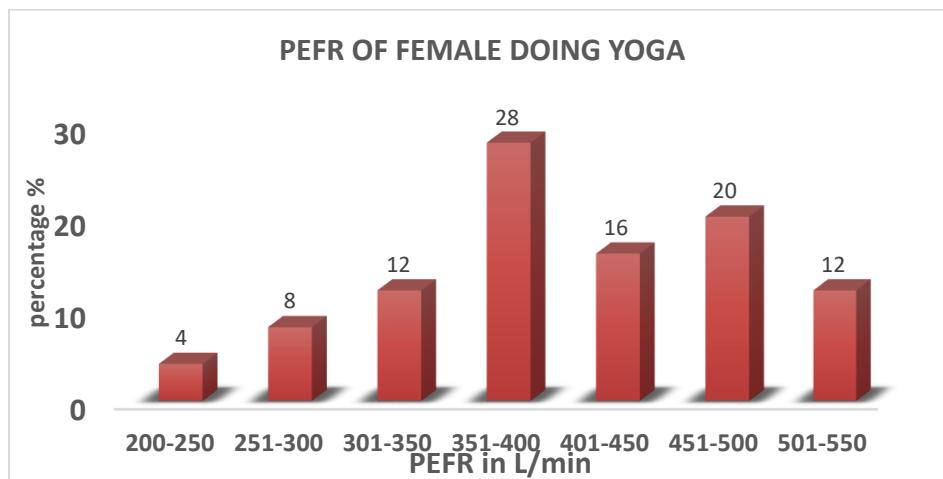
AEROBICS	Mean	N	Std. Deviation	P value
PEFRPRE	344.2	25	57.819	<0.001
PEFRPOST	363.6	25	55.743	<0.001



According to graph no. 4 Between the groups observation group A (yoga) mean value of PEFR is 406.4 with SD 75.79, and in group B(aerobics) value of PEFR is 363.6 with SD 55.74, the obtained p-value is <0.001 & statistically difference is found between groups

PEFR	No. of subjects	Percent
200-250	1	4
251-300	2	8
301-350	3	12
351-400	7	28
401-450	4	16
451-500	5	20
501-550	3	12
<b>Total</b>	<b>25</b>	<b>100</b>

Graph no.4 PEFR in L/min in female doing yoga



According to graph no.4 The PEFR value in yoga group, in 200-250 L/min 4% of subjects were found, in 251-300 L/min 8%, in 301-350L/min 12%, in 351-400L/min 28%, in 401-450L/min 16%, in 451-500L/min 20%, in 501-550L/min 12%

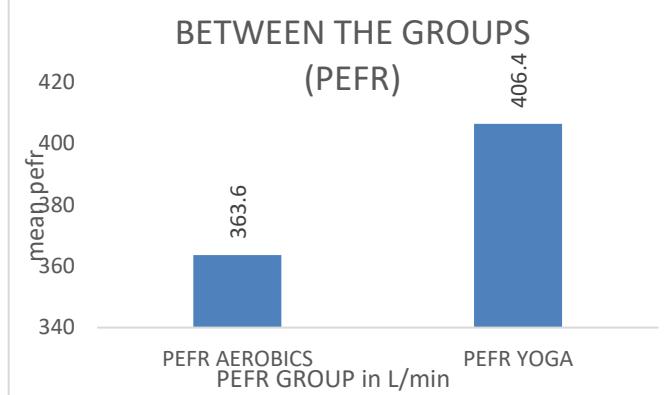
TABLE NO.3 AEROBICS

PEFR values	No. of subjects	%
250-300	5	20.00%
301-350	6	24.00%
351-400	8	32.00%
401-450	6	24.00%

According to graph no.3 The PEFR values in aerobics group was, in 250-300L/min of PEFR value 20% subjects were found, in 301-350L/min 24%, in 351-400L/min 32%, in 401-450L/min 24%.

#### Inter group comparison of data between both groups

Variables	N	Mean	Std. Deviation	P value
PEFR AEROBICS	25	363.6	55.743	<0.001
PEFR YOGA	25	406.4	75.795	<0.001



According to graph no. 4 Between the groups observation group A (yoga) mean value of PEFR is 406.4 with SD 75.79, and in group B(aerobics) value of PEFR is 363.6 with SD 55.74, the obtained p-value is <0.001 & statistically difference is found between groups

## DISCUSSION

The aim of the study is to analyze Peak expiratory flow rate among female population undergoing six months yoga & aerobics training individually under the age group of 19-35. About 28% of females doing yoga had PEFR between 351-400 while that of aerobics was 24%. In yoga, 16% of females had PEFR between 401-450 L/min, 20% female had 451-500, 12% of female had 501-550 L/min, While in aerobics 400L/min is the maximum value and in yoga 550 L/min is the maximum value. PEFR is being easy test for quick assessment of improvement of an over all pulmonary function.<sup>3</sup>

In yoga, breathing is voluntary regulated to make respiration rhythmic and simultaneously to calm the mind<sup>5</sup>. In the present study, yoga and aerobics both are significant on Peak expiratory flow rate but yoga was seen highly significant as yoga strengthens the respiratory musculature due to which chest and lungs inflate and deflate to fullest possible extend and muscles are made to work maximal extend<sup>7</sup>.

The study that supports the present study, according to Shilpa N et. al (2020) showed the significant increase in PEFR values in yoga practitioners as compared to sedentary individuals<sup>5</sup>. As the act of concentration while performing yoga/pranayama removes the attention from worldly worries and de-stress<sup>7</sup>. This stress free state of mind evokes relaxed response in which parasympathetic nerve activity overrides sympathetic activity<sup>7</sup>.

According to Jyoti Sahebrao Kale et. al (2016) the study ‘effect of Sudarshan kriya yoga (SKY) on cardiovascular and respiratory parameters’ showed statically significant ( $p<0.05$ ) lower values of cardiovascular parameters (pulse rate, systolic and diastolic BP) and higher values of respiratory parameters (FVC, FEV1, PEFR, breath holding time) in SKY group as compared to control group i.e. In SKY group the PEFR mean value was  $406.28\pm78.34$  and in control group  $338.4\pm56.61$  with the significance of p-value 0.01. Practicing SKY on regular basis improves many bodily functions. The mechanism by which changes in respiratory functions occur are greater relaxation of respiratory muscles induced by supraspinal mechanisms which increases expiratory reserve volume, contributing to a rise in vital capacity. Lung inflation to near total lung capacity is a major physiological stimulus for release of surfactant and prostaglandins into the alveolar spaces. This causes increase in lung compliance and decrease in bronchiolar smooth muscle tone<sup>8</sup>.

Study did by Candy Sodhi et. al ‘Effect of yoga training on pulmonary function in patients with bronchial asthma’ showed the higher PEFR in group A(yoga) than in group B (control). As pranayama may have psychophysiological benefits by increasing the patients sense of control over stress. yoga stabilizes autonomic equilibrium with tendency towards parasympathetic dominance rather than stress-induced sympathetic dominance. Yoga therapy readjusts the autonomic imbalance, control the rate of breathing and relaxes the voluntary inspiratory and expiratory muscles, which results in decreased sympathetic reactivity<sup>9</sup>. Similar studies, as effect of yoga on cardio-respiratory parameters was carried out by Ashok Solanki et.al<sup>9</sup>, Dr.Vinayak. P.Dojad et.al and Pratik Akhani et.al<sup>10</sup> and showed the significant changes in parameters and had concluded their study as yoga improves respiratory efficiency in healthy individuals and it can be advocated as an adjunctive/alternative to conventional therapy for respiratory diseases<sup>11</sup>.

In the present study, aerobics exercises also have significant changes on Peak expiratory flow rate. According to study conducted by Roopam Bassi et.al ‘The effect of aerobic exercises on PEFR and physical fitness index in female subjects’ there was a significant changes in all parameters, an increase in PEFR, fall in BMI and rise in PFI physical fitness index. Reason of improvement in PEFR values can be because of aerobic exercises, which are known to enhance the breathing efficiency and decrease pulmonary resistance. The improvement in aerobic exercise group may be occurred because of regular exercises strengthen the respiratory muscles(diaphragm and intercostals). They may further help in better chest expansion and therefore improving chest cavity. Larger the chest cavity means more air could be inspired therefore increasing the vital capacity and enabling more capillaries to be formed around alveoli so that more gaseous exchange can take place<sup>3</sup>

Similarly, A study by Chaitra B, Vijay maitri on ‘effect of aerobic exercise training on peak expiratory flow rate: A pragmatic randomized controlled trial, showed a significant p-value in experimental group as compared to control group.

In the present study it is showed as, both the groups statically shows the significant results but yoga is highly significant with the mean value  $406.4 \pm 75.79$  as compare to aerobics with  $363.6 \pm 55.74$ . As Pranayama breathing exercise in yoga, there is an increase in intake of oxygen up to five times. The more oxygen rich blood to brain, heart, lungs & digestive organs will enable these organ to work better and bolster the health of an individual. The breathing patterns in Surya namaskar helps to inhale and exhale to exercises the lungs. It also ensure that fresh blood oxygenated blood is reaching all parts of body.

According to American lung association, when a body exercise heart and lungs work harder to supply the additional oxygen as muscle demands. As aerobics exercise makes muscles stronger it also helps lungs to get stronger<sup>12</sup>

## CONCLUSION

- As the study concludes that the subject of both, Yoga & Aerobics group improved their pulmonary function in female population. But yoga is seen highly significant as compare to aerobics in female population.

## LIMITATIONS OF STUDY

- This was conducted within the age group of 19-35 years.
- Day to day activity were not controlled
- Lifestyle was not considered.

## SUGESTION

- The study can be done in different age groups.
- Sample size can be taken more to observe the changes in large number.
- Other parameters can also be measured for future studies.

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