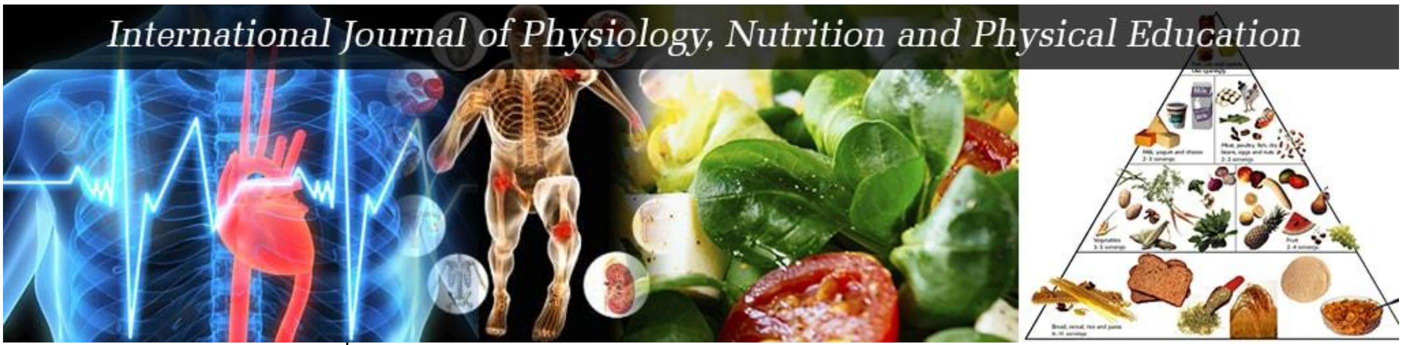
International Journal of Physiology, Nutrition and Physical Education 2018; 3(2): 717-719



ISSN: 2456-0057
IJPNPE 2018; 3(2): 717-719

www.journalofsports.com
Received: 19-05-2018
Accepted: 20-06-2018

Sayad Abdul Hamid
Associate Professor, Dept of Physiology, Kerala Medical College Hospital, Mangode, Cherpulassery, Palakkad, Kerala, India

Dr. Amrith Pakkala
Professor & HOD
Dept of Physiology
Shridevi Institute of Medical Science & Research Hospital, Tumkur, Karnataka, India

Correspondence
Dr. Amrith Pakkala
Professor & HOD
Dept of Physiology
Shridevi Institute of Medical Science & Research Hospital, Tumkur, Karnataka, India

Pulmonary function tests and endurance testing

Sayad Abdul Hamid and Dr. Amrith Pakkala

Abstract
Background: The role of hormones on lung function tests were well known in the normal course of the menstrual cycle. Significant increase in both progesterone (37%) and estradiol (13.5%), whereas no change in plasma FSH & LH was observed in exercising women in previous studies [10, 11]. Therefore this study was intended to see the limitations of the respiratory system in adaptability to exercise in proliferative phase of menstrual cycle in perimenopausal obese homemakers.
Material and methods: Healthy young adult females between 42-45 years who regularly undergo training and participate in competitive middle distance running events for at least past 3 years were considered in the control whereas the study group did not have any such regular exercise program were obese homemakers. The two groups were in perimenopausal age group.
They were made to undergo computerized spirometry after undergoing maximal exercise testing on a motorized treadmill.
Results: It was observed that exercise per se does not cause a statistically significant change in dynamic lung function parameters MMEF, PEFR, MEF 25% to 75% in either of the groups.
Discussion: This finding supports the hypothesis that the respiratory system is not normally the most limiting factor in the delivery of oxygen even under the predominant influence of estrogen in proliferative phase which is further accentuated by exercise.

Keywords: Obese, homemakers estrogen in exercise, PFT, adaptability

Introduction
The role of hormones on the healthy pulmonary system in delivering oxygen to meet the demands of various degrees of exercise has been a matter of differences in opinion. Genomic actions are exerted by steroids such as estrogen, progesterone, testosterone with intracellular receptors [1]. The prevention and treatment of negative affect associated with menopause is becoming increasingly important. Various data suggest that natural changes in endogenous estrogen levels may underlie women increased susceptibility to physiological limitations as a result of the aging process [2]. Fluctuations of ventilation and alveolar p CO_2 in various phases of menstrual cycle have been ascribed to the action of progesterone, though this may not be the sole determinant of these changes [3]. There are conflicting reports that the respiratory System is not normally the most limiting factor in the delivery of oxygen to the muscles during maximal muscle aerobic metabolism whereas others do not subscribe to this [1]. Within this context it is appropriate to study the effect of proliferative phase of menstrual cycle on ventilatory functions after exercise.
Mechanical constraints on exercise hyperpnoea have been studied as a factor limiting performance in endurance athletes [5]'. Others have considered the absence of structural adaptability to physical training as one of the "weaknesses" inherent in the healthy pulmonary system response to exercise [6].
Ventilatory functions are an important part of functional diagnostics [7], aiding selection and optimization of training and early diagnosis of sports pathology. Assessment of exercise response of dynamic lung functions in the healthy pulmonary system in the trained and the untrained has a role in clearing gaps in the above areas especially a special group like perimenopausal women.

Material and methods
The present study was conducted as a part of cardio-pulmonary efficiency studies on two groups of study group consisting of obese women homemakers (n=20) and control group (n=20) comparable in age & sex.

Informed consent was obtained and clinical examination to rule out any underlying disease was done. Healthy young adult females between 42-45 years who regularly undergo training and participate in competitive middle distance running events for at least past 3 years were considered in the control group whereas the study group did not have any such regular exercise program. Smoking, clinical evidence of anemia, involvement of cardio-respiratory system was considered as exclusion criteria. Menstrual history was ascertained to confirm proliferative phase of menstrual cycle.

Detailed procedure of exercise treadmill test and computerized spirometry was explained to the subjects.

Dynamic lung functions were measured in both groups before exercise was evaluated following standard procedure of spirometry using computerized spirometer Spl-95. All subjects were made to undergo maximal exercise testing to VO2 max levels on a motorized treadmill.

After exercise, the assessment of dynamic lung functions was repeated. All these set of recordings were done on both the non-athlete as well as the athlete groups.

Statistical analysis was done using paired students t-test for comparing parameters within the group before & after exercise testing and unpaired t-test for comparing the two groups of subjects.

A p-value of < 0.01 was considered as significant.

Results

Table 1: Comparison of anthropometric data & VO2 max of study and control with statistical analysis.

Parameter	Study group	Control group	P- value	Remarks
Age (Yr)	43.51 ± 2.62	43.47 ± 2.84	< 0.10	NS
Height (cm)	159.71 ± 7.50	155.91 ± 7.24	< 0.10	NS
Weight (kg)	72.66 ± 5.64	55.43 ± 6.26	<0.05	S
BMI (kg/m²]	28.99 ± 2.47	21.60 ± 1.75	< 0.001	NS

NS=Not significant
P<0.01 Significant
P<0.001 Highly Significant
P<0.05 Significant

Table 2: Comparison of Dynamic Lung Functions of study group before exercise testing (BE) & after exercise testing (AE) with statistical analysis. Non-Athletes (n=10)

Parameter	BE	AE	P- value	Remarks
FVC (L)	3.12 ± 0.52	3.01 ± 0.56	< 0.10	NS
FEV1 (L)	3.10 ± 0.50	2.97 ± 0.05	< 0.05	NS
FEV1/FVC	0.95	0.96		
MMEF (L/S)	4.03 ± 1.31	4.05 ± 1.46	< 0.10	NS
PEFR (L/S)	7.01 ±1.78	6.72 ±1.96	< 0.10	NS
MEF 75(L/S)	6.12 ±1.94	5.54 ±1.74	< 0.10	NS
MEF 50(L/S)	5.62 ± 1.44	5.61 ± 1.63	< 0.10	NS
MEF 25(L/S)	3.42 ± 1.16	3.68 ± 1.47	< 0.10	NS

NS = Not Significant
P<0.01 is considered significant

Table 3: Comparison of Dynamic Lung functions of control group before exercise testing (BE) & after exercise testing (AE) with statistical analysis. Athletes (n=10)

Parameter	BE	AE	P- value	Remarks
FVC (L)	3.31 ± 0.39	3.11 ± 0.30	< 0.05	NS
FEV1 (L)	3.22 ± 0.30	3.10 ± 0.30	< 0.05	NS
FEV1 /FVC	0.99	0.99		
MMEF (L/S)	6.02 ± 1.21	6.44 ± 1.07	< 0.1	NS
PEFR (L/S)	8.74 ±1.09	8.49 ± 0.84	< 0.1	NS
MEF 75(L/S)	8.28 ±1.28	8.12 ±1.13	< 0.1	NS
MEF 50(L/S)	6.29 ± 1.20	6.73 ± 0.92	< 0.1	NS
MEF 25(L/S)	4.34 ± 1.11	5.00 ± 1.05	< 0.05	NS

NS = Not Significant
P<0.01 is considered significant

Discussion

Considerable information can be obtained by studying the exercise response of dynamic lung functions in untrained and trained subjects.

Intra group comparison is helpful in noting the exercise response and inter-group comparison in evaluating adaptations of the respiratory system to training.

On comparing the anthropometric data of the two study groups it is clear that the age & sex matched subjects have no statistically significant difference in height taking a p- value of <0.05 as significant.

VO2 max values were higher in controls and was statistically significant (*P*<0.001). This observation is expected in view of the training stimulus and adaptability of both the pulmonary system and the cardio vascular system. VO2 max is an objective index of the functional capacity of the body's ability to generate power.

Forced vital capacity (FVC) is the volume expired with the greatest force and speed from TLC and FEV1 that expired in the 1st second during the same maneuver. The FEV1 was initially used as an indirect method of estimating its predecessor as the principal pulmonary function test, the maximal breathing capacity [8].

On comparing the response of exercise within the two study groups and in between them, there is no statistically significant difference in FVC & FEV1 under any condition.

A normal FEV1/FVC ratio is observed always.

Another way of looking at forced expiration is to measure both expiratory flow and the volume expired. The maximum flow obtained can be measured from a flow–volume curve is the peak expiratory flow rate (PEFR). The peak flow occurs at high lung volumes and is effort dependent. Flow at lower lung volumes is effort independent. Flow at lower lung volumes depends on the elastic recoil pressure of the lungs and the resistance of the airways upstream or distal to the point at which dynamic compression occurs. Measurements of flow at low lung volumes, mid expiratory flow [MEF 25% to 75%] are often used as indices of peripheral or small airways resistance [8].

On examining Table 2 & Table 3 it is clear that exercise per se does not cause a statistically significant change in dynamic lung function parameters MMEF, PEFR, MEF 25% to 75% in either of the groups. This finding supports the hypothesis that the respiratory system is not normally the most limiting factor in the delivery of oxygen. These findings are in line with other studies Bonen A *et al* and Jurkowski JE *et al*. [10, 11]

Thirty minutes of exercise at 74% of VO2 was found to cause a significant increase in both progesterone (37%) and estradiol (13.5%), whereas no change in plasma FSH & LH was observed in exercising women [7]; others have confirmed these findings [8]. This finding supports the hypothesis that the respiratory system is not normally the most limiting factor in the delivery of oxygen even under the predominant influence of a sedentary and obese life style of the group studied.

References

1. Cunningham GR, Tindall DJ, Means AR. Differences in steroid specificity for rat ABP. Steroids. 1979; 33:261-276.
2. Amrith Pakkala. Mid- career blues in healthcare workers: A physiological approach in ethical management. J Mid-life Health. 2010; 1(1):35-37.
3. Frye CA. Steroids, reproductive endocrine function and affect- A review. Minerva Ginecol. 2009; 61:541-562.
4. Guyton AC, Hall JE, editors–Text Book of Medical Physiology, 11th ed. Saunders, 2006, 1061-62.
5. Johnson BD, Saupe KW, Dempsey JA. Mechanical constraints on exercise hypernea in endurance athletes. J Appl Physiol. 1992; 73(3):874-86.
6. Dempsey JA, Johnson BD, Saupe KW. Adaptations and limitations in the pulmonary system during exercise. Chest. 1990; 97(3):81s-87s.
7. Andziulis A, Gocentas A, Jascaniniene N, Jaszczanin J, Juozulynas A, Radzijewska M. Respiratory function dynamics in individuals with increased motor activity during standard exercise testing. Fiziol ZH. 2005; 51(4):80-95.
8. Seaton A, Seaton D, Leitch AG, editors–Crofton and Douglas's Respiratory Diseases, 5th ed. Oxford: Oxford University press, 2000, 43-45.
9. Ganong WF, Review of Medical Physiology, 22nd ed, 2005, 444.
10. Bonen A, Ling WY, MacIntyre KP *et al*. Effects of exercise on the serum concentrations of FSH, LH, progesterone and estradiol. Eur J Appl Physiol. 1979; 43:15.
11. Jurkowski JE, Jones NL, Walker C *et al*. Ovarian hormonal responses to exercise. Eur J Appl Physiol. 1978; 44:109.