EFFECT OF PHYSICAL ACTIVITY ON VARIABLES OF LUNG FUNCTION: AN OBSERVATIONAL STUDY

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Abstract: Background and Objectives: Physical activity is known to improve physical fitness and to reduce mortality and morbidity from numerous clinical conditions .There is positive relation seen between physical activity and variables of lung function (FVC, FEV1,F EV1/FVC, FEV0.5, PEFR, $_{FEF\ 25-75\%}$, MVV).The major purpose of this analytic type of observational study is to explore the role of physical activity on respiratory fitness in healthy people. **Methods:** 90 subjects of age group 18-25 years divided into three groups. Each group is having 30 subjects. Subjects were divided into three groups according to leisure time physical activity assessed by metabolic equivalent minutes/week. Variables of lung function recorded were FEV_1, EV1/FVC, PEFR, F EF_{25-75}, and MVV**. Results** The results of present study were analysed, each group was compared by using ANOVA. p value <0.05 were considered significant. In the present study values of FVC, FEV1, FEV1/FVC were increased .FVC, FEV1, FEV1/FVC increased significantly with increase in physical activity ($p<0.05$) whereas FEF $_{25-75\%}$ and MVV showed highly significantly increase ($p<0.001$).

Interpretation & conclusion: Present study strongly suggests that the intensity or severity of the sports determines the extent of strengthening of the respiratory muscles with a resultant increase in the lung volumes.

Key words: Metabolic equivalent (MET). , physical activity, spirometry.

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Introduction:

Physical activity is known to improve muscle Strength, enhance bone accretion, prevent child obesity, and reduce the risk of cardiovascular diseases[1]. Lung function is an important predictive tool of both morbidity and mortality in medical practice. The Buffalo Health Study concluded that pulmonary function is a long term predictor of overall survival rates in both genders and can be used as a tool for general health assessment[2]. Exercise is a stressful condition that produces marked change in body functions, improves endurance and reduces breathlessness. Skeletal muscles control many crucial elements of aerobic conditioning, including lung ventilation. The possible explanation could be that regular forceful inhalation and deflation of the lungs for prolonged period leads to strengthening of respiratory muscles[3] .There might be an increase in the maximal shortening of the inspiratory muscles as an effect of training, which has been shown to improve lung function parameters[4].

A MET is defined as resting metabolic rate , that is ,the amount of oxygen consumed at rets, sitting Quietly, approximately 3.5ml O2/KG/min. metabolic equivalents are simple practical and easy understood procedure to quantify the energy cost of activities. The MET values were adapted from an expert committee report submitted to the Canada fitness survey[5]. So this study was intended to assess the effect of physical activity according to MET value on variables of lung function.

Material and Methods:

The protocol of this study was approved by the institutional review board of SMS Medical College and associated hospitals ,Jaipur.Number of subjects - 90 subjects of age group 18-25 years were divided into three GROUPS according to MET value [6](after calculating 7days physical activity) . Each group has 30 subjects **Category 1** as Group1 (LOW) this has lowest level of physical activity. Subjects who do not meet criteria for categories 2 and 3. **Category 2** as Group2 (MODERATE)- 3 or more days of vigorous intensity activity of at least 20 minutes per day OR 5 or more days of moderate intensity activity and/or walking at least 30 minutes per day. OR 5 or more days of any

combination of walking, moderate intensity or vigorous intensity activities achieving I minimum total physical activity of at least 600
MET-minutes week. **Category 3**as Group3(HIGH) Vigorous- intensity activity on at least 3 days achieving a minimum total physical activity of at least 1500 MET-minutes/week OR 7 or more days
Of any combination of walking, moderate intensity or vigorous intensity activities achieving a minimum total physical activity of atleast 3000 MET-minutes/week .

Physical activity assessment
The physical activity score was derived by multiplying each activity in hours by the MET score assigned for the activity to give total MET hours of activity for each individual[7].
Inclusion criteria: Apparently healthy young adults with age group 18-25 years.
Exclusion criteria-Subject having following features will be excluded.
Cardiorespiratory disease, Thyroid disease Diabetes mellitus, Smokers, Alcoholic, any previous history of COPD.

Lung function test:
Variables of lung function recorded by spirometer were FVC, FEV_1,FEV_1/FVC, $FEV_{0.5}$, PEFR, $FEF_{25-75\%}$, and MVV for all 3 groups.

Statically Analysis:
Significance of difference in means in all the 3 Groups was inferred by one way ANOVA.

Result:
Table 1 shows the base line characteristics of 3 groups divided according MET score and no significant differences was observed among 3 groups .Thus 3 groups were considered as homogenous groups.
Table 2 showed significant increase ($p<0.05$)in FVC,FEV_1,EV_1/FVC with increase of day to day physical activity as calculated by MET score.EF25-75 and MVV showed highly significant increase($p<0.001$)with increase in day today physical activity as calculated by MET score.

Table 1: Baseline characteristics of all 3 groups of study subject

	GROUPI	GROUP2	GROUP3
Age(years)	19.09±1.75	18.88±1.57	19.40±1.79
Height,(cm)	169.68±4.49	172.20±5.66	172.88±6.50
Weight(,kg)	63.07±14.27	63.07±8.12	64.56±13.4
BMI(Kg/m^2)	21.87±4.16	21.87±2.75	21.62±3.4

Table 2: Comparison of variables of lung function among 3 groups

Para Meters	GROUP1 (mean±sd)	GROUP2 (mean±sd)	GROUP3 (mean±sd)	pVALUE
FVC(L)	2.81±.61	3±.64	3.5±.62	<0.05 (S)
FEV_1(L)	2.61±.46	2.89±.34	3±.38	<0.05 (S)
FEV1/FVC	94.85±2.53	96.4±2.4	99.17±2.3	<0.05 (S)
PEFR(L)	6.36±2.8	7.3±2.9	3±2.66	>0.05 (NS)
FEF_{25-75}(L/S)	4.3±1.29	5.03±1.77	4.9±1.55	<0.001 (HS)
FEV0.52	1.99±1.77	2.33±.61	2. 3±.54	>0.05 (NS)
MVV(L/M)	105±20.5	125.7±21.5	115.5±17.1	<0.001 (HS)

Discussion:
The results of the present study suggested that there was a significant increase in lung function parameters with increase in physical activity.
Our finding are in accordance with previous studies that physical inactivity is linked with low cardiovascular fitness and thus recognised as important cause of morbidity and mortality [8-9] .A study on Chinese school children showed that physical activities positively associated with lung function growth [10]. Bernsten and colleagues found that FVC and FEV1 tended to increase with increasing level of physical activity[11]. Jones et al reported that physical active children had a greater ventilatory capacity than inactive peers[12]. In Norway, Nystad et al. found a trend of decline in lung function with decreasing level of physical activity in all age groups in both men and women [13]. Another two longitudinal studies demonstrated that physical activity was associated with a slower rate of decline in pulmonary function during 3.7-year and 25-year follow-up period[14-15] .

An association between physical activity and FEV_1 and FVC has been reported by previous studies in the general population. Men who remained active had higher FEV_1 and FVC than those who led a sedentary lifestyle [16]. In our study improvement in FEV_1 after an 8-week exercise course is comparable to a study in which significant augmentation in FEV_1 and FVC were observed after physical training in healthy male welders[17]. Another variable is the FVC, which is the maximum volume of air exhaled with maximal effort with deep inspiration, and predicts the compliance of lungs and the chest wall. FEV_1/FVC (FEV1%) is the ratio between the two and in healthy adults this should be approximately 75-80%[18]. Our study was done in order to analyse the effects of physical activity on lung functions in healthy adults. It's limitations included the small sample size, inability to measure maximal oxygen uptake (VO2 max), forced expiratory flow and peak expiratory flow

Conclusion

Repeated periodic exercise helped in improving lung functions, especially FEV1 and ratio of FEV1/FVC. Periodic measurement of FEV1 can help in generating awareness regarding lifestyle modifications, and acquiring a healthy habit of being active

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