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Effects of Aerobic Exercise in Improving Cardio-Respiratory Fitness among Young Male Adult Smokers.

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ABSTRACT

Smoking has become a major problem as it contributes to various health issues, it is known to reduce cardio-respiratory fitness by affecting the respiratory functions like reduced lung volumes and develops dyspnea because of pathological changes due to smoke. Experimental Study was performed in 60 male subjects randomly allocated into 2 groups, Group A Experimental group and Group B Control group based on inclusion and exclusion criteria, Both the groups underwent pre test assessment their dyspnea level was graded using NYHA grading and they were assessed for spirometric variables such as FEV₁, FVC, FEV₁/FVC, MVV. And their cardio-respiratory fitness was assessed using YMCA 3 minute step test. Group A was treated with Aerobic exercise for 4 times a week for a total period of 6 weeks and Group B subjects were treated with Diaphragmatic breathing exercises. At the end of 6 weeks both the groups were assessed for post test same as of pretest and results revealed that group A significantly improved in all variables compared to group B therefore study concludes that Aerobic exercise improved the cardio respiratory fitness among male adult smokers by improving FEV₁, FVC, MVV and YMCA step test scoring and reduced dyspnea.

Keywords: Smoking, Cardio-respiratory Fitness,

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INTRODUCTION

Smoking is known as the silent killer. It slowly destroys a person inside without him knowing the changes; cigarette smoking is known to be the most common type of smoking. It is very addictive, mainly due to the chemical called nicotine which is present in the tobacco of cigarettes. It is one of the 6000 chemicals inside a cigarette. Hindustan Times estimated that 23% of Indian male are smokers in 2012 [1].

World Health Organization reported that 100 million people were killed due to smoking, worldwide in 20th century and by 2030 it could increase up to 10 billion deaths per year [2]. Leading researchers have predicted that lack of or insufficient physical activity could overtake the smoking to become the biggest health concern by 21st century [3].

Cigarette smoke contains more than 400 chemicals like nicotine, carbon monoxide, benzene etc. they can cause changes in the genetic levels of the cells in the lungs, these chemicals affects the cardiovascular function and contributes to various diseases like cardiovascular disease, Chronic obstructive pulmonary disease and can also lead to cancer of the lungs [4] due to the presence of cyanide, butane, ammonia, carbon monoxide and 50 others known carcinogens which is one of the most common cause of cancer to the body.

Smoking is known to harm mucociliary transport, As the cigarette smoke causes metaplastic alterations to the respiratory mucosa and increases the size and number of goblet cells, Smoking can decrease the capacity of lungs by depositing tiny particles of chemicals inside the lungs and on the wall of the airways, that causes irritation to the walls and inflammatory response to the walls [5], contributing to reduced lung volumes. Though people have become aware of the ill effects done by smoking to the body and to the society, still smoking persists and has become a burden contributing various diseases.

George Papathanasiou et al stated that pathophysiology of smoking is widely discussed in various studies and there have been researchers finding the effects of smoking on cardiovascular fitness and he concluded that exercise tolerance level has been significantly impaired among young male smokers by decreasing the capacity of their circulatory system. He also stated when compared to nonsmokers, smokers exercise tolerance level was lower [6].

Adrian stated that Exercise has been recommended as an aid for smoking cessation. But various studies have shown mixed effects of exercise on smoking cessation. And it has been proved that exercise plays a vital role in acute management of tobacco withdrawal symptoms [7]. Smokers generally live a sedentary life style which further increases the independent risk factor for lung cancer and cardiovascular disease [8].

Smoking greatly reduces the cardio-respiratory fitness among the individuals, by developing adverse effect on the lung functions by decreasing the Forced Expiratory Volume in one second (FEV1), Forced Vital Capacity (FVC), FEV1/ FVC, it contributes to various lung diseases like chronic Bronchitis, Emphysema and Lung cancers. Smoking also produces acute changes in the lungs, like alterations in resistance to airflow, cough and irritation of airways [9]. Performing aerobic exercises has positive effects in improving the cardio-respiratory fitness and also reduces the risk of developing respiratory diseases. It also reduces dyspnea which the majority of the smokers have.

This experiment can become an important step in the rehabilitation of smokers as it increases the awareness of the effects of smoking to the lungs and increase lung functions. For these reasons, it is essential to take measures to reduce and prevent health risks among smokers by improving cardio-respiratory fitness through aerobic exercises. Hence, the purpose of the study is to determine the effects of aerobic exercises in improving cardio-respiratory fitness among young male adult smokers.

METHOD

Experimental Study was performed with 60 participants in two different colleges; they were randomly allocated into 2 groups, Group A Experimental group and Group B Control group. Study included male adult smokers, participants between the age of 20 to 35 years. Participants were included if they had a body mass index between 18.5-24.9 kg/m², those with dyspnea - Grade III New York Heart Association (NYHA)

grading and Young Men’s Christian Association (YMCA) 3 minute step test scoring between 95-130. Subjects were excluded if they are not co-operative and mentally unfit, Individuals with cardiac and renal problems, females, and BMI less or more than expected range.

Ethical approval obtained individually in both the institutions, Informed consent obtained from all the participants prior to initiation of the study. After subjects met the selection criteria both the groups underwent pre test assessment their dyspnea level was graded using NYHA grading and they were assessed for spirometric variables such as FEV₁, FVC, FEV₁/FVC, MVV. And their cardio respiratory fitness was assessed using YMCA 3 minute step test [10]. Aerobic training was performed for 4 times a week for a total period of 6 weeks following which post test assessment was performed same as of pretest.

Group A Subjects were given Aerobic Exercises, consists of 3 phases - 45 minutes duration per session per day.

- Warm Up phase – This phase is performed to prepare the body for exercise, Breathing exercises and active free exercises to upper and lower limbs performed for 5 to 7 minutes
- Dynamic phase – Aerobic exercise – Walking & Jogging was performed each for 15 minutes.
- Cool down phase – performed for 10 minutes, to allow the body to come back to the resting level, breathing exercises and stretching of large muscle groups were performed.

Group B subjects were treated with Diaphragmatic breathing exercises with 10 repetitions for 5 sets per day.

The collected Pretest and post test data were analyzed, The mean value and standard errors were calculated for different variables and the difference in mean value was tested for statistical significance using parametric tests such as paired t test used to compare the data within the group and unpaired t test to compare the data between the groups.

RESULTS

Table 1: Comparison of pretest and post results within Group A

Test	Mean		S.D.		Paired t-value	P value
	Pre test	Post test	Pre test	Post test		
FEV1	3.394	3.842	0.22	0.21	28.5746	<0.0001
FVC	4.361	4.586	0.172	0.180	4.6583	<0.0004
MVV	122.67	129.27	3.52	4.28	8.3373	<0.0001
YMCA	111.20	102.40	5.53	8.85	6.5213	<0.0001
Dyspnea	3	1.47	0.00	0.52	11.5000	<0.0001

Figure 1: Comparison of Post test results of FEV1 between Group A and Group B

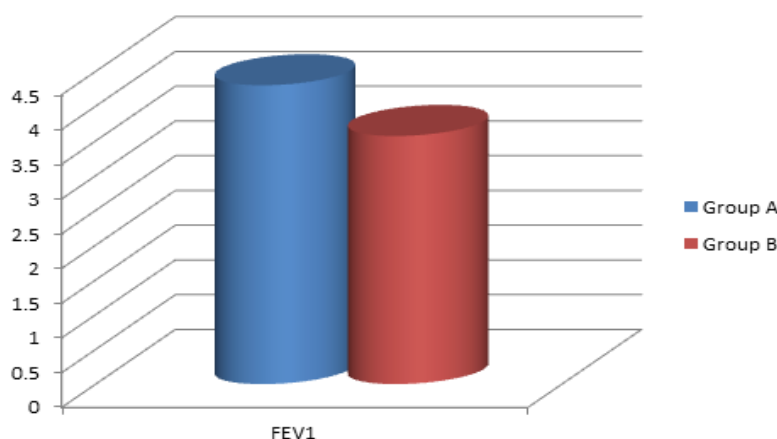


Table 2: Comparison of pretest and post results within Group B

Test	Mean		S.D.		Paired t-value	P value
	Pre test	Post test	Pre test	Post test		
FEV1	3.50	3.57	0.26	0.28	0.9701	0.3485
FVC	3.88	3.72	0.39	0.36	1.6047	0.1309
MVV	114	115	13.94	13.76	1.1938	0.2524
YMCA	114	115	6.18	8.32	0.4910	0.6311
Dyspnea	3	2.27	0.00	0.70	4.0359	0.0012

Figure 2: Comparison of Post test results of FVC between Group A and Group B

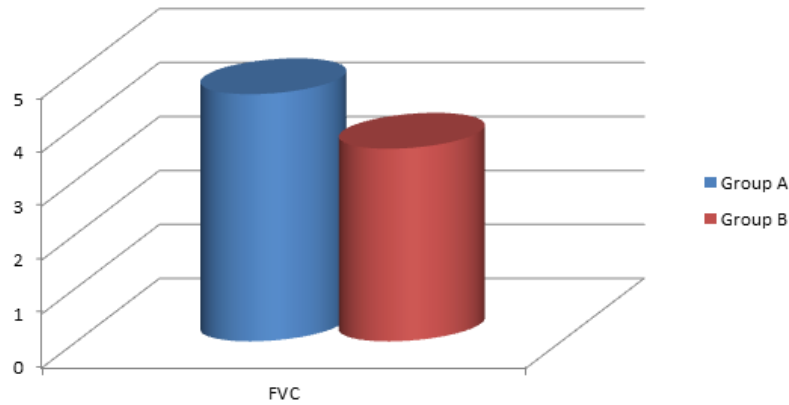


Figure 3: Comparison of Post test results of MVV between Group A and Group B

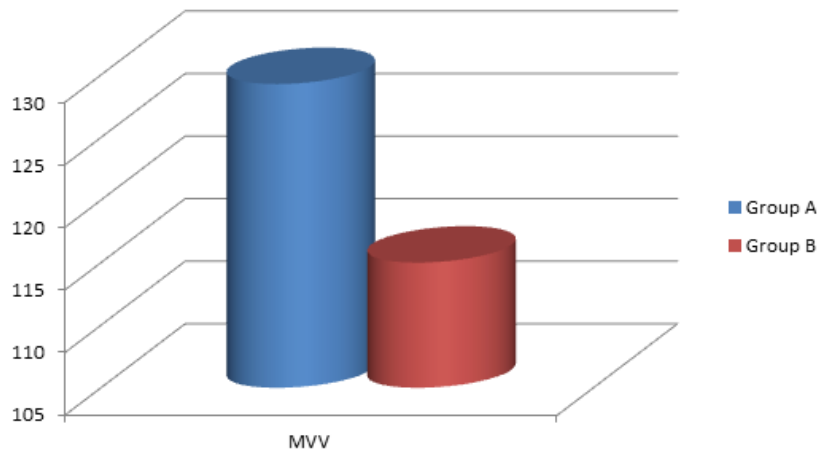


Figure 4: Comparison of Post test results of YMCA between Group A and Group B

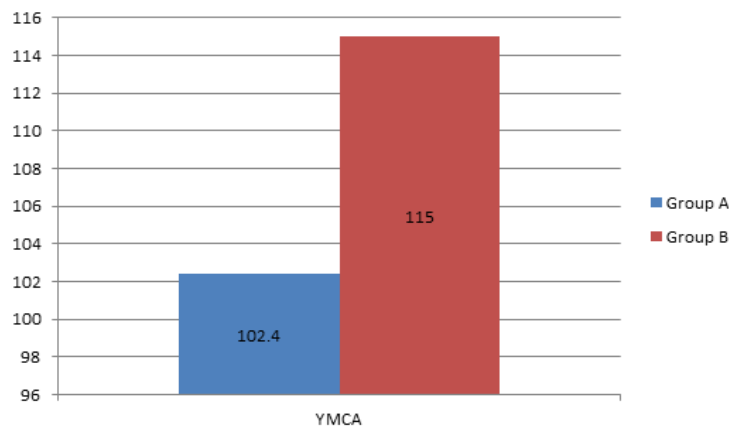
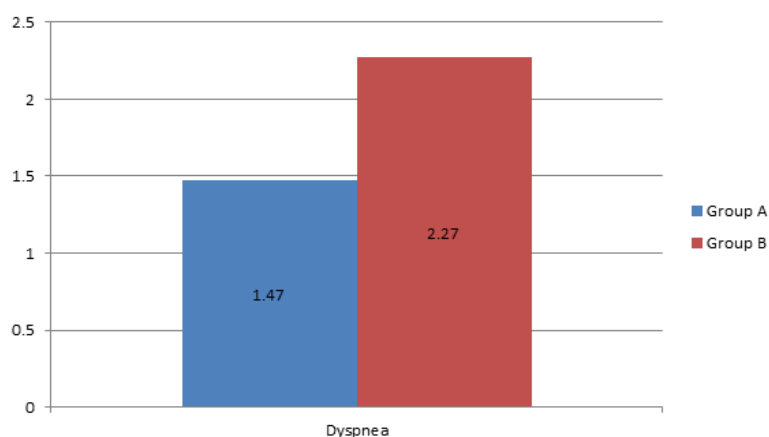


Figure 5: Comparison of Post test results of Dyspnea between Group A and Group B



DISCUSSION

Cigarette smoking is one of the most preventable and modifiable risk factor of all types of cardiovascular disease [20], as cardiovascular disease is the leading cause of 40% mortality in developing countries [13]. Rebecca et al have stated that passive smoking also have biological effects on the body it contributes to cardiovascular disease, lung cancer, obstructive lung diseases, lower respiratory tract infections and breast cancer in younger women [11]. Tobacco is one of the most important public health burden, Tobacco also have various harmful effects on peripheral muscles contributing to decreased exercise tolerance, associated with lower cardiovascular capacity, impaired heart response to exercise, increased pulmonary airway resistance, decreased capacity of arteries to transport oxygenated blood during exercise, these factors significantly contribute to exercise [12,13].

Smoking causes decreased intake of oxygen because of which resting heart rate in smokers are higher than in non smokers, their heart is working harder to pump blood and oxygen in the body ultimately reducing the cardiovascular fitness among smokers [14]. Park et al concluded that smokers who perform aerobic exercise had lower arterial stiffness when compared with sedentary smokers [15].

As we know Exercise training is important as a part of Pulmonary rehabilitation protocol for COPD, it is also an adjuvant treatment in the prevention of the progression of pulmonary disease among smokers. Regular aerobic exercise of moderate intensity serves as an antioxidant effect of exercise that combats cellular oxidative stress which is induced by cigarette smoke and prevents from the development of COPD [16].

Harry Prapavessis et al stated that various researches have indicated that difficulty to quit smoking or relapse due to the physiological and psychological changes such as anxiety, stress, sleep disturbances, weight gain due to smoking withdrawal. There is numerous numbers of studies proving on the effects of exercises on coping ability to manage the negative consequences of smoking withdrawal [17]. Literature also states that aerobic exercise has positive effects on physical functioning, psychological status and mental processes. Therefore the study states that aerobic exercise could benefit individuals who wish to quit smoking.

Ussher et al review had been discussed on at what point of time the exercise program to be begin by the smoker. For which some studies have reported that physical activity program to be begin prior to quit smoking, In order to allow the person to adjust to the changes and demands met by quitting smoking. It has been reported that abstaining smokers are more confident about adopting them to exercise than to prepare to quit smoking. As that exercise could potentially manage the withdrawal symptoms. It has been concluded that there is no harm in promoting physical activity to smokers [18].

R. Farid et al had demonstrated the effect of aerobic exercise among asthma patients and he concluded that aerobic sport exercise increases the FEV1, FVC, PEF & FEF and he added that aerobic exercise program can be a complementary program to medical treatment among asthma patients [19]. Smokers have limitations in cardiopulmonary function as aerobic energy metabolism plays the critical role in supplying energy. Smokers are typically known to have poor cardiopulmonary fitness, smoking limits oxygen delivery

through capillaries in muscles, reducing the ability of skeletal muscles. Hence our study shows aerobic exercise for smokers helps to improve cardio-respiratory fitness.

CONCLUSION

Aerobic exercise improved the cardio respiratory fitness among male adult smokers by improving the spirometric variables FEV₁, FVC, MVV and YMCA step test scoring and reduced dyspnea.

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