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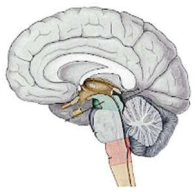

The Effect of Aerobic Exercise on Forced Expiratory Volume in One Second (FEV_1) Among University Students

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ABSTRACT

Harmful lifestyles and behaviors are emerging in society, one of which is a sedentary lifestyle or inactive behavior shown by a lack of physical activity as seen in college students. Because college students rely heavily on technology that allows them to do anything without moving much. FEV_1 is a parameter used to assess lung function. A decrease in FEV_1 can have an impact on a person's lung capacity and health. One way to improve lung function is by doing aerobic exercise. Objective: This study aims to determine the effect of aerobic exercise on Forced Expiratory In One Second (FEV_1) in university students. Methods: This research is a type of quasi-experimental research with a one group pretest and posttest design. The sample of this study were students who fit the inclusion and exclusion criteria. Samples were given jogging exercises 12 times in 1 month and spirometry measurement tools to determine FEV_1. Results: Based on the paired t test, the p-value = 0.000 <0.05, which means that there is an effect of aerobic exercise on FEV_1. Conclusion: Based on the results of the study, it was found that there was an increase in FEV_1 in students after being given aerobic exercise in the form of jogging.

INTRODUCTION

A sedentary lifestyle, characterized by a lack of physical activity, is a prevalent concern in modern society, particularly among students. With technological advancements enabling individuals to complete tasks with minimal physical effort, students are becoming increasingly reliant on digital solutions. A sedentary lifestyle and insufficient physical activity are significant risk factors for cardiovascular diseases. College students, in particular, are among the most vulnerable groups, as prolonged sitting poses substantial health risks (Adibah Afriastini et al., 2023). A sedentary lifestyle, including extended periods of sitting, can weaken respiratory muscles and reduce lung capacity compared to physically active individuals. Those who engage in regular exercise tend to have greater lung capacity than those who do not. A lack of physical activity can result in respiratory maladaptations, including intra- and extrathoracic obstruction, expiratory flow limitation, respiratory muscle weakness, and hypoxemia (Wiraputri A.A.R.K, Wardana I.N.G, Yuliana, 2021).

Aerobic exercise is a form of sustained physical activity that requires oxygen as an energy source and engages large muscle groups. This type of exercise typically lasts between 20 to 50 minutes, is performed at least three times per week, and is conducted at an intensity of 60–80% of maximum heart rate (MHR) or 50–85% of maximal oxygen uptake. Aerobic exercise provides numerous health benefits, including improved circulation, cardiovascular and pulmonary health, and weight management. Common

aerobic exercises include walking, cycling, jogging, and aerobics (Hita, 2020). Health experts recommend taking at least 10,000 steps per day to attain optimal health benefits and mitigate the risks associated with physical inactivity. According to the World Health Organization (WHO), 60% to 85% of the global population does not engage in sufficient physical activity (Fatima et al., 2024).

Low levels of physical activity negatively affect lung function, including forced expiratory volume in one second (FEV_1). A decline in FEV_1 indicates deteriorating lung function, which can impact an individual's physical capacity. Reduced physical activity is associated with diminished cardiac function, systemic inflammation, and muscle weakness. A decline in FEV_1 is linked to health conditions that affect quality of life, including dyspnea (shortness of breath), reduced exercise capacity, lung hyperinflation, an increased risk of cardiovascular diseases, and impaired lung function (Shin, 2018).

FEV_1, or Forced Expiratory Volume in One Second, refers to the amount of air exhaled from the lungs in the first second after a maximal inhalation. It is commonly used as an indicator of lung function to assess bronchospasms, obstructive airway diseases, and the effectiveness of bronchodilators (Basuki et al., 2019).

METHODS

This study used a one group pre-test and post-test design and was classified as quasi-experimental. The research sample was undergraduate Physiotherapy students of Muhammadiyah Malang class of 2021 who met the inclusion criteria. The number of samples was 43, and 9 people were droup out, so the total sample was 34 samples that met the inclusion criteria. This study was conducted for 4 weeks with a total of 12 jogging sessions dosed 3 times a week for 30 minutes at intervals and the instrument used in this study was spirometry to determine FEV_1. Data analysis was performed using a paired t test with a p value <0.05 because the results of the Shapiro-Wilk normality test showed that the data were normally distributed. Equipped with certificate number E.4.d/064/KEPK/FIKES-UMM/IX/2024, this research has successfully completed the ethical examination.

RESULTS AND DISCUSSION

The following is a table of research results based on the data in table 1 characteristics of respondents This study involved a total of 34 respondents consisting of 18 women and 16 men where the respondents were included in the inclusion criteria. average body weight is 55.71 kg and average height is 162.82 cm, which shows that respondents have characteristics with normal BMI.

Table 1 Participant Characteristics

	n	Mean	Minimum	Maximum
Age (years)	34	21.31	19	23
Weight (kg)	34	55.71	44	74
Height (cm)	34	162.82	148	180
BMI	34	20.9806	18.51	24.97

Table 2 Test Results on the Effect of the Average FEV_1 Value

FEV1	Mean	Standard deviation	P value
Pre test	2,3497	0.39929	0,000
Post test	2,3747	0.39782	

The comparison of the average FEV_1 values before and after four weeks of jogging is presented in Table 2. Before the jogging program, the average FEV_1 value was 2.3497 L, which increased to 2.3747 L after the program. This increase indicates a positive effect of jogging on lung function. The data distribution before and after the four-week jogging program was found to be normal. Given the normal distribution, a paired t-test was conducted. The results of the paired t-test confirmed that aerobic exercise had a significant impact on FEV_1 ($p < 0.05$), with $p = 0.000$.

The findings demonstrate that aerobic exercise significantly improved FEV_1 values, indicating that regular physical activity can enhance lung capacity and reduce the risk of declining lung function. Aerobic exercise positively impacts lung health and function. Additionally, cardiovascular endurance can be improved through aerobic training, which contributes to overall physical health (Chuzhou, 2023).

A lack of physical activity, sedentary behavior, and technological advancements are primary contributors to reduced FEV_1 levels. The current population spends excessive time playing video games and watching television, leading to decreased physical activity as they age. This results in reduced cardiorespiratory fitness, which negatively impacts lung health. Low levels of physical exercise can also lead to cardiorespiratory issues such as dyspnea (Hendrawan et al., 2023).

Aerobic exercise training has been shown to have positive effects on lung function, including Forced Expiratory In One Second (FEV_1). Increased lung capacity and efficiency can result from regular aerobic activity that strengthens and stretches the respiratory muscles. This improvement is due to the increased oxygen demand during aerobic activity, which strengthens the respiratory muscles and improves overall lung function. In addition, aerobic exercise can affect lung capacity because the more frequent aerobic exercise the greater the lung capacity. Increasing lung capacity can have a beneficial effect on FEV1 and overall lung function so as to increase respiratory muscle strength, endurance, and oxygen exchange efficiency (Dumat et al., 2016).

Jogging is a variant of physical exercise characterized by running at a moderate pace with the aim of improving overall fitness levels. Jogging is one of the easiest daily exercise and fitness methods to do and trains muscle and body coordination. Jogging not only trains muscle and body coordination but with jogging can increase the awareness of today's adolescents of the importance of physical fitness for health (Prasetya et al., 2024). Regular jogging can cause physiological changes in the lungs. With regular exercise, it can increase the efficiency of oxygen gas exchange and can strengthen respiratory muscles including the diaphragm muscle. Numerous studies have shown that jogging has the potential to improve overall cardiorespiratory capacity. In addition, jogging contributes to increasing the pumping capacity of the heart, strengthening the heart muscle, and the body's efficiency in utilizing oxygen (Barbieri et al., 2023).

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that aerobic exercise influences FEV_1. The results demonstrate a significant difference in FEV_1 values readings before and after jogging following a four-week jogging program, with a p-value of 0.000.

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