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Investigation of the Effect of Aerobic and Anaerobic Endurance Performance of Faculty of Sport Sciences on Spirometric Values

[1]Ercan Gür, [2]Gürkan Tokgöz, [1]Mustafa Karadağ, [1]Fatih Mehmet Uğurlu, [3]Ramazan Erdoğan
[1]Fırat University, Faculty of Sport Sciences, Elazığ/Turkey
[2]Firat University Institute of Health Sciences, Elazığ/Turkey
[3]Bitlis Eren University School of Physical Education and Sport, Bitlis, Turkey

Abstract

The aim of this research is to compare the spirometric values of male and female students at different performance levels studying at the Faculty of Sport Sciences. 13 female students (average age: 22.38) and 11 male students (average age: 22.45) studying at the Faculty of Sport Sciences of Fırat University voluntarily participated in the research. The participants' anaerobic power values were measured with the Wingate test, their aerobic capacity with the Yo-Yo test, and respiratory function values with the spirometer. In spirometric measurements, forced expiratory volume in one second FEV1, forced vital capacity (FVC), forced expiratory volume/forced vital capacity percentage, (forced expiratory volume/ forced vital capacity percentage – FEV1/ FVC%) and peak expiratory flow (PEF) values were recorded. Statistical analyzes of the obtained data were made with the SPSS 22.0 program, and the level of significance was determined as $p<0.05$. As a result of the statistical analysis of the data, no significant difference was found in the comparison of the spirometric values of female and male students in resting, aerobic and anaerobic performances ($p<0.05$). In comparisons made according to the smoking variable, no significant differences were found in spirometric measurements, anaerobic power and aerobic capacity ($p<0.05$). As a result, the spirometric measurement values of male and female students studying at the Faculty of Sport Sciences in different performances did not differ significantly.

Keywords: Spirometric Measurements, Aerobic Capacity, Anaerobic Power

Introduction

Today, with the development of technology, a sedentary lifestyle away from physical activity has been adopted in university life, as in all areas of life. However, as it is known, it is seen that healthy life and sportive performance depend on physical and physiological characteristics as well as basic motoric characteristics, aerobic and anaerobic energy consumption. Health and performance indicators of individuals emerge as a result of the harmonious operation of metabolic functions, as well as using the energy metabolism of the organism at a minimum level. The development of all these features is possible with the effect of regular physical activities on the physiological functions in the organism (Yüktaşır et al., 2003). With regular physical activities, it will be ensured that the body maintains and maintains its life in a healthy way.

Along with physical activities, changes in respiratory functions as well as physical and physiological developments in individuals require more oxygen transport from the respiratory system to the tissues (Mayda, 2016). Along with physical activities, the development of physiological characteristics such as muscle groups, skeletal system, circulation and respiration, as well as a healthier body structure and quality of life in terms of health will change positively with a proper posture structure. In order to maintain these gains throughout the life of the individual, the exercises to be applied must be regular and continuous. Regular exercises applied prevent the negative effects of sedentary life and enable individuals to continue their lives in a healthier way (Kaya et al., 2020). In addition, it is known that the physical activities applied affect the organism differently according to the purpose, scope and intensity. In addition to regular physical activities, tobacco, etc., which has a negative effect on the organism, in order for individuals to continue their lives in a healthy way. products (hookah, cigarettes) should be avoided. As seen in the studies, it has been reported that the use of tobacco products such as cigarettes and hookahs adversely affects physiological events such as oxidative stress, immune system, cardiovascular system and respiratory system in the organism and causes

chronic damage (Fakhreddine et al., 2014; Muddathir et al., 2018). ; Khemiss et al., 2019; Sabi et al., 2020; Ali and Jawad, 2017; Alzaabi et al., 2017). In this context, although there are many studies examining the adaptations of cardiovascular components with intense physical activity, how the use of tobacco products together with physical activities at different loads changes students' respiratory system components (vital capacity, maximum flow rate, pulmonary diffusion capacity, etc.) with lifestyle and exercise. research is limited (Kocahan et al., 2017). In line with this information, the research was conducted to determine the effects of different intensities of physical activities and the use of tobacco products on the respiratory and endurance functions of the students studying at the faculty of sports sciences.

Method

Research Group;

The research group consists of Fırat University Faculty of Sports Sciences; 24 (13 female, 11 male) students participated voluntarily. The age, sports age, height, weight and body mass index averages of the participants are given in Table 1. The participants signed the voluntary consent form and submitted it to the researcher before the research. Necessary information about the tests and measurements to be applied were given to the participants by the researchers. The participants were told not to do any exercise or training the day before the test and measurement day, and to eat at least two hours before. 15 minutes before the tests. Warming up exercises were made by the researcher to the participants. Tests and measurements were applied under the supervision of researchers.

Data Collection;

Height and Weight Measurement;

The body and height weights of the participants were recorded in anatomical stance, with sports clothes and without shoes, using a 0.1 kg precision digital scale and a digital height meter on the scale (SECA, Germany) by determining the height in cm and body weight in kg (Bostancı et al., 2019).

Anaerobic Strength Test;

Wingate Test;

Anaerobic measurements were made with the Wingate anaerobic power test. For this test, Monark 834E (Sweden) bicycle ergonometer with pan was used. After the warm-up exercises, the participants were given a 1-minute rest period. The participants were told to start when they were ready, and when the test began they began pedaling at maximal speed for 30 seconds with a load of 75 g/kg per kilo. Participants were motivated by warnings during the test. After the time was up, the test was terminated. Anaerobic power was recorded in Watts. The bike is calibrated before each test. The applied test protocol was carried out on a ground designed for testing with appropriate ambient temperature (Hazir et al., 2010).

Aerobic Capacity Test;

Yo-Yo Test;

Yo-Yo Intermittent Recovery endurance test was applied to measure the aerobic capacity of the participants. In this test, as seen in Figure 1, a running area was created and the running distance was set as 20 meters and the rest area as 5 meters. Athletes started running from point A with the incoming signal and completed the 40-meter area by running until they came to point A again. It has been determined as a resting area between points A and C. With the signal, the run was repeated and continued. In the time between the first signal given at point A and the second signal repeated after a certain time, the athletes tried to reach point A again. The athlete, who could not reach point A when the second signal sounded, was warned for his first mistake, and when he could not reach the second

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time, his run was finished. The running speed was started with 10 km/h and then continued by increasing it within the test protocol. The distance traveled by the athletes was recorded, and then the maximum oxygen capacity was calculated with the following formula (Budak, 2015).

Formula: Y= 36.4 + (0.0084 * X)

(Y= VO_2max ml/kg-1.min-1, X= Running Distance (m)

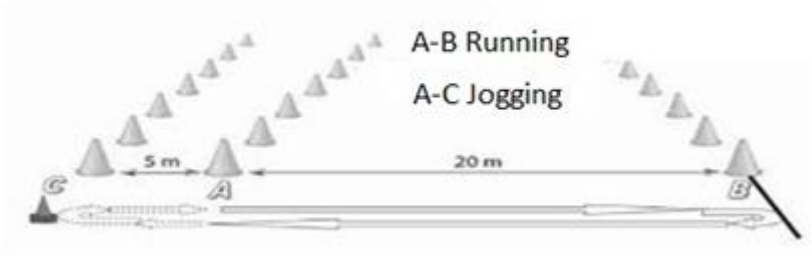

Figure 1: Yo-Yo İntermittent Recovery Test

Spirometric Measurements;

Respiratory parameters were measured with the Cosmed portable Pony spirometer device. The device was first introduced to the participants, and then the participants were seated on a chair and measurements were taken. Due to the precision of the measurements, the noses of the participants were clamped and closed during the measurement to prevent air escape. Measurements were made for each participant in three repetitions and the best score was recorded. FVC, FEV1, FEV1/FVC% and PEF values of the participants were recorded in the study. FVC is the maximum volume of air exhaled with a forced, rapid and deep expiration after deep inspiration. FEV1 is the volume expelled in the first second of forced expiration. Peak (peak) flow rate (PEF 1/s), measured in liters per minute or seconds, is the maximal flow (rate) achieved during the maximum forced expiration initiated. Peak (peak) flow rate (PIF 1/s), measured in liters per minute or seconds, is the maximal flow (rate) achieved at the maximum forced inspiration initiated. (FEV1/FVC%) is the ratio of FEV1 to FVC.

Analysis of Data;

The data obtained in the study were statistically analyzed with the SPSS 22.0 program. Shapiro-Wilk test was applied for normality distribution, and Skewness and Kurtosis values were examined for skewness and kurtosis values. It was determined that the data showed normal distribution and parametric tests were used in the statistical analysis of the data. In the comparison of spirometric values, Anova in Repeated Measurements, Independent-Sample T test was used in the comparison of smoking variable. The significance value in the interpretation of statistical analyzes in the study was determined as $p<0.05$.

Results

Table 1. Research group descriptive statistics

Variables	X(F) n:13	ss	X(M) n:11	ss
Age(year)	22,38	2,10	22,45	1,80
Sports age (year)	7,46	4,01	9,09	2,80
Height (cm)	164,76	6,69	173,18	5,61
Weight (kg)	55,73	5,23	74,12	8,68

BMI(kg/m^2)	20,88	1,53	24,65	2,05
Smoking	1,62	0,506	1,64	0,50

X(W): Average of female's; X(M): male's average; ss: Standard deviation; BMI: Body mass index.

The descriptive statistics of age, sports age, height, weight, bki and smoking use of male and female students participating in the research are given in the table.

Table 2. Normal distribution table of data

Tests	Measured Values	Skewness	Kurtosis	Shapiro-Wilk
Resting Spirometric Parameters	Fvc	0,341	-0,449	0,615
	Fev1	0,105	-1,262	0,229
	Fev1Fvc%	-0,095	-1,377	0,131
	Pef	0,867	-0,171	0,040
Aerobic Spirometric Parameters	Fvc	0,563	-0,687	0,162
	Fev1	0,713	0,616	0,440
	Fev1Fvc%	-0,210	-0,957	0,463
	Pef	1,054	0,371	0,013
Anaerobic Spirometric Parameters	Fvc	0,225	-0,717	0,382
	Fev1	-0,142	-1,064	0,245
	Fev1Fvc%	-0,627	-1,033	0,010
	Pef	0,541	-0,830	0,090

The normal distribution statistical analyzes of the data obtained in the study are given in Table 2. The Shapiro-Wilk value was examined to determine whether the data showed a normal distribution, and the skewness and kurtosis values of Skewness and Kurtosis were accepted as between -1.5 and +1.5. As a result of the analysis of the data, it was determined that there was a normal distribution. For this reason, it was deemed appropriate to use parametric tests for statistical analysis.

Table 3. Descriptive statistics of test and measurement results

Tests	**Measured Values**	**Gender**	**X**	**ss**	**Min**	**Max**
Aerobic Capacity	maxVO_2	Female	39,92	4,85	29,50	48,70
		Male	50,98	6,78	41,80	61,10
Anaerobic Power (watt)	Peak power	Female	378,10	67,61	220,22	461,06
		Male	692,23	107,38	543,88	891,64
	Avarage power	Female	287,00	50,22	151,88	331,64
		Male	502,48	72,83	411,19	669,44
	Power drop	Female	58,68	13,41	42,06	89,12
		Male	71,25	20,89	48,83	106,40
Resting Spirometric Parameters	Fvc	Female	3,43	0,51	2,72	4,29
		Male	4,94	0,61	4,26	6,22
	Fev1	Female	2,22	0,88	1,05	4,18
		Male	3,57	0,89	1,87	4,64
	Fev1Fvc%	Female	62,92	18,75	36,00	97,00
		Male	71,81	17,06	40,00	90,00
	Pef	Female	3,29	1,92	0,73	6,55
		Male	6,73	3,63	2,47	12,57
Aerobic Spirometric Parameters	Fvc	Female	3,31	0,49	2,56	4,38
		Male	4,90	0,78	3,72	6,10
	Fev1	Female	2,25	0,64	1,09	3,46
		Male	3,18	1,04	1,61	5,21
	Fev1Fvc%	Female	67,61	17,22	29,00	89,00
		Male	65,09	21,09	40,00	96,00

	Pef	Female	3,52	1,66	1,20	7,52
		Male	6,20	3,56	1,37	12,41
Anaerobic Spirometric Parameters	Fvc	Female	3,29	0,64	2,52	4,54
		Male	4,86	0,66	3,99	6,08
	Fev1	Female	2,34	0,90	0,97	3,91
		Male	3,43	0,95	2,01	4,62
	Fev1Fvc%	Female	69,07	18,39	38,00	91,00
		Male	70,09	17,92	41,00	92,00
	Pef	Female	3,65	1,83	1,12	6,90
		Male	6,58	3,44	1,62	11,10

The mean, standard deviation, minimum and maximum values of all data obtained as a result of tests and measurements in the research are given in Table 3.

Table 4. Comparison of spirometric values of female students in resting, aerobic and anaerobic performances

Measurements	Measurement variables	X	ss	F	p
Fvc	Rest	3,43	0,51	1,669	0,217
	Aerobic	3,31	0,49		
	Anaerobic	3,29	0,64		
Fev 1	Rest	2,22	0,88	0,216	0,788
	Aerobic	2,25	0,64		
	Anaerobic	2,34	0,90		
Fev1/Fvc%	Rest	62,92	18,75	0,811	0,441
	Aerobic	67,61	17,22		
	Anaerobic	69,07	18,39		
Pef	Rest	3,29	1,92	0,287	0,753
	Aerobic	3,52	1,66		
	Anaerobic	3,65	1,83		

*p<0,05

The spirometric values of female students at rest, in aerobic performance and anaerobic performance were compared with the Anova test in Repetitive Measurements and the findings are given in Table 4. When the table is examined, no significant difference was found between the spirometric values of female students in resting, aerobic and anaerobic performance, which are Fvc, Fev1, Fev1Fvc%, and Pef values (p<0.05)..

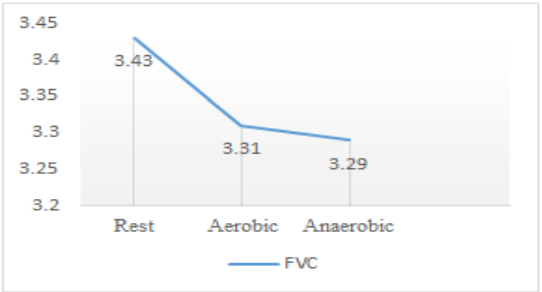

Figure 2. FVC Averages Graph

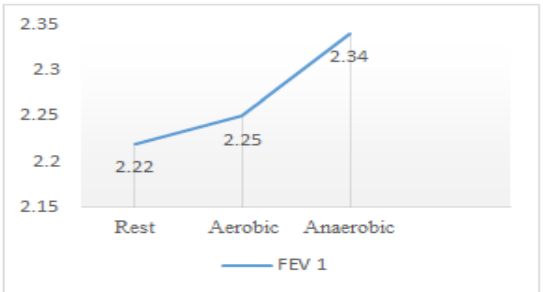

Figure 3. FEV 1 Averages Graph

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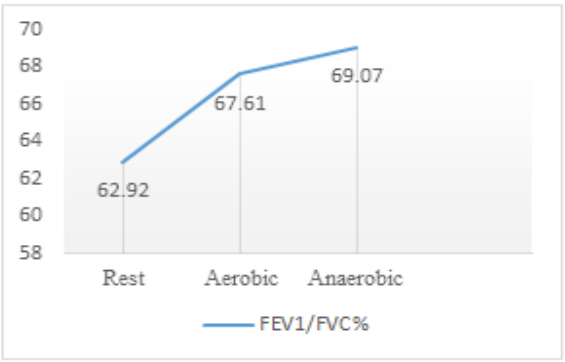


Figure 4. Fev1/Fvc% Averages Graph

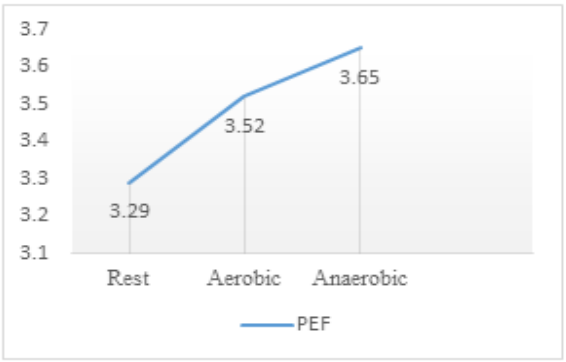


Figure 5. PEF Averages Graph

Table 5. Comparison of spirometric values of male students in resting, aerobic and anaerobic performances

Measurements	Measurement variables	X	ss	F	p
Fvc	Rest	4,94	0,61	0,085	0,871
	Aerobic	4,90	0,78		
	Anaerobic	4,86	0,66		
Fev 1	Rest	3,57	0,89	0,563	0,526
	Aerobic	3,18	1,04		
	Anaerobic	3,43	0,95		
Fev1/Fvc%	Rest	71,81	17,06	0,389	0,627
	Aerobic	65,09	21,09		
	Anaerobic	70,09	17,92		
Pef	Rest	6,73	3,63	0,085	0,847
	Aerobic	6,20	3,56		
	Anaerobic	6,58	3,44		

*p<0,05

The spirometric values of male students at rest, in aerobic performance and anaerobic performance were compared with the Anova test in Repetitive Measurements and the findings are given in Table 5. When the table is examined, no significant difference was found between the spirometric values of male students in resting, aerobic and anaerobic performance, namely Fvc, Fev1, Fev1Fvc%, and Pef values (p<0.05).

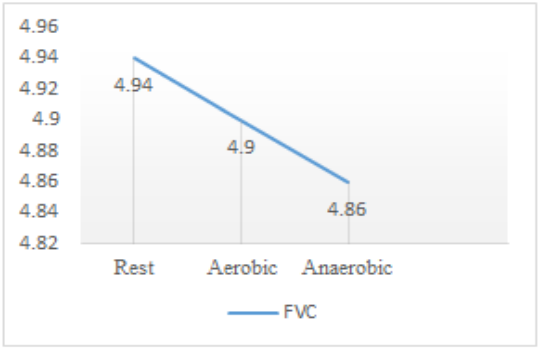
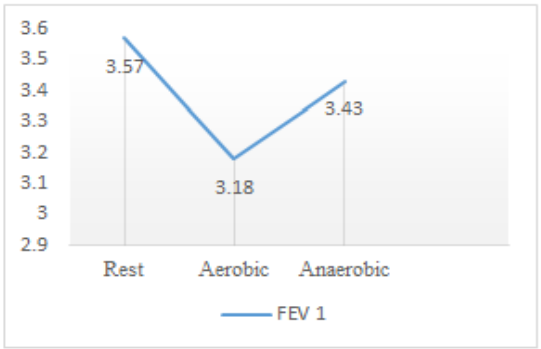
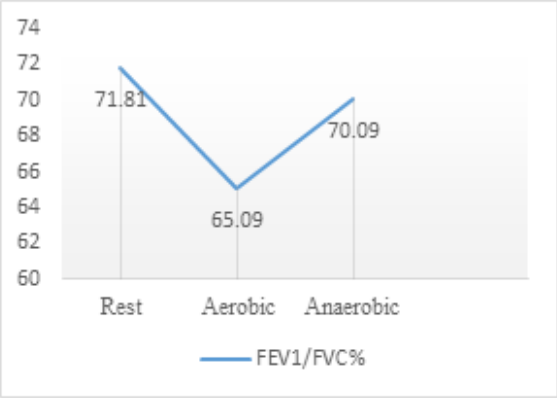
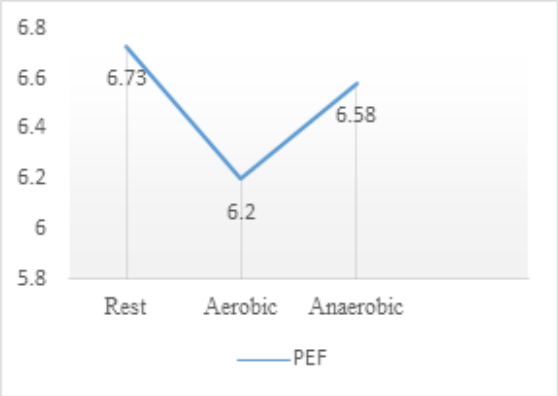


Figure 6. FVC Averages Graph



Şekil 7. FEV 1 Averages Graph





Şekil 8. Fev1/Fvc% Averages Graph

Şekil 9. PEF Averages Graph

Table 6. Comparison of aerobic capacity, anaerobic power and spirometric values in terms of smoking variable

Measurement	Test	Variable	n	X	ss	t	p
Fvc	Rest	Non-smoker	9	4,43	1,14	1,249	0,225
		Smoker	15	3,94	0,78		
	Aerobic	Non-smoker	9	4,07	1,01	0,099	0,922
		Smoker	15	4,02	1,06		
	Anaerobic	Non-smoker	9	4,08	1,13	0,273	0,787
		Smoker	15	3,96	0,99		
Fev 1	Rest	Non-smoker	9	2,94	1,31	0,338	0,739
		Smoker	15	2,78	1,00		
	Aerobic	Non-smoker	9	2,91	1,09	0,946	0,355
		Smoker	15	2,53	0,87		
	Anaerobic	Non-smoker	9	2,97	1,26	0,461	0,649
		Smoker	15	2,76	0,95		
Fev1Fvc%	Rest	Non-smoker	9	63,77	20,18	-0,664	0,513
		Smoker	15	68,93	17,30		
	Aerobic	Non-smoker	9	70,22	15,06	0,756	0,457
		Smoker	15	64,20	20,75		
	Anaerobic	Non-smoker	9	69,88	20,28	0,072	0,943
		Smoker	15	69,33	16,86		
Pef	Rest	Non-smoker	9	5,51	4,22	0,738	0,468
		Smoker	15	4,48	2,65		
	Aerobic	Non-smoker	9	5,69	3,65	1,217	0,236
		Smoker	15	4,18	2,44		
	Anaerobic	Non-smoker	9	5,58	3,43	0,734	0,470
		Smoker	15	4,64	2,81		
Aerobic Capacity	maxVO_2	Non-smoker	9	44,81	6,91	-0,084	0,934
		Smoker	15	45,10	8,81		
Anaerobik Power	Peak power	Non-smoker	9	556,25	218,57	0,707	0,487
		Smoker	15	501,57	160,15		
	Avarage power	Non-smoker	9	417,02	146,90	0,946	0,354
		Smoker	15	367,01	111,24		
	Power drop	Non-smoker	9	58,11	11,36	-1,357	0,189
		Smoker	15	68,24	20,45		

*p<0,05

In the study, the Independent-Sample T test was used to compare the data obtained as a result of the applied tests and measurements in terms of smoking variable. No statistically significant differences were found in the comparison between smokers and non-smokers in spirometric measurements, aerobic capacity and anaerobic power test results ($p<0.05$).

Discussion and Conclusion

In the research conducted with the aim of examining the spirometric values of the Faculty of Sport Sciences students in different performance environments, when the findings were examined, no statistically significant difference was found as a result of the comparison of the spirometric values of female and male students in resting, aerobic and anaerobic environments.

In a literature review on the subject, Kara, Özal and Yavuz (2010) compared the respiratory values of national team basketball players and national team wrestlers and found no significant difference in respiratory Pef, Fev1, Fev1Fvc% values of both groups. Serhatlioglu et al. (2010) found that the measurement results of respiratory parameters were similar in men and women in the exercise test, which included anaerobic and aerobic performance and was performed against a regularly increasing load. Yüksel, Akkoyunlu, and Koç (2017), in their research in which they examined the effect of the altitude training mask on respiratory parameters, did not find a significant difference in the Fev1 and Fvc values of the experimental group and the control group in the measurement results. In their study, Yuktaş and Çolak (2001) examined the effects of training at different anaerobic threshold levels on respiratory parameters, although an increase in the mean of Fev1 and Fvc values and a decrease in the mean of Pef values were observed in the group that was trained above the 10% anaerobic threshold, the differences were not statistically significant. In the literature review, it was seen that there were studies that showed parallelism with the research.

It was determined that there was no difference between smoking and anaerobic power, resting, aerobic and anaerobic spirometric test parameters of the research group. However, it was observed that the anaerobic power, resting, aerobic and anaerobic spirometric test parameter values of the non-smokers were higher than the smokers. Zerin et al., (2010) investigated the effects of short-term and long-term smoking levels on respiratory function parameters in university students and determined that the respiratory function values of the non-smoker group were higher than the short-term and long-term smoking groups, but there was no significant difference. ark., (2017) in a study in which smoking and non-smoking parents determined the respiratory parameters of the children, they determined that the respiratory functions of the children of non-smoking parents were better than the children who smoked, and that exposure to cigarette smoke affected the respiratory functions negatively. Fernández et al., (2015) medicine faculty students determined the effect of smoking on respiratory functions, there was no significant difference between the smoking group and the non-smoker group in terms of respiratory functions and the non-smoker group was determined. They determined that respiratory values were higher than the n smoking group. Lorensia et al., (2021), in their study examining the effects of smoking on lung functions and physical activity, determined that students who smoke had more respiratory problems than students who did not. Adegoke et al., (2015) determined the effect of tobacco use on respiratory functions in undergraduate students and determined that tobacco use negatively affects respiratory functions. In a different study, Zubair et al. (2018) reported that individuals exposed to passive smoking are at risk of chronic obstructive pulmonary disease. Sergio et al., (2019) determined in their study that individuals who smoke and cannot do physical activity regularly have deterioration in respiratory functions. As a result of the research findings, it is thought that smoking affects respiratory functions negatively and these results are caused by the damage and acute changes caused by smoking on respiratory functions.

Among the limitations of this research is that it is applied only to the students of the faculty of sports sciences. In addition, pulmonary function values of students in different faculties and colleges were not investigated. In addition, it may be recommended for future research to design a more comprehensive study in which institutions providing undergraduate sports education in different cities and regions are included.

As a result, no significant differences were found between the respiratory values of the students participating in the study in aerobic, anaerobic and resting states. In addition, it was determined that

the test parameter values of the non-smoking students were higher than the smokers. However, statistical differences were not detected. In line with this information, it is important to raise awareness that smoking is harmful. At the same time, we believe that it will be important for the breakthroughs and developments to be made in this field that the students of the faculty of sports sciences not only contribute to the development of the country's sports and education, but also create the awareness that they are role models in the society.

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