Biomedical Research 2016; 27 (2): 357-359

ISSN 0970-938X
www.biomedres.info

The comparison of the pulmonary functions of the individuals having regular exercises and sedentary individuals.

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Abstract

The object of our study is to determine the differences between the pulmonary functions of individuals having regular and long-term exercises, and sedentary individuals. The study included 29 athletes having regular and long-term exercises, and 27 sedentary individuals who are not interested in any sports branches actively. The parameters such as Forced Expiratory Volume in 1st Second (FEV1), Forced Vital Capacity (FVC), Peak Expiratory Flow (PEF), Vital Capacity (VC), and Maximum Voluntary Ventilation (MVV) of the individuals included in the study have been examined and the results have been analysed with MIR MiniSpir (Via del Maggiolino Roma-Italy) Spirometer. The arithmetic means and standard deviations of data have been obtained in the statistical evaluation. As a result of the findings obtained, Independent Samples t-test has been applied. No significant difference has been found among the age, height, body weight, Body Mass Index (BMI), FEV1 and PEF values of the groups at the end of the test ($P>0.05$); however, a significant difference has been found among MVV, FVC, and VC values ($P<0.05$). When the results of the study are evaluated in accordance with literature data, it has been found out that no difference is present between the FEV1 and PEF values of individuals having long-term and regular exercises, and sedentary individuals; however, there is a significant difference among MVV, FVC and VC values. Therefore, it has been found out that the pulmonary functions (MVV, FVC, and VC) of individuals having regular exercises have improved better than that of sedentary individuals.

Keywords: Pulmonary Function, Exercise, Sedentary, Athlete

Accepted on January 20, 2016

Introduction

It is clear that respiratory and circulatory systems are in close interaction when they are taken into consideration in terms of exercise effects [1]. The regular and systematic physical exercises are vital for a healthy development [2]. During the exercise, the oxygen need of the muscles is above the standard need. Thus, the respiratory system must adapt to said condition in order to satisfy the required oxygen. However, it is known that the increase level is limited and the limits of the enlargement capacity of breathing muscles and chest wall, and elasticity levels of bronchi, lead to changes in said condition [3]. The amount of oxygen that the individuals use is directly proportional to the amount of energy they generate [4]. During the exercise, oxygen and carbon dioxide values tend to be maintained at an appropriate level without increasing the load on the breathing muscles [5]. In order to satisfy the increasing oxygen need, cardiac pulse is increased [6], the energy consumption of the breathing muscles is decreased, and the signals that will increase the pulmonary functions tend to be minimized. As a result of said effects, the exhaustion that will occur in the breathing muscles is decreased; however, exercise performance is increased [5]. During the exercises, an increase in the consumption rate of O_2 in the metabolism, which is also called $MaxVO_2$, is experienced. It is indicated that said increase is above 10%. Therefore, it is important to increase the availability of oxygen, in other words, $MaxVO_2$, during the exercises [7]. It is accepted that the exercise is effective extremely on the circulatory and respiratory systems. The pulmonary capacity of the individual is related to the body structure of the people as well as the oxygen need of the sports branch performed. The respiratory systems of the people who have trained adequately adapt to the increasing oxygen need during the exercise rapidly [8]. Elite endurance athletes have parallel increases of left atrial pressure (Pla) and right atrial pressure (Pra) at high levels of exercise, whereas less well trained or sedentary subjects have smaller increases in Pra than pulmonary wedge pressure (Ppw) with exercise, which suggests that pericardial constraint is acting in the elite athletes at very high levels of exercise. Further confirmation of this theory is provided by studies with athletic animals in which removal of the the pericardium resulted in increased peak end-diastolic volume, stroke volume and maximal oxygen uptake (6). The pulmonary volumes and capacities of the people differ (age, sex, body surface, exercise condition, athlete and sedentary individuals). Therefore, it is better to evaluate the pulmonary functions of the athletes in accordance with MVV results. Apart from MVV, the rate of FEV/FVC, which is below 80%, is accepted as a problem [9]. The effects of physical activity on the pulmonary functions are tried to be classified as early age, adolescence and adulthood stage. While making the classifications, the effects of the exercises performed in accordance with the branches, on the pulmonary functions must be taken into consideration. The object of our study is to determine the differences between the pulmonary functions of the individuals having regular and long-term exercises, and sedentary individuals in accordance with new literature data.

Materials and Methods

Subjects

The study has included 56 participants, of whom 29 are elite athletes, who have an active sports life and accepted to be included in the study voluntarily, and did not have any neurologic diseases, vestibular-visual disorders in the last one year or did not have any serious lower extremity disabilities in the last 6 months, and have regular and high-level exercises, Table 1 (age 24.31 ± 3.28 years, height 172.10 ± 6.07 cm, body weight 75.75 ± 9.56 kg, body-mass index 25.49 ± 2.01), and 27 sedentary individuals, who are not interested in any sports branch and do not have regular exercises (age 25.18 ± 4.61 years, height 175.51 ± 6.92 cm, body weight 75.92 ± 9.26 kg, body-mass index 24.70 ± 2.91).

Measurement of pulmonary functions

The parameters such as Forced Expiratory Volume in 1st Second (FEV1), Forced Vital Capacity (FVC), Peak Expiratory Flow (PEF), Vital Capacity (VC), and Maximum Voluntary Ventilation (MVV) of the individuals included in the study have been analysed with MIR MiniSpir (Via del Maggiolino Roma-Italy) Spirometer. During the measurement, the subjects were made to grasp the spirometer nozzle completely, and to put on respirator.

Statistical analysis

The analyses have been made by using IBM SPSS 21.0 package program, and the significance level has been determined as P<0.05. The arithmetic means and standard deviations of data have been obtained in the statistical evaluation and then, Independent Samples t-test has been applied to the data.

Results

When the findings of the study have been evaluated, no significant difference has been found between FEV1 and PEF values (P>0.05); however, a significant difference has been found among MVV, FVC, and VC values (P<0.05, Table 2).

Table 1. *Demographic data of the participants.*

	N	Age	Height	Weight	BMI
Athletes	29	24.31 ± 3.28	172.10 ± 6.07	75.75 ± 9.56	25.49 ± 2.01
Sedentary individuals	27	25.18 ± 4.61	175.51 ± 6.92	75.92 ± 9.26	24.70 ± 2.91

Table 2. *Comparison of pulmonary functions of athletes and sedentary individuals.*

Parameters (n=56)	Category	X ± SS	t	p
FVC (L)	Athlete (n=29)	5.53 ± 0.53	2,23	0.03*
	Sedentary Individual (n=27)	5.11 ± 0.84		
FEV1 (L)	Athlete	4.55 ± 0.41	0.75	0.45
	Sedentary Individual	4.40 ± 0.71		
PEF (L\s)	Athlete	8.42 ± 2.59	-.032	0.97
	Sedentary Individual	8.44 ± 1.98		
MVV (L\min)	Athlete	114.46 ± 40.11	-3.43	0.01*
	Sedentary Individual	151.34 ± 40.20		
VC (L)	Athlete	5.86 ± 1.05	3,59	0.01*
	Sedentary Individual	4.81 ± 1.13		

*(P<0.05), Significant

Discussion

The main function of the respiratory system is to maintain the blood gas levels within fixed limits, and to provide gas exchange between blood and air [9]. In our study, no significant difference has been found between FEV1 and PEF values (P>0.05); however, a significant difference has been found among MVV, FVC, and VC values (P<0.05). The results showed that the FVC, FEV1, MVV ratio were higher in athletes than in the normal sedentary control individuals [10-13]. FVC and MVV findings support our study and could be considered an important finding. Due to increase in pulse volume, less cardiac pulse is required. The increase in pulse volume helps O_2, which is required during maximal exercises, to be transferred to the muscles. In the meantime, the increase in pulmonary volume and capacity increases the passing movement of O_2 from lungs to the blood [14]. Said increase may arise from the positive effect of exercise on dynamic pulmonary capacity together with strengthening in the breathing muscles. The performance is directly related to the body structure, sex and age, and also has measurable and improvable characteristics. In order to gain success in any sports branch, the characteristics suitable for the aim must be improved [15]. It is indicated that exercises cause increase in pulmonary functions [16] while aerobic exercises lead to higher level of increase in Forced Vital Capacity values when compared to anaerobic exercises [17]. The majority of the studies performed in order to determine that how the exercise affects the pulmonary parameters, lead to many different opinions regarding the subject [18]. Some studies show that the exercise changes the pulmonary parameters [19], while other studies indicate that although no improvement is observed [20], the exercise generally has positive effect on the pulmonary parameters [21,22].

Conclusion

When the results of the study are evaluated together, it has been found out that no difference is present between the FEV1 and PEF values of individuals having long-term and regular exercises, and sedentary individuals; however, there is a significant difference among MVV, FVC and VC values. Therefore, it has been found out that the pulmonary capacities (MVV, FVC, and VC) of individuals having regular exercises have improved better than that of sedentary individuals.

References

1. Albayrak SY, Kayserilioğlu A, Dinçer C, Ünal M, Kaşıkçıoğlu E. The comparison of sedantary group and proffesional rowers' hematological and respiratory parameters. Istanbul Med Fac Mag 2002; 65: 106-109.
2. Kürkçü R, Gökhan İ. The effects of handball training on the some respiration and circulatory parameters of school boys aged 10-13 years. Int J Hum Sci 2011; 8: 135-143.
3. Erkmen N, Taşgın H, Kaplan T. The evaluation of young badminton players' respiratory capacities both boys and girls. Racket Sports Symposium, Kocaeli 2003.
4. Albayrak SY, Kayserilioğlu A, Dinçer C, Kaşıkçıoğlu E, Ünal M. The comparison of professional and amateur footballers' hematological and respiratory parameters. Istanbul Med Fac Mag 2002; 65: 30-33.
5. Ulubay G, Eyüboğlu FÖ. Cardiopulmonary exercise testing. Tubercilosis and Thorax 2006; 54: 90-98.
6. Naeije R, Chesler N. Pulmonary Circulation at Exercise. Compr Physiol 2012; 2: 711-741.
7. Alpay B, Altuğ K, Hazar S. İlköğretim okul takımlarında yer alan 11-13 yaş grubu öğrencilerin bazı solunum ve dolaşım parametrelerinin spor yapmayan öğrencilerle karşılaştırılarak değerlendirilmesi. J Mehmet Akif Uni 2007; 8: 22-29.
8. Taşgın E, Dönmez N. Effect on respiratory parametres of exercise programmers which are applied children between 10 to 16. Selçuk Unı J Phy Edu Sport Sci 2009; 11: 13-16.
9. Çakmakcı O, Fişekçioğlu İB, Çınar V, Akkuş H, Kılıç M. Comparison of the some physical characteritics of a national boxing team of Turkey and Georgıa. Spormetre 2005; 3: 133-136.
10. Vedala S, Paul N, Mane AB. Differences in pulmonary function test among athletic and sedentary population. Natl J Physiol Pharm Pharmacol 2013; 3: 118-123.
11. Prakash S, Meshram S, Ramtekkar U. Athletes, yogis and individuals with sedentary lifestyles: Do their lung functions differ? Indian J Physiol Pharmacol 2007; 51: 76-80.
12. Indira Devi C, Maruthi W. Comparative study of pulmonary function tests in sedentary individuals and dynamic exercising people. J Pharmagy Biological Sci 2015; 10: 73-77.
13. Rosemary Peter, Sood S, Dhawan A. A comparative evaluation of pulmonary functions in athletes, yogis and sedentary individuals. Int J Basic Appl Physiol 2013; 2: 127-131.
14. Günay M, Cicioğlu İ. Sports Physiology. 1.Press, Gazi Books, Ankara 2001.
15. Metin G, Öztürk L, Yücesir İ, Bayraktar B. Pulmonary parameters at rest and during exerise among the first division level elite female basketball players. Respiratory 2003; 5: 220-226.
16. Rong C, Bei H, Yun M, Yuzhu W, Mingwu Z. Lung function and cytokine levels in professional athletes. J Asthma 2008; 45: 343-348.
17. Gökdemir K, Koç H, Yüksel O. Effects of aerobic training program on respiration circulation and body fat ratio of university students. Exercise 2007; 1: 44-49.
18. Kalkavan A, Pınar S, Kılınç F, Yüksel O. The research into the effects of child basketball players' physical structure on biomotoric and physiological features. J Health Sci 2005; 14: 111-118.
19. Kürkçü R, Afyon YA, Yaman Ç, Özdağ S. Comparison of some physical and physiologic properties of soccer players and badminton players of 10-12 years old group. Int J Human Sci 2009; 6: 547-556.
20. Fişekçioğlu İB, Şahin M, Erkek MB. Examining physical and physiological parameters of kids who are attended the city sport centre summer period training programme. Selçuk Unı J Phy Edu Sport Sci 2008; 10: 10-22.
21. Sable M, Vaidya SM, Sable SS. Comparative study of lung functions in swimmers and runners. Indian J Physiol Pharmacol 2012; 56: 100-104.
22. Armour J, Donnelly PM, Bye PT. The large lungs of elite swimmers: an increased alveolar number? Eur Respir J 1993; 6: 237-247.

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