DOI: https://doi.org/10.53350/pjmhs211592920

ORIGINAL ARTICLE

The Effect of Participation in Educational Games Activity on Respiratory Values and Anthropometric Properties in Children

YAŞAR KÖROĞLU[1], MEHMET ŞERIF ÖKMEN[2],
[1]National Education Directorate, Physical Education Teacher, Kayseri, korogluyasar38@gmail.com
[2] mserifokmen@gmail.com

ABSTRACT

Aim: In this study, it was aimed to examine the anthropometric properties and respiratory parameter values of students between the ages of 10-11 who regularly participate in educational games.

Methods: 34 students studying, İncesu Kızılören Parlaklar Secondary School, voluntarily participated in the study. While the experimental group (n=18) participated in educational game activities three days a week along with physical education lessons for five weeks, the control group (n=16) attended only physical education lessons. They did not participate in the educational game activities. Two measurements were carried out to the students as pre-test and post-test.

Results: While the anthropometric measurements of the students participating in the study were measured with the Tanita measuring device, their respiration values were determined with a spirometer. Data are shown as arithmetic mean and standard deviation. A dependent sample t-test was used to compare independent groups and also paired sample t-test was used to compare dependent groups. The significance level was determined as ($p<0.05$). In the study, it was seen that there was a significant difference in body fat mass, lean body mass (FFM), total body fluid (ibw) values of the experimental group ($p<0.05$), while only a significant difference was found in basal metabolic rate (bmh) values in the control group. In the respiratory function values, the forced vital capacity (fvc), the air volume removed in the first second of forced expiration (fev1) of the experimental group. While the difference in peak expiratory flow (pef) and maximum voluntary ventilation (mvv) values were found to be significant, fev1, pef, and mvv values were found to be significant in the control group ($p<0.05$).

Conclusion: It was seen that educational games had a positive effect on anthropometric measurement and respiration values in primary school students aged 10-11 years. We think that increasing the time of the physical education lessons and sparing more time to educational games, explaining the importance of educational games to physical education teachers, school administration, and students, and regular educational game competitions will make a significant contribution to the development of children.

Keywords: Educational Games, Anthropometric Measurement, Respiratory

INTRODUCTION

Play is where children express themselves in the best way. While the child has a good time playing, it also develops socially, emotionally, mentally, and physically. With the game, children learn how to control their bodies while using objects. Play is also defined as activities that develop children's imaginations [1]. The play has become one of the most important activities in each stage of children [2]. The game has not been seen as a leisure activity for children. The game both contributes to the formation of children's personalities and makes an important contribution to learning the events they may encounter in real life. Children have the opportunity to learn many things with play without realizing it. The game teaches children to dream, to grasp an abstract event, to think creatively. Play is where children develop and experience their first experiment [3]. While the child develops physically, mentally, and psychologically in the game he plays, it provides the development of self-confidence. Thanks to the played games, it makes a positive contribution to the spirit of cooperation. While the children's sensitivity is increasing to the environment with the game, they learn to listen to the person speaking, to respect the other person, not to act according to their own interests, and to be tolerant towards everyone [4]. It makes it easier for the child to adapt to the environment. Mobility and struggle in the game contribute positively to the respiratory, circulatory, and digestive systems of children [5]. With the aim of constantly including children in games is to have fun, it is aimed to strengthen their circulatory, respiratory systems and develop psychomotor abilities. While children who spend a certain part of their time playing games are physically and mentally healthy, they provide opportunities to raise individuals whose background is ready for many sports [6]. The task of the respiratory system is to provide the required oxygen for our body. The oxygen needed by the tissues is carried by the circulatory system. the respiratory and circulatory systems acting together, reach the oxygen needed by our body to the tissues [7]. The respiratory system develops better in childhood, especially between the ages of 12-13. Children adapt more quickly to the applied exercises [6]. The best way to learn how the respiratory system works and the degree of development is to measure the lung volume and capacity of the individuals [8]. It has been explained that there are important changes in the respiratory system with the training applied to the people. It has been stated that these changes are the result of regular training [9]. The respiratory system is especially affected by genetic factors. In addition, the respiratory system affects the respiratory system by age, gender, height, body structure, and sports. with the exercises, The increase in the respiratory muscles, the increase in the expansion ability of the lungs, and the changes in the bronchi and bronchioles are important in terms of determining the degree of vital capacity [10]. Respiratory function tests are performed to determine the effect of exercise on the respiratory system. It is stated that respiratory function tests are an impartial application that examines breathing, gas exchange, and mechanical properties in the respiratory system. We can measure the growth, maturation, and physical fitness of individuals, their long-term training, and the respiratory responses of individuals to the training of different intensity with the help of tests [11]. In studies conducted on children, many different opinions have emerged on respiratory values. While the first opinion stated that the training performed by the children increased positively the respiratory values, another group stated that the improvement in the respiratory values of the children was not due to training, but from the period in which the children were in. They explained that since this period is the development period of children, respiratory values are together with the age [12]. A different group of researchers, on the other hand, explained that the change in respiratory values in children, training can not only improve the respiratory values of children but also help to use respiratory values more economically [13.] It is known that exercise plays a major role in the development of children. They explained that among individuals who physically have the same parameters, individuals who do sports have higher respiratory values compared to individuals who are sedentary [14]. In a study conducted, it was stated that after a 20-week training, the endurance of respiratory muscles could be built by 16%. It is stated that normal individuals generally do chest breathing much more, athletes do abdominal breathing and this respiration is an easier way of breathing [7.] Although the respiratory volume of the athletes does not change with the planned and programmed exercises, it is known that there are significant increases with maximal exercises. It is stated that this increase also shows itself in the respiratory rate and respiratory minute volume [15]. In our study, Our general aim is to determine the effect of students participating in educational game activities on respiratory parameters.

MATERIAL & METHODS

Research Group: Primary school fifth-grade students studying at İncesu Kızılören Parlaklar Secondary School in Kayseri province voluntarily participated in the study. The content of the study was explained to the volunteers participating in the study, and informed consent forms were taken from the volunteers and their parents. Volunteers participating in the study were divided into two groups as experimental and control groups. The experimental group attended three hours of physical education in a week. In addition, the experimental group participated in the educational game activity three days a week. The control group, only participated in physical education lessons three days a week and did not participate in educational games. The study was conducted for five weeks. Two measurements were taken as pre-test and post-test. Identity information was used to determine the age of the volunteers participating in the study. All measurements taken within the scope of the study were made in the schoolyard.

Anthropometric Measurements: While the height of the volunteers was measured with a meter, body fat ratio, BMI, BMR, FAT, FFM, and TBW measurements were determined with the Tanita body fat device [16].

Respiratory function test: A spirometer was used to determine the respiratory values of the volunteers participating in the study (Medical International Research). In the spirometer measurements, the noses of the participants were closed with a latch and the results were recorded by reading from the digital instrumentation of the spirometer following the maximum exhalation process after the maximum breathing. Spirometric measurements were taken while the participant was sitting [17]. FVC, FEV, PEF, fev1/fvc, VC, ERV, and MVV measurements were taken about respiratory.

Statistical Analysis: SPSS 22.0 statistics program was used to analyze the data. The data in the study were presented as arithmetic mean (X) and standard deviation (SD). The suitability of the data to normal distribution was determined by the Kolmogorov-Smirnov test. since the data showed normal distribution, independent sample t-test was applied to compare independent groups, while paired sample t-test was applied to compare dependent groups. The significance level of the obtained data was determined as $p<0.05$.

RESULTS

Table 1. Comparison of anthropometric values within groups

Parameters		Experimental group (n=18)			Control group (n=16)		
		x ± ss	t	p	x ± ss	t	p
Age (Year)	Pre-test	10,5 ± 0,51	0,571	0,503	10,313 ± 0,47	0,671	0,507
	Post-test	10,5 ± 0,51			10,313 ± 0,47		
Height (cm)	Pre test	145,667 ± 8,26	0,403	0,685	139,438 ± 8,60	2,152	0,639
	Post-test	145,667 ± 8,26			139,438 ± 8,60		
Weight (Kg)	Pre-test	37,756 ± 8,20	-800	0,435	33,681 ± 5,57	0,367	0,719
	Post-test	37,928 ± 7,91			33,575 ± 5,64		
Basal metabolism rate (bmh)	Pre-test	1249,444±130,58	0,868	0,001***	1176,375±29,88	-4,053	0,001***
	Post-test	1352,333 ± 57,28			1274,6875±60,67		
BKI (kg/boy^2)	Pre-test	17,294 ± 1,82	0,827	0,420	17,431 ± 2,28	0,424	0,678
	Post-test	17,050 ± 2,04			17,344 ± 2,53		
Body fat index (fat)	Pre-test	14,833 ± 7,62	1,000	0,331	16,944 ± 7,30	1,439	0,171
	Post-test	14,589 ± 7,28			16,081 ± 6,67		
Body fat mass (Fat Mass)	Pre-test	6,061 ± 3,77	4,637	0,001***	5,988 ± 3,04	-1,047	0,31
	Post-test	5,511 ± 4,39			6,588 ± 4,39		
Fat free mass (ffm)	Pre-test	31,622 ± 5,01	3,0256	0,008*	27,988 ± 3,43	1,352	0,196
	Post-test	30,300 ± 4,20			27,250 ± 3,29		
Total body fluid (Tbw)	Pre-test	22,300 ± 3,02	2,484	0,024*	20,425 ± 2,44	0,760	0,459
	Post-test	21,816 ± 2,66			20,581 ± 2,01		

p<0.05*, p<0.001*** FAT: body fat index; FAT MASS: body fat mass; FFM: fat-free mass; TBW:total body fluid; BKI:body mass index; BMH:basal metabolism rate

While BMH, FAT, FFM and TBW values of the in-group experimental group were statistically significant (p<0.05), it was observed that the changes in age, height, body weight, BMI and FAT values were not significant (p> 0.05). It was observed that the measured values in the control group were statistically significant only in BMR values (p<0.05), but not in other parameters (p> 0.05) (Table 1).

Table 2. Comparison of respiratory values within groups

Parameters		Experimental group (n=18)			Control group (n=16)		
		x ± ss	t	p	x ± ss	t	p
FVC (L)	Pre- test	2,3667 ± 0,39	-12,854	0,001***	2,0644 ± 0,42	,080	0,937
	Post- test	2,6467 ± 0,40			2,0594 ± 0,42		
FEV1 (L)	Pre-test	1,8072 ± 0,38	-6,005	0,001***	1,6731 ± 0,38	-2,615	0,020*
	Post-test	2,0117 ± 0,31			1,85 ± 0,38		
FEV/FVC (%)	Pre-test	79,33 ± 3,59	0,718	0,483	80,31 ± 3,91	1,979	0,066
	Post-test	79,167 ± 3,51			79,5 ± 2,96		
PEF (L/sn)	Pre-test	2,9128 ± 1,07	-6,248	0,001***	2,715 ± 0,92	-9,182	0,001***
	Post-test	3,1694 ± 1,10			2,8681 ± 0,90		
MVV (L/dk)	Pre- test	62,467 ± 14,23	-10,354	0,001***	58,781 ± 12,06	-2,533	0,023*
	Post- test	72,844 ± 13,83			62,656 ± 12,79		
VC	Pre-test	2,2122 ± 0,35	-2,030	0,058	2,0144 ± 0,34	-1,611	0,128
	Post-test	2,2856 ± 0,26			2,0994 ± 0,23		
ERV (L)	Pre-test	0,9411 ± 0,14	1,224	0,238	1,0031 ± 0,21	0-,636	0,534
	Post-test	0,9267 ± 0,11			1,0119 ± 0,17		

p<0.05*, p<0.001*** FVC: forced vital capasity; FEV1: air volume ejected in the first second of forced expiration; PEF: peak expiratory flow rates; MVV: maximum voluntary ventilation; VC: vital capasity; ERV: expiratory resudual volume.

In the dependent sample t test performed within the group, it was seen that the difference in FVC, FEV1, PEF and MVV values of the experimental group was significant (p<0.05), but there was no significant difference in fev1 / fvc, VC and ERV values (p> 0.05). In the control group, it was observed that the difference in FEV1, PEF and MVV values was statistically significant (p<0.05), and there was no statistically significant difference in FVC, fev1 / fvc, VC and ERV values (p> 0.05) (Table 2).

Table 3. Comparison of anthropometric values between groups

Parameters		Pre-test (n=18)			Post-test (n=16)		
		x ± ss	t	p	x ± ss	t	p
Age (Year)	Deney	10,5 ± 0,51	0,571	0,503	10,313 ± 0,47	0,671	0,507
	Kontrol	10,5 ± 0,51			10,313 ± 0,47		
Height (cm)	Deney	145,667 ± 8,26	0,403	0,685	139,438 ± 8,60	2,152	0,639
	Kontrol	145,667 ± 8,26			139,438 ± 8,60		
Weight (Kg)	Deney	37,756 ± 8,20	1,709	0,098	37,928 ± 7,91	1,861	0,072
	Kontrol	33,681 ± 5,57			33,575 ± 5,64		
Basal metabolism rate (bmh)	Deney	1249,444 ±30,58	1,633	0,112	1352,333 ±57,28	3,837	0,001***
	Kontrol	1176,375±29,88			1274,6875±60,67		
BKI (kg/boy^2)	Deney	17,294 ± 1,82	-0,194	0,847	17,050 ± 2,04	-0,374	0,711
	Kontrol	17,431 ± 2,28			17,344 ± 2,53		
Body fat index (fat)	Deney	14,833 ± 7,62	-0,82	0,417	14,589 ± 7,28	-0,620	0,540
	Kontrol	16,944 ± 7,30			16,081 ± 6,67		
Body fat mass (Fat Mass)	Deney	6,061 ± 3,77	0,062	0,951	5,511 ± 4,39	-0,807	0,476
	Kontrol	5,988 ± 3,04			6,588 ± 4,39		
Fat free mass (ffm)	Deney	31,622 ± 5,01	2,434	0,021*	30,300 ± 4,20	2,334	0,711
	Kontrol	27,988 ± 3,43			27,250 ± 3,29		
Total body fluid (Tbw)	Deney	22,300 ± 3,02	1,971	0,057	21,816 ± 2,66	1,506	0,142
	Kontrol	20,425 ± 2,44			20,581 ± 2,01		

p<0.05*, p<0.001*** FAT: body fat index; FAT MASS: body fat mass; FFM: fat-free mass; TBW:total body fluid; BKI:body mass index; BMH:basal metabolism rate.

As a result of the comparison of the pre-test measurements between the groups, it was seen that there was a statistically significant difference in FFM values (p<0.05), but there was no statistically significant difference in body weight, BMH, BMI, FAT, FAT MASS and TBW values (p> 0.05) (Table 3).

Table 4. Comparison of respiratory values between groups

Parameters		Pre- test (n=18)			Post- test (n=16)		
		X ± ss	t	p	X ± ss	t	p
FVC (L)	Deney	2,3667 ± 0,39	2,137	0,040*	2,6467 ± 0,40	4,155	0,001***
	Kontrol	2,0644 ± 0,42			2,0594 ± 0,42		
FEV1 (L)	Deney	1,8072 ± 0,38	1,012	0,319	2,0117 ± 0,31	1,338	0,190
	Kontrol	1,6731 ± 0,38			1,85 ± 0,38		
FEV/FVC (%)	Deney	79,33 ± 3,59	-0,760	0,453	79,167 ± 3,51	-0,478	0,769
	Kontrol	80,31 ± 3,911			79,5 ± 2,96		
PEF (L/sn)	Deney	2,9128 ± 1,07	0,571	0,572	3,1694 ± 1,10	0,866	0,393
	Kontrol	2,715 ± 0,92			2,8681 ± 0,90		
MVV (L/dk)	Deney	62,467 ± 14,23	0,809	0,425	72,844 ± 13,83	2,220	0,034*
	Kontrol	58,781 ± 12,06			62,656 ± 12,79		
VC	Deney	2,2122 ± 0,35	1,637	0,111	2,2856 ± 0,26	2,143	0,040*
	Kontrol	2,0144 ± 0,34			2,0994 ± 0,23		
ERV (L)	Deney	0,9411 ± 0,14	-1,010	0,320	0,9267 ± 0,11	-1,684	0,102
	Kontrol	1,0031 ± 0,21			1,0119 ± 0,17		

p<0.05*, p<0.001*** FVC: forced vital capasity; FEV1: air volume ejected in the first second of forced expiration; PEF: peak expiratory flow rates; MVV: maximum voluntary ventilation; VC: vital capasity; ERV: expiratory resudual volume.

As a result of the comparison of the pre-test results according to the results of the independent sample t test, it was seen that there was a statistically significant difference in the value of FVC ($p<0.05$, FEV1), but there was no statistically significant difference in fev1 / fvc, PEF, MVV, VC and ERV values ($p > 0.05$) As a result of the comparison of independent samples t test posttest values, a statistically significant difference was observed in FVC, MVV and VC values ($p<0.05$), while there was no statistically significant difference in FEV1, fev1 / fvc, PEF and ERV values ($p> 0.05$) (Table 4).

DISCUSSION

It is stated that genetic factors have an important place in the development of children in primary school age with many factors. They explained that in the developmental period, children playing games suitable for their age would be important in terms of expressing themselves by revealing their existing features in the game, as well as enjoying the game. The game also contributes to the development of skills. The primary education period has an important place in terms of children's development. In terms of children's development, it has been said that playing appropriate games during this period will make a positive contribution to the acquisition of skills and learning new skills [18]. In our study, the effect of children participating in educational game activities on respiratory functions and anthropometric properties was searched.

In our findings, while there was a significant difference in body fat mass, lean body mass, total body fluid, and basal metabolic rate values of the experimental group, it was seen that there was only a significant difference in basal metabolic rate values in the control group. Stamford said that with applied training at a certain intensity, the body fat percentage will decrease with the breakdown of high amounts of calories in the body [19]. We think that the reason for the significant differences in our study might be that the experimental group trained more than the control group and their eating habits might be effective. Gökdemir et al. explained that there are significant differences in body fat percentage values as a result of the aerobic training program [9]. After a similar study, they stated that there were significant decreases in body weight, body mass index, and body fat percentage values in the individuals who participated in the study [20]. It has been stated that with the applied exercises above 50% of the maximum oxygen consumption, there will be a decrease in the body fat percentage [21]. Sarıtaş et al. Stated that while there were no significant difference in body weight, body fat percentage, body fat mass values, there was a significant difference in lean body weight and total body fluid values [22]. At the end of the study conducted by Demirel et al in elite wrestlers, there was a significant decrease in body fat percentage and body fat mass values, while a significant increase was observed in lean body mass and total body fluid values. They explained that there was no significant decrease in body weight, body mass index, and basal metabolic values [23]. At the end of another study, they stated that there was no significant difference in BMI values [24]. Karakaş et al. explained that as a result of applied exercise, there was a decrease in fat mass, while an increase in lean body mass values [25]. They stated that there was chronic hyperhydration in the intracellular and extracellular fluid after exercise in healthy athletes [26]. Karakaş et al. explained that after the exercise they had an increase in the fluid values in the cells of their students [25]. Although our study is similar to the studies in this field, it is seen that it has different results. At the end of our study for five weeks, there was a significant increase in FVC, FEV1, PEF, and MVV values of the experimental group, while there was a significant increase in FEV1, PEF, MVV values occurred in the control group.

It has been explained that the increase in lung volume and capacity will provide an increase in respiratory muscle endurance of the people and will make a positive contribution to the emergence of fatigue in a long time [27]. Regular training is known to strengthen the respiratory muscles. It is explained that exercise makes significant contributions to the physical development of children. It is stated that the breathing capacity of children who are actively involved in sports is at a better level when compared to children of the same age, weight, and height who do not engage in sports [28]. It has been explained that the strength of the respiratory muscles and respiration volume may increase with the training applied within a certain plan and program [29]. Changes in respiratory functions are related to the pattern of training, the development of respiratory muscles, the expansion capacity of the lung with the chest, as well as the flexibility of the bronchi and bronchioles [30]. We think that the reason for the significant increase in the children in the experimental group participating in the study may be that they regularly attend physical education classes and practice their training and their lung capacity may be increased due to their constant participation in educational games. We think that the reason for the increase in the control group is the active participation of children in physical education lessons, participation in sports activities in some idle class, and continuing sports activities outside of school, which have a positive effect on the increase in lung capacity.

In the study, it was stated that after 12 weeks of regular exercise program, the pre-test and post-test results were statistically significant in FVC and FEV1 values [31]. Doherty et al., In their study on 159 swimmers, 130 athletes, and 170 sedentary, explained that the values of the swimmer and athlete groups were higher than the control group in the comparison of VC, FVC, FEV1 parameters [32]. In the study conducted by Wells et al., They stated that the increase in the elite and performance groups was statistically significant, while the control group was insignificant [33]. Kubiak explained that there was a significant difference in VC, FVC, FEV1 values as a result of their 6-month study among 310 elite swimmers aged 12-14 years [34]. Dağlıoğlu, in her/his study, explained that there was a significant difference in FVC values at the end of the aerobic exercise program he applied to the experimental group for 8 weeks [35]. Wicher et al. Stated at the end of their study with 61 children between the ages of 7 and 18 that swimming exercise contributed positively to the increase in respiratory values [36]. 19 handball players participated in the study of Hartz et al. At the end of the study, they explained that there was a significant difference in MVV values [37]. After 8 weeks of respiratory muscle training in Taekwondo athletes, it was seen that maximum voluntary ventilation increased in the experimental group [38]. In another study conducted on 20 healthy people, they stated that there was a significant difference in VC values at the end of the study [39,40,41]. Koç, Stated that there is no statistically significant difference in ERV after respiratory muscle training on Taekwondo athletes [38].

CONCLUSION

It is seen that participation in educational games along with physical education lessons have a significant contribution to students' anthropometric properties and respiration values. Physical education lessons and educational games are important for primary school children. While it is provided that students have fun with educational games, it makes a positive contribution to the development of physical and respiratory parameters. We think that children of primary school age must participate in educational game activities for a longer period of time and in a planned manner.

REFERENCES

1. Jones, M. Play and Child. Çev., Ayda Çayır. İstanbul: Kaknüs Publishing .2001
2. Gelen İ, B Özer. The Effect of Gamification on Problem Solving Skills and Attitudes Towards the Lesson in 5th Grade Mathematics Lesson. e-journal of New World Sciences Academy, 2010: 5(1), 71-88.
3. Varışoğlu B, Şeref İ, Gedik M, Yılmaz İ. Attitude Scale Towards Educational Games Applied in Turkish Lesson: Validity and Reliability Study. Adıyaman University Journal of Social Sciences Institute Special Issue on Teaching Turkish Education, 2013: 6, 11, 1060-1081.
4. Kara M. Teaching Turkish to Foreigners with Games, Journal of Turkish Studies, 2010: 15, 407-415.
5. Işıkoğlu N. Qualitative Research in Education. Education Studies, 2005: 20, 158-165.
6. Mengütay S. Movement Development and Sport in Children, Morpa Kültür publishing İstanbul. 2005
7. Akgün N. (Exercise Physiology, 5th Edition. İzmir, Ege University Press, 1994: 1, 67-9, 81.
8. Atan T, Akyol P, Çebi M. Comparison of respiratory functions of athletes in the category of stars engaged in individual sports. Dicle the journal of medicine. 2013: 40(2), 192-198.
9. Gökdemir K, Koç H, Yüksel O. The effect of aerobic training program on some respiration and circulation parameters and body fat ratio of university students. Exercise Çevrim içi journal. 2007: 1,44-49.
10. Astrand PO. From exercise physiology to preventive medicine. Ann Clin Res, 1988: 20,10-17.
11. Saygın Ö, Polat Y, Karacabey K. The Effects of Movement Education on Physical Fitness Traits in Children. Fırat University Journal of Health Sciences, Elazığ, 2005: 19 (3), 205-12.
12. Hagberg JM, Yerg JE, Seals DR. Pulmonary function in young and older athletes and untrained man. J Appl Psychol, 1988: 65,101-105.
13. Sarı H, Terzioğlu M, Erdoğan F. Comparison of respiratory-circulatory parameters of athletes and sedentary individuals in different sports branches in resting, exercising and resting. Journal of Sports Medicine, 1981: 16,121-133.
14. Bouhuys A, Beck GJ. Large Lungs in Dives J. Appl. Physiol Respirat Environ, Exercise Phsiol, 1979: 19, 967-75.
15. Cicioğlu GM. Sport Physiology, Ankara, Gazi Bookstore, 2001: 129,173.
16. Özer K. Physical Fitness. Nobel publishing, Ankara. 2001
17. Kürkçü R, Gökhan İ. The effects of handball training on some respiratory and circulatory parameters of 10-13 age group students. International Journal of Human Sciences. 2001: 8(1), 135-143.
18. Köroğlu Y, Kaya M, Sarıtaş N. The effect of educational games on skill learning in tennis in adolescent boys. 4th International Sport Sciences Congress 3-5 May, Antalya. 2018
19. Stamford B. The Results of Aerobic Exercise, The Physician and Sportsmedicine, 1983: 1,145-146.
20. Amano M, Kanda T, Moritani T. Exercise training and autonomic nervous system activity in obese individuals. Med Science Sports Exercise, 2001: 33, 1287-1291.
21. Amerikan Collage of Sports Medicine (A.C.S.M.). The Recommended Quantity and Quality of Exercise for Developing and Maintaining Cadionespiratory and Muscular Fitness in Healthy Adults. Med.Sci.Sport Exercise, 1990: 4, 22- 26.
22. Sarıtaş N, Yıldız K, Hayta Ü. Comparison of some motoric and physiological characteristics of primary school students. CBÜ Journal of Physical Education and Sport Sciences, 2017: 12 (2), 117-127.
23. Demirel N, Özbay S, Kaya F, Bayram M. Effects of aerobic and anaerobic training program applied on elite wrestlers on body composition. International Journal of Social Sciences and Education Research, 2017: 3(1), 675-682.
24. Ağırbaş Ö, Kishalı NF, Çolak M. The Effects of Male Handball Players' Body Composition on Blood Lipid and Lipoprotein Levels in the Competition Period. The journal of institute of science and technology, 2009: 2(2), 133-151.
25. Karakaş S, Taşer F, Yıldız Y, Köse H. Comparison of Body Composition with Bioelectrical Impedance Analysis (BIA) Method in Medical Faculty and Sports College Students. Journal of ADU Faculty of Medicine , 2005: 6(3),5-9.
26. Fellmann N, Ritz P, Ribeyre J, Beaufrere B, Delaitre,M, Coudert J. Intracellular Hyperhidration İnduced by A 7-Day Andurance Race. Eur J Appl Physiol Occup Physio, 1999: l 80,353-359.
27. McConnell AK. Breathe Strong, Perform Better. Champaign, Human kinetics, USA. 2011
28. Krahenbuhl GS. Developmental Aspect of Maximal Aerobic Power in Children,Exercise and Sport Science Review, 1986: 13, 503-28.
29. Taşgın E, Dönmez N. The Effect of Exercise Program Applied to 10-16 Age Group Children on Respiratory Parameters. Selcuk University Journal of Physical Education and Sports Science, 2009: 11(2), 13-16.
30. Gözü RD, Liman E, Kan I. Thorax Measurements and Change of Respiratory Functions with Training. Journal of Sports Medicine, 1988: 23(1), 1-8.
31. Doğan Y. The Effect of Regular Exercise on Respiratory Function Parameters in 10-12 Years Old Children. Master Thesis, Malatya, 2020
32. Doherty M, Dimitriou L. Comparison of lung volume in Greek swimmers, land based athletes, and sedentary controls. Br J Sports Med, 2007: 31,337-341.
33. Wells GD, Plyley M, Thomas S, Goodman L, Duffin J. Effects of concurrent inspiratory and expiratory muscle training on respiratory and exercise performance in swimmers. Eur J Appl Physiol 2002:94,527-540.
34. Kubiak-Janczaruk E. Spirometric evaluation of the respiratory system in adolescent swimmers, Ann Acad Med Stetin, 2005: 51,105-113.
35. Dağlıoğlu Ö. Effects of Aerobic Exercise on Respiratory Functions and Aerobic Capacity in Sedentary Men. Institute of Health Sciences, Master Thesis, Gaziantep: Gaziantep University, 2018
36. Wicher IB, Ribeiro MA, Marmo DB, Santos CI, Toro AA, Mendes RT, Cielo FM, Ribeiro JD. Effects of swimming on spirometric parameters and bronchial hyperresponsiveness in children and adolescents with moderate persistent atopic

asthma. Jornal de Pediatria, 2010: 86(5), 384-90.
37. Hartz CS, Sindorf MAG, Lopes CR, Batista J, Moreno MA. Effect of Inspiratory Muscle Training on Performance of Handball Athletes. Journal of Human Kinetics, 2018: 63, 43-51.
38. Koç M. The Effect of Respiratory-Muscle Training on Aerobic and Anaerobic Endurance in Adolescent Taekwondo players, Master Thesis, Erciyes University Institute of Health Science, Kayseri, 2017: 52.
39. Enright SJ, Unnithan VB, Heward C, Withnall L, Davies DH. Effect of high-intensity inspiratory muscle training on lung volumes, diaphragm thickness and exercise capacity in subjects who are healthy. Physical Therapy, 2006: 86(3), 345-354.
40. Karaca Y., Ilkım M., Investigation Of The Attitudes Distance Education Of The Faculty Of Sport Science Students In The Covid-19 Period, Turkish Online Journal Of Distance Education Volume22, Issue 4, Page114-129,2021
41. Ilkım M. Çelik T., Mergan B. Investigation of Sports Management Students' Perceptions and Attitudes towards the COVID-19 Pandemic, Pakistan Journal Of Medical & Health Sciences, Volume15 Issue 2 Page799-803, 2021