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The effect of volleyball training on the physical fitness of high school students

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Abstract

The aim of this study is to determine the effect of regularly applied volleyball training on the physical fitness values of High School students. A total of 62 students from three different high schools participated in the study. The students who participated in the study were divided into two different groups; one group consisted of those who did not join in any sporting activities except for the physical education classes at school while the other group consisted of those who played in the school volleyball team in addition to the physical education classes at school. Eight tests were used derived from the EUROFIT test: flamingo, plate tapping, sit and reach, standing broad jump, handgrip, sit-ups, bent arm hang and 10 x 5m shuttle-run tests to determine the physical fitness of the students. The data obtained were interpreted using the SPSS 14.0 packet program.

Keywords: Physical Fitness, Volleyball Training, Physical Education and Sports, EUROFIT

1. Introduction

The best factor for determining the activity levels of school children is the extent of participation in organized sports and physical education classes. Considering that teenagers spend most of their time at school, physical education and sports classes should significantly contribute to their physical and mental development (Johnston et al., 2007). The physically excessive fat mass and the mental tiredness of teenagers during their adolescence could be minimized with the help of physical education activities. Physical health gained during childhood and adolescence and maintained lifelong, is essential for the body to function at the optimum level (Baltacı, 2008). Physical education is a training process which realizes the optimum development for the benefit of the individual and of society through large muscle activities, without damaging the individual's physical, mental and social integrity (Koç, 1998). The aim of physical education activities is to develop a child's locomotor, manipulative and balance movement skills, and should be part of the school curriculum. At the same time, it aims to contribute to getting the child into the habit of using free time positively and in a useful way, and increasing the learning capacity, social, emotional and perceptual motor development and physical fitness of the child (Çamlıyer & Çamlıyer, 1997). The content and scope of physical education and sports lessons are still under debate throughout the world. The physical circumstances of the school can be big hindrance with regard to achieving a certain standard. When we search the world averages for schools, we can see that the importance given to physical activity has declined over the last ten years (Burgeson et al., 2000). In parallel with this decline, there has also been a decline in the physical compatibility

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of the youngsters (Johnston & O'Malley, 2003). This decline may be the result of inadequate government interest in sports and the increasing importance of academic success. When the students' class levels rise less participation is observed in physical activities (Aaron et al., 2002).Within the framework of a modern approach to education, it has emerged that not only mental development but also physical and psychological developments of teenagers should be provided in education and training activities. Students need physical education lessons to show maximal physical and psychological development. This is because physical education lessons provide an increase in academic success, strengthen social and cognitive abilities, increase the emotions of self-confidence and self-esteem, teach teenagers how to respect their and others' bodies, and also achieve body-brain integration and provide for the development of aerobic and anaerobic capacities which are necessary for health (Talbot, 2001).In some cases, physical (spatial) insufficiencies in terms of the applicability of physical education and sports lessons negatively affect the benefits which students are supposed to gain from physical education and sports, and force them to run another branch in addition to physical education and sports lesson. In this context, volleyball, which has almost no injury risks and which individuals in all age groups will have no difficulty in performing, could be a means for students to participate in sports.

Ball games require a detailed skill, including physical, technical, mental and tactical aspects. Among these, the physical skills of the players significantly affect their game intelligence and the tactics of the team, because ball games require repeated maximum effort. That is why players should have physical skills to strengthen their aerobic and anaerobic capacities in order to undertake fast and hard movements, and to have long lasting offensive and defensive efficiency. These types of physical skills are of great importance when playing volleyball (Tsunawake et al., 2003). Volleyball is an interval sport consisting of short-term loading and resting phases. Volleyball also covers consecutive, aerobic and anaerobic loadings. Therefore, it may be thought to require high muscle strength and skill (Abreu et al., 2003).

The European Test of Physical Fitness (EUROFIT) test battery first emerged in 1977 in the meetings of Directors of Sports Research Institutes, with the idea of measuring the physical fitness of school children in Europe and allowing the creation of a reference database.

In the beginning, the primary aims of this project were as follows:

- Constituting a test battery which would be widely applicable in Europe.
- Helping the teachers to evaluate the physical fitness of the students.
- Helping to measure the health-related compliance of society.
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To be able to understand these aims better, under the organization of the Sports Development Committee, a series of European Research seminars were organized regarding physical fitness. The EUROFIT test battery, developed in these seminars, emerged in the form that is currently used.

This study aims to determine the effects of volleyball training on the physical fitness of high school students over a period of time.

2. Method

2.1. Participants

A total of 62 students (34 males, 28 females) from three different high schools participated in the study. The students were divided into two different groups; a sedentary group consisting of those who were not involved in any sporting activities except for physical education classes at school (n=31, 17 males, 14 females) and an athletics group consisting of those who played in the school volleyball team in addition to the physical education classes at school (n=31, 17 males, 14 females).

Table 2.1. The Basic Physical Features of the Subjects

Variables	Groups		Average
Age (year)	Athlete	Female	15.28 ± 0.46
		Male	15.70 ± 0.77
	Sedentary	Female	15.28 ± 0.46
		Male	15.35 ± 0.60
Height Measurement (cm)	Athlete	Female	163.78 ± 7.63
		Male	172.94 ± 8.21
	Sedentary	Female	160.78 ± 5.82
		Male	169.35 ± 8.23
Weight Measurement (kg)	Athlete	Female	50.50 ± 6.02
		Male	60.35 ± 9.56
	Sedentary	Female	53.92 ± 7.46
		Male	60.76 ± 6.53

2.2. Procedure

Eight tests were used derived from the EUROFIT test: flamingo, plate tapping, sit and reach, standing broad jump, handgrip, sit-ups, bent arm hang and 10 x 5m shuttle-run tests to determine the physical fitness of the students.

Table 2.2. Dimensions and Factors of the Physical Fitness Tests

Dimensions	Factors	Test	Sequence order for testing
Balance	Total body balance	Flamingo balance	1
Flexibility	Flexibility	Sit-and-reach	3
Strength	Explosive strength (power)	Standing broad jump	4
	Static strength	Handgrip	5
Muscular endurance	Trunk strength	Sit-ups	6
	Functional strength	Bent arm hang	7
Speed	Running speed agility	10 x 5m shuttle-run	8
	Speed of limb movement	Plate tapping	2

2.3. Statistics

For processing the data obtained, conventional statistical measures and methods were employed: specifically, the means and standard deviations were computed. Data were analyzed using the SPSS 14.0 statistical package program and in order to compare the means of female and male groups. With regard to some variables, the Mann-Whitney U Test was used and the students't-test was used for comparing total groups. The statistical significance was set at $p<0.05$.

3. Results

Table 3.1. The Measurement Results of Female Subjects

Variables	Groups	N	X ± Std.D.	Mean Rank	Sum of Rank	P
Handgrip (kg)	Athlete	14	36.35 ± 5.49	15.75	220.50	.420
	Sedentary	14	34.78 ± 4.54	13.25	185.50	
Standing broad jump (cm)	Athlete	14	146.35 ± 21.32	16.54	231.50	.190

	Sedentary	14	135.71 ± 19.56	12.46	174.50	
Bent arm hang (s)	Athlete	14	11.34 ± 3.90	17.86	250.00	.031*
	Sedentary	14	7.99 ± 3.89	11.14	156.00	
Sit-ups	Athlete	14	23.28 ± 3.85	20.46	286.50	.000*
	Sedentary	14	17.28 ± 2.12	8.54	119.50	
10 x 5m shuttle-run (s)	Athlete	14	20.17 ± 2.09	9.93	139.00	.003*
	Sedentary	14	24.07 ± 3.39	19.07	267.00	
Plate tapping (s)	Athlete	14	13.86 ± 1.67	16.14	226.00	.291
	Sedentary	14	13.21 ± 2.07	12.86	180.00	
Sit-and-reach (cm)	Athlete	14	27.35 ± 4.70	18.86	264.00	.005*
	Sedentary	14	20.28 ± 8.43	10.14	142.00	
Flamingo balance (mistakes)	Athlete	14	1.14 ± 1.23	8.25	115.50	.000*
	Sedentary	14	8.35 ± 4.46	20.75	290.50	

*p<0.05

The results of the female students were analysed using the Mann-Whitney U Test. It was found that the bent arm hang, sit-ups, 10 x 5m shuttle-run, sit-and-reach and the flamingo balance test results of female students who received volleyball training were statistically superior than the test results of the students who did not receive volleyball training. In terms of the results of the handgrip, standing broad jump and plate tapping tests, there was no statistically significant difference (Table 3.1).

Table 3.2. The Measurement Results of Male Subjects

Variables	Groups	N	X ± Std.D.	Mean Rank	Sum of Rank	P
Handgrip (kg)	Athlete	17	35.23 ± 6.61	19.79	336.50	.178
	Sedentary	17	31.76 ± 7.30	15.21	258.50	
Standing broad jump (cm)	Athlete	17	182.82 ± 28.24	16.88	287.00	.717
	Sedentary	17	183.52 ± 21.75	18.12	308.00	
Bent arm hang (s)	Athlete	17	16.72 ± 7.12	18.71	318.00	.480
	Sedentary	17	14.40 ± 5.61	16.29	277.00	
Sit-ups	Athlete	17	25.58 ± 3.35	23.82	405.00	.000*
	Sedentary	17	20.35 ± 3.31	11.18	190.00	
10 x 5m shuttle-run (s)	Athlete	17	18.39 ± 1.50	14.26	242.50	.058
	Sedentary	17	20.43 ± 3.83	20.74	352.50	
Plate tapping (s)	Athlete	17	11.86 ± 2.22	14.47	246.00	.076
	Sedentary	17	12.96 ± 2.06	20.53	349.00	
Sit-and-reach (cm)	Athlete	17	23.88 ± 7.55	17.94	305.00	.796
	Sedentary	17	22.47 ± 8.50	17.06	290.00	
Flamingo balance (mistakes)	Athlete	17	3.75 ± 3.92	12.29	209.00	.002*
	Sedentary	17	8.70 ± 4.35	22.71	386.00	

*p<0.05

The test results of the male students were analysed using the Mann-Whitney U Test. It was found that the sit-ups and flamingo balance test results of the male students who received volleyball training were statistically superior than test results of the students who did not receive volleyball training. In terms of the handgrip, standing broad jump, bent arm hang, 10 x 5m shuttle run, plate tapping and sit-and-reach test results, there was no statistically significant difference (Table 3.2).

Table 3.3. The Measurement Results of Subjects

Variables	Groups	N	X ± Std.D.	p
Handgrip (kg)	Athlete	31	35.74 ± 6.06	.101
	Sedentary	31	33.12 ± 6.30	
Standing broad jump (cm)	Athlete	31	166.35 ± 31.03	.581
	Sedentary	31	161.93 ± 31.67	
Bent arm hang (s)	Athlete	31	14.29 ± 6.41	.079
	Sedentary	31	11.51 ± 5.82	

Sit-ups	Athlete	31	24.54 ± 3.71	.000*
	Sedentary	31	18.96 ± 3.19	
10 x 5m shuttle-run (s)	Athlete	31	19.19 ± 1.98	.001*
	Sedentary	31	22.07 ± 4.03	
Plate tapping (s)	Athlete	31	12.76 ± 2.20	.573
	Sedentary	31	13.07 ± 2.04	
Sit-and-reach (cm)	Athlete	31	25.45 ± 6.56	.043*
	Sedentary	31	21.48 ± 8.40	
Flamingo balance (mistakes)	Athlete	31	8.54 ± 4.33	.000*
	Sedentary	31	2.58 ± 3.26	

*p<0.05

The students't-test was used for comparing total groups. Statistically it has been observed that the students who attended volleyball training had superior scores with regard to Flamingo, sit-and-reach, sit-ups and 10 x 5m shuttle-run tests than those who did not attend volleyball training ($p<0.05$). But statistically, no difference was observed between the students in terms of the results of the plate tapping, standing broad jump, handgrip and bent arm hang tests (Table 3.3).

4. Discussion

It was intended to measure the static strength of the students using the handgrip test. According to the results of the test, there was no significant difference between the static strengths of the students who received volleyball training and those who did not. In some studies conducted on female students, it has been found that the handgrip test results of athlete students were higher than those of sedentary students (Kızılakşam, 2006; Pense & Serpek, 2010; Günay et al., 2011). Kürkçü et al. compared athlete and sedentary male students in one of their studies, and found significant differences regarding handgrip test results (Kürkçü et al., 2001).There are also some other studies showing similarities with ours in that there is no difference regarding the handgrip test results between athlete and sedentary male students (Gerime, 2003; Kızılakşam, 2006).

The standing broad jump test was intended to measure the explosive strength of the students. According to the results of the test, no significant differences were found in terms of the explosive strength of the male and female students who either received or did not receive volleyball training. In the study carried out by Kızılakşam, no difference was found in the standing broad jump tests of male athletes and sedentary students (Kızılakşam, 2006). This result shows similarities with our study. There are also other studies which show different results from ours (Kürkçü et al., 2001; Gerime, 2003; Pense & Serpek, 2010; Günay et al., 2011).

The bent arm hang test was intended to measure functional strength, meaning the muscle endurance of the students. According to the results of the test, no significant difference was found between the functional strengths of the male students who either received or did not receive volleyball training. In the study carried out by Kürkçü et al. (2001), the bent arm hang values of athlete male students were better than those of sedentary male students. Among female students, the students who received volleyball training had higher test values than did sedentary students. There are other studies showing similar results (Pense & Serpek, 2010).

The sit-ups test was intended to measure body strength such as the muscle endurance of the students. According to the results of the test, it was found that the body strength of the male and female students who received volleyball training was significantly higher than those of students who did not receive volleyball training. There are other studies showing similar results (Kürkçü et al., 2001; Pense & Serpek, 2010).

The 10 x 5m shuttle test was intended to measure the speed and coordination skills of the students. According to the results of the test, it was found that the speed and coordination values of the female students who received volleyball training were significantly higher than those of the female students who did not receive such training. However, no difference was found between male students.

The plate tapping test was intended to measure the movement speed of the upper extremities of the students. According to the results of the test, there was no significant difference between the movement speed of the upper extremities of the male and female students who either received or did not receive volleyball training.

The sit-and-reach test was intended to measure the elasticity of the students. According to the results of the test, it was found that the elasticity values of the female students who received volleyball training were significantly higher than those of the female students who did not receive volleyball training. However, no difference was found between male students.

The flamingo balance test was intended to measure the general balance levels of the students. According to the results of the test, it was found that the general balance values of male and female students who received volleyball training were significantly higher than those of the students who did not receive such training. There are studies showing similar results (Gerime, 2003; Pense & Serpek, 2010; Günay et al., 2011).

5. Conclusions

According to the results of the study, it has been observed that volleyball training, excluding physical education lesson, applied to high school-aged individuals, had a positive effect on the students' physical features such as their body-muscle endurance, functional strength, speed and coordination skills, elasticity and balance. Volleyball training can be applied to students together with the physical education and sports lessons on account of it easily being applicable, and having low injury risk.

References

Aaron, DJ., Storti, KL., Roberston, RJ., Kriska, AM., & LasPorte, RE. (2002). Longitudinal study of the number and choice of leisure time physical activities from mid to late adolescence: implications for school curricula and community recreation programs. *Archives of Pediatrics & Adolescent Medicine*, 156:1075-1080.

Abreu, T., Almeidal, D., & Soaresll EA. (2003). Nutritional and anthoropometric profile of adolescent volleyball athletes. *Revista Brasileria de Medicina do Esporte,* 9:4.

Baltacı, G. (2008). *Çocuk ve Spor*. Klasman Matbaacılık, Sağlık Bakanlığı Yayın no:730, Ankara.

Burgeson, CR., Wechsler, H., Brener, ND., Young, JC., & Spain, CG. (2000). Physical education and activity: results from the School Health Policies and Programs Study. *Journal of School Health*, 71;7:279-293.

Çamlıyer, H., & Çamlıyer, H. (1997). *Hareket Eğitimi ve Spor*. Can ofset, İzmir.

Gerime, G. (2003). *9-12 Yaşlar Arası Spor Yapan ve Yapmayan Kız-Erkek Öğrencilerin Fiziksel Uygunluklarının EUROFIT Test Bataryasıyla Ölçülmesi. Muğla Üniversitesi Sosyal Bilimler Enstitüsü Yükseklisans Tezi. Muğla-Turkey.*

Günay, M., Ciğerci, A.E., Aksen, P. (2011). The evaluation of some physical and motor features of the female and male students aged 12-14 who participated in sports or not. *Bulletin of the Transilvania University of Braşov,* 4(53): 203-210.

Johnston, LD., & O'Malley, PM. (2003). *Obesity among American adolescents: tracking the problem and searching for causes*. Ann Arbor, MI: Institute for Social Research, Youth, Education & Society Occasional Paper, no:3.

Johnston, LD., Delva, J., & O'Malley, PM. (2007). Sports participation and physical education in american secondary schools. *American Journal of Preventive Medicine,* 33: 195-208.

Kızılakşam, E. (2006). *Edirne İl Merkezi İlköğretim Okullarındaki 12-14 Yaş Grubu Aktif Olarak Spor Yapan ve Yapmayan (Beden Eğitimi Dersine Giren) Öğrencilerin EUROFIT Test Bataryaları Uygulama Sonuçlarının Karşılaştırılması.* Trakya Üniversitesi Sağlık Bilimleri Enstitüsü Beden Eğitimi ve Spor Anabilimdalı Yüksek Lisans Tezi. Edirne-Turkey.

Koç, Ş. (1998). *Ortaöğretimde beden eğitimi etkinliklerine genel bir bakış ve uygulamaları*. İzmir Türk Eğitim Derneğiyayınları Öğretim Dizisi, No:6.

Kürkçü, R., Hazar, F., Canikli, A., & Çalışkan, E. (2001). Effects of exercise on physical and physiological parameters of 12-14 years age boys. *Journal of Physical Education and Sports Science*, 1(3): 68-73.

Pense, M., & Serpek, B. (2010). The determination of female 14-16 years old basketball players biomotor and physiological features by eurofit test battery. *Selçuk University Journal of Physical Education and Sport Science,* 12(3): 191-198.

Talbot, M. (2001). The case for physical education. In: Doll-Tepper G, Scoretz D, eds. *World Summit on Physical Education*. Berlin, Germany:ICSSPE; 39-50.

Tsunawake, N., Tahara, Y., Moji, K., Muraki, S., Minowa, K., & Yukawa, K. (2003). Body composition and physical fitness of female volleyball and basketvall players of the japan inter-high school championship teams. *Journal of Physiological Anthropology and Applied Human Science,* 22: 195-201.