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A study on some motoric and anthropometric attributes of competitive and non-competitive taekwondo athletes between the age group 9-12 years

Duygu SEVİNÇ, Mergül ÇOLAK, Vedat YILMAZ
Erzincan Üniversitesi BESYO, Erzincan, TÜRKİYE
Email: 24duygusevinc24@gmail.com

Abstract

Aim: The aim of this study is to examine some motoric and antrophometric attributes of competitive and non-competitive taekwondo athletes within the age group 9-12 years and to determine the difference between those two groups.

Material and method: 31 competitive and 29 non-competitive licensed taekwondo athletes voluntarily participated in the study. The average ages, heights and weight of competitive and non-competitive athletes were 11,16±,93 year, 150,58±17,14 cm and 43,80± 13,97 kg, 9,62±,82 year, 137,31±8,80 cm and 35,24±8,28 kg respectively. Both groups have been practising regularly taekwondo for 2,5 years, 2 days a week and two hours a day. Flamingo balance test, test of disk touching, sit and reach flexibility test, long jump while standing still, 30 sec sit-up test, bent arm pull-up test and 10x5m push up run, right and left hand grip strength test and 20 m shuttle run of the Eurofit test battery were used. Body fat percent, body fat mass, fat free mass, body mass index values were measured. Such antrophometric attributes as hand length, calf and femur circumference, arm length, biceps circumference in flexion, arm span length were measured.

Results: Results of statistical analyses showed a significant difference between two groups in terms of motoric scores ($p<0,01$, $p<0,001$), antrophometric characteristics ($p<0,01$, $p<0,001$), and fat free mass ($p<0,001$) in favor of the competitive group.

Conclusion: Compared with the non-competitive group, significant differences in competitive group can be explained by their active participation in competitions.

Keywords: Taekwondo, Child, Eurofit test battery, Body composition

Introduction

Sports is still an important sector. Taekwondo is a far-east origined combat sport that is also practiced in Turkey (Tel, 1996) In adoption of new habits of the youth who are to take responsibilities in society in the future, restoration of good relations between individuals and societies, for a peaceful life, tendency for sports from childhood is of great importance (Toksöz, 2008)

Physical and physiological tests conducted on children are used to measure and evaluated the effect of regular physical activity on growth, development and health. Children's growth, maturation and physical fitness models, their long-term tendency and acute responses to exercises of various intensity are measured through these tests (Docherty, 1996)

The level of importance given to sports as well as increasing competition between athletes and countries, early discovery of talent in sports are crucial in success in sports. Anatomy and motoric development levels of the selected athletes should be assessed and evaluated according to their training (Pekel et al.2007)

All sports disciplines play an important role in increasing physical performances and social adaptation of the young. The effect of regular exercise on the development of children and adolescents has been a research topic [Baltacı, 1998)

We use categories like good, moderate, weak or so to measure the performance of an athlete. However, such an evaluation would be variable depending on the observer. In order to avoid such a fallacy, only one indisputable assessment method should be taken into consideration, which can be explained through numbers and realities. This method is using tests (Güllü and Esin, 2003).

The aim of this study is to examine some motoric and anthropometric attributes of competitive and non-competitive taekwondo athletes within the age group of 9-12 and to determine the difference between those two groups.

Material and Method

Totally 60 licensed male taekwondo athletes, 31 competitive and 29 non-competitive of 9-12 age group, participated voluntarily in the research. Both groups have been practicing taekwondo regularly for 2,5 years, 2 days a week and 2 hours each day. While competitive group have been training for performance, non-competitive group have been training for a health life.

Measurement forms were prepared for measurement and record of the tests then the values were recorded.

Measurement of Age, Height, and Weight and Calculation of Body Mass Index

The ages of the participants were indicated in years and their height was measured by means of height scale on the weighing machine barefoot with 0,01 cm possibility of precision and their weight by the same weighing machine when wearing dobok with 0,01 kg precision. Their body mass index was measured by division of the mass by the square of the body height (Zorba and Ziyagil, 1995)

Flamingo balance test, test of disk touching, sit and reach flexibility test, long jump while standing still, 30 sec sit-up test, bent arm pull-up test and 10x5m push up run, right and left hand grip strength test and 20 m shuttle run of the Eurofit test battery were used in the research.

For antrophometric attributes, hand length, leg length, calf and femur circumference, bust length, arm length, biceps circumference in flexion, arm span length were measured in cm.

Skinfold and biceps, triceps, suprailiac, subscapula were measured and body density was calculated considering Durning-Wormesley's (1974) formula and body fat percentage according to Siri's (1956) formula. SPSS for Windows Version 15,0 program was used for statistical analysis. Within group difference was tested by Paired-Samples t-test while inter-group difference was measured by independent sample t-test.

Findings

Table 1. Results of age, body height and body mass measurements of competitive and non-competitive groups

	Athlete	N	X ± SS
Age	Competitive	31	11,45±1,26
	Non-competitive	29	9,62±0,82
Height	Competitive	31	150,58±17,14
	Non-competitive	29	137,31±8,80
Mass	Competitive	31	43,80±13,97
	Non-competitive	29	35,24±8,28

Table 2. Eurofit test battery results of competitive and non-competitive groups

	Athlete	N	X ± SS	t	P
10x5m push up run	Competitive	31	143,06 ± 21,49	-13,877	0,000
	Non-competitive	29	286,27±51,54		
Balance test	Competitive	31	1,12 ±1,056	-6,585	0,000
	Non-competitive	29	3,93 ± 2,10		
Disk touching test	Competitive	31	137,67±17,54	-9,208	0,000
	Non-competitive	29	191,58±27,09		
Flexibility test	Competitive	31	24,70±4,87	2,781	0,007
	Non-competitive	29	21,44±4,15		
Long jump test	Competitive	31	183,29±30,93	6,506	0,000
	Non-competitive	29	140,31±18,14		
Hand grip strength - Right	Competitive	31	19,745,77	3,865	0,000
	Non-competitive	29	15,20±2,63		
Hand grip strength- Left	Competitive	31	18,09±5,82	3,459	0,001
	Non-competitive	29	13,96±2,82		
30 sec sit-up test	Competitive	31	28,09±6,79	5,858	0,000
	Non-competitive	29	18,51±5,78		
Bent arm pull-up test	Competitive	31	3,14±141,82	5,537	0,000
	Non-competitive	29	1,60±48,12		
20 m shuttle run	Competitive	31	48,17±9,29	7,488	0,000
	Non-competitive	29	33,82±4,62		

As seen in Table 2, all items of Eurofit test battery suggest statisticallay significant increase (p<0,01, p<0,001)

Table 3. Body composition results of competitive and non-competitive groups

	Athlete	N	x ± ss	t	P
Fat Percentage	Competitive	31	18,68±5,37	-0,111	0,538
	Non-competitive	29	18,84±5,86		
Fat Mass	Competitive	31	8,54±4,25	1,492	0,549
	Non-competitive	29	6,97±3,86		
Fat free mass	Competitive	31	35,26±10,42	3,271	0,000*
	Non-competitive	29	28,26±5,05		
Body mass index	Competitive	31	18,48±2,75	-0,557	0,286
	Non-competitive	29	18,98±4,03		

Table 3 shows significant increase in fat free mass, component of human body measurement ($p<0,001$) while no significant was seen in all other components.

Table 4. Anthropometric results of competitive and non-competitive groups

	Athlete	N	X ± SS	t	P
Biceps circumference in flexion	Competitive	31	23,29±3,61	4,609	0,000
	Non-competitive	29	19,82±1,87		
Calf circumference	Competitive	31	30,12±3,94	3,223	0,002
	Non-competitive	29	26,68±4,31		
Femur circumference	Competitive	31	46,32±6,43	3,18	0,002
	Non-competitive	29	41,34±5,63		
Arm span length	Competitive	31	149,67±17,08	3,531	0,001
	Non-competitive	29	136,82±9,91		
Bust Length	Competitive	31	78,06±7,27	3,732	0,000
	Non-competitive	29	71,75±5,64		
Arm length	Competitive	31	64,58±8,55	3,718	0,000
	Non-competitive	29	58,03±4,21		
Hand length	Competitive	31	17,35±1,97	3,098	0,003
	Non-competitive	29	16,10±0,93		
Leg Length	Competitive	31	88,16±10,13	4,131	0,000
	Non-competitive	29	78,37±7,99		

Table 4 shows that significant differences were seen in terms of all variables in comparisons between competitive and non-competitive groups (p<0,001)

Discussion and Conclusion

The effects of taekwondo, a combat and defense sport, on motoric and anthropometric and body composition attributes of athletes are evaluated by means of tests and measurements. In the present study in which body composition, anthropometric and motoric attributes of 60 licenced taekwondo athletes in 9-12 age groups living in the province of Erzincan were evaluated, significant differences were found in favor of competitive group in terms of motoric (p<0,01,p<0,001), anthropometric (p<0,01, p<0,001) and fat free body mass (p<0,001) values.

Uzuncan (1991) found the results of 10x5 push-up run test of male students at 12 age group as 24.96 ± 1.42 seconds. In another study where fitness conditions of these students were measured, Boreham (1986) found the values of 10x5 mt push-up run as 22.4 ± 1.9 sec. Demirel et al (1990) found speed and coordination test results of male students of 7-11 age group as 24.2 ± 1.8 seconds. The present study shows similarity with the values of 10*5 meter shuttle run of non-competitive group in the relevant literature while average values of competitive group were better compared to those in the literature (Table 2). In one study, it was stated that acute acceleration, speed and coordination played an important role in 15-30 sec pair tackle and combined methods (Çatıkkaş, 2003). The results of Çatıkkaş's research (2003) prove better speed and coordination test of competitive group in this study.

Balance control is a motoric attribute that covers planning of flexible motions and practices as well as sensory integration of input (Ferdjallah et al 2002). Dynamic and static postural control activity develops in all people that do sports for a long period of time (Perrin et al, 2002). Hazar and Taşmektepli (2008) stated that balance affected positively strength of children in pre-puberty period. (Hazar and Taşmektepli, 2008). These findings suggest positive effect of sports on balance.

More than half of the techniques used in taekwondo competitions to get more scores and practically consist of head techniques (Kazemi et al.,2006) Practices and techniques consulted for a high kick, and standing on one foot to give a kick lead a rise in balance increasing postural regulation (Paillard et al., 2006) Violan et al.,1997) Taekwondo athletes stated that rivals during contest maintain their body balance having a better postural stand. (Violan et al.,1997). These results are supportive in that balance values of competitive group are significantly different from those of non-competitive group.

Çalış (1992) found disk touching test results of 15-16 15-16 age group male students attending physical education as 12.2 sec. while Demirel et al (1990) reached 14.3 ± 1,9 sec. The relevant literature supports the results of disk touching test obtained in this study in favor of competitive group.

Taekwondo is a branch of sports in which flexibility is important and flexible activities are intensely followed. A taekwondo athlete whose flexibility is good enough can give a long distance strong kick and protect himself against attacks. Another important activity area of Taekwondo is gymnastics. Gymnastic activities prior to training is crucial for muscle relaxation. Such gymnastic activities consist of running, skip, sit-ups, stretch on legs, hip, curb on knee and ankle circle as well as motions of balance (Gil, 1978).

Increase in upper level technique scores has led athletes toward upper level techniques. An athletes should be most flexible during the contest to show upper level techniques with almost no difficulty, overcome his rival and avoid the risk of getting injured, which makes an emphasis on the flexibility activities. The athletes whose flexibility is higher have run lower risk of getting injured (Arslan, 1989).

Flexibility is an aspect of activity to move the body freely, which is possible by muscle and joint span. Motion in joints is possible through cofunction of joint volatility and flexibility. Unflexible muscles prevent joint volatility. Velocity is improved by flexibility activities and stretch of muscles (Çakmakcı, 2002). Miguel et al. found flexibility values of taekwondo athletes as 36.0+9.1cm according to sit and reach flexibility test (Miguel et al, 1998). Heller et al found flexibility vakues of elite taekwondo values as 6.9+4.5cm (Heller et al, 1998) while Kutlu et al, as 34.44+5.31cm (Kutlu et al, 1996). On the other hand, Çelenk et al found the values as 36.62±9.01cm (Çelenk et al,2005). In this study, the sit and reach flexibility values were found as 24,70+4,87cm. The relevant literature supports the findings in this study in favor of competitive group (Table 2).

Taekwondo is one of the sports that needs anaerobic strength. Anaerobic leg strength is important (explosive power) in leaping shots in defense and attack and counterattack in Taekwondo (CHO, 1988). Tharp et al.(1984) state that anaerobic power is closely related with age, body mass and most importantly fat free body mass. Ergun and Baltacı (1992) argued that height, body mass and age have positive relation with power and the higher the athletes the more powerful they become and the higher they take off. In competitions, active use of leaping shots during defense, attack and counter-attack may account for significantly high explosive power of competitive athletes. In addition, fat free body mass and height of competitive athletes compared to those of non-competitive athletes may also be responsible for higher explosive power. The literature is supportive of the results on explosive power obtained in this study.

In most studies, hand grip power of children has improved by participating in sports and exercise (Bockous et al 1990, Katie et al 2003, Yazarer et al 2004). Saygın (2006) in their study on comparison of physical fitness and physical activity habits of primary school children at different status found average grip power (right) as 16.97 kg. In the study in which physical fitness test results related to performance of children doing athletism were evaluated, Pekel et al (2007) found average grip power (left) of athletes of 10 age group as 15,60 kg. The present study shows similar results of right-left grip power values of non-competitive group as in the literature while competitive group have better average values (Table 2).

Koç (2009) in his dissertation on physical fitness of primary and secondary school children assessed sit-ups averages of 10 age group as 21.87. In one study where sit-ups values of 12-15 age group male volleyball players were examined, Zorba et al (1995b) found 24.81 ± 1.80, sit-up values of sedentary group as 21.57 ± 2.24. In another study, Çalış (1992) found sit-up values of 15-16 age group male students attending physical education course as 20.4 ± 2.5. These findings show similarity with sit-up values of non-competitive group but the values of competitive group are better. (Table 2).

In his dissertation on *"Evaluation of the physical conditions of the students at the primary schools, that are connected to edirne province (şehit asim primary school and trakya university state conservatory primary school), between 8-11 years of age by eurofit tests"* Koray Hasan found bent arm pull-up test results of male students of State Conservatory at

Trakya University as 3,73±4,45. This result supports the findings obtained in favor of competitive group (Hasan, K. 2008).

It was demonstrated that as long as far-east defensive sports are performed in appropriate time and intensity according to their own style, they contribute a lot to physical and cardiovascular fitness as well as physiologic aspects (Liu et al., 2000; Pieter et al., 1990; Zehr et al., 1993). Çalış (1992) found 20 m shuttle run values of 15-16 age group male subjects attending physical education as 63.2 ± 10.0 ml/kg/min.

Taşkıran found Etibank Sas wrestling team average maxVO2 value as 48,9 ml/kg/min and USA national team athletes average values as 55.59 ml/kg/min (Taşkıran, 1992, p.33). In taekwondo like wrestling as a weight sport, since their competition duration is closer to each other, it shows similarity with aerobic power (maxVO2). Significant difference was found in favor of competitive group in our study showing similarity with the above mentioned results $p<0,001$.

Body composition is composed of fat mass and fat free body mass (Mc Ardle, 1991). Muscle structure, physical activity level and eating habits are said to be among the most important factors affecting body mass index. Fatty tissue is inactive and adversely affects performance. Since fat is not oxidized, it does not contribute a lot to fast energy production. Depending on the type of training, fat mass decreases (Akgün,1993). These clues support our findings. Considering that taekwondo athletes do their training individually, more performance means low level of fat free mass depending on adaptation of overloading components to athlete.

Çelenk and Çumragil (2005) revealed findings in their study in favor of individual football players and taekwondo athletes showing similarity with the results in our study. (Çelenk and Çumralıgil, 2005). No significant difference was found in fat percentage, fat mass and body mass index results.

Kankal (2008) in his study found significant difference in chest, waist, hip, femur, biceps in flexion, arm length measurements between aerobic gymnastic and rhythmic gymnastic athletes (Kankal, 2008). In this study, significant difference was found between competitive and non-competitive groups $p<0,001$.

REFERENCES

Akgün, N. (1993). Egzersiz Fizyolojisi, İzmir : 4. Baskı, Ege Üniversitesi, Matbaası, 2, 258-26.

Arslan C. (1989) Fırat Üniversitesinde Spor Yapan ve Yapmayan Erkek Öğrencilerin Seçilmiş Bazı Fizyolojik Özelliklerinin Ölçümü ve karşılaştırılması, Gazi Üniversitesi Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, Ankara

Baltacı G, (1998) Yüzme Sporu Yapan Çocuklarda Kardiyorespiratuar Özelliklerinin Performansa Etkisinin Kontrol Grubu ile Karşılaştırılması, Doktora Tezi, Gazi Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara.

Bockous DD, Farrow JA, Friedl KE. (1990) Assesment of maturity in boys and grip strength. J Adolesc Healty Care.; 11 (6): 497-500.

Boreham, C.A.G., Policzka, V .J. and Nichols, A.K. (1986). Fitness Testing Of Belfast School Children. 5 Th European Research Seminer On T esting Physical Fitness, Formia

CHO, J.W. (1988). A study on the physical performance in children, WTF Taekwondo (Seoul-Korea), 8(4), 34–39.

Çakmakçı, O. (2002) Türkiye ve Gürcistan A Millî Boks Takımlarının Seçilmiş Fiziksel Özelliklerinin Karşılaştırılması. Yayınlanmamış Yüksek Lisans Tezi, Konya.

Çalış, M. (1992) Beden Eğitimi Dersine Katılan Katılmayan ve Spor Yapan 15-16 Yaş Grubu Erkek Öğrencilerin Fizyolojik Parametrelerinin Eurofit Test Bataryasıyla Mukayesesi, (Yüksek Lisans Tezi). Ankara: Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Beden Eğitimi ve Spor Anabilim Dalı.

Çatikkaş, F. (2003). Elit Taekwondocularda Müsabaka Puan Etkileri İle Kan Laktat İlişkisinin İncelenmesi. Y. Lisans, Tezi, Ege Üniversitesi. Sağlık Bilimleri. Enst. İzmir.

Çelenk, I. Çumralıgil, B. (2005). Takım Sporcuları ile Ferdi Sporcuların Bazı Fiziksel ve Fizyolojik Özelliklerinin Karşılaştırılması. Atatürk Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi, 7 (3).

Demirel, H., Açıkada, T., Bayar, B., Turnagöl, H., Erkan, U., Hazır, T., Demirci, R., Haner, B., Pehlivan M. ve Ayalp, Y. (1990).Ankara'da Yükseli_ Koleji _lkokul Bölümünde 7-11 Yaş Grubu Çocuklarda Eurofit Uygulaması. H.Ü Spor Bilimleri I.Ulusal Sempozyumu. s.601-610.

Docherty D. (1996) Measurement in Pediatric Exercise Science, Human Kinetics, USA.

Durning, J.V.G.A., Womersley, J. (1974). Body fat assessed from total body density and its estimation from skinfold thickness-measurements on 481 men and women aged from 16 to 72 years, British Journal of Nutrition, 32 (1),77-97,

Ergun, N. ve Baltacı, G. (1992) Elit sporcularda yaş ve cinsiyete göre statik kuvvet ölçümlerinin fiziksel özellikler ile ilişkisi. H.Ü. Spor Bilimleri Dergisi: C:3, S:3, ss:3-10.

Ferdjallah, M., Harris, G.F., Smith, P., Wertsch, J.J. (2002 Analysis of Postural Control Synergies During Quiet Standing in Healthy Children and Children with Cerebral Palsy, Clinical Biomechanics, 17, 203-210.

Gil, K. (1978). Taekwondo. Niedriehsen, s: 9–19.

Güllü, A. ve Güllü, E. (2003). Genel Antrenman Bilgisi, Malatya: Umut Matbaacılık.

Hasan, K. (2008). Edirne iline bağlı ilkokullardaki (Şehit Asim İlköğretim Okulu ve Trakya Üniversitesi Devlet Konservatuari İlköğretim Okulu) 8-11 Yaş Arasindaki Öğrencilerin Eurofit Testleri İle Fiziksel KondiSyonlarinin Değerlendirilmesi. Y.Lisans Tezi, Trakya Üniversitesi, Sağlık Bilimleri Enstitüsü, Edirne

Hazar, F., Taşmektepligil, Y. (2008) Puberte Öncesi Dönemde Denge ve Esnekliğin Çeviklik Üzerine Etkilerinin İncelenmesi, Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi, Cilt: VI, Sayı: 1, 9- 12.

Heller J., Peric T., Dlouha R., Kohlikova E., Melichna J., Novakove H. (1998). Physiological Profiles of male and female taekwondo (ITF) black belts. Journal of Sports Sciences, 16 : 243-249.

Kankal M.B. (2008); „9-12 Yaş Grubu Aerobik Cimnastik ve Ritmik Cimnastik Sporcularının Fiziksel, Fizyolojik ve Performans Özelliklerinin Karşılaştırılması" Yüksek Lisans Tezi, Ankara Üniversitesi Sağlık Bilimleri Enstitüsü.

Katie MM, Brad SM, Joanne K, Linda DV, Terence J W. (2003) Contribution of timetabled physical education to total physical activity ın primary school children: cross sectional study. BMJ doi: http://dx.doi.org/10.1136/bmj.327.7415.592.; 327-592.

Kazemi,M.,J.Waalen,C.Morgan,etal.(2006)AprofileofOlympicTaekwondocompetitors. J Sports Sci Med. CSSI:114-121.

Koç Y. (2009) İlk ve orta öğretim öğrencilerin fiziksel uygunlukları ile beden eğitimi dersine ilişkin tutum- larının incelenmesi. Doktora Tezi. Ankara: Gazi Üniversitesi.

Kutlu M., Tel M., Ağaoğlu S.A., Onay M., Aydost L. (1996). Türk Taekwondo Millî Takım Düzeyi Sporcularının Fiziksel ve Fizyolojik Profilleri, Hacettepe Üniversitesi IV. Spor Bilimleri Kongresi Bildiri Özetleri, s. 66, 1-3 Kasım.

Liu Y.P., Zhang, B.X., Liu, X.D., Li, X.Z. (2000). Research and analysis of cardiopulmonary functions of taekwonda athletes. Journal of Beijing University of Physical Education, 23(3): 340-341.

McArdle W.D. (1991). Exercise Physiology Energy Nutrition and Human Performance. Lea and Fetsiper, Philadelphia 85-86.

Miguel A., R, Anita, R. M.B., Walter, R. F. (1998). Health Related Physical Fitness Characteristics of Elite Puerto Rican Athlets. Journal of Strength and Conditioning Research, 12 (3) : 199-203.

Paillard, T., F. Noe, T. Riviere, V. Marion, R. Montoya, and P. Dupui. (2006). Postural performance and strategy in the unipedal stance of soccer players at different levels of competition. J. Athl. Train. 41:172–176.

Pekel A., Balcı S., Arslan Ö. (2007). Atletizm yapan çocukların performansla ilgili fiziksel uygunluk test sonuçlarının ve bazı antropometrik değerlerin incelenmesi, Kastamonu Eğitim Dergisi, 15, 427-438.

Perrin, P., Deviterne, D., Hugel, F., Perrot, C. (2002). Judo, Better Than Dance, Develops Sensorimotor Adaptabilities Involved in Balance Control, Gait and Posture, 15, 187–194.

Pieter W., Taaffe, D., Heijmans, J. (1990).Heart rate response to taekwondo forms and technique combinations. Apilot Study. J Sports Med Phys Fitness, 30 (l) :97-102.

Saygın Ö., Kuşgöz A. (2006). Farklı statüdeki ilköğretim öğrencilerinin sağlık ve beceri ilişkili fiziksel uygunlukları ve fiziksel aktivite alışkanlılarının karşılaştırılması. 9. Uluslararası Spor Bilimleri Kongresi, Muğla Üniversitesi. 3-5 Kasım. s. 1287

Siri WE, (1956). The gross composition of the body. In C.A. ToBİAs & J.H. Law- rence (Eds.), Advances in biological and medical physics. New York: Aca- demic.

Tharp, G.D., Johnson, G.O. and Thorland, W.G., (1984). Measurement of anaerobic power and capacity in elite young track athletes using the wingate test. The Journal of Sports Medicine and Physical Fitness: Vol:24, No:2, pp:100-106.

Taşkiran, C. (1992). Yüksek Lisans Tezi. Konya.

Tel, M. (1996), Türk Taekwondo Milli Takım Sporcularının Seçilen Bazı Fiziksel ve Fizyolojik Özelliklerinin Analizi, Fırat Üniversitesi Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, Elazığ 1996; ss 51- 52.

Toksöz İ. (2008). Eurofit testleri ile fiziksel Kastamonu Eğitim Fakültesi Dergisi kondisyonların incelenmesi, Trakya Üniversitesi, Edirne.

Uzuncan, H. (1991). Eurofit Testleri ile 10- 12 Y aları Arasındaki Erkek Örencilerin Aerobik Güç veFiziksel Uygunluklarının Ölçülmesi. Y ayımlanmamı Yüksek Lisans Tezi. Selçuk Üniversitesi., Salık Bilimleri Enstitüsü, Konya.

Violan,M.A.,E.W.Small,M.N.Zetaruk,andL.J.Micheli.(1997).Theeffectofkaratetraining on flexibility, muscle strength, and balance in 8- to 13-year-old boys. Pediatr. Exerc. Sci. 9:55–64.

Yazarer İ, Taşmektepligil MY, Ağaoğlu S, Ağaoğlu SA, Albay F, Eker H. (2004). Yaz spor okullarında basketbol çalışmalarına katılan grupların iki aylık gelişmelerinin fiziksel yönden değerlendirilmesi. Spormetre Beden Eğitimi Ve Spor Bilimleri Dergisi. 4: 163-170.

Zehr, E.P., Sale, D. G. (1993). Oxygen Uptake, Hearthrate and Blood Lactate Responses to the Chito-Ryu Seisan Kata in Skilled Karate Practitioners, Int. J. Sports Med. 14 : 269-274

Zorba E, Ziyagil M.A. (1995). Vücut Kompozisyonu ve Ölçüm Metodları, Gen Matbaacılık, Trabzon.

Zorba, E., Ziyagil, M., Çolak, H., Kalkavan, A., Kolukısa, ., Torun, K., Özda, S. (1995b). 12-15 Yaş Grubu Voleybolcuların Antropometrik ve Fiziksel Uygunluk Değerlerinin Sedanter Grupla Karşılaştırılması. H.Ü. Voleybol Bilim ve Teknoloji Dergisi, 1 : 40