EXAMINING PHYSICAL AND MOTOR DEVELOPMENT OF ADOLESCENT FEMALE TAEKWONDO PLAYERS

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ABSTRACT

In the study it was generally purposed to examine physical and motor developments of adolescents that make physical taekwondo training regularly. Taekwondo players whose 87 were female between 10-13 years old, voluntarily participated in the study.It was measured level, age, height, weight, body mass index (BMI), competition weight, band, vertical jump, speed, grip strength of right hand, grip strength of left hand, leg strength, maximal oxygen consumption (VO2), balance duration, balance point, reaction time, fat percentage of body (BF%), anaerobic endurance, hip flections, hip extension, hip internal rotation, hip external rotation, knee flections, knee extension parameters of the volunteer sportsmen that participated in the study.In statistical analysis, it was calculated averages of groups and their standard deviations. For comparison made inter groups it was applied independent't' test. As a result of comparison made between female sportsmen that were competitors and female sportsmen that were not competitors, it was determined meaningful differences at the level of p<0,05, in view of light reaction time of left hand, selective light reaction time, foot light reaction time, anaerobic endurance, hip flections, hip external rotation and knee flections parameters. It was determined meaningful differences at the level of p<0,01 in view of height, weight, body mass index, balance duration, balance points, light reaction time of right hand, hip extension parameters. It was determined meaningful differences at the level of p<0,001 in view of competition weight, band, fat percentage of body (BF%), hip internal rotation knee extension, parameters.As a result of comparison made between female sportsmen that were degree entered competitors and female sportsmen that were not degree entered competitors in Turkey Competitions, it was determined meaningful differences at the level of p<0,01 in view of height, vertical jump, balance duration, voice reaction time of right hand, hip external rotation parameters. It was determined meaningful differences at the level of p<0,001 in view of band, grip strength of right hand, grip strength of left hand, maximum VO2, balance point, light reaction time of right hand, voice reaction time of left hand, light reaction time of left hand, selective light reaction time, foot light reaction time, fat percentage of body (BF%), hip extension, hip internal rotation, level parameters.As a result; it can be said that the reason why a meaningful difference occurred that was in favor of sportsmen that were competitors between physical and motor parameters compared between sportsmen that were competitor and not competitor and between sportsmen that were placed and not placed in Championship of Turkiye is resulted from the fact that competitor sportsmen trained regularly and those regular trainings affected both physical and motor measurements positively.

Key words: Adolescent, Taekwondo, Motor feature, Physical feature.

INTRODUCTION

The goal of being successful in sport has led scientists in many countries to do extensive researches in these fields, and about what should be done to reveal reaching the performance of the upper limits in sport. Success in sport, in other words performance, depends on aerobic and anaerobic energy consumption, neuromuscular functions such as power, speed, technique, and psychological factors and tactics. Also, these motor characteristics are required to be improved for success in taekwondo sport as well as any other sports.

The physical fitness levels including physical and motor characteristics of children Taekwondo athletes may significantly improve in their adolescence period. This development seems important since it will provide a basis for their future performance. The study aims to determine and investigate the physical and motor characteristics of children that will be future taekwondo champions.

MATERIALS AND METHODS

87 female taekwondo athletes, ranging in age between 10 and 13, who do training on a regular basis participated in the study voluntarily. **Age;** The ages of volunteers on their Republic of Turkey ID cards were recorded. **Tests performed:Height;** measured with a sliding calliper (Holtain, UK). **Body weight;** measured with a weighing machine (Angel) sensitive up to 20 grams with barefoot and only wearing shorts. **Body mass index;** obtained through dividing the

parameters of body weight into the square of height parameters.

Belt levels; obtained through the official website of the Taekwondo Federation of Turkey with record number of athletes. The belt and gup levels were recorded as follows: 10th gup-white belt, 9th gup/white-yellow belt, 8th gup/yellow belt, 7th gup/yellow-green belt, 6th gup/green, 5th gup/ green-blue, 4th gup/blue, 3rd gup/blue - red, 2nd gup/red, 1st gup/red-black.

Vertical jump test; the device called Jumping Takei Physical Fitness Test was used for vertical jump test. The vertical jump heights of the volunteers were measured and recorded Tamer (2000).

30 m Acceleration; Running time of the distance by the subjects were measured in a standard 50m indoor running track, with a photocell timer established between 5 - 35m and the best of three trials was recorded by applying 5 min rest intervals.

Hand Grip Strength Test; hand grip strength was measured with Takkei hand grip dynamometer (2).

Leg strength; Measurement was conducted with Takkei back and lift dynamometer (2).

Maximal Oxygen Consumption ; max VO$_2$, 20 m shuttle run test was used Tamer (2000).

Filamingo balance test; To measure the balance of the volunteers, subjects tried to keep balance as long as possible standing on the balance beam on their preferred leg.

Reaction time; measured with reaction time measurement section of Bosco's Newtest 2000 battery. Volunteer groups visual basic (right and left hand with right foot) RT, auditory basic (right and left hand with right foot) RT and visual-choice RT (hands) were measured (2).

Calculation of body fat in percent (%); subcutaneous fat thickness measurements were made with a Skinfold device (2). Logx = (biceps + triceps + sub-scapular + sacroiliac) % fat = (4.95 / D -4.5) * 100

Anaerobic endurance; as measuring battery, "Hexagonal Obstacle Test" was used Kiber .

Hip flexion, hip extension, hip internal rotation, external rotation of the hip, knee flexion, knee extensor; measurements were done with goniometer Sevim (1995)[4].

Contestant Level; measured in order to determine if volunteers have participated in competitions

Competition Ranking; used to determine ranked and unranked athletes participating in 2009 Taekwondo Championship of Turkey.

Data analysis; the mean and standard deviations of the groups were calculated. For the two independent group comparisons, independent 't' test were applied

RESULT

Table 1: The arithmetic means, standard deviations and 't' and 'p' values of female competitor and non-competitor athletes.

Variables	Competitor (n:67) X ± Ss	Non- Competitor (n:20) X ± Ss	t	p
Age (years)	11,42 ± 1,03	11,80 ± 1,51	1,061	,299
Height (m)	1,48 ± ,12	1,57 ± ,05	2,980	**,004****
Weight (kg)	40,25 ± 14,56	51,16 ± 1,46	3,332	**,001****
Body Mass Indeks (kg / m^2)	17,83 ± 4,09	20,98 ± 2,12	3,302	**,001****
Competition Weight (kg)	39,49 ± 11,83	50,00 ± 2,51	3,929	**,000****
Belt Level (gıp)	4,28 ± 1,39	1,80 ± 1,00	7,417	**,000****
Vertical Jump (cm)	32,78 ± 5,98	30,80 ± 11,56	,736	,470
Speed 30 m (sn)	6,01 ± ,62	6,20 ± 1,35	,877	,383
Right Hand Grip Strength (kg)	14,58 ± 6,04	15,06 ± 3,32	,342	,733
Left Hand Grip Strength (kg)	13,80 ± 6,21	12,52 ± 3,12	,885	,379
Leg Strength (kg)	36,16 ± 12,46	36,90 ± 5,78	,255	,799
Maximal Oxygen Consumption (ml/kg/dk)	37,08 ± 3,88	34,77 ± 4,99	1,905	,068
Balance Time (sn)	48,65 ± 18,37	60,00 ± ,00	2,751	**,007****
Balance Score (score)	2,58 ± 3,63	,00 ± ,00	3,171	**,002****
Right Hand Sound Reaction Time (ms)	245,55 ± 48,90	257,07 ± 28,52	1,002	,319
Right Hand Light Reaction Time (ms)	304,68 ± 58,25	375,05 ± 88,96	3,331	**,003****
Left Hand Sound Reaction Time (ms)	267,07 ± 47,77	257,95 ± 37,32	,784	,435
Left Hand Light Reaction Time (ms)	328,72 ± 69,77	372,05 ± 94,93	2,234	**,028***
Selective Light Reaction Time (ms)	348,30 ± 73,03	375,75 ± 32,04	2,399	**,019***
Foot Sound Reaction Time (ms)	325,72 ± 54,40	309,25 ± 28,90	1,296	,198
Leg Light Reaction Time (ms)	361,30 ± 66,36	410,42 ± 77,97	2,555	**,016***
Body Fat Percentage (%)	10,37 ± 5,06	18,72 ± 2,64	7,083	**,000*****
Anaerobic Endurance (sn)	14,15 ± 3,29	16,06 ± 1,29	2,527	**,013***
hip flexion (º)	122,30± 14,88	134,00 ± 20,11	2,413	**,023***
Hip Extension (º)	27,19 ± 11,97	20,00 ± ,00	2,676	**,009****

Internal Hip Rotation (°)	33,54 ± 6,92	16,00 ± 7,54	9,298	**,000*****
External Hip Rotation (°)	30,70 ± 7,28	28,00 ± 2,51	2,567	**,012***
Knee Flexion (°)	137,73 ± 24,71	123,00 ± 15,08	2,523	**,013***
Knee Extension (°)	183,14 ± 5,22	190,00 ± ,00	5,855	**,000*****

*p<0,05   **p<0,01 ***p<0,001

No significant differences were found as a result of the comparison between competitor and non-competitor female athletes at p>0.05 level in age, vertical jump, speed, right-hand grip strength, left hand grip strength, leg strength, max. VO₂, right-hand volume RT, left-hand volume RT, foot volume RT parameters. A significant difference at p>0.05 level was found in left-hand light RT, eclectic light RT, foot-light RT, anaerobic endurance, hip flexion, hip external rotation, knee flexion parameters. Significant differences were found at p<0.01 level in height, weight, BMI, duration of balance, equilibrium score, right-hand light RT, hip extension parameters, and at p<0.001 level in competition weight, belt, %BF, hip internal rotation, knee extension parameters.

Table 2 The arithmetic means, standard deviations and 't' and 'p' values of ranked female athletes in Taekwondo Championship of Turkey.

Variables	Not-Degree Entered (n:49) X ± Ss	Degree Entered (n:38) X ± Ss	t	p
Age (years)	11,39 ± 1,27	11,66 ± ,99	1,078	,284
Height (m)	1,47 ± ,12	1,54 ± ,09	2,728	**,008****
Weight (kg)	42,46 ± 12,35	43,14 ± 15,18	,223	,824
Body Mass Indeks (kg / m²)	19,09 ± 3,19	17,87 ± 4,71	1,367	,176
Competition Weight (kg)	41,92 ± 10,89	41,89 ± 2,05	,010	,992
Belt Level (gıp)	2,71 ± 1,65	5,00 ± ,00	8,550	**,000*****
Vertical Jump (cm)	30,22 ± 8,71	35,03 ± 4,73	3,065	**,003****
Speed 30 m (sn)	5,98 ± ,95	6,15 ± ,68	,916	,362
Right Hand Grip Strength (kg)	12,73 ± 5,77	17,21 ± 4,00	4,078	**,000*****
Left Hand Grip Strength (kg)	11,35 ± 5,15	16,28 ± 5,09	4,465	**,000*****
Leg Strength (kg)	34,76 ± 10,61	38,35 ± 11,86	1,466	,147
Maximal Oxygen Consumption (ml/kg/dk)	34,93 ± 3,99	38,65 ± 3,63	4,488	**,000*****
Balance Time (sn)	56,18 ± 11,47	44,91 ± 20,28	3,066	**,003****
Balance Score (score)	,12 ± ,60	4,39 ± 3,90	6,690	**,000*****
Right Hand Sound Reaction Time (ms)	261,24 ± 46,91	231,37 ± 36,99	3,223	**,002****
Right Hand Light Reaction Time (ms)	353,51 ± 75,08	278,76 ± 40,42	5,541	**,000*****
Left Hand Sound Reaction Time (ms)	279,67 ± 47	246,02 ± 36,08	3,655	**,000*****
Left Hand Light Reaction Time (ms)	366,35 ± 84,08	303,01 ± 51,01	4,094	**,000*****
Selective Light Reaction Time (ms)	377,04 ± 65,40	325,69 ± 57,28	3,831	**,000*****
Foot Sound Reaction Time (ms)	330,48 ± 54,51	310,91 ± 41,76	1,834	,070
Leg Light Reaction Time (ms)	401,95 ± 76,26	334,74 ±42,73	4,869	**,000*****
Body Fat Percentage (%)	14,29 ± 6,23	9,72 ± 3,98	3,934	**,000*****
Anaerobic Endurance (sn)	14,88 ± 2,57	14,22 ± 3,59	,959	,341
hip flexion (°)	125,82 ± 17,57	123,92 ± 16,03	,518	,606
Hip Extension (°)	21,43 ± 7,07	30,84 ± 12,69	4,391	**,000*****
Internal Hip Rotation (°)	24,59 ± 9,83	35,84 ± 6,64	6,355	**,000*****
External Hip Rotation (°)	27,96 ± 4,32	32,82 ± 7,94	3,401	**,001*****
Knee Flexion (°)	130,92 ± 13,18	138,76 ± 32,18	1,414	,164
Knee Extension (°)	185,41 ± 5,38	183,83 ± 5,39	1,356	,179

*p<0,05   **p<0,01 ***p<0,001

No significant differences were found as a result of the comparison between ranked and unranked female athletes in Turkey Championship at p>0.05 level in age, weight, BMI, competition weight, speed, leg strength, leg volume RT, anaerobic endurance, hip flexion, knee flexion, knee extension parameters. A significant difference was found at p <0.01 level in height, vertical jump, balance duration, right-hand sound RT, hip external rotation parameters and at p<0.001 level in the level parameters of belt, right-hand grip strength, left-hand grip strength, max. VO₂, equilibrium score, right-hand light RT, left-hand volume RT, left-hand light

RT, selected light RT, foot-light RT, BF%, hip extension, hip internal rotation.

DISCUSSION AND CONCLUSIONS

The effects of taekwondo, a defence and combat sport, on physical and physiological characteristics of athletes can be evaluated by the tests and measurements performed. In this study, 87 female taekwondo athletes, between the ages of 10 and 13 in age, participated in voluntarily. It is seen that the groups have similar averages of age. These results indicate that the participation level into competition or the ranking success in competition of athletes should be evaluated independently of the age factor. In addition, this situation may result from the limitations on participation age of the athletes. Therefore, the similar average age of our research groups and the idea that differences will not be due to age differences may support our research to have more reliable bases. It was found out that non-competitor athletes have higher height-average than competitor athletes when the groups' height values were examined. This situation can be considered as one of the typical differences of research group. However, the height that is higher than competition weight in taekwondo can improve the achievement levels of athletes. As a result of the research, it was figured out that the height values of ranked athletes were higher than other unranked athletes. It is considered that having higher height than their competitors provide significant advantages to taekwondo athletes if there is no significant insufficiency in their motor skills and motor characteristics. This answers the question of why athletes with higher average of height than other sport groups are more ranked in competitions. Athletes that will enter the contest are expected to compete in certain weights in taekwondo. The weight, competition weight and BMI values of athletes, who did not participate in competitions, were found higher than the weight, competition weight and BMI values of competitor athletes. This situation may result from the fact that the competitor athletes have to control their weights continuously. Changes in weight value contribute to BMI values as well. Moreover, because weight athletes have to pay attention on their food consumption in order to control their competition weights continuously, this prevents their performance to be affected negatively due to rapid weight loss. It was concluded that the weight, competition weight and BMI values do not have a significant impact in ranking levels of research groups. As a result of the comparison of groups' belt levels, it was found that the belt levels of competitor or athletes, ranked in a competition, were higher than the belt levels of non-competitor or athletes unranked in a competition. Athletes would proof their own levels by the belt colors they wear in terms of testing the adequacy of technical skills of taekwondo and monitoring their development stages. At the same time, the belt scale provides important information about the performance of athletes. This information indicates that the belt levels of taekwondo athletes might be quite effective in the grades of competition participation or ranking in participated competition. As a result of the comparison of ranked and unranked athletes in Turkey Championship, a significant difference was found in vertical jump levels. This difference may result from the positive developments in the vertical jumps of competitor athletes training regularly. The step taking or dances during taekwondo training or during competition can be effective in this positive development. Aydos and Kürkçü, in the measurements of athletes from different sports branch with the same age group, found the vertical jump values as 39±6,51 cm in those who sport and 27,93 ±5,43 cm who do not sport Aydos and Kürkçü (1997)[5]. In the study performed with female basketball players at 14-16 age groups, Sevim and Savaş in the measurements of female athletes from different sports branch with the same age group, found the vertical jump values as 31,7±5,20 cm in the volunteer group and 30,0±2,51 cm in the control group Sevim and Savaş (1992). The obtained information as a result of the study is consistent with the literature. No significant difference was found as a result of the intergroup comparison of speed values of the athletes participated in the research. However, the speed values of competitor or ranked athletes were found as lower than the speed values of non-competitor or unranked athletes. Researches regarding 30 m speed values addressed to examine the differences between before and after a specific training program. However, the findings are parallel to the measured values. These indicated that 10-week training programs increased significantly the sprint averages which were performed on 18 amateur soccer players by Ugras et al. in (2002). In the study, by Eler, in 1996, significant improvements were determined in the averages of speed tests performed on the 15 top-level handball players before and after 12-week training period Eler (1996). Taekwondo trainings, regular and extended over long periods, contribute to the development of speed ability significantly. It is considered that this development results from the speed trainings which have an important place in taekwondo. In maximal strengths of the athletes participating in the research, no significant differences, which would affect the competition result, were found as a result of the intergroup comparison. These obtained results are considered due the significant developments in each group because the training density based on force in taekwondo. The leg strength values, found in the measurements of female athletes from different sports with the same age group, are as follows. Sevim et al., found the values as right hand grip strength 21.0 ± 1.65 kg ., left-hand grip strength 17.9 ± 2.14 kg, leg strength 88.7 ± 8.85 kg, in women basketball players and in the control group right-hand grip strength 20.4 ± 1.43 kg, left hand grip strength 17.3 ± 1.12 kg, leg strength 86.1 ± 18.8 kg Sevim and Savaş (1992). The average grip strength values of candidate athletes for taekwondo national team were found as follows; the right-hand grip strength 47 ± 305.84 kg, left-hand grip strength 46.57 ± 5.16 kg, leg strength mean value 151.46 ± 25.31 kg, respectively Tel (1996). Seliger et al., in adolescent children, found the values as right-hand grip strength 35.8 ± 8.6 kg, left-hand strength 33.6 ± 7.9 kg. Seliger et al (1991). The values of young-national table tennis players were found as right-hand grip strength 41.7 ± 5.38 kg, left-hand grip strength 37.4 ± 1.93 kg, leg strength 112.0 ± 2.11 kg, by Cimen et al.(1997). Senel et. al., (1998) identified the values of young national badminton players as right-hand grip strength 39.15 ± 7.75 kg, left-hand grip strength 34, 53 ± 7.16 kg. Senel et. al. (1998). There are also some differences between our and other research results as well as some similarities exist. These differences can also be explained by different characteristics of the research groups, but it is important to note that the different training methods influence the athletes' strength values significantly. As a

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result of the intergroup comparison, it is seen that the reaction times of athletes, participating in the research, affect the competition result and the situation of being a competitor. Senel et al., in the study on young-national badminton players, found the values regarding reaction time in different sports as (age 17.1 ± 1.85), right-hand light reaction time 135 ± 15.1 sec., right-hand aural reaction time 118.7 ± 13.5 sec. Senel et. al. (1998). Senel et al. (1997), in their study with cyclists (age 24 ± 2.24), found the visual reaction time for right hand as 0.17 ± 0.03 and as 0.18 ± 0.01 for right hand aural reaction time Senel et al. (1997). Values obtained from the research results were higher than the literature information. These low values can be considered as a result of high age averages and sport levels of athlete groups in the literature researches. The reaction time differences that occur in groups result from the training structure of taekwondo branch and fast competition process. In addition, because the fast-strength trainings have continuous quick-direction changes and these trainings mostly improve nerve-muscle coordination, the reaction time is affected positively. In many studies, it was highlighted that there was a significant difference in anaerobic power values between the groups who sport and who do not Güzel et al (2007). It was reported that there was a significant difference between untrained group and taekwondo training group Borlu (2005). The average values of anaerobic power of the candidate athletes for national team were found as 133.81 ± 9.72. These values are very high than the average values of non-sport groups. However, it shows similarity with the

studies performed on some other athletes whom are in sport branches requiring heaviness and challenging Tel (1996). In the study of Borlu, performed on different age groups in 2005, the averages of anaerobic power test was determined as 49.26 ± 7.02 in children Borlu (2005). The averages of anaerobic power test, performed on basketball, volleyball and football players by Yardimci in 1997, were found as 133.04 ± 10.55 in basketball players, 135.15 ± 14.15 in volleyball players and 102.75 ± 10.55 in and football players, and it was determined that there was a significant difference between different branches Yardimci (1997). The reason for this difference can be explained by the positive impact that regular trainings provide on anaerobic powers and strengths of athletes. Athletes participated in the research are in the period of rapid growth. This period is characterized by rapid physical growth and intense hormone activities Açıkada and Ergen (1990). Especially the physical development and biochemical maturation in girls peaks at the age of 14 Özer (2001). In conclusion, participation in a competition or ranking in a competition can be considered as an important selection criteria. However, these athletes that have also more advanced motor skills than other athletes show us that being successful is not only limited to technical skills but motor skills are also quite important in the expression of technical skills. Especially, the reaction time, the relative development level and the joint movement ranges significantly affect the athletes' competition performances.

REFERENCES

TAMER, K., 2000, *Sporda Fiziksel-Fizyolojik Performansın Ölçülmesi ve Değerlendirilmesi. Gelistirilmiş* 2. Baskı, Bağırgan Yayınevi Kültür Matbaası, Ankara 2000; ss 138.

TAMER, K., *Sporda Fiziksel-Fizyolojik Performansın Ölçülmesi ve Degerlendirilmesi.*

Gelistirilmis 2. Baskı, Bagırgan Yayınevi Kültür Matbaası, Ankara 2000; ss 36- 38.

KIBER BEN, W, *The Sport Preparıtıcpatıon Fıtness Examınatıon*, Human Kinetics Boks ss 44- 45

SEVIM, Y., 1995, Antrenman Bilgisi, Gazi Büro Kitabevi, Özkan Matbaacılık, Ankara 1995.

AYDOS, L., KÜRKÇÜ, R., 1997, 13-18 *Yaş Grubu Spor Yapan ve Yapmayan Orta Öğrenim Gençliğinin Fiziksel ve Fizyolojik Özelliklerinin Karşılaştırılması,* G.Ü. Beden Eğitimi ve Spor Bilimleri Dergisi, Cilt:2, Sayı: 2, Ankara 1997; ss 31- 38.

SEVİM, Y., SAVAŞ, S., 1992, 14-16 Yaş *Grubu Kız Basketbolcularda Dairesel çabuk Kuvvet Metodunun Genel Kuvvet Gelişimine Etkileri, H.Ü.* Spor Bilimleri Dergisi, Cilt:3, Sayı: 4, Ankara 1992; ss 40- 47.

UĞRAŞ, A., ÖZKAN, H., SAVAS, S., 2002, *Bilkent Üniversitesi Futbol Takımının 10 Haftalık Ön Hazırlık Sonrasındaki Fiziksel ve Fizyolojik Karakteristikleri,* Gazi Eğitim Fakültesi Dergisi, Cilt 22, Sayı;1, Ankara 2002.

ELER, S., 1996, *Bir Sezonluk Antrenman Periyotlaması Boyunca Üst Düzey Erkek Hentbolcülerin Bazı Motorik ve Fizyolojik Parametrelerinin İncelenmesi,* Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Beden Eğitimi ve Spor Anabilim Dalı, Yüksek Lisans Tezi, Ankara 1996

MİKAİL, TEL., 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.

Seliger ve Arkadaşları, Çekoslavakya'da Somatik Fonksiyonel Motor Özelliklerin Ortalama Değerleri, Uluslararası Biyoloji Programı. Çev: Turnagöl, H. Antrenman Bilgisi Sempozyumu, H.Ü. Spor Bilimleri Ve Teknolojisi Yüksekokulu Yayını Sayfa: 157 Ankara 1991.

ÇİMEN, O., CİCİOĞLU, İ., GÜNAY, M., 1997, *Erkek ve Bayan Türk Genç Milli Masa Tenisçilerin Fiziksel ve Fizyolojik Profilleri,* G.Ü. Beden Eğitimi ve Spor Bilimleri Dergisi, Cilt:2, Sayı: 4, Ankara 1997; ss 7- 12

ŞENEL, Ö., ATALAY, N., ÇOLAKOĞLU, FF., 1998,*Türk Milli Badminton Takımının Antropometrik, Vücut Kompozisyonu ve Bazı Performans Özellikleri, G.Ü. Beden Eğitimi ve Spor Bilimleri Dergisi,* Cilt:3, Sayı: 2, Ankara 1998; ss 15- 20.

ŞENEL, Ö., ATALAY, N., ÇOLAKOĞLU, F.F, 1997, *Türk Milli Bisikletçilerin Fiziksel ve Fizyolojik Prpfilleri, H.Ü. Spor Bilimleri Dergisi* Cilt:8 Sayı:1 Ankara 1997; ss 43, 49.

GÜZEL., NA., ÇOLAKOĞLU, F., KARACAN, S., ÖZ, E., AKYÜZ, M., ASLANOĞLU, E., 2007, 13-16 *Yaş Grubu Kız Voleybol ve Futbolcuların Bazı Fiziksel Fizyolojik* ve Antropometrik Özelliklerinin Karşılaştırılması, Ankara 2007.

BORLU, A., 2005, *Değişik Kategorilerdeki Bayan Basketbolcuların Fiziksel ve FizyolojikParametrelerinin İncelenmesi*, Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Beden

Eğitimi ve Spor Anabilim Dalı, Yüksek Lisans Tezi, Ankara 2005.

YARDIMCI M, 1997, *Değişik Sportif Oyun Branşlarıyla Aktif Olarak Uğrasan Sporcuların Fiziksel ve Fizyolojik Performans Parametrelerinin Karşılaştırılması*, Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Beden Eğitimi ve Spor Anabilim Dalı, Ankara 1997.

AÇIKADA C, ERGEN E, 1990, *Bilim ve Spor*, Büro – Tek Ofset Matbaacılık, Ankara 1990.

Özer K, Fiziksel Uygunluk, Nobel Yayın Dağıtım, Ankara 2001; ss 153- 154

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