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THE EFFECT OF CORE TRAINING PROGRAM ON AEROBIC ENDURANCE, BLOOD-OXYGEN SATURATİON AND FLEXIBILITY IN ADOLESCENT TAEKWONDO COMPETITORS

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ABSTRACT

The purpose of the study is to detect the effect of 8 weeks core training on aerobic endurance, blood-oxygen saturation and elasticity in the male taekwondo competıtors 15 to 17 years old. A total of 30 taekwondo athletes, between 15 and 17 years old of whom were 15 experimental and 15 control groups, participated in the study. The age (year), height (cm), weight (kg) of athletes were recorded on personal information form using an electronic scale, Geonaute. While the athletes in control group were regularly proceeding on taekwondo workouts, the core training programme was applied to the ones in experimental group three days a week for an extra eight weeks. Before starting to the workouts, yo-yo aerobic endurance test in the determination of aerobic endurance measurement; pulse oximetry measuring device in the determination of measurement; sit and reach test in the determination of elasticity ability were applied After all data were collected, it was recorded as pre-test and post-test. The control group proceeded regularly on taekwondo training significance levels were accepted as 0.05 in these tests. As a result, it was determined that the core training programme had a positive effect on aerobic endurance and elasticity test, pre-test and post-test difference values of the control and experimental groups. In both of these determined differences, it was detected that the values of the experimental group were higher than the control group. However, it was observed that there was no significant difference between resting heart rate and blood oxygen saturation test, post-test and pre-test of the conrol and experimental groups. It is thought that the core training programme will help the athletes to improve their sportive performances during working season, in the process of training and competition season and to take them to an advanced level.

Keywords: Aerobic endurance, elasticity, blood oxygen saturation, core training.

1 This study was adapted from master's degree dissertation written by Yunus Emre DEMİR and supervised by Emre SERİN at Mersin University Institute of Educational Sciences.

INTRODUCTION

Taekwondo is defined as an individual combat sport in which sportive skills are exhibited in competitions, requiring the obligation to apply technique in continuous and suddenly changing situations (Tel, 2008). Competitions in Taekwondo require athletes to have high physical and physiological characteristics (Marković & Misigoj-Duraković, 2005). In Taekwondo, the use of techniques thrown in combination during the competition, the high number of kicks thrown to this area and the variety of techniques due to the high number of kicks to the head area, and the penalty points for contact with the ground and falling to the ground while throwing a technique in accordance with the rules of the competition have started to make the strength of the core area even more active. Because the rapid change of direction that occurs in Taekwondo competitions, being able to recover quickly after combined techniques, staying in balance after the technique is thrown, explosive strength is important for a good performance when applying attack or counterattack (Yılmaz, 2021).

Considering all these, it is important to improve the planned training programs and which features in order to achieve maximum performance in sports performance both in competitions and in training and in order for the athletes to be superior to each other. Especially in such sports braces, the development of the core area of the athletes is necessary to increase the performance. In addition, the energy systems of the athletes should be in place. Therefore, athletes with good aerobic power and flexibility can use oxygen as needed during competition or training. All these can be increased to a higher level with improved training programs.

Aerobic endurance is completely related to the aerobic energy production of the organism. In physiological terms, the maximal endurance of an individual is expressed as the maximal aeorobic capacity of this individual. In other words, it is the maximal amount of oxygen that a person can use during a maximally loaded exercise. A large number of exercises performed at the same level are limited by the individual's ability to return to normal, that is, the capacity to rest. In other words, the individual's ability to recover after a strenuous effort depends entirely on the aeorobic system. Athletes with good aeorobic endurance can return to normal more quickly, so they can respond better to the loads in training (Açıkada & Ergen, 1990). It can be said that aeorobic endurance is of high importance for competitive taekwondo athletes because taekwondo competitions are in three rounds of two minutes and the competitions continue with elimination procedure during the day and they can recover quickly after the competitions.

Core training in taekwondo can help improve flexibility, balance and explosive strength, along with a healthier recovery during competition (Willardson, 2004). It is important that the continuous use of different kinds of movements in taekwondo is applied properly in the competition rules. Therefore, athletes must have good mobility. At the same time, the organism must have the advantage of being able to engage in such sports games for a certain period of time. Focusing on such variables, especially in such sports branches where it has a core relaxing effect, is among the targets that are among those who do not achieve success. The aim of this study is to examine the effect of core training program on aerobic endurance, blood oxygen saturation and

flexibility in adolescent male competitive taekwondo players, considering that core training that will support the studies to be applied to increase the basic motoric skills and sportive performance specific to taekwondo will cause an increase in the aerobic endurance, blood oxygen saturation and flexibility performances of the athletes.

METHOD

Model of the Research

Experimental method was used in the research. In this study; with experimental and control group pre-test and post-test models were used. Experimental and control group of the core training program effectiveness has been studied. The presence of pre-tests in the model, the teams' pre-experiment be aware of similarity measures and check the posttest results accordingly has helped. In this model, pre-test and post-test to see how effective the program is. test measurement results were used. To this end; first, the pre-test numbers are compared, the comparison If there is an insignificant difference in the result, only the post-test numbers are considered and the averages are formed. Incoming changes will be tested (Karasar, 2003).

Study Group

The study group consisted of 30 male taekwondo players in the age range of 15-17 years with an average age of 16.1±0.7 years and height of 169.9±5.1 cm in the control group and 16.5±0.5 years and 178.8±5.3 cm in the experimental group. A total of 30 participants, 15 in the experimental group and 15 in the control group, were randomly selected. In the study, yo yo test was used to determine aeorobic endurance performance, oximeter blood oxygen saturation determination test was used to determine blood oxygen saturation measurements, and sit-stand test was used to determine flexibility performance.

Data Collection Tools

Height Measurement

The height of the athletes was measured with a wall scale. The athletes were measured in anatomical position on a flat surface, barefoot and in an upright position, with their back to the wall scale. Apparent values were recorded in cm. (Serin, 2019).

Body Weight Measurement

Fakir Hausgerate / Hercules electronic scales were used to measure body weight. The athletes entered the measurement with bare feet and light sports clothes. The apparent values were recorded in kg. (Serin & Taşkın 2016).

Aerobic Endurance Test

The yo-yo aerobic endurance running test is performed from point A to point B. During the runs from A to B, the signal is heard and the line is pressed and jogged back to A. When you reach A, the signal is heard again and you jog from A to C and wait at the starting point A until the signal is heard again. Running speed increases according to the test protocol. If the athlete fails to catch the signal for the first time when he/she arrives at A, he/she receives an error and if he/she fails to be at A when the signal is heard for the second time in a row, the test is terminated. Each time the athlete comes to A, the test distance is marked and recorded on the test paper. The test conditions should always be the same field and weather conditions (the weather should not be hot or cold, the ground should not be wet to prevent athletes from slipping, etc.). Athletes participating in the test should be asked to wear the same type of soccer shoes so that they do not fall during the run and the running area should be on natural grass. The test will start at a running speed of 10 km/h. At the end of every 40 meters, the running speed will increase by 0.5 km/h or 1 km/h depending on the test protocol (Castanga et al. 2005).

Oximeter Blood Oxygen Saturation Measurement

Pulse oximetry works by analyzing color according to whether hemoglobin in red blood cells holds oxygen or not. Sensors use the color of the blood to detect the oxygen content. Depending on the amount of oxygen carried by the red blood cells, the color of the blood changes. The pulse oximeter sends out red and infrared light from one side and uses a sensor on the other side to provide the measurement. Highly oxygenated blood is bright red and absorbs most of the light from the pulse oximeter. By measuring the amount of light that reaches the other side, the oxygen saturation in the blood is determined. Oxygen saturation was measured twice with a pulse oximeter (Detel Pro Fingertip Pulse Oximeter), one week before and one week after the 8-week training period. The oximeter probe was checked and cleaned before each measurement. To prevent erroneous measurements, care was taken to ensure that the measurement environment was bright. Before the measurements, the subjects were informed about the pulse oximetry SpO2 test, which is a noninvasive method. Each subject was rested before the measurement and the oximeter probe was placed on the index fingers in a position where they could sit comfortably (Hakverdioğlu, 2007). Each subject was measured for 10 minutes (Çalışkan et al., 2008).

Sit-Recline Flexibility Test

Sit and lie measures the flexibility of the lower limb and hamstring muscle groups. This test is also important as it provides information about lumbar lordosis (curvature of the spine) and lower back problems. The athletes were asked to sit on the floor with their shoes off and place the sole of their foot flat on the sit-reclining test table. The athletes were asked to reach to the last point they could reach by bending their body forward without bending their knees, push the ruler slowly forward and wait at least 2 seconds at the last point without

moving. The measurement was repeated twice and the highest value was recorded in cm (Yıldırım & Ersöz, 2021).

Analysis of Data

Data were analyzed using the SPSS 22.0 statistical package program for Windows. Arithmetic mean (X), standard deviation (SD), maximum (Max.) and minimum (Min.) values were determined for descriptive variables. Shapiro-Wilk Test was used to determine the normality distribution of the data. Since the data obtained did not show normal distribution and the number of subjects in the groups was n<30, parametric test assumptions were not met, the differences between the groups were determined using the Mann Whitney-U Test in accordance with the experimental design of the study. In addition, the statistical significance level was accepted as p<0.05 (Karasar, 2018).

FINDINGS

All the findings of the study are Table 1, Table 2, Table 3, Table 4, Table, respectively. 5, Table 6, Table 7 and 8 are given in detail.

Table 1. Normality Test Results of Heart Rate, Blood Oxygen Saturation, Aerobic Endurance and Flexibility Values of Control and Experimental Groups

Group	n	Parameter(Unit)	Shapiro-Wilk		
			Statistic	Sd.	p
Control	15	Resting Heart Rate(beats/min)	,874	15	,039
		Blood O_2 Saturation(%)	,413	15	,000
		Aerobic Endurance(m)	,877	15	,043
		Flexibility(cm)	,817	15	,006
Experiment	15	Dinlenim Kalp Atım Hızı(atım/dk)	,908	15	,127
		Blood O_2 Saturation(%)	,744	15	,001
		Aerobic Endurance(m)	,950	15	,528
		Flexibility(cm)	,844	15	,015

When Table 1. is examined, it is seen that the heart rate, oxygen saturation, aerobic endurance and flexibility values of the taekwondo players participating in the study do not have a normal distribution in terms of control and experimental groups according to the Shapiro-Wilk Normality Distribution Test (p<0.05).

Table 2. Age, Height and Body Weight Values of Control and Experimental Groups

Parameter	Group	n	Minimum	Maksimum	$\bar{X}$	Sd.
Age (year)	Control	15	15,0	17,0	16,1	0,7
	Experiment	15	16,0	17,0	16,5	0,5
Height (cm)	Control	15	160,0	178,0	169,9	5,1
	Experiment	15	170,0	193,0	178,8	5,3
Body Weight (kg)	Control	15	45,0	89,0	60,7	14,3
	Experiment	15	48,0	82,0	62,6	10,4

When Table 2. is examined; the mean values of the control group are calculated as 16.1±0.7 years for age, 169.9±5.1 cm for height and 60.7±14.3 kg for body weight; while the mean values of the experimental group are calculated as 16.5±0.5 years for age, 178.8±5.3 cm for height and 62.6±10.4 kg for body weight.

Table 3. Heart Rate, Oxygen Saturation, Aerobic Endurance and Flexibility Test Pretest Values of Control and Experimental Groups

Parameter	Group	n	Minimum	Maksimum	$\bar{X}$	Sd.
Resting HR(beats/min)	Control	15	65,0	72,0	69,4	2,3
	Experiment	15	61,0	69,0	65,8	2,7
O_2 Saturation(%)	Control	15	96,0	98,0	97,5	0,6
	Experiment	15	96,0	98,0	97,1	0,6
Aerobic Endurance(m)	Control	15	800,0	1240,0	1013,3	136,6
	Experiment	15	1200,0	1880,0	1509,3	206,4
Flexibility(cm)	Control	15	7,0	20,0	14,0	3,7
	Experiment	15	16,0	34,0	20,1	4,8

When Table 3. is analyzed; the pre-test mean values of the control group are 69.4±2.3 beats/min for resting heart rate, 97.5±0.6% for blood O2 saturation, 1013.3±136.6 m for aerobic endurance, 14.0±3. 7 cm for flexibility, while the mean values of the pre-test of the experimental group are 65.8±2.7 beats/min for resting heart rate, 97.1±0.6% for blood O2 saturation, 1509.3±206.4 m for aerobic endurance, and 20.1±4.8 cm for flexibility.

Table 4. Aerobic Endurance Test Heart Rate Pretest Values of Control and Experimental Groups

Parameter	Group	n	Minimum	Maksimum	$\bar{X}$	Sd.
HR before warm-up (beats/min)	Control	15	85,0	109,0	95,8	6,7
	Experiment	15	80,0	110,0	98,9	10,0
Post Test HR (beats/min)	Control	15	130,0	160,0	143,7	9,2
	Experiment	15	130,0	170,0	147,4	13,2

When Table 4. is examined; the mean values of the control group's pre-test aerobic endurance test pre-warm-up heart rate were 95.8±6.7 beats/min, the mean values of the pre-test aerobic endurance test post-test heart rate were 143.7±9. 2 beats/min, while the mean values of the experimental group were 98.9±10.0 beats/min before the pre-test aerobic endurance test warm-up and 147.4±13.2 beats/min after the pre-test aerobic endurance test.

Table 5. Heart Rate, Oxygen Saturation, Aerobic Endurance and Flexibility Test Posttest Values of Control and Experimental Groups

Parameter	Group	n	Minimum	Maksimum	$\bar{X}$	Sd.
Resting HR(beats/min)	Control	15	62,0	71,0	66,8	2,6
	Experiment	15	58,0	69,0	61,9	3,0
O_2 Saturation(%)	Control	15	96,0	98,0	97,3	0,6
	Experiment	15	96,0	97,0	96,6	0,5
Aerobic Endurance(m)	Control	15	760,0	1200,0	962,7	141,6
	Experiment	15	1400,0	2240,0	1776,0	232,2
Flexibility(cm)	Control	15	5,0	19,0	13,1	3,9
	Experiment	15	17,5	37,0	22,2	5,1

When Table 5. is examined; the posttest mean values of the control group are found as 66.8±2.6 beats/min for resting heart rate, 97.3±0.6% for blood O2 saturation, 962.7±141.6 m for aerobic endurance, 13.1±3. 9 cm for flexibility, while the posttest mean values of the experimental group are 61.9±3.0 beats/min for resting heart rate, 96.6±0.5% for blood O2 saturation, 1776.0±232.2 m for aerobic endurance, and 22.2±5.1 cm for flexibility.

Table 6. Aerobic Endurance Test Heart Rate Posttest Values of the Control and Experimental Groups

Parameter	Group	n	Minimum	Maksimum	$\bar{X}$	Sd.
HR before warm-up (beats/min)	Control	15	95,0	107,0	99,4	3,2
	Experiment	15	94,0	110,0	101,2	5,2
Post Test HR (beats/min)	Control	15	127,0	159,0	141,3	8,8
	Experiment	15	158,0	186,0	168,6	8,1

When Table 6. is analyzed; the mean values of heart rate of the control group before the post-test aerobic endurance test warm-up are 99.4±3.2 beats/min, the mean values of heart rate after the post-test aerobic endurance test are 141.3±8. 8 beats/min, while the experimental group's post-test aerobic endurance test pre-warm-up heart rate mean values are 101.2±5.2 beats/min, post-test aerobic endurance test post-test heart rate mean values are 168.6±8.1 beats/min.

Table 7. Heart Rate, Oxygen Saturation, Aerobic Endurance and Flexibility Test Post-Test-Pre-Test Difference Values of Control and Experimental Groups

Parameter	Group	n	Minimum	Maksimum	$\bar{X}$	Sd.
Resting HR(beats/min)	Control	15	-5,0	1,0	-2,6	1,8
	Experiment	15	-9,0	2,0	-3,9	3,6
O_2 Saturation(%)	Control	15	-1,0	0,0	-0,1	0,4
	Experiment	15	-1,0	1,0	-0,5	0,6
Aerobic Endurance(m)	Control	15	-120,0	0,0	-50,7	32,8
	Experiment	15	160,0	400,0	266,7	73,5
Flexibility(cm)	Control	15	-2,0	0,0	-0,9	0,8
	Experiment	15	1,0	3,0	2,0	0,7

When Table 7. is examined; the posttest-pre-test mean difference values of the control group are -2.6±1.8 beats/min for resting heart rate, -0.1%±0.4% points for blood O2 saturation, -50.7±32.8 m for aerobic endurance, -0.9±0. 8 cm, while the mean difference values of the experimental group between posttest and pretest are -3.9±3.6 beats/min for resting heart rate, 0.5±0.6% points for blood O2 saturation, 266.7±73.5 m for aerobic endurance, and 2.0±0.7 cm for flexibility.

Table 8. Mann Whitney-U Test Comparison Results of Post-Test-Pre-Test Differences in Heart Rate, Oxygen Saturation, Aerobic Endurance and Flexibility of Control and Experimental Groups

Parameter	Group	n	Rank Mean	Rank Sum	U	Z	p
Resting HR(beats/min)	Control	15	16,9	253,5	91,500	-,883	,377
	Experiment	15	14,1	211,5			
O_2 Saturation(%)	Control	15	18,1	271,0	74,000	-1,896	,058
	Experiment	15	12,9	194,0			
Aerobic Endurance(m)	Control	15	8,0	120,0	0,000	-4,720	,000*
	Experiment	15	23,0	345,0			
Flexibility(cm)	Control	15	8,0	120,0	0,000	-4,738	,000*
	Experiment	15	23,0	345,0			

When Table 8. is examined, a significant difference is determined between the post-test and pre-test difference values of the control and experimental groups in aerobic endurance and flexibility tests ($p<0.05$). In both of these differences, it is determined that the values of the experimental group are higher than the control group ($p<0.05$). However, no significant difference is found between the post-test and pre-test difference values of resting heart rate and blood oxygen saturation test of the control and experimental groups ($p>0.05$).

CONCLUSION and DISCUSSION

In this study, which was conducted to investigate the effect of core training program on aerobic endurance, blood oxygen saturation and flexibility in adolescent male competitive taekwondo athletes, when we look at the results of the pre-test values of heart rate, oxygen saturation, aerobic endurance and flexibility test of the control and experimental groups after 8 weeks of core training program in adolescent male competitive taekwondo athletes, the pre-test mean values of the control group were 69. 4±2.3 beats/min for resting heart rate, 97.5%±0.6% points for blood O2 saturation, 1013.3±136.6 m for aerobic endurance, and 14.0±3.7 cm for flexibility; while the pretest mean values of the experimental group were 65. 8±2.7 beats/min for resting heart rate, 97.1%±0.6% points for blood O2 saturation, 1509.3±206.4 m for aerobic endurance and 20.1±4.8 cm for flexibility. When we look at the pre-test values of aerobic endurance test heart rate of the control and experimental groups after the 8-week core training program in adolescent male competitive taekwondo athletes, the mean values of the pre-test aerobic endurance test heart rate of the control group were 95.8±6. 7 beats/min and 143.7±9.2 beats/min after the pre-test aerobic endurance test, while the mean values of the experimental group were 98.9±10.0 beats/min before the pre-test aerobic endurance test warm-up and 147.4±13.2 beats/min after the pre-test aerobic endurance test. When we look at the results of heart rate, oxygen saturation, aerobic endurance and flexibility test post-test values of the control and experimental groups after 8-week core training program in adolescent male competitive taekwondo athletes, the post-test mean values of the control group were 66.8±2.6 beats/min for resting heart rate, 97. 3±0.6% points for blood O2 saturation, 962.7±141.6 m for aerobic endurance, and 13.1±3.9 cm for flexibility, while the posttest mean values of the experimental group were 61.9±3.0 beats/min for resting heart rate, 96.6±0.5% points for blood O2 saturation, 1776.0±232.2 m for aerobic endurance, and 22.2±5.1 cm for flexibility. When we look at the post-test-pre-test difference values of heart rate, oxygen saturation, aerobic endurance and flexibility tests of the control and experimental groups after the 8-week core training program in adolescent male competitive taekwondo athletes, the post-test-pre-test mean difference values of the control group were -2.6±1. 8 beats/min for resting heart rate, -0.1%±0.4% points for blood O2 saturation, -50.7±32.8 m for aerobic endurance and -0.9±0.8 cm for flexibility, while the posttest-pre-test mean difference values of the experimental group were -3. 9±3.6 beats/min for resting heart rate, 0.5%±0.6% points for blood O2 saturation, 266.7±73.5 m for aerobic endurance and 2.0±0.7 cm for flexibility. As a result, it was determined that the study showed positive results on the experimental group. According to Yılmaz (2018); As a result of examining the effect of aerobic training program on cardiopulmonary parameters and blood oxygen saturation in elite judoists, it was reported that the aerobic training program applied to judoists had a positive effect on

cardiopulmonary parameters and oxygen saturation. According to Cengiz (2015); oxygen supplementation applied to wrestlers at short rest intervals was effective in short-term recovery after exercise. In addition, oxygen supplementation protected oxygen saturation levels in the 60 and 30-minute rest intervals given between competitions, and reported that it was effective in reducing heart rate and lactate levels in the 30-minute rest interval. Gökhan (2010) reported that 8-week swimming training had a statistically significant effect on capillary oxygen saturation, respiration, circulation and some metabolic parameters in young sedentary males.

According to Özdal et al. (2014); Aerobic training had an effect on increasing the percentage of oxygen saturation on both athletes and sedentary people, therefore, aerobic training might have positive effects on hemoglobin oxygen saturation in arterial blood. Dikici (2018) reported that core training model had a positive effect on selected physiological (balance, speed, agility, strength, anaeorobic capacity, aeorobic capacity) parameters of students in secondary school children doing sports (handball-football). According to Doruk et al. (2019); The relationship between core muscle endurance and aeorobic capacity, speed, agility and sport-specific skills in wheelchair basketball players was examined, and they reported that the inclusion of exercises for core muscles in the training programs of athletes would contribute to their on-field physical performance development. According to Macit (2019); As a result of examining the effect of core training on selected biomotor (flexibility, strength, speed, balance, agility) characteristics and branch-specific techniques in 9-10 years old male handball athletes, it was reported that core training with their own body weight in addition to handball training for 8 weeks provided positive improvement on biomotor and branch-specific techniques measured in handball athletes. According to Başkaya (2020), it was revealed that additional core training applied to child soccer players at different durations had an effect on soccer skills and motoric (flexibility, strength, speed, agility) characteristics, as well as long-term (at least 10 weeks) core training was more effective and especially dynamic core training contributed significantly to the multi-directional development of soccer players. According to Atıcı (2013); it was reported that core training performed regularly 3 days a week for 8 weeks had a statistically significasnt effect on body fat percentage, right and left hand grip, leg and back strength, flexibility, balance, peak expiratory flow, maxVo2 and vertical jump performances of 18-24 years old women doing swimming sports.

It was determined that the core training program had a positive effect on the post-test-pre-test difference values of aerobic endurance and flexibility tests of the control and experimental groups. In both of these differences, it was determined that the values of the experimental group were higher than the control group. However, no significant difference was found between the post-test-pre-test difference values of resting heart rate and blood oxygen saturation test of the control and experimental groups.

RECOMMENDATIONS

It is thought that the core training program will help the athletes to improve their sportive performances during the training season, during the training process and during the competition season. In terms of obtaining different results from the study, the age of the group participating in the study Range can be changed and different function can be designed. For those targeting the result range, athletes with the same age range have different It can be examined that it works with the athletes in the training with the core training program. The research sample includes only adolescent male athletes. In order to examine the result of the gender difference of the study, adolescent athletes and female athletes can also be included in the research sample.

ETHICAL TEXT

In this article, journal writing rules, publication principles, research and publication ethics and journal ethical rules have been complied with. All responsibilities for the article belong to the responsible authors. This Necessary permission to conduct the study was obtained from Mersin University Science and Engineering Sciences Ethics Committee. Ethics Committee (Date: 17.05.2022, decision number:13).

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REFERENCES

Açıkada, C., & Ergen, E. (1990). *Science and sport*. Bürotek Ofset Printing.

Atıcı, M. (2013*). Investigation of the effect of core training on some physiological and motoric parameters in women between the ages of 18-24 who do swimming*. (Unpublished Master's Thesis). Sıtkı Koçman University.

Başkaya, G. (2020). *The effect of core training on soccer skills and motoric characteristics of child soccer players.* (Unpublished Doctoral Dissertation). Dumlupınar University, Institute of Postgraduate Education.

Cengiz, A. (2015*). The effect of oxygen supplementation applied to elite wrestlers between competitions on oxygen saturation and some recovery parameters*. (Unpublished Doctoral Dissertation). Gazi University.

Castagna, C., Grant, A., & Stefano, D. (2005). Competitive-level differences ın yo-yo ıntermittent recovery and twelve minute run test performance in soccer referees. *Journal of Strength and Conditioning Research*, 19(4), 805-809.

Doruk, M., Mustafaoğlu, R., Yıldız, A., & Öztürk, M. (2019). Investigation of the relationship between core muscular endurance and aerobic capacity, speed, agility and sport-specific skills in wheelchair basketball players: *Hacettepe Journal of Sport Sciences*; 30(3), 96-106.

Dikici, S. (2018). *The Effect of core training model on students' physiological parameters in secondary school students doing sports*. (Unpublished Master's Thesis). Sütçü İmam University.

Gökhan, İ. (2010). *The effect of 8-week swimming training program on respiration, circulation, capillary oxygen saturation and some metabolic parameters in young sedentary men*. (Unpublished Doctoral Dissertation). Fırat University.

Karasar, N. (2018). *Scientific research method: Concepts*, Principles, Techniques. Nobel Publishing House.

Marković, G. and Misigoj-Duraković, M. (2005). Trninić s fitness profile of elite croatian female taekwondo athletes. *Coll Anthropol*, 29(1):93-9.

Macit, S. (2019). *Investigation of the effect of core training on selected biomotor and branch-specific techniques in 9-10 years old male handball athletes*. (Unpublished Master's Thesis). İnönü University.

Özdal, M., Dağlıoğlu, Ö., Demir, T., & Özkul, N. (2014). The effect of aeorobic training on hemoglobin oxygen saturation. *Journal of Sport and Performance Research*, 5(1), 27-34.

Serin, E. (2019). Profesyonel, amatör ve sedanter futbol oynayanların fiziksel, fizyolojik ve motorik özelliklerinin değerlendirilmesi–anaerobik dayanıklılıklarını etkileyen faktörlerin belirlenmesi. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi*, 14(2), 344-355.

Serin, E., & Taşkın, H. (2016). Anaerobik dayaniklilik ile dikey siçrama arasindaki ilişki. *Spor ve Performans Araştırmaları Dergisi*, 7(1), 37-43.

Tel, M. (2008). *Taekwondo as a sport branch.* E-Journal Of New World Sciences Academy.

Yılmaz, D. (2021). The effect of core exercises on sports performance: taekwondo example mini review. Erzincan University School of Physical Education and Sports: *Turkey Clinics J Sports Sci, 13*(1), 174-82.

Yılmaz, T. (2018). *The effect of aerobic training program on cardiopulmonary parameters and oxygen saturation in elite judo players*. (Unpublished Master's Thesis). Gaziantep University.

Yıldırım, Y., & Ersöz, Y. (2021). *Physical fitness. Physical Education Teacher OABT* (First Edition). Yargı A. Publishing.

Willardson, J.M. (2004). The effectiveness of resistance exercises performed on unstable equipment. *Strength And Conditioning Journal*; 26(5):70-4.