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The Effect of Shadow Badminton Trainings on Some the Motoric Features of Badminton Players*/**

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Abstract

Objectives: The purpose of this study is to research the impacts of 12-week shadow badminton trainings on some physical performance parameters of 8-10 age group of children. In addition to this, the aim is to contribute to the determination of the application frequency and duration of badminton trainings in the beginners of badminton sport by comparing training practices of shadow badminton and classical badminton.

Methods: Subjects of the research group have been divided into 3 groups as shadow badminton training group (SB, n= 35, 17 boys and 18 girls), classical badminton training group (CB, n= 34, 19 boys and 15 girls) and control group (CG, n= 32, 15 boys and 17 girls), who has not been involved in any physical activity during the study and it has been carried out on 101 subjects. SB and CB groups were trained 4 days a week for 16 weeks and as preparation and basic trainings period. After 4 weeks of preparation works, preliminary tests of all groups (SB-CB-CG) were carried out. After the preliminary tests, subjects of CB training group were applied classical badminton training program 4 days a week for 12 weeks, subjects of SB training group were applied 2 days classical badminton training and 2 days shadow badminton trainings in a week as during 12 weeks and 4-day training in a week. After 8 weeks, mid-term tests and after 12 weeks final tests were applied during basic training period.

Results: It was determined an improvement in physical performance parameters of subjects of both training group (SB-CB). In addition, statistically significant differences were

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found in the parameters of the subjects of SB group in terms of balance, 20 m speed, vertical jump, anaerobic power and maximum oxygen consumption capacity (p<0.05).

Conclusion It has been concluded that shadow badminton trainings have positive effects on physical performance parameters of 8-10 age group of individuals and frequency and duration of the application may be considered sufficient.

Keywords: *Physical features, performance, children*

INTRODUCTION

Badminton is one of the most popular sports in the world that can easily be played in all age groups for competition or recreation (Sucharitha, Reddy, and Madhavi, 2014; Yousif and Yeh, 2011). Nowadays, 188 countries are members of the International Badminton Federation and by 2016 there are 111 million licensed athletes worldwide (BWF, 2017). It is very important for badminton sports to practice running with a racket without a ball. In badminton there is a well-known maxim: If the athlete's foot movement is fast, regular, rhythmic and harmonious he will be successful (Kale, 2011). It is stated that there are great benefits for beginners to teach the techniques of shooting and running together (Salman and Salman, 1994). In this way, the athlete can improve the strength of the muscles of the leg muscles, the overall strength and the quickness, while stabilizing the running technique. In this sport it is very important for success to complete a move (long step) quickly and return to the starting point or to move in another direction (Kale, 2011; Vicen, Del Coso, Millan, Salinero, and Abian, 2012).

Badminton is a sport where you have to think very fast during the game and make the necessary moves and make sure your technique is important to be able to send the ball to the target ball. However, it is necessary to be in the right place at the right time so that the technique and tactic can be applied smoothly and easily. Badminton is the basic principle to meet the ball coming in the game at the front and top. One of the most important conditions for this is to have running techniques in the badminton sport-specific court. Because in today's badminton, the technical skills are largely based on running, foot movements have a great precaution.

In a study of competition analysis, it was reported that the ball returned after 0.93 seconds from a stroke in the rally (Cabello-Manrique and Gonzalez-Badillo, 2003). In other research, it was identified that the maximum speed of the badminton ball was measured at 421

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km/h, the fastest ball in the world (Bankosz, Nawara, and Ociepa, 2013; Huynh, 2011). These values show how a hit is made in almost a second in rallies and how fast the game is played, which reveals the importance of badminton-specific foot movements and work in badminton sports. Although it has been indicated by some sources that the pacing exercises of shadow badminton are used in foot exercises and constitute a considerable part of them (Badminton Association of England, 2002; Yousif & Yeh, 2011), there is very little in the literature about special foot practice (Chin et al., 1995; Hazar, 2005).

The main purpose of the study was to investigate the effects of a 12-week shadow badminton training course on some the motoric features in children aged 8-10 years. In addition, the other objective was to compare the practice of shadow badminton with classic badminton practice to determine the frequency and duration of shadow badminton training in beginners at the sport.

METHODS

The research was conducted on students in the 8-10 age group. 101 students (50 girls and 51 boys) participated in the research, including the badminton shadow training group (SB, n = 35, 17 boys and 18 girls), the classic badminton training group (CB, n = 34, 19 boys and 15 girls) and the control group (CG, n = 32, 15 boys and 17 girls), that was not included in any physical activity during the research.

Approval was obtained from the Ethics Committee (Report No: 2015/222) at Necmettin Erbakan University Medical Faculty.

The study consisted of four days a week for 16 weeks of preparation and basic training periods. For four weeks, the badminton shadow training group and students in the classic badminton training group (n = 69) studied game rules and field knowledge and prepared for the transition to the basic techniques used in badminton and the in situ posture positions.

Pre-test was applied to all groups (SB-CB-CG) after four weeks of preparatory work. The classic badminton training program was applied to subjects of the classic badminton training group for 12 weeks. The classic badminton training program was applied to subjects of the shadow badminton training group for 12 weeks with four days of training per week, classic badminton training for two days and shadow badminton-training program for two days. The daily and weekly training intensity was assessed according to the athlete's training adaptation process and the relative intensity was increased. Intermediate tests were performed at the end of eight weeks and final tests were performed at the end of 12 weeks in the basic

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training period. A 15 min warm-up period was given before the tests started. With the exception of the 20 m shuttle running, two measurements were made with 5-10 minutes rest intervals on each test battery and the best ratings were recorded.

Applied Tests

Height and Body weight: In the linear measurements a tapeline with 0.01 m sensitivity score was used. Weight measurements were made with a digital weighing scale with a sensitivity level of 0.01 kg (Zorba and Saygın, 2009).

Body mass index: Using body weights and lengths, BMI was determined using the BMI = Body weight / (Length)^2 formula (Zorba and Saygın, 2009).

Flexibility measurement: It was determined by sit and reach test and recorded in cm (Günay, Tamer, and Cicioğlu, 2013).

Balance measurement: Balance scores were determined with Flamingo balance instrument. The test lasted for one minute and when the time was up, every attempt to balance your balance was recorded as a test result (Tsigilis, Douda, and Tokmakidis, 2002).

20 m speed test: A course with a 20-meter straight running track was prepared in the hall. The time between start and end was determined with NewTest 2000 photocell device and recorded in sec (Bogdanis, Nevill, Lakomy, and Boobis, 1998).

Vertical jump test: Determined using the Takei brand vertical jumping gauge (Chin et al., 1995).

Anaerobic power measurement: Measurements of body weight with vertical jump distance (m) were determined by the Lewis formula using the resulting values (Günay, Tamer, and Cicioğlu, 2013).

(P=√4.9 * Body weight * √D) P= Anaerobic Power, D= Vertical jump distance (m).

Determination of maximum oxygen consumption: 20 shuttle running tests were performed and at the end of the test, the maximum number of shuttles was calculated, and the maximum VO_2 values were determined and recorded as ml / kg / min (Günay, Tamer, and Cicioğlu, 2013).

Training Program

Preparation training period (Weeks 1-4):

During this period, the same training program was applied to both training groups (SB and CB) for 60 min per day four days per week (Monday - Tuesday - Thursday - Friday). Necessary information about game features, the field and equipment is provided. The rules of

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the game are explained, and training for the development of the racket and ball is given. During these training sessions, children were prepared for badminton and played games for the workshops to be performed during the basic training period.

Training Period (Week 5-16)

Table 1. Badminton shadow group weekly training program

Days	**1st day**	**2nd day**	**3rd day**	**4th day**
Time	60-65 minutes	60-65 minutes	60-65 minutes	60-65 minutes
Aim	Technical Exercise	Badminton Shadow + Technical Exercise	Technical Exercise	Badminton Shadow + Technical Exercise
Badminton shadow part	Total Time 20 – 25 min. Drill time 10 sec. Rest time between drills 20 sec. Set point 2 - 4 Rest time between sets 1-2 min.			
Weekly Training Program	--15' Warm-up run and gymnastic -- 10' Serve exercises (short-long) -- 10' Clear technical exercises -- 10' Drop technical exercises -- 10' free game + match -- 3-5' cooling exercises	--15' Warm-up run and gymnastic -- 10' Drive technical exercises -- 20-25' badminton shadow training practice According to running directions • to the numbers 1-3, 1-4, 1-5, 3-4, 3-5 step exercises -- 5-10' free game +match -- 3-5' cooling exercises	--15' Warm-up run and gymnastic -- 10' front of net-drop technical exercises -- 10' front of net lob (lift) technical exercises -- 10' repetition of technical exercises -- 10' free game + match -- 3-5' cooling exercises	--15' Warm-up run and gymnastic -- 10' preliminary of smash exercises -- 20-25' badminton shadow training practice According to running directions • to the numbers 4-5, 4-6, 4-8, 5-6, 5-8 step exercises -- 5-10' free game +match -- 3-5' cooling exercises

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Table 2. Classic badminton group weekly training program

Days	1st day	2nd day	3rd day	4th day
Time	60-65 minutes	60-65 minutes	60-65 minutes	60-65 minutes
Aim	Technical Exercise	Technical Exercise	Technical Exercise	Technical Exercise
Weekly Training Program	--15' Warm-up run and gymnastic -- 5' foot movements -- 10' Serve exercises (short-long) -- 10' Clear technique exercises -- 5' Free game + match -- 10' Drop Technical exercises -- 3-5' cooling exercises	--15' Warm-up run and gymnastic -- 5' Free game + Match --10' front of net-drop technique exercises -- 10' front of net lob (lift) technical exercises -- 5' Free game + match -- 10' repetition of clear, drop technical exercises -- 3-5' cooling exercises	--15' Warm-up run and gymnastic -- 5' foot movements -- 10' Serve exercises (short-long) -- 10' Drive technique exercises -- 10' repetition of Net-drop, lob (lift) techniques -- 5' free game + match -- 3-5' cooling exercises	--15' Warm-up run and gymnastic -- 10' repetition of clear, drop technical exercises -- 10' preliminary of smash exercises -- 10' repetition of drive technique -- 10' repetition of Net-drop, lob (lift) technique -- 5' free game and + match -- 3-5' cooling exercises

Statistical Analysis

SPSS 18.0 statistical package program was used to evaluate the data obtained within the scope of the research. Arithmetic mean and standard deviations were calculated and recorded. One-way analysis of variance was used for all age groups averages. The ANOVA (ReAnova) was used to determine whether there was a significant difference between pre-, intermediate and post-test measurements according to the sex of the training groups and the control group and participants. Significance level was taken as $p < .05$.

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RESULTS

Table 3. Comparison of age results of training groups and control group

Age	N	Average	Standard Deviation	F	p	Significant difference
Badminton Shadow	35	9,64	0,29			
Classic Badminton	34	8,70	0,50	63,258	0,000*	*Classic and Shadow *Classic and Control
Control Group	32	9,52	0,31			

*p<0.05

Table 4. Comparison of height, weight and body mass index results measured by gender of subjects with training groups and control group

Variables		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Height (cm)	Beginning	138,47	140,56	139,54	132,26	131,71	132,03	138,76	137,31	138,06
	Week 8	139,65	141,44	140,57	133,05	132,79	132,94	139,47	139,38	139,42
	Week 12	139,65	141,44	140,57	133,05	132,79	132,94	139,47	139,38	139,42
Variables		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Weight (kg)	Beginning	31,98	33,32	32,67	29,67	29,80	29,73	34,70	33,20	33,97
	Week 8	33,31	34,33	33,84	30,57	30,74	30,65	35,72	33,79	34,78
	Week 12	33,25	34,29	33,79	30,68	30,76	30,72	36,06	33,88	35,00
Variables		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Body mass index (kg/m^2)	Beginning	16,66	16,68	16,67	16,88	17,14	16,99	17,91	17,44	17,68
	Week 8	17,02	16,90	16,96	17,22	17,37	17,29	18,19	17,23	17,73
	Week 12	17,02	16,93	16,97	17,14	17,16	17,15	18,33	17,30	17,83

The results of the ANOVA for repeated measures of whether there is a significant difference between the measurement results are shown in Table 5.

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Table 5. Descriptive statistics of the results of height, weight and body mass index measured by genders of subjects with training groups and control group

	Variance Sources	Sum of squares	Std	Average of squares	F	p
Height	Measurements	83,052	2	41,526	38,828	0,000*
	Between Groups	3.284,032	2	1.642,016	12,468	0,000*
	Sex	8,083	1	8,083	0,061	0,805
	Group and Sex	94,603	2	47,301	0,359	0,699
Weight	Measurements	67,392	2	33,696	88,269	0,000*
	Between Groups	915,285	2	457,643	3,316	0,041*
	Sex	3,142	1	3,142	0,023	0,880
	Group and Sex	118,357	2	59,178	0,429	0,653
BMI	Measurements	2,689	2	1,344	6,478	0,002*
	Between Groups	39,467	2	19,734	0,929	0,398
	Sex	4,618	1	4,618	0,217	0,642
	Group and Sex	12,645	2	6,323	0,298	0,743

*p<0.05

A significant difference was found between height, body weight and body mass index scores measured at three different time points (p <0.05). There was no statistically significant difference between boy and girl children in terms of the gender factor of classical badminton training group (CB) and control group (CG) of shadow badminton training group (SB) participating in the study, while classical badminton was between length shadow badminton and control group, whereas in body weight, significant differences were found between classical badminton and control group (p <0.05).

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Table 6. Comparison of motoric parameters measured by sex of training groups and control group

VARIABLES		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Sit-Reach Test (cm)	Beginning	16,59	16,78	16,69	19,63	17,50	18,73	17,82	16,31	17,09
	Week 8	18,06	18,78	18,43	20,00	18,57	19,39	19,24	16,19	17,76
	Week 12	18,65	18,83	18,74	21,47	19,93	20,82	20,24	17,25	18,79
		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Flamingo balance (min/pcs)	Beginning	12,47	10,50	11,46	13,32	13,36	13,33	13,41	13,25	13,33
	Week 8	10,35	10,00	10,17	12,68	11,64	12,24	13,06	12,19	12,64
	Week 12	10,00	9,56	9,77	12,74	11,43	12,18	12,47	11,44	11,97
		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
20 m speed (sn)	Beginning	4,46	4,88	4,68	4,90	5,31	5,07	4,28	4,74	4,51
	Week 8	4,28	4,64	4,47	4,84	5,19	4,99	4,36	4,83	4,59
	Week 12	4,21	4,54	4,38	4,76	5,13	4,92	4,43	4,77	4,60
		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Vertical Jump (cm)	Beginning	26,88	24,83	25,83	26,21	22,71	24,73	26,41	26,31	26,36
	Week 8	30,00	27,72	28,83	27,16	23,14	25,45	26,29	26,25	26,27
	Week 12	34,29	31,00	32,60	30,00	24,86	27,82	27,29	26,50	26,91
		Badminton Shadow			Classic Badminton			Control Group		
		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Anaerobic power (kg-m/sec)	Beginning	36,53	36,48	36,51	33,19	31,46	32,46	39,26	37,51	38,41
	Week 8	40,12	39,84	39,98	34,70	32,76	33,87	40,22	38,08	39,18
	Week 12	42,79	41,90	42,33	36,73	33,94	35,54	41,44	38,45	39,99
		Badminton Shadow			Classic Badminton			Control Group		

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		Boy	Girl	Mean	Boy	Girl	Mean	Boy	Girl	Mean
Max VO_2 ml/kg/min	Beginning	27,72	24,48	26,05	24,35	23,80	24,12	25,96	24,62	25,31
	Week 8	28,98	25,83	27,36	25,22	24,34	24,85	25,77	24,99	25,39
	Week 12	29,30	26,18	27,69	25,36	24,51	25,00	25,91	25,43	25,68

The ANOVA for repeated measures was used to determine whether there was a significant difference between the measurement results and the values for the descriptive statistics are shown in Table 7.

Table 7. Descriptive statistics of motoric parameters measured by genders of subjects with training groups and control groups

	Test	Variance sources	Sum of squares	Std	Average of squares	F	p
Sit-Reach		Measurements	191,570	2	95,785	34,462	0,000*
		Between Groups	173,166	2	86,583	1,107	0,335
		Sex	123,701	1	123,701	1,582	0,212
		Group and Sex	112,889	2	56,445	0,722	0,488
Flamingo balance		Measurements	112,338	2	56,169	40,670	0,000*
		Between Groups	302,474	2	151,237	8,214	0,001*
		Sex	47,266	1	47,266	2,567	0,112
		Group and Sex	0,722	2	0,361	0,020	0,981
20 m speed		Measurements	0,748	2	0,374	12,747	0,000*
		Between Groups	15,732	2	7,866	21,584	0,000*
		Sex	11,538	1	11,538	31,660	0,000*
		Group and Sex	0,047	2	0,024	0,065	0,937
Vertical Jump		Measurements	606,338	2	303,169	62,120	0,000*
		Between Groups	657,334	2	328,667	3,469	0,035*
		Sex	416,916	1	416,916	4,401	0,039*
		Group and Sex	187,987	2	93,993	0,992	0,375

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Anaerobic power	Measurements	603,353	2	301,677	96,962	0,000*
	Between Groups	2.063,760	2	1.031,880	4,856	0,010*
	Sex	196,564	1	196,564	0,925	0,339
	Group and Sex	56,461	2	28,230	0,133	0,876
Max VO_2	Measurements	49,353	2	24,677	136,248	0,000*
	Between Groups	323,574	2	161,787	13,851	0,000*
	Sex	191,532	1	191,532	16,397	0,000*
	Group and Sex	95,128	2	47,564	4,072	0,020*

*$p<0.05$

A significant difference was found between the results of sit and reach test, flamingo balance test, vertical jump test, anaerobic power test and Max VO_2 test results measured at three different times from the subjects ($p <0.05$). Sit and reach test and flamingo balance test results did not differ ($p> 0.05$), whereas 20 m speed test, vertical jump test and Max VO_2 test results were significantly different according to the gender of the subjects. While there was no significant difference in sit and reach test results, significant differences were found in the results of flamingo balance test, 20 m speed test, vertical jump test, anaerobic power test and Max VO_2 among all groups ($p <0.05$). The differences were found in the results of the flamingo balance test and the maximum oxygen consumption, between the shadow badminton group and the classical badminton and control groups, in the results of 20 m speed test and anaerobic power test, between the classical badminton group and the shadow badminton and control groups and in the vertical jump test, classical badminton group and shadow badminton group ($p <0.05$).

DISCUSSION

In the study, the effects of 12-week shadow badminton training on some motoric features of 8-10 year old children were investigated. We also aimed to determine the frequency and duration of shadow badminton training for beginners by comparing badminton shadow weighted training with classical badminton training practices.

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BMI findings were found to be within the normal limit values reported by the WHO (World Health Organization, 2000).

The flexibility values of the participants were determined by the sit and reach test and it was determined that although there was an increase in the mean values between the beginning and the end of the study, it was not statistically significant. When the literature was examined, the mean flexibility values of female and male students (n = 1050) who did not play sports between 7-9 years were 24,32 cm in 7-year-old girls and 24,21 cm in boys, 18,72 cm in 8-year-old girls and 18.39 cm in boys, 18,73 cm in 9-year-old girls and 19.82 cm in boys and it was reported that there was no significant difference between girls and boys in all age groups (Çelik, Günay, and Aksu, 2013). In another study that examined the effect of 8-week football training in boys in summer sports schools, the mean values of flexibility were found to be 16.2 cm in the pre-test and 18 cm in the end of the study, and a statistically significant improvement was observed (Güler, 2009). In another study among 9-11 age group children, the average values of flexibility were 18 cm for badminton players, 17.6 cm for tennis players, 18.5 cm for soccer players, 18.9 cm for swimmers, 17.1 cm for karate players, 19.6 cm for basketball players and 29.4 cm for gymnasts, and the flexibility value of gymnasts was found to be statistically significantly higher than other sports (Opstoel et al., 2015). It can be concluded that the mean values obtained after our study are in parallel with the results of the literature investigations. It can also be explained by the fact that no significant difference was found in the comparison between the training groups and the control group, and that there was not enough flexibility development work in the training programs of the SB and CB groups constituting the training groups.

When the balance measurements are examined, it is seen that the mean values of the balance error numbers of the girls are lower than the boys but it does not mean statistically. The better balance performance of girls can be a sign of the game habits, such as skipping, jumping, improving the balance of children in this age group. In a study on 119 children who did not actively participate in sports, an exercise program was applied for 5 months. At the end of the study, pre-test mean values of male and female were 16,48 and 16,21 min / pcs respectively in flamingo balance test measurements and 11 and 11,57 min / pcs post-test mean values were found statistically significant improvement (Cepero, Lopez, Suarez-Llorca, Andreu-Cabrera, and Rojas, 2011). The number of flamingo balance errors before 12-week judo training for 8-10 year-old children was found to be 11.4 min / pcs and 8.6 min / pcs after the study

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(Çakıroğlu, Sökmen, and Arslanoğlu, 2013). In another study, flamingo balance error numbers were found to be 13,78, 3,73 and 4,04 min / pcs at 7, 8 and 9 years, respectively, in the students participating in physical education lessons, while the students who did not participate in physical education lessons were 7, 8 and 9 years 12,95, 4,84 and 7,2 min / pcs respectively (Koç and Tekin, 2011). Similarly, in a study on male soccer players in young age groups, the mean values of flamingo balance error were reported as 3.21 min / pcs at 9 years, 5 min / pcs at 10 years and 3.92 min / pcs at 11 years (Şimşek et al., 2014). It can be said that the results obtained from the study generally correspond to the literature results. However, in some studies (Koç and Tekin, 2011; Şimşek et al., 2014) the balance error numbers are seen to have much better scores than the study result. It is thought that this situation may be caused by the fact that in the flamingo balance test it is not measured with test devices which express precision such as duration or force indicators and that the obtained values depend on the observer's attention and error evaluation.

The speed performances of the subjects participating in the study were determined by the 20 m speed run test. In a study conducted on young male footballers, the mean values of 20 m sprint speed were reported as 4.06 sec at 9 years, 3.90 sec at 10 years and 4.03 sec at 11 years (Şimşek et al., 2014). It was reported that the mean value of 20 m sprint average was 4.76 sec in the study performed on 1777 female children between 8-10 years of age (Ayan, 2008) and 4.47 sec in another study done on male children in the same age range (Ayan, Erol, Mülazımoğlu, and Gültekin, 2008). It can be said that these results are similar to the mean values of 20 m speed in the study. According to pre-test results, when the CG subjects got better scores than the subjects who made up the SB group, but the interimediate test and the post-test were examined, it was seen that the subjects who formed the group of the resultant training program got better scores than the CG at 20 m speed. This can be a sign that shadow badminton training has a positive effect on acceleration.

The explosive force characteristics of the subjects participating in the study were determined by the vertical jump test, one of the performance indicators. When the literature is examined, in a study on male national and amateur badminton players with a mean age of 11, the average values of vertical jump were determined as 31.70 cm in the national badminton players and 27 cm in the amateur badminton players (Kafkas, Taşkıran, Arslan, and Açak, 2009). In a study conducted on 9-year-old girls, it was reported that the average vertical jump was 17.27 cm (Ayan, 2008), while the same age group was 18.03 cm on boys (Ayan and

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Mülazımoğlu, 2009). In another study on girls, Mondal (2006) reported that the mean value of vertical jump of girl subjects in the 9-10 age group was 24.82 cm. It is seen that the mean values obtained in our research are similar to the results of other studies in the literature, with the mean values being higher than the mean values of some studies (Ayan, 2008; Ayan and Mülazımoğlu, 2009). The fact that the average values of the vertical jump of the subjects of the SB group are higher than the CB group can be explained by the result that the shadow badminton training causes more power increase in the leg muscles than the classical badminton training.

When the anaerobic power results of the subjects participating in the study were examined, it was determined that the mean values of the subjects of the SB group were higher in the statistically significant level than the subjects who constituted the CB group. The anaerobic energy system in the field of badminton sports is very important and the positive effects of the weight training exercises in the SB group can be seen as an expected result. The average anaerobic power was found to be 39,2 kg-m / sec in 10-year-old male players and 35,6 kg-m / sec in female players in a study on athletics (Pekel et al., 2007). In another study in which 30-girl tennis players with a mean age of 10.4 were exercised without ball for 12 weeks, 37,40 kg-m / sec in the pre-test and 39,60 kg-m / sec and was reported statistically significant increase (Ölçücü, Cenikli, Kaldırımcı, and Bostancı, 2011). As a result of the study, it is observed that shadow badminton-weighted training increases the anaerobic power values during the 8 week study period. But it can be concluded that 12 weeks of this training will have a more positive impact on the performance development of the athletes.

The 20 m shuttle running test was applied to the subjects participating in the study and the maximum oxygen consumption capacity was determined by the values obtained from the 20 m shuttle running test. When the results related to maximum oxygen capacity were examined, mean values of male subjects were statistically higher than female subjects in terms of gender factor. In a study of 11-year-old girls and boys who did not exercise, the mean values of Max VO_2 were 27.76 ml / kg / min and 32.11 ml / kg / min, respectively (Saygın, Karacabey, and Saygın, 2011). In another study conducted at 7-11 years of age, aerobic capacities of 766 male students were reported as 46,4 ml / kg / min (Esmaeilzadeh, Kalantari, and Nakhostin-Roohi, 2013). In another research carried out on footballers, the average values of male soccer players playing in the teams who have reached a grade in the primary school competition between primary schools were found to be 37.3 ml / kg / min and 26.5 ml / kg / min of

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football players playing in the last teams and it has been reported that the values of the male soccer players in the degree teams are statistically different (Güler, Çelik Kayapınar, Pepe, and Yalçıner, 2010). When the results obtained from the study are compared with the literature results, it is seen that the values obtained are slightly lower. This may be due to minor age differences in the comparison sport, or it may be a result of differences in the training programs applied in different sports. Badminton is a sporting sport where the anaerobic energy path dominates, but it is also important in terms of aerobic performance because the duration of the match is not clear and the athletes in the tournament are in consecutive competitions. It can be said that the maximum oxygen consumption capacity of the subjects in the SB training group is higher than the CB and CG subjects and that the shadow badminton training and footwork have a positive effect on badminton game performance especially in terms of oxygen consumption capacity. In addition, it was determined that the mean values of Max VO_2 of the subjects in the SB group improved significantly over the first 8 weeks, but only a limited improvement in the final test values. According to these results, it can be said that shadow badminton training is a significant effect in the 8 week study period, though it is thought that the development can be made as long as training in the development of maximum oxygen consumption capacity.

CONCLUSIONS

As a result of the study, it was found that the participants were at the age of development and that they continued regularly to the training and it was determined that the subjects forming both training groups (SB-CB) improved their physical performance parameters. In addition, statistically significant differences were found in the vertical jump, anaerobic power, balance, 20 m speed and maximum oxygen consumption capacity parameters of the SB group according to CB. When the gender factors of the subjects were evaluated, the average values of height, body weight, body mass index, flexibility and balance were similar between boys and girls. In addition, it was found that boys had better values in terms of anaerobic power and statistically significant differences than the girls in the average values of the vertical jump, 20 m speed and maximum oxygen consumption capacity.

In addition to the technical training in badminton, we believe that the training of the athletes in foot movements and shadow badminton training practices is better than the classical badminton training of today. This is because, although it is necessary to have technical development in order to send the shuttlecock to the correct point in the game, it is

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necessary for the athlete to be in the right place and at the right time to be able to perform the appropriate technique. Considering the speed of the badminton ball, we also think that it is only possible to move continuously in the court with foot movements and especially with badminton foot working studies. As a result, it can be said that shadow badminton training has positive effects on the physical performance parameters of 8-10 age group individuals.

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