

Summer Sports Camp and Physical Development in Adolescents: A Study¹

Fatih YILMAZ²
Evrım ÇAKMAKÇI³

Gönderim Tarihi: 25.10.2022

Yayın Tarihi: 31.12.2023

Makale Türü: Tez Özeti

Abstract

This study aims to describe research comparing physical parameters between adolescents who participate in summer school and those who do not. As the experimental group, 115 adolescents who received training in various sports disciplines such as football, basketball, volleyball, handball, and taekwondo at a summer sports school in Tokat city center were selected. The control group consisted of 50 adolescents who did not participate in any sports program. The research examines the effects of 8 weeks of physical training on both groups. According to the findings of the study, the 8-week training programs had a positive impact on adolescents' grip strength, flexibility, long jump, number of sit-ups, and hand-eye coordination. However, there were no significant differences between the groups in terms of flexibility, grip strength, and speed skills. Additionally, it was observed that girls had better flexibility, while boys excelled in long jump, grip strength, number of sit-ups, and 30-meter sprint. It was also found that as age increased, hand-eye coordination, running speed, long jump distance, grip strength, and the number of sit-ups also improved. There was no gender difference in balance and hand-eye coordination. Balance skills were not associated with age, and there was no relationship between flexibility (sit-and-reach test) and age, height, weight, and body mass index. In conclusion, this research emphasizes the importance of sports participation in improving adolescents' physical skills. However, it should be noted that certain skills may vary depending on factors such as gender and age.

Key Words: Adolescent, Physical Parameters, Physical Fitness, Motor Skills, Summer Sports Camp

Yaz Spor Okulu ve Adolesan Dönemi Çocuklarda Fiziksel Gelişim: Bir İnceleme

Öz

Bu çalışma, yaz okuluna katılan adolesanlar ile katılmayanlar arasında fiziksel parametrelerin karşılaştırılmasını amaçlayan bir araştırmayı tanımlamaktadır. Deney grubu olarak, Tokat il merkezinde yaz spor okulunda futbol, basketbol, voleybol, hentbol ve tekvando branşlarında eğitim gören 115 adolesan seçilmiştir. Kontrol grubu ise herhangi bir spor programına katılmayan 50 adolesandan oluşmaktadır. Araştırma, her iki grup üzerinde 8 hafta boyunca yapılan fiziksel antrenmanların etkisini incelemektedir. Araştırmanın sonuçlarına göre, 8 haftalık antrenman programları adolesanların kavrama kuvveti, esneklik, uzun atlama, mekik sayısı ve el-göz koordinasyonunu olumlu yönde etkilemiştir. Ancak, gruplar arasında esneklik, kavrama kuvveti ve sürat becerilerinde anlamlı farklılık bulunmamıştır. Ayrıca, kız çocukların esneklik açısından daha iyi olduğu, erkek çocukların ise uzun atlama, kavrama kuvveti, mekik sayısı ve 30 m hızında daha başarılı olduğu görülmüştür. Yaş

¹ This article is derived from the master's thesis of the first author.

² **Corresponding Author:** Fatih Yılmaz, Ph.D. Student, Selçuk University, Konya/Turkey, ftherenyilmaz@gmail.com, ORCID ID 0000-0001-8012-158X

³ Evrim Çakmakçı, Prof. Dr., Faculty of Sports Sciences, Selçuk University, Konya/Turkey, evrimcakmakci@selcuk.edu.tr, ORCID ID 0000-0003-1043-901X

artıkça el-göz koordinasyonu, koşu hızı, uzun atlama mesafesi, kavrama kuvveti ve mekik sayılarının da arttığı bulgusu elde edilmiştir. Denge ve el-göz koordinasyonu açısından cinsiyet farkı bulunmamıştır. Denge becerisi yaş ile ilişkilendirilmemiştir ve esneklik (otur-eriş testi) ile yaş, boy, ağırlık ve vücut kitle indeksi arasında ilişki bulunmamıştır. Sonuç olarak, bu araştırma, adolesanların fiziksel becerilerini geliştirmek için spora katılmalarının önemini vurgulamaktadır. Ancak, bazı becerilerin cinsiyet ve yaş gibi faktörlere bağlı olarak değişebileceği unutulmamalıdır.

Key Words: Adolesan, Fiziksel Parametre, Fiziksel Uygunluk, Motorik Beceri. Yaz Spor Okulu

Introduction

In the branches of science that examine human development, developmental periods are classified as "prenatal, infancy, early childhood, pre-adolescence, adolescence, and adulthood." The determination of these periods takes into consideration physical, cognitive, personality, and social development (Kılıçgil, 1999; Acar, 2023).

The World Health Organization has clarified the age ranges that the adolescent group, which constitutes the sample of this study, should cover, and it is observed that individuals between the ages of 10-19 are defined as adolescents (Menteş et al., 2011). This defined age range is broad and encompasses different physical development stages for boys and girls. Therefore, the adolescent age group of 10-19 has been divided into different categories, separately for boys and girls. These categories are defined as early period (boys aged 10-13, girls aged 9-12), middle period (boys aged 13-15, girls aged 12-14), and late period (boys aged 15-17, girls aged 14-16). In this study, the research population is limited to boys and girls aged 12-14.

Various physical parameters are taken into consideration in determining an individual's physical development. These parameters are categorized as strength, speed, endurance, mobility (flexibility), and balance development. Physical activity and exercise not only enhance motor skills but also improve functions such as endurance, speed, agility, and balance. However, achieving the desired developments depends on carrying out exercise and physical activities within a specific plan and program. In this study, the impact of regular physical activity and exercises on the physical parameter changes of children aged 12-14 is examined, and a comparison is made with children who do not engage in any physical activity.

Among the physical parameters considered in the study, strength is defined as the "maximum contraction force produced by a muscle or muscle group against resistance" in static and dynamic forms. In sports sciences, classifications such as "maximal, rapid, continuity" are observed (Özer, 2016; Acar, 2015).

Speed, another physical parameter taken into account in the study, is defined as the ability to "move at the highest speed" or "perform actions and movements at the highest speed." Speed is considered important in all sports branches, and it leads to different requirements depending on the sport. Speed skills are achieved through conscious training and represent the ability to make quick decisions and the rapid movement of the muscular system (Weineck, 2011).

Another physical parameter evaluated in this study is endurance, defined as the "duration of muscle contraction repetition against resistance." The longer the duration of contraction, the higher the endurance. For example, if a muscle group has high endurance, the number of repetitions of a challenging movement will also increase (Krstulović et al., 2006).

Flexibility skill is another important component of physical parameters. Flexibility, limited by the structure of bones, muscles, joints, tendons, and skin, not only affects an athlete's performance but is also directly related to injuries. Therefore, increasing flexibility will reduce the occurrence of injuries. As stated in the definition of flexibility, the "range of motion" skill increases the mobility

of muscles and bones. Therefore, as flexibility (movement skill) increases, physical activity can be performed smoothly (Bompa, 2017; Acar and Erdogan, 2023).

In this study, the final skill used as a physical parameter is balance. Balance is defined as the ability of the body to transition to the desired position statically and dynamically during movements and maintain that position. Although balance is a physical parameter, it is also related to the coordination between the auditory, visual, inner ear, and motor systems. Therefore, it is observed in the literature that balance is defined as coordination. Any problem in the systems responsible for maintaining balance will cause imbalance and negatively affect the response given (Ivanenko and Gurfinkel, 2018).

Materials and Methods

In this section, information regarding the research model, sample, measurement instrument, and data analysis is provided.

Research Model

In the research, an experimental research design was employed, which is one of the empirical research designs. The experimental model is the research field where data of interest is observed to find cause-and-effect relationships among controlled variables. In experimental research, there is at least one comparison (Karasar, 2005), and in this study, the data before and after the experiment were compared for both the control and experimental groups.

Sample of the Research

The research sample consists of 104 adolescents in the experimental group who receive training in various sports branches such as football, basketball, volleyball, handball, and taekwondo in the summer sports school in the central district of Tokat, as well as 50 adolescents in the control group who do not participate in any sports branch. Before the study, the families were informed about the study, and a voluntary consent form was obtained.

Data Collection

During the research, the participants in the study were subjected to their own training programs in their respective branches for 8 weeks, while the control group was not included in any training program. Measurements were taken for both groups at the beginning and at the end of 8 weeks, including height, weight, flamingo balance test, disc touching test, sit and reach test, standing long jump, grip strength, sit-up, and 30-meter sprint measurements. All tests to measure physical fitness parameters were conducted in a well-ventilated, spacious room.

Measurement of Children's Body Weights: The weights of the subjects were measured in kilograms (kg) with a scale (Angel brand) with an accuracy of ± 20 grams while they were wearing shorts, barefoot, and in an anatomical standing position (Tamer, 2000).

Measurement of Children's Heights: The heights of the subjects were measured in centimeters (cm) with a Charder hm-200 p brand measurement tool while the subjects were standing upright, with the caliper sliding on the scale touching the top of the subject's head, with an accuracy of 1 mm (Tamer, 2000).

Body Mass Index: After the weights and heights of children in both the control and experimental groups were taken, the body mass index was calculated by dividing the weight in kilograms (kg) by the square of the height in meters (m) $[(\text{Weight (kg)} / \text{Height (m)}^2)]$ and recorded (Tamer, 2000).

Flexibility (Sit and Reach) Test: The flexibility measurements of the participants were conducted using a table suitable for the Eurofit test battery, with a length of 35 cm, width of 45 cm, height of 32 cm, and an upper surface length of 55 cm, width of 45 cm. Additionally, there was a 50 cm measuring ruler on the upper surface. The subjects sat with their feet straight up on the table without bending their knees, leaned forward, slowly touched the ruler with their fingertips, and waited in this position for 1-2 seconds. Two attempts were made, and the best result was recorded (Tamer, 2000).

Flamingo Balance Test: To measure general balance, the subjects tried to maintain their balance with the foot they wanted to use on a wooden beam that was 50 cm long, 4 cm high, and 3 cm wide. They bent the other leg from the knee and pulled it towards their hip while holding it with the same side's hand. After the subjects balanced themselves in this way, the timer was started, and they tried to maintain their balance for 1 minute. When the balance was disrupted or they released the foot they were holding with their hand, the timer was stopped. The subjects were asked to regain their balance on the balance device, and the timer continued from where it left off. The number of attempts made by the subjects to regain their balance was counted, and this number was recorded at the end of the test (Tamer, 2000).

Disc Touching Test: To measure arm movement speed, the subjects touched two plastic discs, A and B, with a diameter of 20 cm, placed 80 cm apart on a flat table, as quickly as possible with their dominant hand. The test ended when the subject completed 25 touches, and the time was stopped. The test was performed twice, and the best performance was recorded as the test result (Tamer, 2000).

Standing Long Jump: The subjects stood in an upright position on a hard surface with their feet shoulder-width apart. When ready, they pulled both arms back while bending their knees. With the forward movement of their arms, they jumped forward as far as possible onto a soft surface. The distance from where their heels left a mark was measured. Each subject performed two attempts, and the best result was recorded (Tamer, 2000).

Measurement of Grip Strength: Using a Takkei brand hand dynamometer (Hand Grip), measurements were taken while the subject stood with their arm at a 45-degree angle to their body without bending their arm and without it touching their body. Two repetitions were performed, and the best value was recorded in kilograms (kg) (Tamer, 2000).

Sit-Up Test: To measure abdominal muscle endurance, the subjects lay on a gymnastics mat, with their backs on the ground, hands clasped behind their heads, and knees pulled toward their abdomen. They positioned their feet flat on the mat. Within 30 seconds, they repeated the movement with their elbow touching their knees, and the number of movements was counted at the end of the test. The test was performed twice, and the best result was recorded (Tamer, 2000).

Sprint Run (30 Meters): The aim was to determine the speed of the subjects. The subjects ran with high intensity and maximal speed in a previously determined 30-meter area. A photocell (Microgate Witty Double Photocell) was used for the 30-meter sprint. The time elapsed during the run was recorded in seconds (Tamer, 2000).

Data Analysis

SPSS 21.0 statistical software was used for the analysis of the data. Descriptive statistics tables were prepared separately for each group, including age, height, body weight, body mass index, and test scores of the control and experimental groups. Within each group, paired t-tests were conducted to compare age, height, body weight, body mass index, and test scores before and after the training. Independent two-sample t-tests were employed to compare the pre-test results between

the control and experimental groups and to compare the post-test results between the groups. Correlation analysis was used to examine the relationships between age, height, body weight, body mass index, and test scores. The confidence interval was set at 95% (significance level of 0.05, $p < 0.05$).

Results

In this section of the study, descriptive statistics for gender, age, height, body weight, body mass index, and test measurements of the participants are presented.

Table 1. *Distribution of Children by Gender and Age*

		Experimental Group		Control Group		Total	
		N	%	N	%	N	%
Gender	Female	25	35,2	22	50,0	47	39,8
	Male	46	64,8	22	50,0	68	60,2
Age	12 years	31	43,7	18	40,9	49	42,6
	13 years	24	33,8	14	31,8	38	33,0
	14 years	16	22,5	12	27,3	28	24,3

According to Table 1, of the 148 adolescents who participated in the study, 39.8% were female, 60.2% were male; 42.6% were aged 12, 33% were aged 13, and 24.3% were in the 14-year-old age group.

Table 2. *Descriptive Statistics for Height, Body Weight, and Body Mass Index Experimental Group Control Group*

		Experimental Group		Control Group		t	p
Variable		\bar{X}	SS	\bar{X}	SS		
Pre-test	Height	158,22	9,54	154,49	10,24	1,94	0,054
	Weight	51,87	13,83	48,64	11,76	1,34	0,184
	Body Mass Index	20,55	4,43	20,22	3,66	0,43	0,666
Post-test	Height	159,23	9,56	154,74	10,26	2,34	0,021
	Weight	52,37	12,74	48,64	11,72	1,60	0,112
	Body Mass Index	20,53	4,08	20,16	3,65	0,50	0,615

According to Table 2, it was determined that there was no significant difference ($p > 0.05$) among the experimental group's pre-test parameters of height, body weight, and body mass index.

Table 3. *Descriptive Statistics for Pre-test and Post-test Scores of the Experimental Group*

Test Time	Test	Min.	Max.	\bar{X}	SS	Skewness
Pre-Test	Flamingo balance (count)	12,00	26,00	16,99	3,74	0,55
	Disk touch (s)	103,80	241,30	136,10	20,16	0,51 ^a
	Flexibility (sit-and-reach) (cm)	2,00	32,50	18,89	7,24	-0,10
	Long jump (cm)	71,00	189,00	137,54	23,02	-0,21
	Grip strength (kg)	12,40	40,10	23,46	6,23	0,95
	Sit-ups (count)	7,00	24,00	17,55	3,67	-0,34
	30m sprint (s)	4,49	7,16	5,67	0,53	0,36
Post-Test	Flamingo balance (count)	9,00	27,00	16,02	4,00	0,55
	Disk touch (s)	103,00	195,60	127,75	15,22	-0,29 ^a
	Flexibility (sit-and-reach) (cm)	3,50	35,00	20,07	7,82	0,03
	Long jump (cm)	82,00	199,00	145,78	23,75	0,02
	Grip strength (kg)	15,30	44,00	25,29	6,85	0,89
	Sit-ups (count)	11,00	25,00	18,51	3,12	-0,25

30m sprint (s)	4,52	6,88	5,57	0,49	0,42
----------------	------	------	------	------	------

^a: A logarithmic transformation has been performed.

According to Table 3, before the program, the experimental group had an average of 16.99 ± 3.74 attempts in the flamingo balance test, a touch time of 136.10 ± 20.16 seconds in the disk touching test, a reach distance of 18.89 ± 7.24 cm in the flexibility (sit-and-reach) test, a long jump distance of 137.54 ± 23.02 cm, a grip strength of 23.46 ± 6.23 kg, 17.55 ± 3.67 sit-up repetitions, and a 30m sprint time of 5.61 ± 0.53 seconds.

After the program, the experimental group showed a decrease in the number of attempts in the flamingo balance test (16.02 ± 4.00), a reduction in the disk touching time (127.75 ± 15.22 seconds), an increase in flexibility test results (20.07 ± 7.82 cm), an improvement in long jump distance (145.78 ± 23.75 cm), an increase in grip strength (25.29 ± 6.85 kg), an increase in the number of sit-ups performed within 30 seconds (18.51 ± 3.12), and a decrease in the 30m sprint time (5.57 ± 0.49 seconds). Whether the difference between the pre-test and post-test results of the experimental group is statistically significant was analyzed using the paired t-test in Table 5.

Table 4. Descriptive Statistics for Pre-Test and Post-Test Scores of the Control Group

Test Time	Test	Min.	Maks.	\bar{X}	SS	Skewness
Pre-Test	Flamingo balance (count)	9,00	25,00	18,39	4,08	-0,59
	Disk touch (s)	103,80	173,40	137,48	17,85	0,26
	Flexibility (sit-and-reach) (cm)	5,40	44,00	18,56	7,79	0,92
	Long jump (cm)	83,00	202,00	130,54	26,45	0,66
	Grip strength (kg)	14,20	38,70	23,31	6,36	0,75
	Sit-ups (count)	4,00	27,00	16,07	4,66	-0,68
	30m sprint (s)	4,17	7,05	5,62	0,68	-0,18
Post-Test	Flamingo balance (count)	10,00	27,00	19,20	4,62	-0,46
	Disk touch (s)	105,00	174,00	137,71	17,72	0,21
	Flexibility (sit-and-reach) (cm)	5,50	43,50	18,59	7,85	0,81
	Long jump (cm)	81,00	202,50	131,84	26,22	0,56
	Grip strength (kg)	14,10	38,50	23,69	6,44	0,72
	Sit-ups (count)	4,00	28,00	16,05	4,73	-0,50
	30m sprint (s)	4,11	6,95	5,57	0,71	-0,22

^a: A logarithmic transformation has been performed.

According to Table 4, the control group's average for the pre-test flamingo test balance attempt count was 18.39 ± 4.08 , the time to touch the disc was 137.48 ± 17.85 seconds, flexibility (sit-and-reach) distance was 18.56 ± 7.79 cm, long jump distance was 130.54 ± 26.45 cm, grip strength was 23.31 ± 6.36 kg, the number of sit-ups completed in 30 seconds was 16.07 ± 4.66 , and the 30-meter sprint time was 5.62 ± 0.68 seconds.

For the control group, the post-test flamingo test balance attempt count increased (19.20 ± 4.62), the time to touch the disc 25 times increased (137.71 ± 17.72), they reached a farther point in the flexibility test (18.59 ± 7.85), long jump distance increased (131.84 ± 26.22), grip strength increased (23.69 ± 6.44), the number of sit-ups completed in 30 seconds decreased (16.05 ± 4.73), and the 30-meter sprint was completed in a shorter time (5.57 ± 0.71). The differences between the pre-test and post-test scores of the control group were analyzed for statistical significance using the paired t-test in Table 6.

Table 5. Comparison of Pre-Test and Post-Test Scores for the Experimental Group

Test	n	\bar{X}	SS	Fark	t	p
Flamingo balance (count)	59	17,10	3,72	1,08	4,06	0,000
	59	16,02	4,00			
Disk touch (s)	59	136,77	20,89	9,02	6,08	0,000
	59	127,75	15,22			
Flexibility (sit-and-reach) (cm)	59	18,77	7,52	-1,30	-5,67	0,000
	59	20,07	7,82			
Long jump (cm)	59	138,81	22,85	-6,97	-6,98	0,000
	59	145,78	23,75			
Grip strength (kg)	59	23,70	6,54	-1,59	-7,74	0,000
	59	25,29	6,85			
Sit-ups (count)	59	17,81	3,50	-0,69	-3,80	0,000
	59	18,51	3,12			
30m sprint (s)	59	5,62	0,53	0,05	2,40	0,019
	59	5,57	0,49			

According to Table 5, statistically significant differences were observed between the physical parameters of the experimental group before and after the training. There was a significant improvement in physical parameters after the 8-week program ($p < 0.05$), indicating that the training conducted in the experimental group had a significant positive impact on physical parameters.

Table 6. Comparison of Pre-Test and Post-Test Scores for the Control Group

Test	n	\bar{X}	SS	Fark	t	p
Flamingo balance (count)	44	18,39	4,08	-0,82	-3,51	0,001
	44	19,20	4,62			
Disk touch (s)	44	137,48	17,85	-0,23	-1,02	0,315
	44	137,71	17,72			
Flexibility (sit-and-reach) (cm)	44	18,56	7,79	-0,02	-0,27	0,790
	44	18,59	7,85			
Long jump (cm)	44	130,54	26,45	-1,31	-3,85	0,000
	44	131,84	26,22			
Grip strength (kg)	44	23,31	6,36	-0,38	-4,49	0,000
	44	23,69	6,44			
Sit-ups (count)	44	16,07	4,66	0,02	0,14	0,888
	44	16,05	4,73			
30m sprint (s)	44	5,62	0,68	0,05	1,96	0,056
	44	5,57	0,71			

According to Table 6, in the control group where no training program was applied, a significant decrease in balance was observed, while significant improvement was observed in long jump and grip strength ($p < 0.05$). There were no significant changes in discus touch, flexibility, sit-ups, and 30-meter sprint ($p > 0.05$).

Table 7. Comparison of Pre-Test Scores of Experimental and Control Groups

Test	Group	n	\bar{X}	SS	t	p
Flamingo balance (count)	Experiment	71	16,99	3,74	1,89	0,062
	Control	44	18,39	4,08		
Disk touch (s)	Experiment	71	136,10	20,16	0,37	0,711
	Control	44	137,48	17,85		
Flexibility (sit-and-reach) (cm)	Experiment	71	18,89	7,24	-0,23	0,818
	Control	44	18,56	7,79		
Long jump (cm)	Experiment	71	137,54	23,02	-1,50	0,137
	Control	44	130,54	26,45		
Grip strength (kg)	Experiment	71	23,46	6,23	-0,12	0,906
	Control	44	23,31	6,36		
Sit-ups (count)	Experiment	71	17,55	3,67	-1,89	0,061
	Control	44	16,07	4,66		
30m sprint (s)	Experiment	71	5,67	0,53	-0,42	0,676
	Control	44	5,62	0,68		

According to Table 7, at the beginning of the study, the physical parameters of the experimental and control groups were compared, and it was determined that there was no significant difference in the physical parameters of the groups at the initial stage ($p>0.05$).

Table 8. Comparison of Post-Test Scores of Experimental and Control Groups

Test	Group	n	\bar{X}	SS	t	p
Flamingo balance (count)	Experiment	59	16,02	4,00	-3,74	0,000
	Control	44	19,20	4,62		
Disk touch (s)	Experiment	59	127,75	15,22	-3,06	0,003
	Control	44	137,71	17,72		
Flexibility (sit-and-reach) (cm)	Experiment	59	20,07	7,82	0,95	0,344
	Control	44	18,59	7,85		
Long jump (cm)	Experiment	59	145,78	23,75	2,82	0,006
	Control	44	131,84	26,22		
Grip strength (kg)	Experiment	59	25,29	6,85	1,20	0,232
	Control	44	23,69	6,44		
Sit-ups (count)	Experiment	59	18,51	3,12	3,18	0,002
	Control	44	16,05	4,73		
30m sprint (s)	Experiment	59	5,57	0,49	0,04	0,967
	Control	44	5,57	0,71		

According to Table 8, measurements taken after 8 weeks revealed that the experimental group, which underwent the training program, showed a significant improvement in flamingo balance, discus touch, long jump, and sit-up numbers compared to the control group that did not undergo any training program ($p<0.05$). After 8 weeks, there was no significant difference between the experimental and control groups in terms of flexibility, grip strength, and 30m sprint runs ($p>0.05$).

Table 9. Comparison of Test Scores by Gender

Test	Gender	n	\bar{X}	SS	t	p
Flamingo balance (count)	Female	40	15,83	4,08	-2,86	0,005
	Male	63	18,37	4,57		
Disk touch (s)	Female	40	133,78	18,23	0,84	0,400
	Male	63	130,88	16,20		
Flexibility (sit-and-reach) (cm)	Female	40	21,85	8,53	2,56	0,012
	Male	63	17,91	7,00		
Long jump (cm)	Female	40	128,44	22,51	-3,82	0,000
	Male	63	147,06	25,06		
Grip strength (kg)	Female	40	22,50	4,71	-2,61	0,010
	Male	63	25,94	7,42		
Sit-ups (count)	Female	40	15,08	3,40	-5,35	0,000
	Male	63	18,97	3,72		
30m sprint (s)	Female	40	5,93	0,44	5,61	0,000
	Male	63	5,34	0,56		

According to Table 9, a significant difference by gender was observed in flamingo balance, flexibility, long jump, grip strength, sit-up, and 30m sprint run ($p < 0.05$). Male adolescents demonstrated significantly higher performance in balance, long jump, grip strength, sit-up, and 30m sprint run compared to female adolescents. On the other hand, female adolescents showed significantly higher flexibility performance than male adolescents.

Table 10. Comparison of Test Scores by Age Groups

Test	Age	n	\bar{X}	SS	F	p	SD
Flamingo balance (count)	A-12 years	40	18,28	4,59	4,98	0,009	A,C>B
	B-13 years	35	15,49	4,08			
	C-14 years	28	18,46	4,41			
Disk touch (s)	A-12 years	40	141,52	19,68	12,59	0,000	A>B,C
	B-13 years	35	125,90	12,27			
	C-14 years	28	126,04	11,05			
Flexibility (sit-and-reach) (cm)	A-12 years	40	18,96	6,37	0,78	0,459	
	B-13 years	35	20,76	6,66			
	C-14 years	28	18,46	10,65			
Long jump (cm)	A-12 years	40	125,88	21,28	12,69	0,000	B,C>A
	B-13 years	35	145,35	23,08			
	C-14 years	28	152,85	25,69			
Grip strength (kg)	A-12 years	40	20,99	4,39	12,84	0,000	B,C>A
	B-13 years	35	25,91	6,61			
	C-14 years	28	28,15	7,20			
Sit-ups (count)	A-12 years	40	16,15	4,30	3,67	0,029	B,C>A
	B-13 years	35	18,49	3,55			
	C-14 years	28	18,04	3,92			
30m sprint (s)	A-12 years	40	5,84	0,49	12,04	0,000	A>B,C
	B-13 years	35	5,57	0,50			
	C-14 years	28	5,19	0,63			

According to Table 10, a significant difference by age groups was observed in flamingo balance, discus touch, long jump, grip strength, sit-up, and 30m sprint run ($p<0.05$). According to the LSD post hoc test results:

- The balance performance of adolescents in the 12 and 14 age groups is significantly higher than that of adolescents in the 13 age group.
- The discus touch, long jump, grip strength, sit-up, and 30m sprint run performances of adolescents in the 13 and 14 age groups are significantly higher than those of adolescents in the 12 age group.

Table 11. Relationship Between Test Scores, Height, Weight, and Body Mass Index

Test	Height	Weight	BMI
Flamingo balance (count)	-0,17	0,16	0,31**
Disk touch (s)	-0,53**	-0,34**	-0,08
Flexibility (sit-and-reach) (cm)	-0,01	-0,01	-0,02
Long jump (cm)	0,51**	0,16	-0,16
Grip strength (kg)	0,72**	0,65**	0,33**
Sit-ups (count)	0,27**	0,10	-0,09
30m sprint (s)	-0,43**	-0,10	0,19

According to Table 11, a positive and significant relationship has been observed between the height of adolescents and their performance in discus touch, long jump, grip strength, sit-ups, and the 30m sprint ($p<0.05$). There is also a positive and significant relationship between the weight of adolescents and their performance in discus touch and grip strength ($p<0.05$). Additionally, a positive and significant relationship has been found between the body mass index of adolescents and their performance in balancing on one foot and grip strength ($p<0.05$).

Discussion and Conclusion

In this study, a comparison of certain physical parameters in adolescents attending summer sports school and those not engaged in regular physical activity was conducted. The findings revealed that the 8-week training program in the group attending the summer sports school had a positive impact on the adolescents' balance, long jump, grip strength, and other physical parameters. When compared with the control group, significant improvements were observed in balance, disk touching, long jump, and sit-up performance.

Reviewing the literature, similar results were found, indicating that regular training has a significant and positive effect on adolescents' balance, strength, flexibility, and endurance (Ağaoğlu et al., 2008; Türker, 2010; Akar, 2013; Yüksel, 2017; Akay, 2018; Aksoy, 2018; Ceylan, 2019; Şimşek, 2019). The findings of this study align with the literature, indicating that physical training in sports like taekwondo, basketball, soccer, handball, and volleyball positively contributes to adolescents' grip strength, flexibility, long jump, sit-up count, balance, and hand-eye coordination.

However, it was observed that the 8-week training program did not significantly contribute to the adolescents' disk touching, flexibility, sit-up, and 30m running performance in the group attending the summer sports school when compared to the control group. Literature findings also suggest that there is no significant improvement in disk touching, flexibility, sit-up, and 30m

running performance between groups with or without 8-week or shorter training programs (Türker, 2010; Akar, 2013; Yüksel, 2017; Akay, 2018; Öztürk, 2019; Ceylan, 2019; Şimşek, 2019). Thus, the study's findings align with the literature, suggesting that the short duration of the training program and the rapid physical development of adolescents may not have a significant impact on their flexibility, grip strength, and speed.

Furthermore, it was found that female adolescents had significantly better flexibility compared to male adolescents, while male adolescents outperformed female adolescents significantly in long jump, grip strength, sit-up count, and 30m sprint. Similar results are present in the literature (Türker, 2010; Erol, 2011). The findings of this study parallel the literature, indicating that the higher flexibility in girls and better performance in short-distance sprint, long jump, grip strength, and sit-up count in boys may arise from physiological differences between male and female children.

As adolescents' age increased, it was observed that their hand-eye coordination, running speed, long jump distance, grip strength, and sit-up abilities also improved accordingly. Additionally, an increase in body weight led to a decrease in balance and hand-eye coordination but an increase in grip strength. An increase in body mass index (BMI) resulted in a decrease in balance, long jump distance, and 30m sprint speed but an increase in grip strength. As height increased, long jump distance, grip strength, sit-up count, and 30m sprint speed improved, while hand-eye coordination decreased. Similar findings were identified in the literature (Ağaoğlu et al., 2008; Türker, 2010; Erol, 2011; Abatay, 2018; Kara, 2018; Şimşek, 2019).

In conclusion, this study's findings align with existing literature, demonstrating that as adolescents' age increases, their physical performance, including hand-eye coordination, running speed, long jump distance, grip strength, and sit-up abilities, improves. However, the impact of an 8-week training program on certain physical parameters may not be significant due to its short duration and the rapid physical development of adolescents.

References:

- Abatay, B. (2018). *7-13 yaş spor okulu futbolcularının antropometrik değerleri ile motor becerilerinin karşılaştırılması (İstanbul ili örneği)*. (Yayımlanmamış Yüksek Lisans Tezi), İstanbul Gelişim Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul, Türkiye.
- Acar G (2015). Impact of personal justice perceptions of students at the faculty of sport sciences on their decision making level. *Anthropologist*, 19(3), 627-632.
- Acar, G. & Erdoğan B.S. (2023). *Antrenörlük etiği ve sporda çocuk koruma*, Bursa: Ekin Kitabevi.
- Acar, G. (2023). determining students' health literacy levels during the Covid-19 pandemic. *Akdeniz Spor Bilimleri Dergisi*, 6(1), 159-172.
- Ağaoğlu, S.A. Taşmektepligil, Y. Aksoy, Y. & Hazar, F. (2008). Yaz spor okullarına katılan gençlerin yaş gruplarına göre fiziksel ve teknik gelişimlerinin analizi. *SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi*, 6(3), 159-166.
- Akar, F. (2013). *Beceri ve oyun tabanlı antrenmanların adölesan erkek futbolcuların fiziksel performans ve teknik beceri gelişimi üzerine etkileri*. (Yayımlanmamış Yüksek Lisans Tezi), Aksaray Üniversitesi Sosyal Bilimler Enstitüsü, Aksaray, Türkiye.
- Akay, H. (2018). *Adölesan dönemi judocu çocuklarda denge antrenmanlarının reaksiyon zamanı üzerine etkileri*. (Yayımlanmamış Yüksek Lisans Tezi), Gaziantep Üniversitesi Sağlık Bilimleri Enstitüsü, Gaziantep, Türkiye.
- Aksoy, Ö. (2018). *11-13 yaş grubu çocuklarda 8 haftalık futbol antrenmanlarının seçilmiş fiziksel uygunluk unsurları ile ince motor becerileri üzerine etkisinin incelenmesi*. (Yayımlanmamış Yüksek Lisans Tezi), Muğla Sıtkı Koçman Üniversitesi Sağlık Bilimleri Enstitüsü, Muğla, Türkiye.

- Bompa, T.O. (2017). *Antrenman kuramı ve yöntemi dönemleme* (Çev. İ. Keskin, A. Burcu Tuner, H. Küçükgöz-). 5. baskı. Ankara: Spor Yayınevi.
- Ceylan, E.C. (2019). *Rekreasyonel etkinliklerin adölesan dönem çocuklarda bazı parametrelere ve sağlıklı yaşam biçimi davranışları üzerine etkisi*. (Yayımlanmamış Yüksek Lisans Tezi), Necmettin Erbakan Üniversitesi Sosyal Bilimler Enstitüsü, Konya, Türkiye.
- Erol, K. (2011). *Çocuklarda fiziksel uygunluk düzeyini belirlemede kullanılan eurofit ve fitnessgram test bataryalarının Türk çocuklarında uygulanması*. (Yayımlanmamış Yüksek Lisans Tezi), Marmara Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.
- Ivanenko, Y. & Gurfinkel, V.S. (2018). Human postural control. *Front Neurosci*, 12(1), 1-9.
- Kara, İ. (2018). Spor okullarındaki çocukların beden kitle indeksi ile sürat ilişkisinin incelenmesi. (Yayımlanmamış Yüksek Lisans Tezi), İstanbul Gelişim Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.
- Karadamar, M. Yiğit, R. & Sungur, M.A. (2015). Ergenlerin kiloları ile ilgili algıları ve kilo kontrolüne yönelik davranışlarının incelenmesi. *Hemşirelikte Araştırma Geliştirme Dergisi*, 17(1), 51-61.
- Kılıçgil, E. (1998). *Sosyal çevre-spor ilişkileri*. Ankara: Bağırman Yayınevi.
- Krstulović, S. Zuvela, F. & Katić, R. (2006). Biomotor systems in elite junior judoists. *Coll Antropol*, 30(4), 845-851.
- Menteş, E. Mentş, B. & Karacabey, K. (2011). Adölesan dönemde obezite ve egzersiz. *Uluslararası İnsan Bilimleri Dergisi*, 8(2), 964-977.
- Özer, M.K. (2016). *Fiziksel uygunluk*. 6. baskı. Ankara: Nobel Yayın Dağıtım.
- Öztürk, R. (2019). *Retro hareketlerin çocuk basketbolcuların denge kuvvet ve esneklik parametreleri üzerine etkisi*. (Yayımlanmamış Yüksek Lisans Tezi), Mersin Üniversitesi Eğitim Bilimleri Enstitüsü, Mersin, Türkiye.
- Şimşek, T. (2019). *Adölesan dönemdeki futbolculara uygulanan core ve pliometrik antrenmanın motorik ve teknik beceriye etkisi*. (Yayımlanmamış Yüksek Lisans Tezi), Hitit Üniversitesi Sağlık Bilimleri Enstitüsü, Çorum.
- Tamer, K. (2000). *Sporda fiziksel-fizyolojik performansın ölçülmesi ve değerlendirilmesi*. Ankara: Bağırman Yayınevi.
- Türker, A. (2010). Basketbol antrenmanının 10-12 yaş grubu kız ve erkek sporcuların bazı fiziksel, psikomotor ve antropometrik özellikler üzerine etkisinin araştırılması. (Yayımlanmamış Yüksek Lisans Tezi), Dumlupınar Üniversitesi Sağlık Bilimleri Enstitüsü, Kütahya, Türkiye.
- Weineck, J. (2011). *Futbolda kondisyon antrenmanı* (Çev. T. Bağırman). Ankara: Spor Yayınevi.
- Yüksel, M.F. (2017). Yaz spor okulunda badminton eğitiminin çocukların fiziksel gelişimleri üzerine etkisi. *İnönü Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi*, 4(3), 68-82.