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THE EFFECT OF NATURE ACTIVITIES ON PHYSICAL FITNESS AND ACADEMIC SUCCESS IN CHILDREN[']

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Abstract

By participating in various nature and sports activities in schools, children get rid of excess energy in their bodies and thus relax. In addition, they feel that they belong to a social group because they do activities with others and are more successful with the support they receive from their environment. All these ensure that children have high motivation. This situation increases their physical, social, and mental activities, gives them the habit of working systematically, increases their school discipline and academic success, and strengthens their mental aspects. Accordingly, the aim of this study is to investigate the effects of nature walks and nature-based educational games on some physical, physiological characteristics and school achievement of children aged 11-14 years. The participants of the study consisted of a total of 60 healthy volunteer students, 15 boys and 15 girls in the study group and 15 boys and 15 girls in the control group. The data obtained within the scope of the study consisted of physical measurements performed in November and January in the autumn term of the 2020-2021 academic year and academic achievement scores, including the results of the 1st and 2nd exams during the term. In addition to descriptive statistics, "Mann-Whitney U Test" was used to determine whether there was a difference between the experimental and control groups, and the "Wilcoxon Signed Ranks Test" was used to determine whether there was a difference between the pretest and posttests of the experimental and control groups. The pre-test and post-test measurement averages of the experimental group were, respectively, BMI (19.46 and 19.88 kg/m2), two leg flexibility (25.05 and 26.07 cm), push-ups (10.79 and 12.07), sit-ups (45.90 and 57.90), 10 m sprint (2.44 and 2.37 s), 30 m sprint (5.94 and 5.82 s), anaerobic power (71,17 kgm/sec and 74,86 kgm/sec), VO2 max (21,79 ml/kg/min and 22,89 ml/kg/min), and grade point average (85,94 points and 84,24 points). A statistically significant ($p<0.05$) difference was found in push-ups, sit-ups, anaerobic power, VO2 max and grade point average pre-test and post-test values; no statistically significant difference was found in other parameters. In the control group, BMI (18.90 and 18.81 kg/m2), two leg flexibility (23.49 and 23.37 cm), push-ups (7.80 and 7.80), sit-ups (50.03 and 48.10), 10 m sprint (2.46 and 2.48 s), 30 m sprint (6,12 and 6,01 s), anaerobic power (66,16 kgm/sec and 69,02 kgm/sec), VO2 max (22,49 ml/kg/min and 22,20 ml/kg/min) and grade point average (80,87 points and 79,33 points). The study found a statistically significant ($p<0.05$) difference only in anaerobic power and grade point average pre-test and post-test values. This research will add to the scant body of knowledge regarding nature walks and nature-based educational activities that can contribute substantially to the health and physical characteristics of girls and boys aged 11 to 14 years.

Keywords: Physical Fitness, Nature Activities, Academic Achievement, Children

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1. Introduction

Physical activities, which affect the social, cultural, and economic welfare levels of countries, play an important role in issues such as improving the physical, mental, social, and spiritual health of individuals, personality and character formation and development, and facilitating environmental adaptation by gaining knowledge and skills. On the other hand, sports activities are carried out in order to ensure solidarity, harmony, and peace between individuals, societies and nations, and to increase ability, strength, excitement, and competition (Toksöz, 2008). Playgrounds are places that increase children's self-confidence, improve their language, communication, higher brain functions, and social skills as well as many physical abilities (Bal, 2005). Playgrounds are important not only for children's physical strength but also for their mental and emotional development (Pehlivan, 2005). With urbanization, the limited playgrounds among the dense urban texture are only enough to meet the basic mobility and activity needs of children. As time passes, children's playgrounds have been lost in the urban texture. As a result, play has become isolated from nature and institutionalized in closed spaces (Onur, 2007). However, children need natural elements and play activities to be used together with nature. Views on the importance of the relationship between children, play and nature have been discussed for a long time, and it has been emphasized that children interact intensively with their physical environment. Constantly changing, highly emotional and mobile spaces are very pleasing for children. Natural gardens are a natural sanctuary where young people and children take refuge for protection and where participants and professionals fulfill their role of productive achievement. The gardens have a special significance for the child who must find both courage and consolation in order to complete his/her inner life with the outer world. Natural areas have therapeutic effects on people, effectively attract people's attention to themselves, and remove negative emotions from the environment (Özgüner, 2004).

Sporting activities for children are both physically and psycho-emotionally effective. Through these activities, the child communicates with his or her environment, increases his/her self-confidence, and strengthens his or her position in society. Play establishes many positive developments, such as psychological self-control, concentration, decision-making, and motivation to succeed (Damar, 2020). Trekking is an outdoor activity that is carried out alone and/or in groups in unorganized natural places outside the city. Factors such as being done in nature from a functional point of view, providing the individual with a high level of risk perception, feelings of excitement and adventure, and requiring high concentration have important features that distinguish trekking from other sports activities (Ardahan & Lapa, 2010). Similarly, play, which is the most effective product of children's ways of showing their cultural activities, is a necessity for children to participate in the outside world during childhood. Children develop their mental and spiritual abilities not only through birth but also through the interaction of external factors (Demiral, 2010). Children's participation in natural areas, the external environment and the world is a necessity during their childhood (Aral, 2000), and these environments are considered simple, spiritual and physical areas where they play freely and

spend their free time. Open and free spaces constitute a large part of children's daily recreation needs, increasing their physical and social development, attention and mental characteristics, understanding of the environment, and ability to take responsibility and initiative in society (Müftüoğlu, 2006). In the United Nations Human Rights Law and the Declaration of the Rights of the Child dated 1959; "the child should be given full opportunity to play as well as in education, and society and public authority should try to fulfill this right" (Tekkaya, 2001).

1.1. Purpose of the Research

Today, many health problems caused by inactivity have started to affect children. The urbanization process, on the other hand, leads children to distance themselves from nature or even completely move away from it. However, a study emphasizes that playful activities in nature have positive effects on children (Ceylan, 2019). 6. Previous studies have indicated the negative effects of health problems such as obesity, diabetes, and cardiovascular diseases caused by inactivity on children. The positive contributions of balanced and adequate nutrition, physical activity for at least one hour a day and natural life on the development of children are undoubtedly known. It is known that light and moderate physical exercises in nature have positive effects on people's mental performance, and regular physical activities started at an early age in natural environments increase the healthy life capacity of people and eliminate the bad effects of sedentary life (Alkan & Mutlu, 2020). Although playful activities in nature are important practices in terms of the acquisition of both physical, physiological, social, spiritual, and mental-academic skills, there are certain gaps in the literature in terms of research on the development of physical, physiological, social, spiritual, and mental-academic characteristics and motoric functions in children. We think that the results from this study will be effective in terms of providing a scientific contribution to both the literature and the popularization of outdoor activities. Accordingly, the aim of this study is to investigate the effects of nature walks and nature-based educational games on some physical, physiological characteristics and school achievement of children aged 11-14 years.

2. Method

This study was designed with an observation-based pre-test and post-test control group experimental model in accordance with the quantitative research method. The observational experimental model is the research area in which the data to be observed are produced to determine the cause-and-effect relationships between variables under the control of the researcher (Emir, 2020). Within the scope of the research, permission was obtained from Amasya Directorate of National Education with the letter dated 03.01.2022 and numbered E-47613789-60501- 28477410 and from the parents or guardians of all students since the participants were under the age of 18, and approval from the Ethics Committee was obtained from Amasya University Social Sciences Ethics Committee with the decision numbered 15386878-044 dated 16.10.2020.

2.1. Participants

In this study, we recruited a total of 60 healthy volunteer students, aged 11-14, studying in secondary schools affiliated with the Ministry of National Education located in Amasya Gümüşhacıköy district center in the 2020-2021 academic year. There were 30 boys and 30 girls, with 15 boys and 15 girls in the study group, and the same number in the control group. Considering the statistical analysis of the planned study, we used G*Power 3.1.9.2 (Power Analysis) determine the sample size. In order to determine the differences between the pre-test and post-test values of the applications planned for the participants, the effect size was 0.82, alpha=0.05 and power=0.95, while the minimum number of samples required in the group was determined as 18 and 9 per group. However, considering the possible problems in the research (such as measurement errors, individuals leaving the training halfway through), the applications were carried out with 15 people in each group.

2.2. Data Collection

Physical and physiological measurements were taken before starting the outdoor activities. The experimental group students were applied a nature walk and a nature-based educational game program for a total of 180 minutes, 2 days a week, 90 minutes a day for 8 weeks. No specific program was applied to the control group. At the end of 8 weeks, physical and physiological measurements of both the experimental group and the control group were taken and compared with the initial measurement values. In the study, height and body weight measurements, flexibility, vertical jump, push-up, sit-up, 10-meter sprint, 30-meter sprint, 20-meter shuttle run tests and 1st and 2nd exam grades were used as data collection tools. The BMI (Body Mass Index) formula was used to determine the body fat level of the participants (Güler, 2018), anaerobic power values were calculated using the Lewis formula (Tamer, 2000) using the vertical jump test and body weight measurements, and aerobic power values were calculated using the VO2max estimation table (Ramsbottom et al., 1988; Reeves et al., 1999) according to the results of the 20 m shuttle run test.

2.3. Nature Activities Program

For 8 weeks, the experimental group was taught nature and environmental knowledge, environmental awareness, cleanliness and sensitivity, first aid in nature, introduction of plants and animals, scouting and orienteering activities, nature walks, and nature-based educational games for 90 minutes a day, 2 days a week. Information on nature and environmental knowledge, environmental awareness, cleanliness and sensitivity, first aid in nature, and introduction of plants and animals were generally given in nature walks, scouting, and orienteering activities. Before starting nature-based educational games, warm-up activities were carried out. Nature walks and nature-based educational games were included in every working day.

2.4. Data Analysis

The Kolmogorov-Smirnov test was used to assess the normality of the data, and it was determined that the data did not show normal distribution. All physical and physiological data of the participants were analyzed descriptively. In the inferential statistics of the data, "Mann-Whitney U Test" was used to determine whether there was a difference between the experimental and control groups, and the "Wilcoxon Signed Ranks Test" was used to determine whether there was a difference between the pretest and posttests of the experimental and control groups, taking gender into account.

3. Findings

The findings obtained as a result of the analysis of the data obtained are presented in tables below:

Table 1. Comparison of Physical and Physiological Characteristics of Groups

Variables	Experimental Group				Control Group				p
	n	x̄ ±Sd	Med.	IQR	n	x̄ ±Sd	Med.	IQR	
Height (cm)	30	159,6±7,4	161,0	11,0	30	156,2±9,5	155,0	16,0	0,87
Body Weight (kg)	30	51,0±10,2	51,00	14,0	30	46,3±11,2	42,0	15,0	0,25
BMI (kg/m)2	30	19,9±3,0	20,2	3,4	30	18,8±3,1	17,9	3,6	0,32
Right leg flexibility (cm)	30	26,0±4,4	28,0	8,0	30	23,5±4,8	24,0	7,0	0,17
Left leg flexibility (cm)	30	26,1±4,4	28,0	6,0	30	23,2±5,1	24,0	6,0	0,36
Push-ups (count)	30	12,1±8,9	11,5	12,0	30	7,8±7,1	5,0	12,0	0,03
Sit-ups (count)	30	57,9±18,3	75,0	35,0	30	48,1±19,3	42,0	43,0	0,01
10 meter sprint (seconds)	30	2,4±0,3	2,4	0,4	30	2,5±0,2	2,5	0,3	0,05
Anaerobic power (kgm/sec)	30	74,9±17,9	73,8	24,9	30	69,0±17,9	61,7	33,5	0,59
30 meter sprint (seconds)	30	5,8±0,6	5,7	0,8	30	6,0±0,6	6,0	0,8	0,75
VO2 max (ml/kg/min)	30	22,9±3,0	23,4	3,2	30	22,2±4,4	21,3	6,4	0,01
Grade average (points)	30	84,2±11,1	87,3	19,7	30	79,3±11,6	81,9	13,2	0,80

When evaluated according to Table 1, were found significant differences between the subject and control group mean of push-ups, sit-ups, 10 m speed and VO_2max ($p<0.05$, $p<0.01$). No difference was found in other parameters.

Table 2. Comparison of Physical and Physiological Characteristics of Groups According to Gender Variables

Gender	Variables	Experimental Group (*n* = 15)			Control Group (*n* = 15)			p
		x̄ ±Sd	Med.	IQR	x̄ ±Sd	Med.	IQR	
Girls (30)	Height (cm)	159,1±6,2	161,0	9,0	155,7±8,6	153,0	9,0	0,93
	Body Weight (kg)	50,8±10,8	51,5	13,0	45,1±11,8	41,0	15,0	0,42
	BMI (kg/m^2)	19,6±3,2	20,2	3,1	18,4±3,1	17,8	4,6	0,33
	Right leg flexibility (cm)	26,5±4,5	29,5	7,0	24,7±3,6	24,0	8,0	0,45
	Left leg flexibility (cm)	26,4±4,9	29,5	7,0	24,5±3,9	25,0	6,0	0,67
	Push-ups (count)	9,1±7,0	5,5	12,0	8,3±7,3	5,0	11,0	0,31
	Sit-ups (count)	62,0±16,9	75,0	28,0	44,7±18,7	40,0	30,0	0,01
	10 meter sprint (seconds)	2,3±0,2	2,3	0,4	2,5±0,2	2,5	0,3	0,02
	Anaerobic power (kgm/sec)	74,5±20,2	73,8	23,6	65,96±18,6	61,6	29,2	0,47
	30 meter sprint (seconds)	5,8±0,6	5,7	0,8	6,2±0,6	6,0	0,8	0,25
	VO2 max (ml/kg/min)	22,5±1,6	23,2	2,6	21,5±3,6	21,3	4,5	0,01
	Grade average (points)	84,9±11,7	88,6	22,5	85,0±7,2	84,5	10,4	0,74
Boys (30)	Height (cm)	160,1±8,7	161,0	13,0	156,7±10,6	157,0	21,0	0,70
	Body Weight (kg)	51,2±10,0	51,0	15,0	47,6±10,7	50,5	16,0	0,48
	BMI (kg/m^2)	19,9±2,8	20,0	3,9	19,3±3,1	18,5	3,9	0,72
	Right leg flexibility (cm)	25,5±4,4	25,0	9,0	22,3±5,7	24,5	5,0	0,24
	Left leg flexibility (cm)	25,8±4,0	26,0	7,0	21,9±5,9	23,5	4,0	0,44
	Push-ups (count)	15,1±9,7	13,5	12,0	7,3±7,1	4,5	13,0	0,04
	Sit-ups (count)	53,8±19,3	51,0	37,0	51,5±19,9	50,0	36,0	0,05
	10 meter sprint (seconds)	2,4±0,4	2,4	0,5	2,4±0,2	2,5	0,3	0,60
	Anaerobic power (kgm/sec)	75,2±15,9	77,3	27,5	72,4±17,2	75,3	33,1	0,95
	30 meter sprint (seconds)	5,9±0,7	5,8	1,1	5,9±0,6	6,0	1,2	0,58
	VO2 max (ml/kg/min)	23,3±4,1	23,4	7,9	23,0±5,2	22,6	7,7	0,04
	Grade average (points)	83,6±10,8	87,3	15,4	73,7±12,6	75,7	22,7	0,55

As seen in Table 2, a significant difference was found the mean of shuttle, 10 m sprint and VO_2max between the subjects and control groups of the girls; between the mean of push-ups, sit-ups and VO_2max between the subjects and control groups of men ($p<0.05$, $p<0.01$). No difference was found in other parameters.

Table 3. Comparison of the pretest and posttest averages of the Groups' Physical and Physiological Characteristics

Groups	Variables	Pretest			Posttest			
		x̄ ±Sd	Med.	IQR	x̄ ±Sd	Med.	IQR	p
Experimental Group (30)	Height (cm)	156,1±6,8	157,5	8,0	159,6±7,4	161,0	11,0	0,00
	Body Weight (kg)	47,8±11,6	48,0	14,0	51,0±10,2	51,0	14,0	0,00
	BMI (kg/m)2	19,5±3,8	19,7	4,5	19,9±3,0	20,2	3,4	0,15
	Right leg flexibility (cm)	25,1±5,0	26,0	8,0	26,0±4,4	28,0	8,0	0,10
	Left leg flexibility (cm)	25,0±5,1	25,5	10,0	26,1±4,4	28,0	6,0	0,14
	Push-ups (count)	10,8±14,5	7,5	11,0	12,1±8,9	11,5	12,0	0,03
	Sit-ups (count)	45,9±20,8	38,5	46,0	57,9±18,3	75,0	35,0	0,01
	10 meter sprint (seconds)	2,4±0,3	2,5	0,3	2,4 ±0,3	2,4	0,4	0,24
	Anaerobic power (kgm/sec)	71,2±20,5	70,6	27,5	74,9±17,9	73,8	24,9	0,00
	30 meter sprint (seconds)	5,9±0,6	5,8	0,8	5,8±0,6	5,7	0,8	0,74
	VO2 max (ml/kg/min)	21,8±3,0	21,3	2,4	22,9±3,0	23,4	3,2	0,01
	Grade average (points)	85,9±10,3	88,7	17,8	84,2±11,1	87,3	19,7	0,01
Control Group (30)	Height (cm)	152,6±9,8	151,0	18,0	156,2±9,5	155,0	16,0	0,00
	Body Weight (kg)	44,6±12,0	43,0	14,0	46,3±11,2	42,0	15,0	0,01
	BMI (kg/m)2	18,9±3,4	17,9	4,3	18,8±3,1	17,9	3,6	0,59
	Right leg flexibility (cm)	23,7±5,1	24,0	7,0	23,5±4,8	24,0	7,0	0,66
	Left leg flexibility (cm)	23,3±5,2	24,0	6,0	23,2±5,1	24,0	6,0	0,90
	Push-ups (count)	7,8±7,4	5,0	15,0	7,8±7,1	5,0	12,0	0,50
	Sit-ups (count)	50,0±18,7	48,0	36,0	48,1±19,3	42,0	43,0	0,20
	10 meter sprint (seconds)	2,5±0,2	2,5	0,3	2,5 ±0,2	2,5	0,2	0,85
	Anaerobic power (kgm/sec)	66,2±18,6	62,4	29,0	69,0±17,9	61,7	33,5	0,01
	30 meter sprint (seconds)	6,1±0,7	6,0	1,0	6,0±0,6	6,0	1,1	0,12
	VO2 max (ml/kg/min)	22,5±3,8	22,2	5,3	22,2±4,4	21,3	6,4	0,28
	Grade average (points)	80,9±12,0	85,3	14,4	79,3±11,6	81,9	13,2	0,04

When the physical and physiological variables of the experimental and control groups shown in Table 3 were examined, statistically significant differences were found in the pre-test and

post-test sit-ups, push-ups, anaerobic power, aerobic power and academic grade values of the experimental group ($p<0.05$, $p<0.01$). In the control group, statistically significant differences were found only in anaerobic power and academic grade values ($p<0.05$, $p<0.01$). There was a decrease in the academic grade scores of both the experimental and control groups. The results obtained show significant increases in the scores of the participants in the experimental group and this can be considered the contribution of outdoor activities.

Table 4. Comparison of the pretest and posttest averages of the Experimental Group' Physical and Physiological Characteristics According to Gender Variable

Gender	Variables	Pretest			Posttest			
		x̄ ±Sd	**Med.**	**IQR**	**x̄ ±Sd**	**Med.**	**IQR**	**p**
Girls (15)	Height (cm)	155,9±5,7	157,0	7,0	159,1±6,2	161,0	9,0	0,01
	Body Weight (kg)	48,1±13,1	48,0	16,0	50,8±10,8	51,5	13,0	0,06
	BMI (kg/m)2	19,6±4,6	18,7	5,5	19,9±3,2	20,2	3,1	0,31
	Right leg flexibility (cm)	26,0±5,0	29,5	7,0	26,5±4,5	29,5	7,0	0,28
	Left leg flexibility (cm)	25,5±5,4	29,5	07,0	26,4±4,9	29,5	7,0	0,26
	Push-ups (count)	6,1±5,5	3,0	8,0	9,1±7,0	5,5	12,0	0,02
	Sit-ups (count)	48,0±21,2	46,5	45,0	62,0±16,9	51,0	37,0	0,03
	10 meter sprint (seconds)	2,4±0,2	2,5	0,2	2,3±0,2	2,3	0,4	0,05
	Anaerobic power (kgm/sec)	71,5±23,9	69,1	30,4	74,5±20,2	73,8	23,6	0,19
	30 meter sprint (seconds)	6,0±0,4	5,8	0,7	5,8±0,6	5,7	0,8	0,07
	VO2 max (ml/kg/min)	20,9±1,9	2,1	2,5	22,5±1,6	23,2	2,6	0,00
	Grade average (points)	87,4±9,9	90,4	18,2	84,9±11,7	88,6	22,5	0,01
Boys (15)	Height (cm)	156,2±8,0	157,5	12,0	160,1±8,7	161,0	13,0	0,00
	Body Weight (kg)	47,5±10,3	48,0	14,0	51,2±10,0	51,0	15,0	0,00
	BMI (kg/m)2	19,3±3,0	19,7	3,7	19,9±2,8	20,0	3,9	0,33
	Right leg flexibility (cm)	24,3±4,9	25,0	9,0	25,5±4,4	25,0	9,0	0,19
	Left leg flexibility (cm)	24,4±4,9	25,0	9,0	25,8±4,0	26,0	7,0	0,37
	Push-ups (count)	15,9±19,1	11,0	17,0	15,1±9,7	13,5	12,0	0,50
	Sit-ups (count)	43,8±21,0	36,0	29,0	53,8±19,3	51,0	37,0	0,09
	10 meter sprint (seconds)	2,5±0,3	2,4	41,0	2,4 ±0,4	2,4	0,5	0,18
	Anaerobic power (kgm/sec)	70,8±17,3	73,9	23,4	75,2±15,9	77,3	27,5	0,00

	30 meter sprint (seconds)	5,9±0,8	5,8	1,1	5,9±0,7	5,8	1,1	0,63
	VO2 max (ml/kg/min)	22,7±3,6	22,0	3,1	23,3±4,0	23,4	7,9	0,23
	Grade average (points)	84,5±10,9	88,5	18,6	83,6±10,8	87,3	15,4	0,38

As seen in Table 4, when the pre-test and post-test measurements of the boys in the experimental group were evaluated, statistically significant differences were found between push-ups, sit-ups, 10 m sprint measurements, VO2 max, and academic grade averages ($p<0.05$, $p<0.01$). In boys, only the difference in anaerobic power averages was statistically significant in favor of the post-test ($p<0,01$). There was a decrease in the academic grade scores of both the experimental and control groups. Significant increases, especially in the female experimental group, were found in more parameters than in the male group.

Table 5. Comparison of the pretest and posttest averages of the Control Group' Physical and Physiological Characteristics According to Gender Variable

Gender	**Variables**	**Pre-test**			**Post-test**			
		x̄ ±Sd	**Med**	**IQR**	**x̄ ±Sd**	**Med.**	**IQR**	**p**
Girls (15)	Height (cm)	152,4±9,5	150,0	10,0	155,73±8,6	153,0	9,0	0,00
	Body Weight (kg)	43,9±13,1	38,0	13,0	45,1±11,8	41,0	15,0	0,17
	BMI (kg/m)2	18,6±3,5	17,8	4,1	18,4±3,1	17,7	4,6	0,78
	Right leg flexibility (cm)	25,2±3,6	25,0	6,0	24,7±3,6	24,0	6,0	0,62
	Left leg flexibility (cm)	24,7±3,8	25,0	6,0	24,5±3,9	25,0	8,0	0,86
	Push-ups (count)	6,2±7,0	4,0	5,0	8,3±7,3	5,0	11,0	0,08
	Sit-ups (count)	45,5±18,9	42,0	21,0	44,7±18,7	40,0	30,0	0,4
	10 meter sprint (seconds)	2,5±0,2	2,5	0,3	2,5±0,2	2,5	0,3	0,18
	Anaerobic power (kgm/sec)	63,9±20,1	54,9	28,0	65,6±18,6	61,6	29,2	0,13
	30 meter sprint (seconds)	6,2±0,6	6,1	1,0	6,1±0,6	6,0	0,8	0,83
	VO2 max (ml/kg/min)	21,3±2,8	20,9	4,3	21,5±3,6	21,3	4,5	0,65
	Grade average (points)	87,2±7,3	79,6	21,0	85,0±7,2	84,5	10,4	0,07
Boys (15)	Height (cm)	152,9±10,5	153,0	21,0	156,7±10,6	157,0	21,0	0,00
	Body Weight (kg)	45,3±11,1	45,0	14,0	47,6±10,7	50,5	16,0	0,01
	BMI (kg/m)2	19,2±3,4	18,2	5,2	19,3±3,1	18,5	3,8	0,50
	Right leg flexibility (cm)	22,2±6,1	24,0	9,0	22,3±5,7	24,5	5,0	0,94

Left leg flexibility (cm)	21,9±6,1	23,5	7,0	21,9±5,9	23,5	17,0	1,00
Push-ups (count)	9,40-±7,8	9,0	14,0	7,3±7,1	4,5	13,0	0,05
Sit-ups (count)	54,6±1,08	55,0	41,1	51,5±19,	50,0	36,0	0,42
10 meter sprint (seconds)	20,5±0,2	2,5	0,3	2,4±0,2	2,5	0,3	0,20
Anaerobic power (kgm/sec)	68,5±17,3	65,1	30,8	72,4±17,2	75,3	33,1	0,01
30 meter sprint (seconds)	6,1±0,8	6,0	1,3	5,9±0,6	6,0	1,2	0,05
VO2 max (ml/kg/min)	23,7±4,4	24,0	5,2	23,0±5,2	22,6	7,7	0,12
Grade average (points)	74,6±12,7	79,6	21,0	73,7±12,6	75,7	22,7	0,32

According to the gender variable, when the pre-test and post-test measurement results of girls and boys in the control group were evaluated, no statistically significant difference was observed in any parameter ($p>0.05$), while statistically significant differences were found between push-ups, 30 m sprint, and anaerobic power averages in favor of the post-test in boys ($p<0.05$, $p<0.01$). An unexpected outcome of this study was that there was no physical and physiological development in the experimental group of boys, while it was seen in the control group (Table 5). For this reason, further research on the gender variable may make new contributions to the literature.

4. Discussion and Conclusion

In this study, the effects of nature walks and nature-based educational games on some physical and physiological characteristics and school achievement of children aged 11-14 years were examined. Research shows that, like all forms of exercise, hiking and outdoor activities are some of the best ways to lose weight and stabilize cholesterol levels. Accordingly, on average, 100 calories are burned for every 1 mile (1609 m) walked. If walking at a speed of 2.5 miles per hour, about 200 to 250 calories per hour can be burned, and if walking at a speed of 4.5 miles per hour, about 500 calories per hour can be burned. Therefore, it has been stated that light aerobic or nature walks and activities can cause weight loss (Lloyd Jones et al., 2010). Saçaklı (2017) found a statistically significant decrease in body mass index at the end of the post-tests for both women and men in a study that involved nature walks, treadmills, and resistance exercises over twelve weeks. Ross et al (2000), in their study on obesity, reported an 8% reduction in body weight with 12-week aerobic exercise. Amano et al. (2001), in their study, had 18 obese individuals perform 30 minutes of aerobic exercise three days a week for three months and as a result of their research, they stated that the decrease in body weight, body mass index, and body fat percentage was statistically significant. Kızılay (2012) reported that aerobic exercise increased body weight in the control group and decreased it statistically significantly in the study group. Drexel et al. (2021) found that trekking exercises for eight weeks caused statistically significant weight loss in the body weight of the study group. İzzet et al. (2018), in

their study to determine the physical fitness of children who do and do not engage in sports, found no significant difference in BMI values between boys who do sports and those who do not. Güneş (2022) found a statistically significant relationship between the BMI level of the participants and their status in doing regular sports. Savcı et al. (2006) reported that there was no significant difference between body mass index and physical activity levels in their study titled Investigation of physical activity levels of university students. In our study, no change was observed in BMI pre-test and post-test values (Table 3, 4, 5) and between groups (Table 1, 2). Contradictory findings were found in the literature and in the the results of this study. The reason why this result is contradictory with the literature is that the age of the sample group in some sample studies is older; it may be due to the fact that those in the study group in this study are of developmental age.

In this study, although the pre-test and post-test flexibility averages of the study group increased numerically, it was found that there was no statistically significant difference ($p>0.05$) in both right leg and left leg flexibility levels (Table 1, 2, 3, 4, 5). Ongül et al. (2017) conducted a study on 9-10-year-old students studying at the first level of primary education and found a statistically significant difference in pre-test and post-test stretching values based on gender. Altınkök et al. (2013) applied a 6-week physical education course program including aerobic exercise to preschool children and as a result of their study, a statistically significant difference was found in the pre-test and post-test flexibility measurements of the study group. Saygın et al. (2005), in their research on movement education, found that the effect of movement education program on flexibility in children was significantly different. Koç and Tekin (2011) applied a regular physical education course program to students at the first level of primary education and found no significant difference in flexibility level. Yılmaz and Bozkurt (2017) found a statistically significant improvement in the pre-test and post-test flexibility levels of the study group as a result of the basic movement training they applied to 9-10 years old primary school 4th grade students. Cirav (2018) implemented educational games with 10-year-old participants for 12 weeks and found no statistically significant difference in the pre-test and post-test flexibility findings between the control group and the experimental group. Grinyova and Mulik (2013) applied sports tourism recreation activities, including trekking activities, to children aged 10-13 years, and concluded that flexibility ability improved in all age groups. It was observed that the increase in flexibility values in the study group was not significant ($p<0.05$), although approximately 8-10 minutes of flexibility movements were applied in each session in the 8-week program, 2 days a week. This result is similar to some of the results of the analyzed research, but not to all of them.

Although no significant difference was found in this study, it is believed that outdoor activities can increase flexibility ability. In this study, it is seen that outdoor activities including nature walks and educational games significantly ($p<0.05$, $p<0.01$) increased the pre-test and post-test push-ups, sit-ups and anaerobic power of the study group and 10 m sprint levels in boys (Table 3, 4, 5). At the same time, it was determined that there were significant ($p<0.05$,

p<0.01) differences in favor of the experimental group in push-ups, sit-ups and anaerobic power levels in the experimental and control groups, and in 10 m sprint levels in girls (Table 1, 2). Bağaçlı (2019), in his study in which he gave folk dance training to children, found that the number of sit-ups of the children who played was significantly higher than that of the children who did not play. Yılmaz and Bozkurt (2017), as a result of their study on primary school students aged 9-10 years, stated that there was a significant difference between the shuttle pull pre and post test scores of the study group and that these characteristics developed positively. In Önal's (2019) study on games and physical activity training for children, games and physical activities caused a significant increase in the shuttle parameter of students at a positive level. In his study, Başal (2020) found that educational games applied to 12-13 age group children caused significant differences in 30s sit-up and 30s push-up tests of girls and boys. Cirav (2018), in his study in which he applied educational games to 10-year-old participants for 12 weeks, revealed that there was a significant difference in favor of the study group in the speed and quickness variables of educational games. Altınkök (2012), in his study examining the effect of cooperative teaching methods on the development of basic motor skills of 9-10 year old children, found that there was a significant difference in the agility and quickness pre-test and post-test measurement values of the study group in favor of the post-tests. Koç (2017) reported that there was a significant difference in the running speed and quickness values of students participating in educational game activities. Demiral (2010) reported that, following an educational game-based training given to children aged 7-12 years, a significant improvement was observed in the quickness values of the study group's male and female participants compared to the control group. Livonen et al. (2011) and Draper et al. (2012) reported that there was a significant improvement in favor of the post-test in the pre-test and post-test values related to running speed and running skills in girls and boys as a result of leisure activities in children. In addition, it is stated that educational game-style light aerobic exercise activities play an effective role in the development and maintenance of speed. Educational games involving high-speed and short-distance running can play an effective role in the development of speed (Tortop, 2005). Tohumat and Arabacı (2017) found a significant difference in favor of the study group between the 30 m sprint test measurement results of the study group and the control group of 7-9 age group students in the folk dances study for 12 weeks. Grinyova and Mulik (2013) applied sports tourism and recreation activities, including trekking activities, to children aged 10-13 years and concluded that 30 m sprint ability improved. Kuru and Köksalan (2016), found a statistically significant difference between the 15 m sprint values in the study group in favor of the post-test in girls and boys. In the study, it was emphasized that games positively affected the development of children's running skills. Okludil and Serin (2010) found that 8-week bosu exercise program positively affected anaerobic power performance in adolescent female volleyball players, but not significantly. Every activity that children do daily (outdoor games, going to school, running, jumping) provides the development of leg muscle group (Günay & Cicioğlu, 2001). The studies also suggested that the significant difference observed in both the control and play groups may be attributed to the continuous use of these muscle groups by

children (Kuru & Köksalan, 2016). When the results obtained from the studies in the literature and our study were compared, similar findings were found. When the results obtained from the studies in the literature and our study are evaluated together, it is concluded that physical activity and game activities have a positive effect on sit-up, push-up and anaerobic power parameters. The interesting result of these results is that in some studies there was a positive development in the control groups. As in this study, it was found that strength, speed and anaerobic power skills increased in both experimental and control groups. In the study, the reason for the significant difference especially in both experimental and control anaerobic power variables may be due to the daily play activities of the children.

According to the findings of this study (Tables 1, 2, 3), a statistically significant difference ($p<0.05$, $p<0.01$) was found in the VO2max averages of the experimental groups according to both general and gender in favor of the 1st and the 2nd measurements and between groups, but not in the control group. Evrim (2006) measured the mean VO2max as 31.01 ml/kg/min for the pre-test and 31.92 ml/kg/min for the post-test and observed a statistically significant difference ($p<0.05$) in the technique-related strength continuity study in 16-18 age group children. Sinanoğlu (2016) found the mean VO2max values of 10-12 years old male participants of 16-week tennis training as 47.13 ml/kg/min before training and 48.83 ml/kg/min after training and found a statistically significant difference ($p<0.05$). In female participants, the means of 44.71 ml/kg/min before training and 46.04 ml/kg/min after training were found and no statistically significant difference was found ($p>0.05$). Ağar (2006) also found a significant difference in VO2 max capacity in his study investigating jumping rope and interval running in boys aged 9-11 years. When the literature and the findings of this study are evaluated, it can be stated that positive improvements can be found in the endurance ability of individuals who regularly participate in physical activity, since the findings of this study are supported by the literature.

At the end of the walking educational game activities carried out in nature, it was determined that there were significant decreases in both the study and control group grade averages between the pre-test and post-test averages ($p<0.05$, $p<0.01$). As a result of the study, it was seen that the grades of the participants decreased in both groups. While there was no significant relationship between academic achievement and physical activity level in 2 of 3 studies conducted at the secondary school level, it was found in only one study (Karaburçak et al., 2021). Kılıç (2018) stated in his study that leisure activities (such as sports, swimming, and hiking) have lasting effects on the Holy Quran and religious education. Başün and Doğan (2020), in their study on play and mathematics lessons in children, found a significant difference between the mathematics course achievement averages of the study group before and after the application. Soltz (1986), in a study involving high school students, compared and analyzed the academic achievement of students who engaged in physical activity and students who did not engage in physical activity, and concluded that the academic achievement of students who engaged in physical activity was significantly higher. Telford et al. (2012), in a study involving a total of 757 students selected from 29 different primary schools, found that there was a very strong

positive relationship between physical activity and academic achievement and that physical activity had a positive effect on students' academic achievement. Kwak et al. (2009) examined the relationship between physical activity levels and academic achievement of 9th grade students and emphasized that vigorous physical activity was effective for female students and increased their academic achievement. In a study conducted by Wald (2010), no decrease was observed in the grades of students who did moderate weight training five or more days a week. In a study conducted on secondary school students, it was found that students who participated in school sports had higher grade point averages (Öcal & Koçak, 2010). When the literature findings are analyzed, it is seen that physical activity or educational games have an effect on academic achievement. However, when the literature and the findings of this study are compared, no similarity is observed. Although the 8-week trekking and game activities did not have a negative effect on the grade point average, it is thought that this result may be due to the fact that the last exams were more comprehensive and difficult and the duration of the activity is shorter. The data derived from this research provide compelling evidence that 8-week nature walks and nature-based educational games can significantly contribute to the health and physical characteristics of 11-14 years old girls and boys, but may not statistically significantly affect their academic achievement.

In the light of these findings, future research may cover the following topics: It may be necessary to design longer or more intensive programs to determine the impact of nature walks, nature-based games on children's academic achievement. For example, the duration and frequency of these activities could be increased or integrated into the curriculum. It may also be valuable to investigate potential indirect relationships between nature walks and nature-based games and academic achievement. This could include investigating variables such as children's concentration levels, levels of stress reduction, and general psychological well-being. Both of these variables may influence students' academic performance. The specific effects of hiking and nature-based play on children's physical health and characteristics could be examined in more detail. For example, more information could be collected on the impact of such activities on children's cardiovascular health, muscle strength, flexibility or balance, as well as on specific physical characteristics. Finally, similar research could be conducted on children of various age groups. This could help identify the potential impact of hiking and nature-based games on the health and academic achievement of younger or older children. This may be important for determining the ideal age of implementation.

5. Theoretical and Practical Implications

The outcomes of this research have important implications. This research provides valuable insights about the benefits of nature walks and nature-based educational games on the physical and physiological attributes of children aged 11-14. It enriches the existing body of knowledge

by adding the perspective of a different age group, adolescents, to the discourse. Contrary to other studies, our results did not show any significant changes in the body mass index (BMI) pre and post-tests of the study group, indicating a potential difference in the impacts of these activities on different age groups. The study also found no significant improvement in flexibility despite the numerical increase, providing further grounds for research. Our findings seem to suggest that outdoor activities might enhance flexibility capability, even though there were no significant differences in our study. These results hint at the importance of context and age in determining the impacts of such activities on health and physical fitness, implying a need for more nuanced and age-specific research in this area.

The results of this study can inform the creation of health and educational policies. Given the identified benefits of nature walks and educational games, schools could be encouraged to incorporate more outdoor activities into their physical education curriculum, aiming not just at weight loss and overall fitness but also at improving children's anaerobic strength and speed levels. Despite no significant increase, there was numerical improvement in flexibility, suggesting that these activities could still be helpful for enhancing it. This can encourage physiotherapists and trainers to incorporate such activities into their routines for adolescent patients and clients. The absence of significant differences in the BMI pre- and post-tests of the study group in this age range can inform nutritional and weight-loss programs to consider the possible differing impacts of physical activities across age groups.

6. Limitations and Recommendations for Future Research

Despite offering a number of significant insights, this study has a handful of limitations. First, the research was conducted with a specific age group (11 to 14 years old), which may limit the generalizability of the results to other age groups. Contrary to some previous research, this study found no substantial change in body mass index (BMI) or flexibility measurements. This discrepancy may be attributable to the age difference between the present and previous sample groups or to the developmental stage of the participants in this study. Moreover, while this study found improvements in certain physical and physiological characteristics, it did not assess comprehensively the cognitive, social, and affective benefits that may be influenced by nature walks and educational activities. Lastly, the study did not account for the baseline physical activity or diet of the participants, which could have significantly influenced the results.

Declaration of Conflicting Interests and Ethics

"The authors declare no conflict of interest."

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