

Eğitsel Oyunların Erken Ergenlik Dönemi Çocukların Fiziksel Uygunluk Düzeylerine Etkisi

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Özet

Gelişim bir bütün olarak düşünüldüğünde olumlu ya da olumsuz bir durum bir sonraki gelişim dönemini aynı şekilde etkilemektedir. Fiziki gelişimin çok hızlı gerçekleştiği erken ergenlik döneminde diğer gelişim alanlarının da etkilendiği bilinmektedir. Bu etkinin zararlarını en aza indirmek için çocukların gelişiminde eğitsel oyun önemli bir faktördür. Eğitsel oyun, bir yandan oynayan çocuklara eğlence ve neşe verirken bir yandan ise çocukların sağlıklı olmasını sağlayan, kişisel davranışlarını geliştiren ve güzel alışkanlıklar kazandıran bir etkinlikler bütünüdür. Bu araştırmanın amacı; 8 hafta süre ile uygulanan eğitsel oyunların erken ergenlik döneminde bulunan erkek çocukların fiziksel uygunluk düzeylerine etkilerini incelemektir. Araştırma, gerçek deneme modellerinden ön test – son test kontrol gruplu model olarak desenlendi. Araştırma deseninde, bağımlı değişken erken ergenlik dönemi erkek çocukların fiziksel uygunluk özellikleri iken, bağımsız değişken ise haftada 3 gün ve 8 hafta süre ile uygulanan eğitsel oyunlardır. Araştırmanın çalışma grubunu ortaokul düzeyinde öğrenimine devam eden ve erken ergenlik döneminde bulunan deney (n=20, yaş ort; 12,25, boy uzunluğu; 146 cm, vücut ağırlığı; 38,8 kg) ve kontrol (n=20, yaş ort; 12,15, boy uzunluğu; 147 cm, vücut ağırlığı; 40,7 kg) grubu olmak üzere 40 erkek çocuk oluşturdu. Program öncesinde ve sonrasında katılımcıların fiziksel uygunluk düzeylerini belirlemeye yönelik ölçüm ve testler (boy uzunluğu, vücut ağırlığı, beden kütle indeksi, esneklik, dikey sıçrama, 20 m sürat, 30 sn mekik çekme, 20 m mekik koşu, maksimum oksijen tüketimi) gerçekleştirildi. Deney ve kontrol grubundaki katılımcıların ön testleri gerçekleştirildikten sonra deney grubunu oluşturan katılımcılara 8 hafta süre ile haftada 3 gün ve her birim çalışmanın 90 dk ile sınırlandırıldığı eğitsel oyun programı uygulandı. Elde edilen veriler SPSS 24.0 programı kullanılarak analiz edildi. Katılımcıların grup içi ön test ve son test ortalama değerleri arasındaki farklılığın tespiti “Wilcoxon İşaretili Sıralar Testi” ile gerçekleştirildi. Deney ve kontrol gruplarında yer alan katılımcıların ortalama değerleri arasındaki farkların tespiti ise “Mann-Whitney U Testi” ile belirlendi. Araştırma sonucunda, grup içi karşılaştırmalarda major bulgular deney grubunu oluşturan katılımcıların tüm değerlerde son test lehine daha iyi sonuçlar olduğunu gösterdi. Kontrol grubunda yer alan katılımcıların esneklik değerlerinde ve deney grubunda yer alan katılımcıların ise esneklik, dikey sıçrama, 20 m sürat, 30 sn mekik çekme, 20 m mekik koşu ve maksimum oksijen tüketimi değerlerinde istatistiksel olarak anlamlı farklılık olduğu ($p < 0,05$) belirlendi. Sonuç olarak, 8 hafta süre ile uygulanan eğitsel oyunların erken ergenlik döneminde bulunan erkek çocukların fiziksel uygunluk seviyeleri üzerine olumlu etkileri olduğu tespit edildi. Çocukların gelişimi açısından, okul döneminde eğitsel oyun aktivitelerinin planlı bir şekilde yaptırılması önerilmektedir.

Anahtar Kelimeler: Eğitsel oyun, fiziksel uygunluk, erken ergenlik dönemi.

The Effect of Educational Games on the Physical Fitness Levels of Children in Early Adolescence

Abstract

When development is considered as a whole, positive or negative conditions influence subsequent developmental stages in a similar manner. It is well known that during early adolescence—a period in which physical development occurs very rapidly—other developmental domains are also affected. In order to minimize the potential negative effects of this process, educational play constitutes an important factor in children’s development. Educational play is a set of activities that not only provides enjoyment and pleasure for children but also promotes health, enhances personal behaviors, and fosters positive habits. The aim of this study was to examine the effects of educational games implemented over an eight-week period on the physical fitness levels of boys in early adolescence. The study was designed using a true experimental pretest–posttest control group model. In the research design, the dependent variables were the physical fitness characteristics of boys in early adolescence, while the independent variable was an educational games program administered three days per week for eight weeks. The study group consisted of 40 male middle school students in early adolescence, divided into an experimental group ($n = 20$; mean age: 12.25 years; height: 146 cm; body weight: 38.8 kg) and a control group ($n = 20$; mean age: 12.15 years; height: 147 cm; body weight: 40.7 kg). Measurements and tests were conducted before and after the program to determine participants’ physical fitness levels, including height, body weight, body mass index, flexibility, vertical jump, 20 m sprint, 30 s sit-up test, 20 m shuttle run, and maximal oxygen consumption ($VO_2\text{max}$). Following the administration of pretests to both the experimental and control groups, the participants in the experimental group took part in an educational games program for eight weeks, three days per week, with each session limited to 90 minutes. The obtained data were analyzed using SPSS 24.0 software. Differences between pretest and posttest mean values within groups were examined using the Wilcoxon Signed-Rank Test, while differences between the experimental and control groups were analyzed using the Mann–Whitney U Test. As a result of the study, within-group comparisons revealed that the major findings favored posttest values in all variables for the experimental group. Statistically significant differences were found in flexibility values in the control group, and in flexibility, vertical jump, 20 m sprint, 30 s sit-up test, 20 m shuttle run, and maximal oxygen consumption values in the experimental group ($p < 0.05$). In conclusion, it was determined that educational games implemented for eight weeks had positive effects on the physical fitness levels of boys in early adolescence. From the perspective of children’s development, it is recommended that educational play activities be systematically planned and implemented during the school period.

Keywords: Educational game, physical fitness, early adolescence.

Introduction

The increasingly digitalized era we live in not only provides various conveniences for the human body but also promotes a sedentary lifestyle. Numerous technological devices such as smartphones, elevators, cars, and remote controls have become an integral part of daily life (Adak & Yüksel, 2021; Ekinçi et al., 2024), consequently reducing the amount of time individuals spend engaging in physical movement. Although these innovations make life more convenient, they also contribute to a decline in physical activity levels and a deterioration of physical fitness. In fact, the development of any biomotor ability such as endurance, balance, flexibility, or coordination requires consistent stimulation and training. Therefore, these comfort zones, often perceived as conveniences, negatively affect public health and pose a significant risk to children, who represent the future of society.

Children's developmental domains are interconnected, much like the links in a chain (Erkek et al., 2021). When development is considered as a holistic process, a positive or negative influence in one domain inevitably affects subsequent developmental stages (Muratlı, 2013; Yüksel, 2017). During early adolescence—a period characterized by rapid physical growth (Uzun et al., 2020; Blum et al., 2014) other developmental domains are also influenced (Uzun & Boyalı, 2020). To minimize the adverse effects of these influences, play serves as a crucial factor in child development. Through play, children explore their environment, life, and nature. It is one of the most effective means of fostering various skills. The fact that plays simultaneously supports children's movement needs, socialization, and the development of individual identity further highlights its significance (Dao, 2021). To make learning more engaging and less monotonous, various games can be designed that take into account children's social, psychological, and physical development. One of the most effective methods for reinforcing learned knowledge is through educational games.

Educational play not only provides children with fun and enjoyment but also supports their health, enhances personal behaviors, and fosters positive habits. Educational games have multiple benefits for child development: they strengthen muscular power, teach control over both gross and fine motor skills, and support appropriate movement speed. They also improve reaction time and attention, enhance coordination and balance among body systems, and contribute to agility and flexibility (Cocca et al., 2020; Noemí & Máximo, 2014).

The aim of this study is to examine the effects of an eight-week educational games program on the physical fitness levels of male children in early adolescence.

Material and Methods

This research was designed using a true experimental pre-test–post-test control group model. The symbolic representation of the research design is explained below:

	Pre-test		Post-test	
EG				
	R	O1.1	X	O1.2
CG		O2.1		O2.2

EG: Experimental Group

CG: Control Group

R: Random assignment of participants to groups

O1.1 and O1.2: Pre-test and post-test measurements of the experimental group

O2.1 and O2.2: Pre-test and post-test measurements of the control group

X: Independent variable applied to the experimental group (Educational Games)

In this research design, the dependent variable was the physical fitness characteristics of male children in early adolescence, while the independent variable consisted of educational games administered three times a week over a period of eight weeks.

Study Group

The study group consisted of a total of 40 male students in early adolescence, attending middle school, divided into an experimental group (n = 20) and a control group (n = 20). The mean values for age, height, body weight, and body mass index (BMI) in the experimental group were 12.25 years, 146 cm, 38.8 kg, and 18.1 kg/m², respectively. In the control group, these mean values were 12.15 years, 147 cm, 40.7 kg, and 18.7 kg/m², respectively. No significant differences were found between the groups in terms of age, height, weight, or BMI (p > 0.05). All participants and their parents provided informed consent. Participants were healthy children who were not engaged in regular physical activity or sports programs.

Data Collection Tools

Physical fitness tests and measurements were used to assess the physical fitness levels of the participants.

Multiple parameters were measured during the study. Height, body weight, and BMI were determined using the method described by Zorba & Saygın (2009). Flexibility was assessed using the Sit-and-Reach Test (Mackenzie, 2005). 30-second sit-up and vertical jump tests were administered according to the criteria established by Günay et al. (2013). The 20 m sprint test was conducted using the method of Bogdanis et al. (1998). The 20 m shuttle run test and maximal oxygen consumption (VO₂max) were determined according to Leger et al. (1988).

Procedure

Throughout this research, the "Guidelines for Scientific Research and Publication Ethics in Higher Education Institutions" have been followed. All procedures were carried out in accordance with ethical guidelines, respecting participants' rights and privacy. After pre-test measurements were completed for both experimental and control groups, the participants in the experimental group underwent an educational games program. This program was implemented three days a week (Monday, Wednesday, Friday) over an eight-week period, with each session lasting 90 minutes. All tests and measurements were conducted at the same time of day to control for circadian variation.

After height and body weight measurements, a 15-minute warm-up session was led by the researcher before the performance tests. Participants wore appropriate sports clothes (shorts, t-shirts, sports shoes). Except for the 20 m shuttle run and 30-second sit-up tests, all measurements were repeated twice, and the best score was recorded.

Data Analysis

The data collected in this research were analyzed using SPSS 24.0. Because the sample size in both groups was below 30, non-parametric tests were applied. Within-group comparisons of pre-test and post-test mean values were conducted using the Wilcoxon Signed-Rank Test. Between-group comparisons of mean values were analyzed using the Mann–Whitney U Test. The level of statistical significance was set at $p < 0.05$.

Findings

Table 1. Physical Fitness Pre-test and Post-test Mean Values of Participants

Variable	Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)
Sit and reach (cm)	Control	22.3±2.05	22.7±1.9
	Experimental	22.3±1.6	23.3±1.7
Vertical jump (cm)	Control	30.9±1.19	30.9±1.4
	Experimental	31.5±1.2	31.9±1.16
20 m sprint (sn)	Control	3.83±0.10	3.83±0.10
	Experimental	3.79±0.10	3.79±0.10

30 s sit-up (number)	Control	20.7±1.9	20.8±1.7
	Experimental	22.5±2.4	23.7±2.1
20 m shuttle run (number)	Control	28.8±2.9	28.7±2.9
	Experimental	27.45±3.4	29.05±3.6
VO ₂ Max (ml/kg/dk)	Control	27.48±2.9	27.52±2.7
	Experimental	27.32±3.4	27.5±3.2

(n = 20)

Table 2. Wilcoxon Signed-Rank Test Results for Physical Fitness Parameters

Variable	Group	n	Mean Rank	z	p
Sit and reach	Control	20	4.50 5.06	-2.309	0.021*
	Experimental	20	0.00 8.50	-3.704	0.000*
Vertical jump	Control	20	3.00 2.00	-0.378	0.705
	Experimental	20	6.50 7.15	-2.000	0.046*
20 m sprint	Control	20	2.00 2.00	-0.577	0.564
	Experimental	20	3.00 0.00	-2.236	0.025*
30 s sit-up	Control	20	5.00 5.00	-0.333	0.739
	Experimental	20	4.50 8.77	-3.351	0.001*
20 m shuttle run	Control	20	5.00 5.00	-1.000	0.317
	Experimental	20	0.00 9.00	-3.671	0.000*
VO ₂ Max	Control	20	11.89 9.36	-0.075	0.940
	Experimental	20	0.00 10.50	-3.920	0.000*

*p<0.05

Examination of Table 2 revealed no statistically significant differences between pre-test and post-test mean scores of the control group in vertical jump, 20 m sprint, 30 s sit-up, 20 m shuttle run, and VO₂max (p > 0.05). A significant difference was observed only in the flexibility parameter (p < 0.05). In contrast, participants in the experimental group showed statistically significant improvements in all parameters flexibility, vertical jump, 20 m sprint, 30 s sit-up, 20 m shuttle run, and VO₂max (p < 0.05).

Table 3. Mann–Whitney U Test Results for Pre-test Values

Variable	Group	n	Mean Rank	U	p
Sit and reach	Control	20	20,90	192.000	0.823
	Experimental	20	20,10		
Vertical jump	Control	20	18,40	158.000	0.240
	Experimental	20	22,60		
20 m sprint	Control	20	29,08	28.500	0.000*

	Experimental	20	11,93		
30 s sit-up	Control	20	16,43	118.500	0.026*
	Experimental	20	24,58		
20 m shuttle run	Control	20	22,78	154.000	0.215
	Experimental	20	18,23		
VO ₂ Max	Control	20	20,35	197.000	0.935
	Experimental	20	20,65		

*p<0.05

As shown in Table 3, there were statistically significant differences between the experimental and control groups in 20 m sprint and 30 s sit-up ($p < 0.05$), while no significant differences were found in the other parameters ($p > 0.05$).

Table 4. Mann–Whitney U Test Results for Pre-test Values

Variable	Group	n	Mean Rank	U	p
Sit and reach	Control	20	18,68	163.500	0.316
	Experimental	20	22,33		
Vertical jump	Control	20	17,15	133.000	0.058
	Experimental	20	23,85		
20 m sprint	Control	20	29,88	12.500	0.000*
	Experimental	20	11,13		
30 s sit-up	Control	20	13,68	63.500	0.000*
	Experimental	20	27,33		
20 m shuttle run	Control	20	19,90	188.000	0.744
	Experimental	20	21,10		
VO ₂ Max	Control	20	18,30	156.000	0.234
	Experimental	20	22,70		

*p<0.05

Table 4 indicates statistically significant differences between the groups in 20 m sprint and 30 s sit-up ($p < 0.05$), but not in other parameters ($p > 0.05$).

Discussion and Conclusion

This study examined the effects of an eight-week educational games program on the physical fitness levels of male children in early adolescence. The within-group comparisons demonstrated significant improvements in all measured parameters for the experimental group, while the control group showed improvement only in flexibility. Similarly, between-group comparisons revealed higher post-test scores in the experimental group compared to the control group.

Educational games are similar to other types of play but include instructional elements, making them both engaging and educational. Numerous studies have highlighted the positive effects of educational games on motor skill development (Astuti et al., 2024; Dao, 2021; Ekiz et al., 2022; Kaya et al., 2019;

Kuznetsova et al., 2022; Noemí & Máximo, 2014). Motor skill enhancement is closely related to physical fitness; as children develop their motor abilities, their physical fitness also improves. Physical fitness is fundamental for performing daily activities and contributes to overall dynamic health, supporting both physical and psychological functioning (Gustiana & Puspita, 2020). Health-related physical fitness is a characteristic that school-aged children need to maintain a healthy body, cope with environmental stress, and perform daily activities, especially learning (García-Hermoso et al., 2021) and playing. It is also a strong indicator of children's health status, with low fitness levels associated with a higher risk of cardiovascular diseases, overweight/obesity, and mental health issues (Ruiz et al., 2009). The educational games used in this study are activities that stimulate heart and lung function to improve children's cardiovascular capacity and strengthen the heart muscle. Indeed, the average values obtained in the children in the experimental group indicate an increase in VO₂max levels. These findings are supported by the results of studies by Astuti et al. (2024), Cocca et al. (2020), and Dimiyati et al. (2022). It has also been reported that an increase in VO₂max is directly proportional to physical fitness (Metzler, 2011), and cardiovascular endurance is the most important component of physical fitness and is often used synonymously with physical fitness (Sammito et al., 2016). Therefore, it can be said that the educational games with running content in the program applied to the experimental group improved the endurance levels of the participants.

In the current study, participants' flexibility levels were determined using a sit-and-reach test, and their speed characteristics were determined using a 20-m sprint test. Significant improvements were observed in both parameters in the posttest for the children in the experimental group. This may be a result of educational games focused on speed and mobility. Previous studies have also reported that the flexibility levels of children in different age groups increased (Aynacıyan & Özer, 2020; Cocca et al., 2020; Ekiz et al., 2022; Kuznetsova et al., 2022) and their speed characteristics improved (Astuti et al., 2024; Kaya et al., 2019; Kuznetsova et al., 2022).

Participants' strength characteristics were determined using vertical jump and 30-second sit-up tests. Similarly, significant improvements were observed in the average values of both the vertical jump and 30-second sit-up for the participants in the experimental group. The findings are consistent with the results of studies conducted by Cocca et al. (2020), Dimiyati et al. (2022), and Göksu (2025). In the games included in the educational play program, children consistently engaged in strength-based movement activities such as jumping, carrying, pulling, and pushing. As a result of this struggle to win the game, the children's strength characteristics improved, which is an expected result.

Thanks to educational games, children feel happy during play, and their desire to move increases. This can increase children's physical fitness. Being active automatically leads to exercise, which in turn has an impact on their physical fitness levels. Furthermore, a school curriculum that adopts an

integrated theme is very important when implementing educational games. In addition to improving physical fitness, it can also stimulate other areas of development such as children's cognitive, social-emotional (Noemí & Máximo, 2014; García-Hermoso et al., 2021), and, of course, physical-motor skills. Educational games are one of the learning methods that can have a significant impact on children's physical fitness levels. Furthermore, educational game tools can reduce children's boredom because they include elements of cooperation, competition, creativity, and stimulate children's movement skills. Therefore, educational game tools can be used as an alternative to improve children's physical fitness.

In conclusion, the eight-week educational games program significantly improved the physical fitness levels of male children in early adolescence. It is recommended that structured educational games be incorporated into school programs to support children's physical development in this critical period.

Ethics Committee Permission Information

Ethics evaluation board: Necmettin Erbakan University Faculty of Medicine, Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research

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Conflict of Interest Statement

There is no conflict of interest in this study.

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