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RESEARCH ARTICLE

Examining the Effect of 8-Week Educational Games on Gross Motor Skills in Children with Autism

Hayriye DOĞAN[1], İsa AYDEMİR[*2] and Vedat ÇINAR[3]

[1,3]Firat University, Faculty of Sport Sciences, Physical Education and Sports Teaching, Elazığ, Türkiye
[2]Hakkari University, Faculty of Education, Physical Education and Sports, Hakkari, Türkiye
*Corresponding author: aydemirisa23@gmail.com

Abstract
Families with autistic children expect their children to be self-sufficient and to play games like normal children. However, it appears that there are few initiatives and scientific research in our nation that would emphasize the importance of physical activity-based educational games in order to overcome this problem. The study's goal was to look at the impact of educational games on the development of gross muscular motor skills in people with autism. The study comprised 11 boys aged 10 to 12 who had never previously engaged in an educational game program on a regular basis. Measurements were gathered from the participants twice: once before the 8-week instructional gaming program and once after it ended. The control group received no instructional game software. The SPSS package application was used to perform statistical analysis on the data. There was a significant difference between the experimental group's pre-test and post-test results in hand grip, medicine ball throwing, speed, flexibility, sit-up, and balance ($p<0.05$). As a result, at the end of eight weeks, the educational game program based on physical activity and exercise had a positive influence on the gross motor abilities of children with autism. It may be recommended in this regard to further extend and promote educational game programs, as well as to include educational games in the education programs of children with autism.

Keywords
Autism, Educational Game, Motor Skills, Physical Development

INTRODUCTION

Autism is defined as a complicated neurodevelopmental illness marked by limited (Apa, 2013) and repetitive behaviors in social and communication abilities, and it has become increasingly common in recent years, with 1 in every 44 children being affected (Maenner et al., 2021). The causes of autism have yet to be discovered. As a result, its origin could not be determined. A framework for autism diagnosis has been developed through scientific research. Autism is a chronic neurological and psychiatric disorder that impairs the quality of life for people with the disease and their parents who are responsible for their care. Various therapy approaches used by families with autistic children over the years, as well as the efforts they made toward their recovery, have failed to produce results. However, in recent years, studies indicating that physical activities improve mental and physical health in people with autism (Baptista and Janz, 2012; Mikkelsen et al., 2017) have given families with autistic children hope.

Scientific studies on the benefits of physical activity for disabled people show that it has a significant impact on the physical, emotional, and social well-being of both healthy and impaired people (Aydemir et al. 2020). Physical activity is stated to be a greater need for disabled individuals in terms of providing them with a sense of success and pleasure, being at peace with their disability,

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struggling, and providing positive gains in social communication, in addition to its positive effect on the affective and psychomotor development problems of disabled individuals. Appropriate physical and motoric development is an unavoidable requirement for participation in physical activities, and activities modified for impaired individuals should be prioritized; the goal is to make physical and motoric features compatible with physical activity standards (Polat, 2019).

Physical activity-based educational activities can help children with autism improve their quality of life by enhancing their basic motor abilities, decreasing behavioral issues, assuring balance, acquiring hand-eye coordination, and communication skills. The multi-media and interactive features of educational games will aid not only in the development of motor skills but also in sociability. The physical and motoric development afforded by educational games will contribute to the general health of the autistic individual by increasing self-confidence and a sense of success. Autism and other disability groups must plan physical activity programs that take into account the limitations of individuals with autism, their living standards, their families' expectations, and the belief that they should be treated as individuals in society. In light of this information, the study looked at the impact of educational games on the development of major motor skills in people with autism.

MATERIALS AND METHODS

This study followed ethical standards and received approval from the Frat University's Non-Interventional Research Ethics Committee with reference number (March 23, 2023, session number 2023/05-22). Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures. Patients diagnosed with autism by psychiatrists and attending a special education and rehabilitation center in Elazig, 11 boys aged 10-12 who had never consistently engaged in any educational gaming program before, took part in the study. The experimental group had six persons and the control group had five people. Educational games were applied to the experimental group for 60 minutes a day, 3 days a week, for 8 weeks. As a result of the preliminary performance tests, a homogeneous grouping was made as much as possible within the framework of the limitations determined and foreseen. The special education expert and psychologist working in the unit were also consulted when identifying the children with autism who would be involved in the study. Before beginning to work with autistic children, institutional managers, instructors, and students' families were interviewed, the study was explained, and the appropriate approvals were secured. The study was carried out in a special education and rehabilitation center, in halls equipped with appropriate flooring, heat, light, and sound insulation for educational games. Measurements were also made in these halls. Before starting the educational games, dynamic warm-up and stretching movements were performed for the first 10 minutes. In the main segment, educational games were played for 40 minutes. To round up the one-day educational game program, 10 minutes of static relaxation and cooling activities were conducted following the educational game. Measurements were gathered from the participants twice: once before the 8-week instructional gaming program and once after it ended.

Prerequisites for children with autism to participate in the study

Children with autism are between the ages of 10-12. Families provide voluntary consent forms. Ability to carry out given commands. Not reacting unnecessarily to touch. No other disability. Having the ability to hold the toilet. To determine these prerequisite skills, information was obtained from their instructors and families.

Educational games to be played by the experimental group in the study

Movements in autistic children must be very repetitious in order to achieve progress. As a result, one instructive game was played each week. Eight instructive games were played and completed in total. Eight educational games were chosen with age group and developmental features in mind (Aynacıyan, 2020).

Collection of Data

Height Measurement

The participants were measured for height while standing barefoot with their heads upright, using a meter, and the values obtained were entered in cm on the participants' form.

Body Weight Measurement

Participants were asked to wear t-shirts and shorts while their body weight was determined. Body weights were determined in kilograms (kg) using an electronic scale**.**

Body Mass Index (BMI) Calculation

The body mass index values of the participants were determined by the body mass index formula.

Standing Long Jump

Participants began by standing behind the line (feet shoulder-width apart, toes not touching the line). He executed the jump by stooping down, generating strength by moving his arms backwards and then forwards, then supported himself with his legs after being told he could. The distance in centimeters between the limbed person's end point and starting point, which was the shortest between the location where he jumped and the point of his fall, was measured (Urlu, 2014).

Right- and Left-Hand Grip Strength

In a standing position (feet shoulder-width apart) and looking directly forward, the participant squeezed the dynamometer with maximum effort, with the upper arm hanging straight down and the forearm positioned at a 180-degree angle. The tester was instructed to do the test by saying, "Are you ready?" and "Now squeeze with all your strength." The participant was careful not to shake the dynamometer, no matter how hard he tried, and neither a change in the original body position nor contact of the hand with the body was permitted during the experiment. After the value was written, the dynamometer was reset, and after a 30-60 second rest was given with the same hand between trials, the participant was prepared for the next trial (Özer, 2013).

Medicine Ball Throw

The competitor stood at the line-drawn starting point and threw the medicine ball forward over his head in a throw-in stance. The first location at which the medicine ball made contact with the ground was determined, and the distance from this point to the beginning position was measured in centimeters (Urlu, 2014; Yan, 2007).

20m Sprint

With the use of lines and skittles, a straight track with clearly defined starting and finishing places has been built. It began when the participant was prepared. The time began when he passed the starting line and ended when he reached the finish line (one leg was sufficient) (Çıplak et al. 2020).

Sit-Reach Test

If the participant sat on the ground for an extended period of time, his legs were straight and the bottom of his foot was put on the bottom of the sit-and-reach test platform. The apparatus on the box was moved forward with both hands while maintaining the beginning posture. The number advanced by waiting for 2 seconds was recorded as a result of yawning (Özer, 2013).

Sit Up Test

The participant was instructed to sit on the mat and lie back, with his hands clasped around his neck, his feet bent at a 90o angle, and his feet touching the mat. Then he was instructed to lie on his back with his shoulders on the mat. He sat down with his elbows forward in order to acquire a comfortable take-off position. The subject was instructed to do as many sit-ups as he could in 30 seconds, which began when he was ready, and the number of sit-ups he could complete was recorded.

Flamingo Balance Test

Participant is 50 cm long, 4 cm tall, and 3 cm wide. For one minute, stand on a wide wooden balancing beam. He attempted to maintain his equilibrium throughout. Time is halted when the equilibrium is interrupted (if he lets go while gripping his foot, falls off the board, touches the ground with any part of his body, etc.). The timer restarted when the individual restored his balance by climbing on the balancing beam. This pattern was repeated for one minute. When the time was up, each effort by the participant to retain balance (after falling) was counted and recorded as a score at the end of the test when one minute was over (Deforche et al., 2003).

Analysis of Data

The SPSS package application was used to perform statistical analysis on the data. As descriptive statistics, mean, standard deviation, percentage, and frequency distribution approaches were used. The data was normality tested and parametric tests were used for the data that was found to be normally distributed. The "Paired Samples t" test was used in the study to compare within groups. The threshold for statistical significance was set at $p<0.05$.

RESULTS

When Table 1 is assessed, it is monitored that the average age of the control group is 11.6 minimum height is 133 cm and the maximum is 159 cm. The minimum body weight is 26.5 kg and the maximum body weight is 40 kg.

Table 1. Analysis results showing age, height and body weight values of the control group

Variable	N	Mean	Minimum	Maximum
Age (years)	5	11,6	11	12
Height (cm)	5	143,20	133	159
Body Weight (kg)	5	34,10	26,50	40

When Table 2 is scrutinized, it is seen that the average age of the experimental group is 11.17 years, the average height is 145.83cm, and the average body weight is 35.33 kg. The youngest participant in the experimental group is 10 years old, while the oldest is 12 years old. It is seen that the minimum height is 135 cm and the maximum is 160 cm. The minimum body weight is 28 kg and the maximum body weight is 45 kg.

Table 2. Analysis results showing age, height and body weight values of the experimental group

Variance	N	Mean	Minimum	Maximum
Age (year)	6	11,17	10	12
Height (cm)	6	145,83	135	160
Body Weight (kg)	6	35,33	28	45

When Table 3 is examined, no significant difference was detected between the pre-test and post-test scores of the control group in hand grip, medicine ball throwing, speed, flexibility, shuttle and balance (p>0.05).

Table 3. Analysis results showing control group gross motor skill measurement values

		Pre Test	Post Test		
Measurement	**N**	Mean±Sd	Mean±Sd	**T**	**P***
Hand Grip	5	18,56±10,19	18,45±9,45	,362	0.735
Medicine Ball Throw	5	241,40±101,62	240,2±97,59	,673	0.121
Speed Test	5	8,74±0,75	8,78±0,74	-,395	0.713
Flexibility	5	21,40±15,04	21,72±14,66	1,233	0.285
Shuttle	5	4,80±0,84	5±0,71	-,535	0.621
Balance	5	19,11±9,14	18,97±8,89	,467	0.665

When Table 4 is analyzed, a significant difference was detected between the pre-test and post-test scores of the experimental group in hand grip, medicine ball throwing, speed, flexibility, shuttle and balance (p<0.05).

Table 4. Experimental Group Gross Motor Motor Skill Measurement Values Analysis Results

		Pre Test	Post Test		
Measurement	**N**	Mean±Sd	Meant±Sd	**T**	**P***
Hand Grip	6	11,47±6,19	12,75±6,48	-6,559	0.001
Medicine Ball Throw	6	197±58,41	250,5±55,53	-4,995	0.004
Speed Test	6	8,63±0,84	7,65±0,96	6,411	0.001
Flexibility	6	19,17±7,25	22,5±7,34	-5,423	0.003
Shuttle	6	3,83±0,75	5,83±0,98	-7,746	0.001
Balance	6	14,08±6,01	15,41±6,02	-9,053	0.000

DISCUSSION

Individuals with autism have difficulty using gross muscular motor abilities when compared to their typically developing counterparts. The utilization of large muscle groups varies. Fat is defined as the inability to display large and small muscle talents as well as a lack of intramuscular coordination. Individuals with autism have more difficulties in aspects such as speed, flexibility, balance, and gait when compared to their typically developing peers (Kars et al. 2020; Kara et al. 2019; Yarımkaya et al. 2017; Yanardağ et al. 2009).

The effect of educational games on the development of big motor skills in people with autism was investigated in this study. According to the findings of the study, 8 weeks of exercise and physical activity-based educational activities increased gross muscular motor skills in children with autism. There was a significant link found between pre-test and post-test hand grip, medicine ball throwing, speed, flexibility, shuttle, and balance scores.

When the literature was reviewed, it was found that children with autism who participated in physical education, exercise, and movement training programs improved their social skills, gained mobility, and achieved physical and social growth through educational games (Derer, 2018; Alp and Çamlıyer, 2018). The benefits of an 8-week educational play program on children with autism were studied, and it was discovered that the play program offered a general improvement in children with autism and reduced potentially troublesome behaviors (Tezcan and Sadik, 2018). In another study, it was found that adapted game-supported physical education programs improved motor skills in children with autism (Akin and Alp, 2019). In a study that looked at the influence of sports training on basic motor abilities in children with autism, it was discovered that after sports training, they could do several actions that they couldn't accomplish before (Elaltunkara, 2017). 25 studies were analyzed in a comprehensive meta-analysis research on the importance of physical education and sports in children with autism. According to the findings of the study, physical education, educational gaming programs, and movement training programs improved motor skills (Kaya and Alp, (2022). These findings, as disclosed by scientific methods, support the findings of our study. It is seen that children with autism who leave a sedentary lifestyle behind and participate in exercise programs show physical development. It can be said that exercise programs and educational games have an effect on the development of gross motor skills.

Conclusion

As a result, it has been determined that educational games focused on exercise and physical activity improve the gross motor skills of children with autism. Regular and structured use of exercise-based educational games will improve the physical development and quality of life of people with autism. Given the literature and our findings, it is advised that educational game programs be expanded and disseminated, as well as educational games be included in the education programs of children with autism, in order to protect and continue the development of children with autism.

Appreciation

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Conflict of Interest

No conflict of interest is declared by the authors.

Ethics Committee

The study protocol was approved by the Ethics Committee of the Institute of Health Sciences of Firat University (Ethics Committee Approval: 2023/05-22).

Author Contributions

Study Design, İA, VÇ, HD; Data Collection, İA, HD; Statistical Analysis, İA, VÇ; Data Interpretation, VÇ; Manuscript Preparation, VÇ, İA, HD; Literature Search, İA, HD. All authors have read and agreed to the published version of the manuscript.

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