Universal Journal of Educational Research 7(2): 580-587, 2019 http://www.hrpub.org
DOI: 10.13189/ujer.2019.070231

Effects of Pre-school Play on Motor Development in Children

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Abstract Motor skills are considered important for children's physical, social, and psychological development. Pre-school age seems to be decisive for the development of motor skills. Our study's aim was to investigate the effect of 12 weeks game education on the motor development of pre-school children aged 4 to 6 years. In the research, experimental method pre-test / post-test and control group design was used. In this study, a total of 30 boys and 30 girls were enrolled. The research consisted of a total of 60 children who were studying in pre-school and were selected via random sampling model. In order to collect data, 12 weeks game education was conducted on participants. Motor Performance test protocol, developed by Morris, Atwater Williams and Willmore in 1980, was used on both experiment and control group children, in order to measure their motor performance before and after 12-weeks game education. Average and standard deviation values were calculated for the data collected. Children's throwing, catching, long jump, vertical jump, running, and stopping skills were measured. Mean and standard deviations of the data obtained in the study were taken. A statistically significant difference was found between the experimental and control groups in terms of post-test. A statistically significant difference was found in the experimental group pre-test and post-test comparisons. In these comparisons, the post-test values were found to be higher than the pre-test values. According to the results of the research, it is necessary to apply more long-term applications to increase the positive effect of 12-Weeks basic game education at the levels of motor development in children aged 4 to 6 years old.

Keywords Child, Motor Development, Motor Test, Pre-school, Game Education

1. Introduction

During childhood and pre-school age, movement is an integral part of children‘s life. In the first six years of life, children discover themselves and the world through movement and capture their surroundings, through their body and their sensations [1]. Thus, especially in that period of human life, the study of a child‘s motor performance can significantly contribute to the full understanding of his/her entire personality [2]. Additionally, the sound assessment of children‘s motor development level is directly associated with the planning of developmentally adequate movement programs [3], the implementation of which is considered essential, not only for the better preparation of children in the field of learning, but also for the avoidance of motor disorders and the important subsequent problems during the period of growth and development [4]. By means of a valid and reliable assessment procedure, the essential information is gathered so that the program elements can be chosen, according to the individual needs of children. Then, the effects of the movement program on the children‘s motor performance will be evaluated and new aims will be set [5]. Finally, the identification of children that may have developmental delays is the first step towards forestalling later difficulties. Early intervention services are relatively less expensive than treatment at a later stage [6]. Narrowing and in some cases minimizing problems are associated with developmental delays [7]. The studies of pre-school aged children‘s motor development usually focus on the examination of the movement features that change subsequent to growth and differentiate according to environmental factors or unique characteristics of various population groups (gender, race, social surrounding, developmental disorders, etc). A large volume of papers refers to the improvement of the performance across age. There is a consensus among the researchers that age, as an index of maturation, is a vital factor for children‘s motor performance [8], [9]. [10]. The second most widely considered issue is the motor performance differences between males and females with considerable attention given to school aged children and adolescents. Are gender differences in motor performance already noticeable during the pre-school years (a period that is so critical for human development) [11]

Motor is defined as something having to do with

muscular movement. An example of motor is being able to move your arms up and down, to have motor skills. Every individual begins to develop physically while in the womb. This development continues to accelerate after being born. Some of these movements, which were reflex at first, continue as such for all lifetime and some of them turn into motor skills with the conscious use of organs in time. Breathing or blinking is the reflexive movement that continues throughout the life of the individual, even if it is not. However, bouncing or cutting paper on one foot is the action taken by the use of organs and is considered within psychomotor development. Psychomotor development is the process of controlling the behaviors that occur in lifelong motor skills. Behaviors, sensory organs, mind and muscles work together. In a sense, the process that enables these behaviors to be controlled is psychomotor development. Psychomotor development is defined as the growth of physical organism and the development of the central nervous system. Although the motor development undergoes different changes, it is an ongoing process throughout the life of the individual. Motor development follows a regular sequence. Great muscle motor skills are also referred to as in gross motor skills ’or‘ the use of large muscles. It is used to describe the control over movements such as crawling, standing, walking, running, swinging, rolling, jumping, balance. Small muscle motor development can also be called fine motor skills. It covers the skill of using hand, foot and object skills. Examples include handling, grip, writing, tearing, drawing, gluing, and cutting. A child's ability to cut paper with scissors, stringing beads, eating olive with a fork, drawing geometric shapes with a pen are related to fine motor skills [12].

Motor development examines the changes in human motor skills, the underlying and affecting factors throughout life [13]. Motor development is also defined as the continuous change in motor behavior that occurs during the life caused by the interaction of the biological structure of the individual, the requirements of the motor task and the environmental conditions [14]. Motor development examined by Gallahue and Ozmun (2002) is separated in four periods, including reflexive (intrauterine-1 age), primitive (0-2 years), basic (2-7 years) and sport specific movements period (7-10 years and above) section. It is important to know and follow normal motor development in order to prepare programs to increase mobility capacities. Because it is necessary to carry out a structured program and trial to perform motor skills involving the activity of large muscles at maturity level [15]. That is why motor development is evaluated by researchers in different periods and groups. The period of basic movements (2-7 years) during the motor development period is important because it is the period in which the skills forming the basis of more complex motor programs develops. The movement is an indispensable element for learning and communication in children during this period and they are ready to learn new motor skills in the rapid development process [16].

Basic movement models, such as running, jumping, bouncing, are part of children's educational and learning experiences. The skills learned in this period will be lifelong permanent and will provide the basis for new skills. On the other hand, not giving or limiting movement and testing opportunities may adversely affect motor skill performance in children and may cause reluctancy and timidity to learn more complex skills called “Sport Competency Block” [14]. Therefore, it is also important to monitor motor development in the period of basic movements.

In our study, the aim was to investigate the effects of 12-Weeks game education of 4 to 6 year old boys and girls on motor development.

2. Method

In this current study, experimental method, pre-test/post-test, control group was used. The sample of the research consists of a total of 60 girls and boys (N_k=30-N_b=30) who have continued their education in Private Bilkent Primary School. 30 of the students participated in the control group and 30 of them participated in experimental group. The children who participated in the experiment group were applied a 12 weeks game education program and the control group did daily physical activity. The program “Educational Play Activity Towards The Acquisitions About The Motor Development Placed in The Ministry of National Education Pre-School Program” was applied for the experimental group as 40 minutes for 2 days in a week for 12 weeks and for the control group physical activity was applied as 10 minutes for every morning, 5 days in a week for 12 weeks [17].

In order to measure children’s motor performance in both group before and after 12 weeks (game education and physical activity) “motor performance tests” were used. For pre-test “motor test protocol” which was developed by Morris, Atwater Williams and Willmore (1980) was used. In 1986, Sevimay Özer applied Turkish motor performance test to 205 children aged 3-6 years and its implementation protocol is explained below [18].

After the 12 weeks game education and physical activity, the children's throwing, catching, long jump, vertical jump, running and stopping skills were measured. The difference between pre-test and post-test was analysed by Paired-Samples t-test. The differences between experimental group and control group were analysed by independent-Samples t-Test. The pre-test values of the experimental and control groups in the investigation were analysed by Independent Samples t-Test.

Running

a. Objective: To determine how fast the child is able to run for 15 meters.

b. Preparation of the test environment: A band is applied to the starting line. Another band is applied 15 meters far from the first line for indicating the finish.
c. Tools: Stopwatch, band, whistle
d. Application: At the sound of the whistle, the child is allowed to leave the starting point and the child tries to reach the end point as soon as possible. The application is repeated 3 times and the time's average of the three is recorded.

Stopping

a. Objective: To determine how far the child can stand when the stop command is received.
b. Preparation of the test environment: A starting point is created and the bands are applied for 30 meters at intervals of one meter.
c. Tools: Whistle, band
d. Application: The child leaves the starting point at the sound of the whistle and he starts running along the line. At any time and point, stop command is given to the child with the whistle and is calculated how much distance the child is running before he can stop after receiving the command. The process is applied 3 times and is recorded the average of the three.

Ball Throwing

a. Objective: To determine how far the child can throw the tennis ball.
b. Preparation of the test environment: A starting point is created and the bands are applied for 30 meters at intervals of one meter.
c. Tools: Band, 3 tennis balls
d. Application:It is said to the child who was standing at the throwing point "throw the ball as far as possible when you feel ready" and the point where the ball fall down is determined. The process is repeated 3 times and the average of the three is calculated.

Ball Catching

a. Objective: To determine how many times a child can hold a ball under certain rules.
b. Preparation of the test environment: Throwing point is determined for the ball and it is asked to the child to go 5 meters far from this point, catch the ball which is thrown.
c. Tools: 3 volleyball balls, band
d. Application: The person who was at the point of throwing the ball throws it to the child in the same way every time. The process is repeated 3 times. It is asked to the child to hold the ball using his hands and fingers, not the whole body. It is recorded how many times he could hold the ball under certain rules.

Long Jump

a. Objective: To calculate how far the child can jump from the point where he / she is standing without speeding.
b. Preparing the test environment: The child's stopping point is determined and a tape measure is placed next to it.
c. Tools: Tape measure, band
d. Practice: It is calculated how far the child can jump with the help of fling forward. The process is repeated three times and the average of the three is recorded.

Vertical Jump

a. Objective: To calculate how much the child can jump vertically from the point where he / she is standing.
b. Preparation of the test environment: Lines are drawn on the wall with intervals of one cm.
c. Tools: Tape measure
d. Application: it is asked to the child to stand with his back facing in front of the straight line drawn on the wall and with jump command to jump by pushing himself upwards with only his legs. The process is repeated three times and the average is recorded.

3. Findings

Table 1. shows the comparison of the values before and after the game education without gender discrimination in the experimental group; $p < 0.05$ was found statistically significant as a result of 12 weeks game practices in running, throwing ball, catching ball, long and vertical jump skills while it was not found statistically significant ($p > 0.05$)

Table 2 shows the comparison of the values before and after the physical education without gender discrimination in the control group and it found that statistically significant differences in the running, jumping forward, jump up ($p<0.05$) while it was not found statistically significant differences in the stopping, throwing ball and catching ball ($p<0.05$)

Table 1. Findings for Pre-test - Post-test Values Without Gender Differences in the Experimental Group

Sub-tests	Measurements	N	X	ss	sd	t	p
Running	Pre-test	30	4.13	0.45	104	6.812	0
	Post-test	30	3.84	0.55			
Stopping	Pre-test	30	207.9	30.12	104	0.402	0.64
	Post-test	30	164.1	85.71			
Throwing Ball	Pre-test	30	11.36	5.62	104	-2.438	0.006
	Post-test	30	13.9	5.74			
Catching Ball	Pre-test	30	1.68	1.24	104	-2.468	0.042
	Post-test	30	2.62	0.8			
Long Jump	Pre-test	30	92.42	18.12	104	-6.852	0
	Post-test	30	114.44	22.72			
Vertical Jump	Pre-test	30	126.54	6.35	104	-3.234	0
	Post-test	30	134.16	8.21			

Table 2. Findings for Pre-test - Post-test Values in the Control Group without Gender Differences

Sub-Tests	Measurements	N	X	ss	sd	t	p
Running	Pre-test	30	4.12	0.32	104	6.36	0
	Post-test	30	3.8	0.29			
Stopping	Pre-test	30	306.62	55.65	104	-506	0.544
	Post-test	30	312.4	63.42			
Throwing Ball	Pre-test	30	14.22	3.88	104	-0.648	0.567
	Post-test	30	14.88	4.34			
Catching Ball	Pre-test	30	1.84	1.26	104	-1.436	0.25
	Post-test	30	2.04	1.12			
Long Jump	Pre-test	30	90.87	12.63	104	-3.106	0
	Post-test	30	93.6	16.72			
Vertical Jump	Pre-test	30	170.2	8.15	104	-5.012	0
	Post-test	30	168.96	7.8			

Table 3. Findings for Pre-test - Post-test Values of Girls in Experimental Group

Sub-Tests	Measurements	N	X	ss	sd	t	p
Running	Pre-test	30	5.46	0.54	46	3.862	0
	Post-test	30	4.68	0.41			
Stopping	Pre-test	30	120.6	61.65	46	-1.644	0.069
	Post-test	30	196.4	78.44			
Throwing Ball	Pre-test	30	6.72	3.02	46	-3.548	0.001
	Post-test	30	8.64	4.02			
Catching Ball	Pre-test	30	1.68	1.62	46	-4.22	0
	Post-test	30	2.82	0.98			
Long Jump	Pre-test	30	84.64	14.16	46	-5.602	0
	Post-test	30	90.14	20.8			
Vertical Jump	Pre-test	30	180.16	5.44	46	-3.12	0.005
	Post-test	30	186.32	8.6			

Table 3 shows that the comparison of the values of the girls before and after the game education in the experimental group and it found that statistically significant differences in running, throwing ball, catching ball, long jump, vertical jump ($p<0.05$) while it was not found statistically significant in stopping ($p<0.05$)

Table 4. shows the comparison of the values of the girls in the control group before and after the game education and it found that statistically significant differences in running, long jump, vertical jump ($p<0.05$) while it was not found statistically significant in the other parameters.

Table 5 shows the comparison of the values of the boys before and after the game education in the experimental group; it was found that statistically significant in running, throwing ball, long jump and vertical jump it was not found statistically significant in catching ball and stopping.

Table 4. Findings for Pre-test - Post-test Values of the Control Group

Sub-Tests	Measurements	N	X	ss	sd	t	p
Running	Pre-test	30	3.96	0.36	46	5.078	0
	Post-test	30	2.66	0.24			
Stopping	Pre-test	30	340.2	56.6	46	-0.042	0.654
	Post-test	30	236.42	59.9			
Throwing Ball	Pre-test	30	8.53	1.98	46	0.088	0.648
	Post-test	30	8.22	1.66			
Catching Ball	Pre-test	30	1.6	0.86	46	0.089	0.186
	Post-test	30	2.05	1.04			
Long Jump	Pre-test	30	40.54	10.06	46	-2.42	0.002
	Post-test	30	84.3	12.22			
Vertical Jump	Pre-test	30	98.66	3.42	46	-4.524	0
	Post-test	30	124.12	3.18			

Table 5. Findings for Pre-test - Post-test Values of Boys in Experimental Group

Sub-Tests	Measurements	N	X	ss	sd	t	p
Running	Pre-test	30	2.98	0.48	64	5.216	0
	Post-test	30	2.34	0.72			
Stopping	Pre-test	30	168.66	82.42	64	0.434	0.066
	Post-test	30	146.44	96.64			
Throwing Ball	Pre-test	30	18.68	5.24	64	-3.122	0.042
	Post-test	30	19.88	4.04			
Catching Ball	Pre-test	30	1.86	0.74	64	0.232	0.714
	Post-test	30	1.64	0.65			
Long Jump	Pre-test	30	101.6	12.62	64	-6.652	0
	Post-test	30	128.66	8.6			
Vertical Jump	Pre-test	30	214.6	5.02	64	-3.298	0.01
	Post-test	30	286.12	6.22			

Table 6. Findings for Pre-test - Post-test Values of Boys in the Control Group

Sub-tests	Measurements	N	X	ss	sd	t	p
Running	Pre-test	30	2.58	0.41	64	0.065	0
	Post-test	30	2.14	0.34			
Stopping	Pre-test	30	198.12	59.82	64	-0.65	0.642
	Post-test	30	214.96	66.48			
Throwing Ball	Pre-test	30	1244	3.42	64	-0.602	0.36
	Post-test	30	12.94	3.96			
Catching Ball	Pre-test	30	1.86	1.34	64	-0.722	0.685
	Post-test	30	1.98	0.86			
Long Jump	Pre-test	30	96.86	9.63	64	-3.044	0.024
	Post-test	30	109.34	10.66			
Vertical Jump	Pre-test	30	124.64	6.62	64	-4.12	0.006
	Post-test	30	146.8	6.88			

Table 6 shows the comparison of the values of the boys in the control group before and after the game education in the control group, It was found statistically significant in running, long jump and vertical jump, while it was not found statistically significant in the other parameters.

4. Discussion and Results

When we look at the level of development as a result of the game education for boys and girls, we see that the children develop in all areas except stopping skill. When we examine level of development in the post-test data of children who do not have game education, we see that there is improvement in running, long jump, vertical jump skills, but there is not found improvement in stopping, throwing ball and ball catching skills.

According to the analysis results of balance, speed and catching tests, significant difference was found statistically between the control and experimental group ($p<0.05$). The difference among the test averages of long jump by standing and throwing tennis ball of the control group was not found significant ($p>0.05$). The difference between pre-test and post-test belonging to experimental group was analysed by paired t-test.

The difference among promptness, long jump by standing, stand in balance on one-foot, throwing tennis ball, sprint and catching tests was found significant statistically ($p<0.05$). It is understood that regular implementation of motor acquisitions placed in pre-school education curriculum on 5 year-old group children can develop the motor performances such as balance, speed and catching skills significantly [19].

Even if children do not play games at school, we can explain that they have improved in certain skills and that their daily physical activity is high but we can not imagine that the level of development of the children in the control group is as advanced as the experimental group students. If we look at the development difference between the experimental group and the control group, initially the mean of the experimental group was 4.13 while the average of the group in the post-test data was 3.84. The mean of the pre-test data of the control group was 4.12, the average of the post-test 3.80. As can be seen, there was an improvement in the experimental and control group. The mean of the advanced jumping ability of the experimental group was 92.42, The average of the group in the post-test data was 114.44. The mean of the pre-test data of the control group was 90.87, the average of the post-test 93.30. As seen, there was an improvement in the experimental group and control group. The ability to run and long jump in experimental and control groups, and on the contrary, a greater increase was achieved in the control group. We see that the girls who did not join games that were included in curriculum at school saw certain of their skills still developed. Of course, this development of activities during the day (such as jump rope, game hopscotch) is made possible to explain the rough motor skills. However, although the daily activities have made a significant difference in these skills, we can see the difference between the games played in the curriculum in school. In addition, the importance of the game in metaphors for physical activity is emphasized by the administrators who are the practitioners of the school curriculum [21]. The mean average running of girls' experimental group was ($x = 5.46$) at the beginning, while the average of the group was ($x = 4.68$) in the post-test data. The mean of pre-test data of the control group was ($x = 3.96$), the average of the post-test data ($x = 2.66$) As seen, there is an improvement in the experimental group and control group. In the same way, the mean of the girls' ability to long jump was ($x = 84.14$) while in the post-test data the mean of the group was 90.14. The mean of the pre-test data of the control group was ($x = 40.54$) and the average of the post-test ($x = 84.30$). As seen,

there was an improvement in the experimental group and control group. When we look at the level of development as a result of the games played by boys, we see that children develop in all areas except stopping and catching.

Sports activities have a great importance in terms of increasing young people's life skills [22]. İn the experimental group, the mean of boys' ability to run at the beginning was (x = 2.98), whereas in the post-test data the mean of the group was (x = 2.34). The mean of the pre-test data of the control group was (x = 2.58) and the average of the post-test (x = 2.14). As can be seen, there is an improvement in the experimental group and control group. In the same way, the mean ability of the boys in the experimental group to jump forward (x = 101.60), while in the final test group (x = 128.66) is the average. The mean of the pre-test data of the control group (x = 96.86) was the average of the post-test (x = 109.34). As can be seen, there was an increase in the experimental group and control group. In addition, there was no significant difference between the boys in the control group and in the experimental group. It is thought that the boy children are more developed in this age group compared to the girls and they have developed as a result of the fact that they are not as advanced as girls in fine motor skills. In the study, after the physical education and sports activities applied in the experimental group of children vertical splash, long jump and Flamingo Equilibrium tests for Quickness, Agility and 30m Speed, the post-test values of the run tests were significantly better in the control group. Control the only score of the tennis ball throwing post-test scores from the same score of the experimental group was significant has determined to be considerably high [23]. Similar to study findings; Dursun (2002) in his study balance between groups, speed, agility, ball throw, catching ball, standing long jump skills, determined significant difference in favor of the experimental group [24].

Saygın et all (2005), children between the final test values of the experimental group and the control group after the movement training. They found significant differences in vertical jump, anaerobic power, elasticity and body mass index parameters [25]. Kerkez (2004), the game and exercise program applied to 5-6 year old children. The scores of the object control tests were significantly different in favor of the experimental group [26]. When pre-test and post-test of students in experimental group participated in the research were compared, it was determined that there was a statistically significant difference ($p<0,001$, $p<0,005$). In these comparisons, it was found that post-test values were higher than pre-test values. As a result, it was found in this research which was carried out to investigate motor development of children between 5-6 years old that education programme caused a significant difference in motor development children in experimental group.

Consequently, it was determined that education programme positively affected motor development properties of children [27]. As for the statistical results between the pre-test values of the groups and the pre- and post-test values of the control group, no significant difference was found in any of the variables, Whereas, between the post-test values of the groups and the pre-and post-test average values of the experimental group, significant differences at different levels were found in favour of the experimental group and the post-test during the motor performance tests [28].

When we look at the ability to jump up in both boys and girls, the mean of the experimental group pre-test data was (x = 126.54), the average of post-test data (x = 134.16) and the percentage increase without gender discrimination; the mean of pre-test data in the control group was (x = 170.20), the average of post-test data 168.96 and the percentage increased; the mean of the experimental group pre-test data of the girls was (x = 180.16), the average of the post-test data (x = 186.32) and the percentage increased; the mean of pre-test data in the control group was (x = 98.66), the average of the post-test data (x = 124.12) and the percentage increased; the mean of the experimental group pre-test data of the boys was (x = 214.60) and the average of the post-test data (x = 286.12). In the control group, the mean of the pre-test data was (x = 124.64) and the post-test data average (x = 146.80). Contrary to running and long jump skills, there was a greater increase in the control group's ability to jump up. The reason for this is that even if we matched the weight of the children they are thought to be able to improve better. The result showed that the children have improved their gross motor skills more than expected; the skill of catching the ball (fine motor skills) is in favor of girls compared to boys. It was concluded that the stopping skill is hard to improve meaningly thanks to game.

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