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The Effects of Coordination and Movement Education on Pre School Children's Basic Motor Skills Improvement

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Abstract This research was conducted for the purpose of analyzing the effect of the movement education program through a 12-week-coordination on the development of basic motor movements of pre-school children. A total of 78 students of pre-school period, 38 of whom were in the experimental group and 40 of whom were in the control group, were incorporated into the study in line with their own consent after their families had also been informed. During the research period, the experimental research model with a "pre-test - post-test control group" was used. In order to determine the effect of the movement education program through coordination on children; agility, swiftness, standing long jump tests as well as the tests concerned with throwing a tennis ball, sprinting (speed running), flexibility, vertical jump, and running coordination tests and flamingo balance motor performance tests were performed. In the analysis of the data, the "independent t" package program was used to find out the difference between the experimental and control groups, whereas to find out the experimental and control intra-group differences, the "paired samples t" statistical package program was used. 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. Consequently; it follows that the movement education program through coordination, which has been planned and prepared for long-term practices and in which children's activities during practices are enhanced, will enable pre-school children to develop their basic motor movements as well as bringing them to the point at which they will be available for the next upper educational degree as having ensured their psycho-motor development phases.

Keywords Movement Education, Basic Motor Movements, Coordination and Teaching

1. Introduction

The effects of the advancements and developments in science and technology and in educational and social sciences, which are among the current study fields in recent years, are also reflected on the fields of sports sciences and movement education. The main view on the movement education, along with the integration of recent developments into the fields of sports sciences and movement education, is focused on the fact that it is of great importance to enhance children's activeness in participating in various activities to provide an effective and efficient education through the functionality of the educational methods used in the learning-teaching process.

Coordinative properties are influential and important in teaching the sports skills, developing the relevant skills, and sustaining quality. In addition, it is considered that they will facilitate the learning cascading and formation of the complex movements, and support the adaptation to the movements in different conditions in a fast manner, and make it easier to exhibit an economic and soft flow of movement. The movement education throughout the period when children actively take part in activities is thought to positively affect their basic movements, physical body awareness, motor compatibility (strength/power, coordination, speed, swiftness) and physical compatibility (flexibility, strength, endurance) as well as the increase in their socialization levels [1, 2, 3]. In the pre-school stage, one of the efficient teaching methods is the Coordinated-Movement Teaching, which is used to develop the big and small muscles in the psychomotor area in game and activity classes. It is reported that, with the increasing complexity of the movement, the coordination level that is needed for the performance is also important, and the coordinative skills are classified as the motor learning, motor guiding, motor adaptation and changing skills [4, 5]. Pedagogically, however, it can be defined as follows: "Co-ordination stands for the overall abilities concerned with showing reactions to challenging and complicated movements or skills, exhibiting them in the form of behaviour, and being capable of learning or teaching those

movements and skills within a very short period of time by quickly adapting the somatic configuration / constitution in accordance with its purpose and circumstances in different environments". The configuration/constitution rate of the brain development and synaptic connections of pre-school children is known to be experienced at its most intense and rapid pace. It is reported that coordination practices prove to be more efficient at early ages, and that the processes of processing concepts and information become weakened along with the increasing age [6, 7, 8, 9, 10].

Generally, coordination exercises are examined in three classes [1, 6, 11, 31, 32].

1. Exercises intended for the perfection of basic movement forms, and for the enrichment of motor experiences (they correct all the general movement forms like Running, Jumping, Throwing and Climbing).
2. Exercises intended to clarify and perfect the coordination skill,
   a- Non-disjunction exercises (Shooting the target with various tools are limited with certain time, bouncing the ball)
   b- Direction finding exercises (Jumping to the target, Bouncing the ball in the track, Jump-racing and throwing a rolling ball)
   c- Balance exercises (Jumping, Gymnastics / throwing / holding a ball in the balancing beam and clashing the ball, swimming/running etc.)
   d- Reaction exercises (Start exercises done from different start points and from various signals)
   e- Rhythm exercises (running or ball games according to predefined rhythm, The movements of the opponent must be followed)
3. Special coordination exercises that are intended to perfect the conditional skills. They are intended to perfect the coordination skills. They are applied for advanced level sportsmen.

The brain development of the children during this period paves a powerful way for their cognitive, linguistic, motor, social and emotional development, and particularly during this period, as in puberty, the child grows up quite rapidly and his/her developmental areas mature surprisingly fast, as well Thus, it is thought that this period of the individual is the most suitable time to reinforce the characteristics of motor adaptation, coordination and adaptation more harmoniously and permanently, which is also thought to be associated with the child's power of exploration, his/her capacity of learning as well as the learning rate, the supportive attitudes of his/her environment and the learning-teaching facilities provided for him/her [11, 32, 33]. Children's joining activities that are suitable for their individual properties means starting constructing knowledge and skills. It may not be possible that each child participating in the activity performs or imagines it in accordance with its requirements at the same level. However, the teacher must, at this level, ensure a rich activity medium in which everybody can take part at a medium difficulty level. For this purpose, first of all, it is compulsory that the activity process is followed, activities that are proper for every level are included, and the acquisitions are determined. In addition, the teacher must be able to act as a good guide in the learning-teaching process, as a navigator, a leader, and as the applier of the feedbacks, corrections and reinforcements at the right time and at the right place.

In 2004, The U.S. Department of Health and Human Services issued Physical activity for children: A statement of guidelines for children ages 5-12. Reston. These guidelines include the following recommendations for Preschoolers children [12]:

Guideline 1: Preschoolers should accumulate at least 60 minutes of structured physical activity each day.

Guideline 2: Preschoolers should engage in at least 60 minutes -- and up to several hours -- of unstructured physical activity each day, and should not be sedentary for more than 60 minutes at a time, except when sleeping.

Guideline 3: Preschoolers should be encouraged to develop competence in fundamental motor skills that will serve as the building blocks for future motor skillfulness and physical activity.

Guideline 4: Preschoolers should have access to indoor and outdoor areas that meet or exceed recommended safety standards for performing large-muscle activities.

Guideline 5: Caregivers and parents in charge of preschoolers' health and well-being are responsible for understanding the importance of physical activity and for promoting movement skills by providing opportunities for structured and unstructured physical activity.

In the research, it was aimed that the effect of movement education method through coordination on the basic motor movements of pre-school children be put forward in order to facilitate skill acquisition and to prepare the children for becoming versatile for the next upper educational level by means of developing their larger and smaller muscle groups of the psycho-motor field during the lessons involving movement and game activities included in the pre-school educational program. In addition, it is considered that the study will contribute greatly to the revision and organizing of the preschool movement education plan. In line with this objective, the answers to the following questions were tried to be sought: 1. Can the movement education method through coordination be applied to pre-school children?

2. Is the movement education method through coordination effective on the development of the basic motor movements of children?

3. Is it possible to ensure children's activeness/activity by using the movement education method through coordination?

4. Is there any difference between the experimental group in which the movement education method through

coordination is practised and the control group in which this method is not practised in terms of the development of basic motor movements?

2. Method

In this research, the experimental model with the "pretest-posttest control group" was used, and the relationships between the dependent variable and a series of independent variables were analyzed. The effect of the movement education method through coordination- which was determined as the independent variable and the effect of which was to be investigated - on the development of basic motor movements determined as the dependent variable was investigated.

The Study Group consisted of 78 students, who were registered in preschool educational institutions, and who did not have attendance issues, which is in the same direction of the purpose of the study. 40 students (20 girls - 20 boys) constituted the Control Group; and 38 students (19 girls - 19 boys) constituted the Study Group. The students were determined by paying attention of the number of the boys and girls being equal and by using the random selection technique. All of the parents of the children were informed about the study, and the parent permissions were received before the study started.

The subjects selected for the research were identified through a random selection in line with the objective of the research, and these subjects comprised a total of 78 students, 38 of whom belonged to the experimental group and 40 of whom belonged to the control group in which there were students enrolled in the pre-school educational institutes as well as those without any attendance problems. All the parents of the children involved were informed about the study, after which the study was initiated in the wake of receiving the necessary parent permissions.

2.1. Data Collection

Coordination racetracks (the skill or skills that are intended to be developed are placed in stations one after the other, and children are ensured to develop their skills in this track as a whole unit of activities) were designed and practised in accordance with the characteristics of the trainings and along with the active participation of the children in activity classes, sports halls and school yard, as well.

The measurements/assessments were performed by three people consisting of a researcher, a measurement assistant and an interviewer who noted down the scores obtained from the tests into the forms. The data collection was performed at 4 stages. These stages are as follows:

2.1.1. Preliminary Study

The activities involving movement education through Coordination, which were practised during the research period and the effect of which were investigated, were prepared by the researcher by taking the expert views into consideration, as well. Prior to the commencement of 12-week-activities involving movement education through Coordination, a preliminary study was performed for the purpose of initiating the pre-tests on all the subjects at the same level, applying the test instructions, arranging the measurement platforms, calculating the mean duration-per-test as well as testing the measurement tools and providing group homogeneity. The formation of the Study Group and the Control Group was realized in this stage by paying attention to the number of the boys and girls being the same. The formation of the Study Group and the Control Group was realized in this stage by paying attention to the number of the boys and girls being the same.

2.1.2. Application of Pre-Tests

The pre-tests, in accordance with the pre-study results, were applied by being separated into 5 business days by being arranged in the way that the tests of both groups would be followed by one another. During the pre-test practices, all the students were made to go through Basic Motor Movement tests, such as Agility, Swiftness, Standing Long Jump, Tennis Ball Throwing, Speed Race/Sprinting, Flexibility, Vertical Jump/Leap, Running Coordination and Static Balance motor performance tests, and hence, the measurements were completed.

On the 1st day, "agility" and "standing long jump" tests,

On the 2nd day, "swiftness" and "tennis ball throwing" tests,

On the 3rd day, "flexibility" and "sprinting (speed race)" tests,

On the 4th day, "vertical leap" and "running coordination" tests, and

On the 5th day, "static balance" tests were performed, respectively.

In the course of the practices, the movements were demonstrated to the children once, the attention was drawn to the characteristics of the movements involved, the instructions on test tools were explained, and the children were provided with feedback, corrections/re-adjustments and reinforcers.

2.1.3. Application of Physical Education (PE) Program

During the study; the experimental group, after the pre-test measurements, was subjected to the activities of Movement Education through Coordination, which has a number of variations and in which there are activities for developing Basic Motor Movements, for a total of 12 weeks in the form of two days a week and two course hours a day. Whereas, the control group was regularly subjected to the activities involving games and movement education included in their program for 12 weeks.

2.1.4. Application of Post-Tests

During the post-tests, motor performance test tools

applied in the pre-tests were used for pre-school children in order to put forward the effectiveness of the method of Movement Education through Coordination that is used as an educational method during the courses involving movement and games activities and also to measure whether Basic Motor Movements developed or not. Also in the post-tests was the test procedures used in the same way as in pre-tests.

2.2. Data Analysis

During the research, the statistical package program was used for obtaining the results. The "independent t" test was used to find out the difference between the experimental and control groups, whereas to find out the experimental and control intra-group differences, the "paired samples t" statistical tests were used. The statistical significance levels varied according to Motor Performance tests.

3. Findings

In this section, the data obtained from the statistical tests that were performed were analyzed, and the findings were included in this section in line with the development of motor movements followed up during the process of practice.

As can be seen in Table 1, as the result of the 'independent t" test performed to determine whether or not there was any significant difference among the averages of Pre-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance motor performance test values pertaining to the experimental and control groups, the differences between group averages were found to be statistically insignificant (p>0,05).

Table 1. Pre-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance motor performance test values pertaining to the experimental and control groups.

Test	Group	N	Mean ± SD	T test		
				T	sd	P
Agility	Experimental	38	6,93 ± ,70	-1,03	76	,347
	Control	40	7,08 ± ,65			
Swiftness	Experimental	38	6,88 ± ,68	-1,14	76	,336
	Control	40	6,65 ± ,64			
Long Jump	Experimental	38	83,24 ± 13,05	-1,31	76	,314
	Control	40	87,35 ± 14,46			
Tennis Ball Throwing	Experimental	38	8,42 ± 2,40	-1,38	76	,170
	Control	40	9,31 ± 3,19			
Sprinting	Experimental	38	7,79 ± ,73	,31	76	,881
	Control	40	7,74 ± ,82			
Flexibility	Experimental	38	14,70 ± 2,90	2,30	76	,645
	Control	40	13,17 ± 2,95			
Vertical Leap	Experimental	38	15,03 ± 2,84	-2,46	76	,948
	Control	40	16,65 ± 2,97			
Running Coordination	Experimental	38	5,53 ± ,81	-2,78 -2,79	76	,425
	Control	40	6,08 ± ,93			
Static Balance (Flamingo)	Experimental	38	25,99 ± 15,53	-2,57	76	,320
	Control	40	34,97 ± 15,31			

Table 2. Pre- and Post-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance motor performance test values pertaining to the control group.

Test		N	Mean ± SD	T test		
				T	sd	P
Agility	Pre-test	40	7,08 ± ,65	1,11	39	,270
	Post-test	40	7,02 ± ,70			
Swiftness	Pre-test	40	6,65 ± ,64	1,40	39	,167
	Post-test	40	6,27 ± ,68			
Long Jump	Pre-test	40	87.35 ± 14.46	-1.36	39	,180
	Post-test	40	89.93 ± 12.22			
Tennis Ball Throwing	Pre-test	40	9.31 ± 3.19	-2.19	39	,054
	Post-test	40	9.77 ± 3.00			
Sprinting	Pre-test	40	7.74 ± .82	.64	39	,525
	Post-test	40	7.69 ± 1.10			
Flexibility	Pre-test	40	13.17 ± 2.95	-2.24	39	,051
	Post-test	40	13.72 ± 3.36			
Vertical Leap	Pre-test	40	16.65 ± 2.97	-1.89	39	,065
	Post-test	40	17.10 ± 3.07			
Running Coordination	Pre-test	40	6.08 ± .93	-.04	39	,968
	Post-test	40	6.09 ± .94			
Static Balance (Flamingo)	Pre-test	40	34.97 ± 15.31	3.23	39	,052
	Post-test	40	30.15 ± 17.73			

As can be seen in Table 2, as the result of the "paired samples t" test performed to determine whether or not there was any significant difference among the averages of Pre- and Post-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance values pertaining to the control group, the differences between group averages were found to be statistically insignificant, the difference among the group averages was found to be insignificant (p>0,05).

Table 3. Pre- and Post-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance motor performance test values pertaining to the experimental group.

Test		N	Mean ± SD	T test		
				T	sd	P
Agility	Pre-test	38	6,93 ± ,70	19,02	37	,000
	Post-test	38	5,77 ± ,23			
Swiftness	Pre-test	38	6,88 ± ,68	10,26	37	,000
	Post-test	38	5,74 ± ,26			
Long Jump	Pre-test	38	83,24 ± 13,05	-7,90	37	,000
	Post-test	38	93,69 ± 9,62			
Tennis Ball Throwing	Pre-test	38	8,42 ± 2,40	-5,87	37	,000
	Post-test	38	11,41 ± 3,67			
Sprinting	Pre-test	38	7,79 ± ,73	6,59	37	,000
	Post-test	38	7,16 ± ,63			
Flexibility	Pre-test	38	14,70 ± 2,90	-10,02	37	,000
	Post-test	38	16,61 ± 2,51			
Vertical Leap	Pre-test	38	15,03 ± 2,84	-14,48	37	,000
	Post-test	38	19,16 ± 2,13			
Running Coordination	Pre-test	38	5,53 ± ,811	7,11	37	,000
	Post-test	38	4,91 ± ,78			
Static Balance (Flamingo)	Pre-test	38	25,99 ± 15,53	-4,47	37	,000
	Post-test	38	37,39 ± 12,63			

As can be seen in Table 3, as the result of the "paired samples t" test performed to determine whether or not there was any significant difference among the averages of Pre- and Post-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance values pertaining to the experimental group, the difference among the group averages were found to be statistically insignificant, the difference among the group averages was found to be statistically significant at the level of ,01 ($p<0,01$). The differences in question proved to be in favour of the post-tests. This difference that proved to be in favour of the post-tests is thought to be due to the effectiveness of the activities involving Movement education through Coordination that was practised.

As can be seen in Table 4, as the result of the "independent t" test performed to determine whether or not there was any significant difference among the averages of Post-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance values pertaining to the experimental and control groups, there were statistically significant differences in the averages of agility, swiftness and vertical leap test values at the level of ,01 ($p<0,01$), whereas in the averages of Long Jump, Tennis ball throwing, Sprinting, Flexibility, Running Coordination and Static Balance test values, statistically significant differences at ,05 level were found ($p<0,05$). The differences in question proved to be in favour of the experimental group. This difference that proved to be in favour of the experimental group is thought to be due to the effectiveness of the activities involving Movement education through Coordination that was practised.

Table 4. Post-test agility, swiftness, long jump, tennis ball throwing, sprinting, flexibility, vertical leap, running coordination and static balance motor performance test values pertaining to the experimental and control groups.

Test	Group	n	Mean ± SD	T test		
				T	Sd	P
Agility	Experimental	38	5,77 ± ,23	-19,46	76	,000
	Control	40	7,02 ± ,70			
Swiftness	Experimental	38	5,74 ± ,26	-10,61	76	,000
	Control	40	6,27 ± ,68			
Long Jump	Experimental	38	93,69 ± 9,62	1,50 1,51	76	,047
	Control	40	89,93 ± 12,22			
Tennis Ball Throwing	Experimental	38	11,41 ± 3,67	2,16 2,15	76	,035
	Control	40	9,77 ± 3,00			
Sprinting	Experimental	38	7,16 ± ,63	-2,58 -2,61	76	,016
	Control	40	7,69 ± 1,10			
Flexibility	Experimental	38	16,61 ± 2,51	4,27 4,30	76	,048
	Control	40	13,72 ± 3,36			
Vertical Leap	Experimental	38	19,16 ± 2,13	3,41 3,44	76	,009
	Control	40	17,10 ± 3,07			
Running Coordination	Experimental	38	4,91 ± ,78	-5,93 -5,96	76	,044
	Control	40	6,09 ± ,94			
Static Balance (Flamingo)	Experimental	38	37,39 ± 12,63	2,06 2,08	76	,026
	Control	40	30,15 ± 17,73			

4. Discussion and Results

During the research; the movement education program through coordination was applied to the experimental group during the lessons involving movement and game activities included in the pre-school program for 12 weeks in the form of 2 days and 4 course hours a week. The control group, however, was made to perform the activities required during the lesson hours involving movement and games activities within the same time-frame, and they were not incorporated into the movement education program through co-ordination. In this research, the development of basic motor movements of the children in the experimental group in which the method of Movement Education through Coordination was practised progressed far better than the basic motor movements of those in the control group, and the difference between them was found to be significant in favour of the experimental group. Other study results that seem to support this research are as follows:

As the result of the studies conducted by Rutledge (1993), Zülkadirlioğlu (1995), Aytekin (2001), Şen (2004), Kerkez (2004), Dursun (2004), Ballı (2006), Altınkök (2006), Kerkez (2006), Özdenek (2007), Kırıcı (2008), Karagöz (2009), Öztürk (2009), Çelebi (2010), Ulutaş (2011), Boz (2011), Boz & Aytar (2012), Şahin et al. (2012), Fuchslocher et al. (2013), Yarımkaya & Ulucan (2015), Şenturk et al. (2015) and Altınkök (2015), it is seen that in the development of motor skills, physical development and compatibility and in the development of the components of different sports branches, the absolute development values, when compared with the other children, proved to be higher and more significant in the children on whom different movement education models were practised in a planned and long-term fashion. On the other hand, Çağlak (1999), apart from the conventional methods of education, compared the education on the concept of energy with the education of physical activities in the children aged between 5-6. As a result, it was put forward that as the education on the concept of energy was concerned, the physical education activities in the children aged 5-6 were more effective than the conventional education [13, 14, 15, 16, 17, 18, 19, 20, 21, 22]. Chatrath (2002), in his study in which the physical fitnesses/adaptabilities of the children living in the cities of the USA were analyzed, emphasized the fact that the children whose activities were supposed to be kept at high levels but were ignored had suffered from cardiovascular problems during their adulthood; thus, he came to the conclusion that it was of great importance to pay attention to the activity programs performed during childhood. It is reported that as for the children participating in sports activities during the pre-school period, there will be an increase to be observed in their physical activities and development as well as their social skills by maintaining a collaboration with the specialists in this field, as well [24]. The preference of recreative activities for a healthy and active life-style reduces obesity and minimizes smoking habits by increasing the mental health more and more and becomes efficient in raising healthy and conscious individuals. It was put forward by a number of researches that active life-style and participation in recreative activities during childhood lead to an active adulthood at later ages [25, 26]. It is considered that determining the time and place of recreative activities to be performed and organizing them in the way that they will be beneficial for children are of great importance, and it is thought that such activities need to be supported by the State and private institutions, as well [27, 28].

In Arıkan's (2002) study, which was conducted for the purpose of evaluating the physical activity programs performed in the pre-school educational institutions in Ankara, it was determined that physical activities were included within the program, and that the managers of the involved institution had played a role in specifying the curriculums/programs, while the graduates of the Department of Pediatric Development in universities had played a role in the implementation of these programs; yet, it was also ascertained that the graduates of the Department of Physical Education had participated less in the practices involving these activities. In the course of performing movement education, on the other hand, it was stated that balls were used at most as materials of training, whereas materials like ropes, hoops and cushions were hardly used [18]. Korkmaz & Kuter (2002), however, came to the conclusion that in pre-school educational institutions, there was the need for instructors who were experienced and trained in the field of movement education, and that the activities involving movement education had to be implemented by the instructors experienced in this field. In the study conducted by Korkmaz & Erol (2004), the teachers/instructors in Bulgaria and in Turkey were observed to provide time for leisure time activities as well as taking part in those activities; yet, with respect to the development of rough and fine motor skills in the psychomotor field, the instructors in Turkey were observed to provide very little time for balance and coordination activities when compared with those in Bulgaria; moreover, they were determined to have spared time for running and jumping skills as well as for fine motor skills instead. In line with this, it is understood that the instructors/teachers trained and educated in Turkey do not promote the coordinative faculties as sufficiently as possible, nor as much as it should be [29, 30].

In conclusion; These results seem to support the fact that the field experts in these practices are not proficient in participating in the activities, and that the movement education programs provided for children consist of extremely insufficient and single-level practices in terms of coordination skills, and that the activities regarding movement education must be implemented only after the experts involved in this field or those experienced in this field have provided the necessary in-service training for the instructors of pre-school movement education. When the studies regarding movement and physical activity for healthy

growth in pre-school children and the international literature are taken into consideration, it is thought that guidelines on physical activity, movement and games must be very urgently prepared for families, instructors and institutions during the pre-school period, and that convenient and equal conditions must also be provided in terms of physical activity and movement in pre-school institutions [18, 22]. The development of basic motor movements of the children in the experimental group in which the movement education method through coordination was practised was observed to have shown a much better progress than the basic motor movements of those in the control group, and the difference between them was found to be in favour of the experimental group. Along with the results of the research, it follows that apart from clearly mentioning the importance of educational movement practices so as to develop the larger and smaller muscle groups of the psycho-motor field, the effect of the methods used in education is also great, and the movement education method through coordination has an impact on maintaining and supporting the development of basic motor movements and body coordinations of children as well as supporting the other delicate and indelicate motor muscle groups. Researches as to what methods that are more effective and efficient for children could the pre-school movement education program be provided through as well as determining the problems experienced in this field are advised to be performed for prospective studies.

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