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EXAMINATION OF MOTOR SKILLS IN KINDERGARTEN CHILDREN

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Abstract

The purpose of the research was to study 680 children - 370 boys and 310 girls of to 5-7 year age, they were examined concerning their motor skill. It was found that physical advancement of children reaches, or more exactly exceeds the home references by 50 percent. Their physical advancement is a good base for the physical performances. Evaluated the motor skill of children it was found that in this age interval the girls are better in balancing compared to the boys. The growth rate of girls is also higher than that of the boys. These results are interpreted as characteristics of motion development at the end of the small child age. Uniform development rate was observed in running with evasion and in the two tests elaborated by our group, the boomerang running and the obstacle course. Reliability and validity of both tests were qualified excellent expect for one case. They are both recommended for practical use.

Keywords: motor skill, kindergarten, children

Introduction

In the recent years the motor skill as well as its changes and components have been studied in 410 kindergarten age children (Lepeš &Rajić, 2007). As a result of this study it was found that the physical power of kindergarten age children is determined not only by conditional capacities which support the power but mainly the level of basic forms of motion or the ability to perform motions. Based on these studies it was supposed that in kindergarten age the differences in physical power can bee explained by the differences of skill ability. Following this observation it was decided to study the motor skills of the given age group or more exactly to try out two different tests which are utilizable for complete evaluation of this feature of children. The present study demonstrates the results of the above-mentioned examination.

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Method

During the academic year 2007/2008, 680 children - 370 boys and 310 girls were examined. The age end sex distribution of the participants as well as the average age of different age groups are given in.

Table 1

Age and sex distribution of sample (the average age of the given age group is shown in brackets)

Age	Boys	Girls	Total
Five-year-olds	145 (5.09)	98 (5.08)	243
Six-year-olds	120 (6.06)	129 (6.05)	249
Seven-year-olds	105 (6.49)	83 (6.49)	188
Total	370	310	680

The methods of examinations can be divided into two groups: the examinations of body dimensions and the tests of physical power. Two body dimensions, i.e. the height and body mass were measured according to the standards of anthropometry. By collecting these data our aim was to determine the body development of children such as a background variable which may influence the physical power. The motor skills were assessed by four tests. Two of them were *Fleischman's running with evasion* test and *Standing on one foot* test which were used as standard tests while the over two tests, the *Boomerang running* test and the *Obstacle course* test, were our own developed tests.

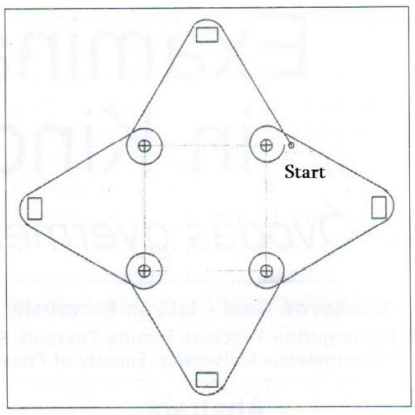
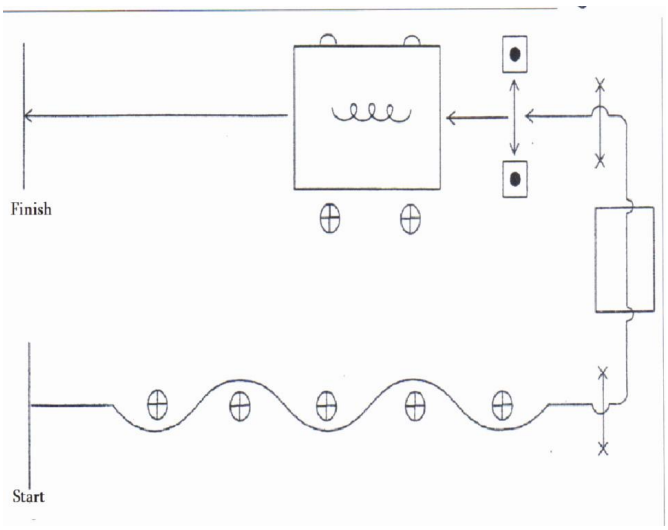


Figure 1. Boomerang running

Boomerang running; A quadrangle area (100 x 150 cm) was drown, with the corners and the centre marked. At each corner of the area a medicine ball was placed. To four directions from the centre through the midpoint of the sidelines, at 200 cm, suitable objects were placed. The exercise was the following: children ran from the medicine ball to the object located at 200 cm distance, and going around it they proceeded towards the direction of the next medicine ball. Approaching it they started crawling (hands and feet on the floor), went around it, then stood up and started going towards the next ball. Each medicine ball and each object at 2 m distance had to be gone around. The test was finished when the children returned and crossed the starting line in a crawling position, having gone around the 4 medicine balls. Time was measured to 0.1 s accuracy. The children completed the course twice in the same order. The results of both trials were recorded.

Figure 2 ***Obstacle course***



Obstacle course. The following course was built: Five medicine balls were set up at 1.5 m from the starting line, and et each 1 m from that. A 50 cm high obstacle was set up at 1 m from the last medicine ball, then place on a small table. One 40 cm high obstacle was also positioned in line with the one on the other side, At 2.5 m distance from this obstacle two balls were placed 2 meters far from each other. The imaginary line connecting the two balls was at the right angle to the direction of the progress. Another obstacle mat was placed proportionally on the remaining distance, in one line with the starting line. The completion of the obstacle course was as following: after the starting signal was given, children ran between the medicine balls with slalom, then passed under the first obstacle. Then they turned and jumped onto the small table, crawled along the surface, then turned round and jumped off on the other end. Having made a turn, they stepped over the second obstacle, and slid along in a sitting position up to the line of the balls. They stood up, changed the two balls and rolled along the mat to its other side. Only one trial before testing was allowed. The examiner explained the next part of the test during the execution. The time was measured to 0.1 s accuracy. The children had to pass the course twice and both of them were recorded.

The basic statistical data; the mean, standard deviation, variation coefficient as well as minimum and maximum values were calculated after checking the accuracy of data. The correlation between the analysed parameters were calculated and a factor analysis was carried out. From the latter one only the weight factor was used to characterize the validity of new tests. In verification of new tests it is fundamental to analyse these two characteristics. Reliability means that the test gives the consistent results each time it is repeated. Validity refers to degree to wich the test accurately measures what it was designed to measure. Both are considered good if the correlation coefficient is higher than 0.8 while the value higher than 0.85 means excellent metric characteristics. For reliability the method of tests and retest was applied.

Table 2

Reliability and validity of Boomerang running and Obstacle course tests

	Boomerang running				Obstacle course			
	Boys		Girls		Boys		Girls	
Age	Reliability	Validity	Reliability	Validity	Reliability	Validity	Reliability	Validity
5 yrs	.886	.931	.947	.931	.869	.937	.941	.937
6 yrs	.948	.977	.883	.951	.958	.993	.911	.981
7 yrs	.960	.971	.817	.888	.942	.979	.928	.934

It can be stated that reliability and validity values are excellent in both tests, in all age groups, in boys and girls. Thus these tests are suggested for assessment of motor skills of kindergarten age children.

Results

The body growth related to the assessments of motor skill was analyzed by the comparison of height and body mass to the standard values. As a result of the comparison it is possible to evaluate the motor power referring to different levels of somatic condition and development. Finally it could be examined if the somatic and motor development are parallel to each other. However for this purpose it necessary to get the standard values of motor power. The statistical data of participant's height are shown in Table 3.

Table 3

Height of participants: descriptive statistics

Age	M	sx	SD	Min	Max	KV
			Boys			
5-year-olds	112,42	0,41	6,02	94,6	128,56	5,29
6-year-olds	117,89	0,32	5,75	101,0	134,40	4,89
7-year-olds	121,0	0,36	5,49	107,0	137,0	4,51
			Girls			
5-year-olds	111,21	0,40	6,02	97,22	136,25	5,40
6-year-olds	116,98	0,34	6,05	99,2	135,0	5,15
7-year-olds	121,68	0,40	5,80	101,0	138,2	4,69

M – Mean; sx - Mean Standard Error; SD – Standard Deviation; Min – Minimal Value; Max – Maximal Value; KV – Koefficient of Variability

The body mass is more sensitive to the influence of environment, e.g. the nutrition, way of life and regular exercise, than the height. Therefore its variability is also higher (see the dispersion and the variation coefficient) than that of height. The minimum and maximum values also refer to the fact that in the samples there are both underweight and overweight children. It is well known that the bigger body mass, i.e. the adiposis is disadvantageous from point of view of efficiacy in some motor tasks. Thus the bigger variability of body mass may cause variations of the motor power. The statistical data of body mass are shown in Table 4.

Table 4

Body mass of participants: descriptive statistics

Age	M	sx	SD	Min	Max	KV
			Boys			
5-year-olds	20,01	0,22	3,23	12,4	30,8	16,17
6-year-olds	22,09	0,21	3,64	13,3	39,2	16,60
7-year-olds	23,01	0,25	3,79	13,0	45,3	16,80
			Girls			
5-year-olds	19,29	0,23	3,41	12,3	34,0	18,01
6-year-olds	21,61	0,23	4,09	13,0	44,9	19,01
7-year-olds	23,01	0,28	4,04	12,4	41,0	17,51

M – Mean; sx - Mean Standard Error; SD – Standard Deviation; Min – Minimal Value; Max – Maximal Value; KV – Koefficient of Variability

If five to six years age grouop, the average height of boys is bigger than that of girls, as it was found in body mass as well. In seven years age group, there is no difference in body mass between sexes. Finally it can be concluded that the examined children have been in good state of bodily development thus is could not be a limiting factor from point of view of physical power. As it was mentioned in the mehod section, the motor skills of children was studied by four motor tests. The balancing and running with evasion tests are well-known. The later requires the ability of good sense of locality and the ability for reorganization of motion. The so-called boomerang running developed by our team for usage in the kindergarten milieu is similar to it. It has been found that all types of coordination abilities contributed in accomplishment of the obstacle course.

Balancing. The statistical data of tests are shown in Table 5.

Table 5

Balancing: descriptive statistics

Age	M	sx	SD	Min	Max	KV
			Boys			
5-year-olds	30,11	0,92	13,39	10,0	59,0	43,66
6-year-olds	32,76	0,88	15,74	10,0	60,0	48,12
7-year-olds	35,29	1,11	16,80	12,0	60,0	47,58
			Girls			
5-year-olds	30,09	0,92	14,12	10,0	60,0	46,88
6-year-olds	34,33	0,83	15,36	10,0	60,0	44,72
7-year-olds	36,49	1,10	16,37	10,0	60,0	44,84

M – Mean; sx - Mean Standard Error; SD – Standard Deviation; Min – Minimal Value; Max – Maximal Value; KV – Koefficient of Variability

Significant relative dispersion observed in both groups, i.e. boys and girls, indicates that samples are highly variable. The balancing power improves continuously between the age of five and seven. The better balancing capacity of girls compared to that of boys near the end of the young child age may be interpreted as a peculiarity of development of motion in girls' group, of course with a very wide range of variability.

Running with evasion. The statistical data are shown in Table 6.

Table 6

Running with evasion: descriptive statistics

Age	M	sx	SD	Min	Max	KV
			Boys			
5-year-olds	33,29	0,50	7,55	17,7	59,0	22,13
6-year-olds	31,11	0,40	7,02	15,1	57,0	22,55
7-year-olds	28,34	0,52	7,72	12,0	55,7	27,28
			Girls			
5-year-olds	34,04	0,51	7,69	16,1	57,5	22,60
6-year-olds	31,54	0,42	7,62	11,0	63,9	24,21
7-year-olds	29,71	0,51	7,49	12,4	55,9	25,21

M – Mean; sx - Mean Standard Error; SD – Standard Deviation; Min – Minimal Value; Max – Maximal Value; KV – Koefficient of Variability

It was found that the average power in relation to to the different ages improved continuously. The total development of boys during the two years was bigger than that of girls. The results of boys were higher in the Kanjiža kindergarten as well.

Boomerang running. The statistical data show an improvement of 3.2 s in boys and 2.51 s in girls between the age of 5 and 7 years.

Table 7

Boomerang running

Age	M	sx	SD	Min	Max	KV
			Boys			
5-year-olds	25,58	0,47	6,58	12,8	49,0	26,58
6-year-olds	24,66	0,42	7,59	10,7	58,0	30,50
7-year-olds	22,45	0,46	6,87	13,1	60,0	30,79
			Girls			
5-year-olds	25,88	0,48	7,29	10,6	53,0	28,30
6-year-olds	24,71	0,36	6,94	10,2	50,0	27,02
7-year-olds	23,32	0,44	6,70	14,2	48,0	28,71

M – Mean; sx - Mean Standard Error; SD – Standard Deviation; Min – Minimal Value; Max – Maximal Value; KV – Koefficient of Variability

The difference between the extreme values and the relative dispersion resulting from it, are bigger than values found in running with evasion. It allows the conclusion that this test is more complicated for this age group than running with evasion. In both sexes the relative dispersion in 7 years age was bigger than in the previous ages. This finding suggests that the dimension of the test-field should be modified because of the height increase in the period between the 5 and 7 years age, as in our examinations this height increase was 8.5 cm in boys 9.85 cm in girls. It is supposed that evasion of objects which are close to each other is more difficult for taller children especially when they have to go round the objects on their hand and knees.

Obstacle course. The statistical data shown in Table 8.

Table 8

Obstacle course: descriptive statistics

Age	M	sx	SD	Min	Max	KV
			Boys			
5-year-olds	32,7	1,24	7,41	23,1	51,4	22,49
6-year-olds	28,51	0,82	6,59	15,2	50,1	23,10
7-year-olds	26,90	1,16	6,41	14,98	41,9	23,80
			Girls			
5-year-olds	31,71	1,36	9,8	19,7	58,7	26,79
6-year-olds	29,80	0,97	7,55	18,5	56,8	25,39
7-year-olds	27,01	0,99	5,34	17,0	40,1	19,79

M – Mean; sx - Mean Standard Error; SD – Standard Deviation; Min – Minimal Value; Max – Maximal Value; KV – Koefficient of Variability

The changes of mean values across different age groups are uniform, however the improvement is higher between the age 5 and 6 years and lower between the age of 6 and 7. Boys show better performance in every age group but the total increase is bigger than in girls' group. Although the relative dispersion is acceptable, the extreme values demonstrate that there are very agile and very clumsy children in the sample as well.

Discussion

The height and body mass of children were measured for the assessment of bodily development. When comparing obtained data to the Vojvodina reference values, it was found that average values of boys does not reach 75% while in the other age groups it is bigger. The average values of girls at the age of 6 and 7 are higher than 50%, and the means of other age groups are higher than 75% which is a favorable base for the motor performance. The motor tests examined the developmental state of coordination abilities. It was concluded that in the transition period between the nursery and the school, besides the average values of motor performance, the knowledge of basic development of skills connected to the fundamental forms of motion are also important. Analysis of age-dependent differences based on the motor performances shows that the sensitive period of motor development is the period between the age 6-7 years. It occurs not by chance but as a result of systematic factors influencing the development. Based on the results it can be pointed out that the transition period between the nursery and the school is a very sensitive and crucial period from point of view of motor development. This period may determine the acquirement of different types of motor skills needed in the different branches of sport in later ages.

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