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Effects of Kindergarten Period on School Readiness and Motor Abilities

Gustav Bala[1], Željko Krneta[1] and Ratko Katić[2]

[1] Faculty of Sports and Physical Education, Novi Sad, Serbia
[2] Faculty of Kinesiology, University of Split, Split, Croatia

A B S T R A C T

A battery of 4 school-readiness tests and 16 motor tests were administered in a sample of 660 preschool children (333 male and 327 female) just about to enroll in the first grade, in order to analyze the effects of kindergarten period on school readiness and motor abilities. The sample of children was divided into six groups according to sex and duration kindergarten attendance (kindergarten period of 5 years, 3 years and 8–9 months). Study results showed the entire education and motor activities in kindergarten to contribute significantly to school-readiness and motor abilities of children. The highest school readiness was found in the children that attended kindergarten for the longest period, whereas lowest school readiness was recorded in children that attended kindergarten for only one academic year or less before enrolling in the first grade.

Key words: *preschool children, motor abilities, school readiness*

Introduction

In south-east Europe (former republics of Yugoslavia) and in some neighboring countries (Hungary, Romania, Bulgaria, Greece, etc.), children are generally very early included in the education process at preschool institutions. These children spend a varying time at preschool institutions, some being included in the process as early as at the age of 18 months, and others at the age of 36 months to 4 years or later prior to enrolling in school. Some children stay at preschool institution from the age of 4 until enrolling in elementary school, whereas others are included in the process 9 months before enrolling in elementary school. According to age at starting the process or different times spent at preschool institutions, we might speak of different children groups subjected to different education treatments. All groups practice morning and day-time physical activities (calisthenics, walking, running, crawling, climbing, passing through obstacles, pulling, jumping, throwing, balancing, ball games, and other games), strolling and outings. Models of activities, types of exercises, intensity, duration and frequency of exercises are, naturally, gradually increased in quantity and complexity from baby age to the older preschool age.

Different times spent at preschool institutions lead to a conclusion that it is not possible to realize a complete program of preschool education, thus raising the question of the effects of education on the psychosomatic state of these groups at the time of enrolling in elementary school. By getting an insight into the situation, we can obtain information on the characteristics and abilities that are important for enrolling in the school system, i.e. the value of education in separate stages at preschool institutions.

The basic idea of such an approach emerged from the findings of Bala, Sabo and Popović (2005)[1] in a sample of 660 preschool children about to enroll in first grade, where a battery of 16 motor tests were applied to analyze the relation between the children's motor abilities and school readiness. The relation obtained showed general motor ability to correlate positively with general school readiness both in male and female children. Statistical significance and positive correlation between the set of motor variables and the set of school readiness variables, i.e. cognitive abilities, pointed to the extreme importance of motor exercising in preschool age.

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The aim of this paper is to analyze the effects of kindergarten period on the development of motor and cognitive abilities in preschool children about to enroll in elementary school first grade.

Materials and Methods

Participants

The sample was drawn from the population of children in the city of Novi Sad (Voivodina, Serbia) immediately before enrolling in the first grade. The study included a sample of 660 preschool children, mean age 6.5 (SD=0.17) years, consisting of the following six subgroups:

- 116 boys and 110 girls having attended kindergarten from age 1.5 year, i.e. 5 years in kindergarten (5-year group);
- 108 boys and 110 girls who having attended kindergarten from age 3 years, i.e. 3 years in kindergarten (3-year group); and
- 109 boys and 107 girls having attended kindergarten for only 8–9 months, i.e. one year before enrolling school (1-year group).

Instruments

School readiness of preschool children was evaluated by use of POŠ test (Toličič, 1986)[2], which consists of four cognitive subtests:

- understanding messages, demands, orders, as well as identification and understanding sentences, words and syntax: 1) speech comprehension;
- ability to conclude and use experience: 2) reasoning;
- fine hand coordination, as well as ability to copy different figures as a whole and their parts: 3) graphomotor abilities; and
- perceptiveness: 4) understanding amounts.

The battery of 16 motor tests used in the study was selected on the basis of experiences with adults, and some of the tests were modified for small children (Bala, 1999a, 1999b)[3,4]. These tests estimate (for adults) the effectiveness of the following functional mechanisms: movement structuring, tonus and synergetic regulation, regulation of excitation intensity and regulation of excitation duration (Gredelj et al., 1975; Kurelić et al., 1975)[5,6]. Motor abilities of preschool children were estimated by the following motor test battery:

- gross body coordination: 1) coordination by baton, 2) obstacle course backwards, 3) slalom with 3 balls;
- frequency of simple movements: 4) arm plate tapping, 5) foot tapping;
- flexibility: 6) forward bend on a bench, 7) straddle split;
- balance: 8) standing on two legs-across, 9) standing on one leg-along;
- explosive strength: 10) standing broad jump, 11) hand grip;
- static strength: 12) bent-arm hang, 13) holding legs on a box;
- dynamic strength: 14) leg-lifting, lying on the back, 15) sit-ups; and
- sprint (dash): 16) 15-meter dash.

The motor tests are briefly described below.

1) Coordination by baton. The child is standing in the middle of the mat holding a wooden stick in front of him/her. On »GO« command his/her task is to turn around by 180^0, sit, lay on his/her back, pull through both legs over the stick between his/her hands, and stand up in start position. The score is the length of time required to complete the task, measured in tenths of second.

2) Obstacle course backwards. The child has to walk backwards on all fours and cover a 10-m distance, climb the box top and go through one section of the box. The score is the length of time required to complete the task, measured in tenths of second.

3) Slalom with 3 balls. On »GO« command the child rolls three balls between cones and covers a 10-m distance. After he/she has passed the last of five cones, the child turns around it while continuously rolling the balls around the cones towards the start line. The task is completed when the child rolls all three balls over the start line. The score is the length of time required to complete the task, measured in tenths of second.

4) Arm plate tapping. For fifteen seconds the child has to tap, in sitting position, alternately two plates on the tapping board with his/her dominant hand, while holding the other hand between the two plates. The score is the number of alternate double hits completed in 15 seconds.

5) Foot tapping. For twenty seconds the child, sitting on the chair, has to lift his/her preferred foot over the perpendicular partition of the board for foot tapping and tap the board on the other side. The score is the number of cycles completed in 20 seconds.

6) Forward bend on a bench. The child stands on a bench and bows as deep as possible. A straight-angle ruler which points down with the 40 cm mark at the child's feet, and 40 cm below it, is next to him/her. The score is the depth of the reach measured in cm.

7) Straddle split. The child is standing on a wooden plate, side to the wall, and with his/her foot touching the wall. The task is to move his/her other leg as far as possible to the other side over the wooden plate. The score is the horizontal distance from the wall to outside distance of the subject's foot, measured in centimeters.

8) Standing on two legs-across. The child balances on the wood balance rail standing with both legs with the long axis of the rail perpendicular to the long axis of the feet, with his/her hands on his/her hips. When the child feels he/she has his/her balance he/she says »GO«, and the tester starts the stop watch. The time ends when the child touches the floor with any part of his/her body, or when he/she removes either hand from his/her hips. The

score is the time he/she held his/her balance, measured in tenths of second.

9) Standing on one legs-along. This task is similar to the previous one, only the child balances on the wood balance rail standing with preferred leg with the long axis of the rail parallel to the long axis of the foot, with his/her hands on his/her hips. The score is the time he/she held his/her balance, measured in tenths of second.

10) Standing broad jump. The child jumps with both feet from the reverse side of Reuter bounce board onto a carpet that is marked in cm. The score is the length of the jump in cm. The task is performed three times without rest, with the longest jump recorded as the final result.

11) Hand grip. Using the stronger hand, the child on command squeezes the dynamometer once, sharply, as hard as he/she can. The score is the best of three squeezes repeated with rest of at least thirty seconds between trials.

12) Bent-arm hang. The child under-grips the bar and holds the pull-up as long as he/she can (with the chin above the bar). The score is the time of the hold, measured in tenths of second.

13) Holding legs on a box. The child is laying flat on his/her stomach on a wooden box with his/her legs in horizontal position over the floor. The task is to hold this position as long as he/she can. The score is the time of the hold measured in tenths of second.

14) Leg-lifting lying on the back. The child is laying flat on his/her back, hands behind his/her neck, the partner holds his/her elbows down to the floor. After the »GO« signal the child raises his/her legs until they are vertical, and then returns them to the floor. The score is the number of times the legs were elevated to vertical position in twenty seconds.

15) Sit-ups. The child lies on his/her back with his/her knees bent and arms crossed on the opposite shoulders. He/she rises into seated position and returns into starting position. The instructor's assistant holds the child's feet. The score is the number of correctly executed rises to the seated position (no longer than 60 seconds).

16) 15-meter dash. On »GO« command the child that stands behind the start line has to run 15 m as fast as he/she can to the end of the track (15 m). The score is the time of running, measured in tenths of second.

Procedures

Measuring and testing was carried out at the time of school enrollment (in the same academic year). Children's parents were asked to give their consent for their children's participation in the study and to provide necessary information on their children. School readiness was tested by psychologists, whereas motor abilities were tested by senior students of the Faculty of Sports and Physical Education and Preschool Teachers' Training College in Novi Sad. All measurements and tests were performed under standard conditions and by standard apparatus.

Data analysis

Multivariate and univariate analyses of variance and canonical discriminative analysis were used to test for the significance of differences in all variables between male and female children at the time of school enrollment. The effects of interaction of the children classification according to kindergarten period and sex were assessed by the same statistical methods.

Results

The values of means (Mean) and standard deviations (SD) of the variables analyzed in male and female children statistical tests for multivariate (F and P) and univariate (f and p) analyses of variance are presented in Table 1. The results of multivariate and univariate analyses of variance showed statistically significant differences in cognitive and motor abilities of children ($p=0.00$). However, the variables used to evaluate cognitive readiness for school (speech comprehension, reasoning, graphomotor abilities, and understanding amounts) and some manifestations of motor abilities, i.e. coordination (Coordination by baton, Slalom with 3 balls), frequency of simple movements (Arm plate tapping), flexibility (Straddle split), balance (Standing on two legs across), and strength (Holding legs on a box, Leg-lifting lying on the back, Sit-ups) yielded no statistically significant differences.

As the whole system of variables was statistically significant in discrimination between male and female children ($p=0.00$), it was determined generally that motor variables had the most important effect on the discriminant factor structure. The following motor variables were associated with a significant effect: Standing broad jump, Hand grip, Obstacle course backwards, Foot tapping, Standing on one leg-along, Bent-arm hang, Forward bend on the bench, Leg-lifting lying on the back, 15-meter dash, Slalom with 3 balls, and Arm plate tapping. Boys performed significantly better on the motor tests evaluating explosive strength (Standing broad jump and Hand grip), gross body coordination (Obstacle course backwards, Slalom with 3 balls), strength (Bent-arm hang, Leg-lifting lying on the back) and sprint (15-meter dash). Girls were more successful on the motor tests assessing the frequency of simple movements (Foot tapping), flexibility (Forward bend on the bench), and balance (Standing on one leg-along).

The information needed to answer the problem of the study is presented in Tables 2 and 3. In male children, the system of the variables applied was statistically significant in discriminating the three groups of children (Table 2).

It was easy to note that kindergarten period produced significant differences in school readiness (cognitive) and motor variables, which showed statistically significantly better results in subjects having attended kindergarten for a longer period of time. This conclusion was reached by ANOVA and gradation of quantitative values of these

TABLE 1
RESULTS OF MANOVA (F and P) AND ANOVA (f and p) AND CANONICAL DISCRIMINATIVE ANALYSIS OF VARIABLES BETWEEN MALE AND FEMALE CHILDREN

Variable	Male (n=333) $\bar{X}$±SD	Female (n=327) $\bar{X}$±SD	f	p	DF
Speech comprehension (point)	11.77±2.64	12.00±2.42	1.41	0.24	0.09
Reasoning (point)	8.15±3.39	8.28±3.36	0.24	0.62	0.04
Graphomotor abilities (point)	12.10±5.52	11.98±5.41	0.08	0.77	–0.02
Understanding amounts (point)	7.76±2.61	7.42±2.89	2.46	0.12	–0.11
Coordination by baton (0.1 s)	50.94±30.70	51.56±28.91	0.07	0.79	0.02
Obstacle course backwards (0.1 s)	311.91±94.77	356.69±119.75	28.40	0.00	0.39
Slalom with 3 balls (0.1 s)	755.08±245.23	783.09±235.04	2.24	0.13	0.11
Arm plate tapping (freq.)	13.98±1.95	14.19±1.83	2.05	0.15	0.10
Foot tapping (freq.)	26.35±3.14	27.07±3.07	9.01	0.00	0.22
Forward bend on a bench (cm)	42.89±5.49	43.91±5.52	5.71	0.02	0.17
arsid13646857 Straddle split (cm)	112.28±9.24	111.51±10.70	0.99	0.32	–0.07
Standing on two legs-across (0.1 s)	89.39±79.91	95.35±79.25	0.92	0.34	0.07
Standing on one leg-along (0.1 s)	76.95±80.58	95.38±104.46	6.45	0.01	0.18
Standing broad jump (cm)	118.33±17.08	108.75±16.40	53.95	0.00	–0.53
Hand grip (kp)	12.45±2.37	11.24±2.06	48.60	0.00	–0.51
Bent–arm hang (0.1 s)	77.48±65.73	65.28±58.13	6.36	0.01	–0.18
Holding legs on a box (0.1s)	219.65±185.22	209.86±185.99	0.46	0.50	–0.05
Leg-lifting lying on the back (freq.)	17.46±10.15	16.25±8.46	2.79	0.09	–0.12
Sit-ups (freq.)	9.43±8.80	9.16±8.42	0.17	0.68	–0.03
15-meter dash (0.1 s)	41.20±4.99	41.76±3.74	2.73	0.10	0.12
	F=9.27	p=0.00			
Group Centroids	–0.532	0.544		Can R=0.474*	

DF – structure of discriminative function, Can R – coefficient of canonic discrimination, *p<0.001

variables according to groups, i.e. the best and similar results were recorded in the 5- and 3-year groups of children, whereas poorest results were found in the 1-year group.

The following variables yielded no statistically significant differences: Coordination by baton, Forward bend on the bench, Standing on two legs-across, Hand grip, Bent-arm hang, Holding legs on a box, and Sit-ups. Some of these include complex gross body coordination (Coordination by baton, as yet inappropriate for small children due to the disproportional growth of extremities), flexibility (by some considered not to be a motor ability; Forward bend on a bench), and variables for strength assessment (which definitely is not characteristic of small children) (Hand grip, Bent-arm hang, Holding legs on a box, and Sit-ups).

Canonical discriminative analysis indicated only one discriminative factor to have a significant role in discrimination among the three children groups (Table 2). The set of variables used in female children was also statistically significant in discrimination among the three groups of children (p=0.00).

In this analysis, quantitative differences were also in favor of children with longer kindergarden period. The magnitude of coefficients in the structure of canonical discriminant function revealed all the variables to play a role in discrimination of the three groups of children, however, cognitive variables, i.e. those assessing school readiness were most important. The involvement of motor variables for assessment of gross body coordination, frequency of simple movements, but also explosive strength and partly balance was also recorded. These data, along with the size and group centroid patterns, revealed the children with longest kindergarten period (5-year group) to be significantly superior to the children having attended kindergarten for 3 years (3-year group), and even more to the children with 1-year kindergarten period (1-year group).

In female children, the length of kindergarten period also produced significant differences in school readiness (cognitive) and motor variables, with statistically significantly better results in subjects having attended kindergarten for a longer period than the 1-year group. This conclusion was reached by ANOVA and gradation of quantitative values of these variables within the groups,

TABLE 2
RESULTS OF MANOVA (F and P) AND ANOVA (f and p) AND CANONICAL DISCRIMINATIVE ANALYSIS OF VARIABLES IN MALE CHILDREN

Variable	5-year n=116 Mean	3-year n=108 Mean	1-year n=109 Mean	F	p	DF
Speech comprehension (point)	12.75	12.32	10.17	37.12	0.00	0.66
Reasoning (point)	9.19	8.97	6.24	30.64	0.00	0.60
Graphomotor abilities (point)	14.35	13.05	8.76	38.20	0.00	0.67
Understanding amounts (point)	8.56	8.22	6.45	23.78	0.00	0.53
Coordination by baton (s)	4.93	4.92	5.44	1.03	0.36	–0.11
Obstacle course backwards (s)	29.70	29.61	34.34	9.40	0.00	–0.33
Slalom with 3 balls (s)	72.38	73.64	80.69	3.75	0.02	–0.21
Arm plate tapping (freq.)	14.20	14.19	13.53	4.26	0.01	0.22
Foot tapping (freq.)	26.76	26.49	25.77	2.99	0.05	0.19
Forward bend on a bench (cm)	43.66	42.91	42.06	2.41	0.09	0.16
Straddle split (cm)	114.63	113.06	109.01	11.67	0.00	0.37
Standing on two legs-across (s)	9.36	8.98	8.45	0.36	0.70	0.06
Standing on one leg-along (s)	8.24	8.77	6.05	3.55	0.03	0.19
Standing broad jump (cm)	122.11	118.14	114.49	5.77	0.00	0.24
Hand grip (kp)	12.58	12.54	12.23	0.71	0.49	0.09
Bent-arm hang (s)	7.86	8.41	6.97	1.33	0.26	0.11
Holding legs on a box (s)	22.58	24.38	18.91	2.49	0.08	0.23
Leg-lifting lying on the back (freq.)	18.46	18.78	15.10	4.51	0.01	0.15
Sit-ups (freq.)	8.48	8.99	10.88	2.30	0.10	–0.16
15-meter dash (s)	4.07	4.02	4.27	8.47	0.00	–0.30
	F=4.01		p=0.00			
Group Centroids	0.605	0.376	–1.016		Can R=0.583*	

DF – structure of discriminative function, Can R – coefficient of canonic discrimination, *p<0.001

i.e. the best and similar results were recorded in the 5- and 3-year groups, and poorest results in the 1-year group.

The following variables showed no statistically significant differences: Coordination by baton, Obstacle course backwards, Arm plate tapping, Foot tapping, Standing on two legs-across, Standing on one leg-along, Hand grip, Bent-arm hang, Holding legs on a box, and Sit-ups. These are manifestations of gross body coordination (Coordination by baton, and Obstacle course backwards), frequency of simple movements (Arm plate tapping, and Foot tapping), and variables for assessment of static strength (Bent-arm hang, and Holding legs on a box), and dynamic strength (Sit-ups).

Table 3 indicates that the discriminative factor structure was not defined significantly by these variables. Instead, the variables for intellectual status assessment played a major role (Graphomotor abilities, Speech comprehension, Reasoning, and Understanding amounts), and to a considerably lesser yet significant extent the variables assessing flexibility (Straddle split and Forward bend on a bench), explosive strength and coordination (Standing broad jump, 15-meter dash, and Slalom with 3 balls). Based on group centroids, female children with longest kindergarten period (5-year group) showed significantly superior performance according to all these variables, whereas those with shortest kindergarten period (1-year group) had significantly inferior results.

Discussion

Analysis of the variables used to assess school readiness in preschool children yielded no statistically significant sex differences, suggesting that mental development, i.e. cognitive functioning, follows the same pattern in both male and female children.

Boys were significantly better in performing motor tests for prediction of gross coordination and explosive strength, while girls were superior in the frequency of simple movements, flexibility and balance. This finding is in agreement with the results of Bala (2003)[7] in a sample of 367 children, 223 male and 144 female, 4–7 years of age, subjected to seven motor tests. Upon partialization of motor test variables by children's age and body composition variables, the results obtained pointed to the existence of the 'motor potential capacity'. In such a motor

TABLE 3
RESULTS OF MANOVA (F and P) AND ANOVA (f and p) AND CANONICAL DISCRIMINATIVE ANALYSIS OF VARIABLES IN FEMALE CHILDREN

Variable	5-year n=110 Mean	3-year n=110 Mean	1-year n=107 Mean	f	p	DF
Speech comprehension (point)	12.90	12.82	10.24	56.12	0.00	0.63
Reasoning (point)	9.42	9.20	6.18	38.67	0.00	0.52
Graphomotor abilities (point)	14.32	13.80	7.71	71.42	0.00	0.71
Understanding amounts (point)	8.22	8.26	5.75	31.82	0.00	0.47
Coordination by baton (s)	4.79	5.02	5.67	2.74	0.06	–0.14
Obstacle course backwards (s)	34.57	34.74	37.74	2.40	0.09	–0.13
Slalom with 3 balls (s)	73.57	77.73	83.73	5.22	0.00	–0.18
Arm plate tapping (freq.)	14.48	14.08	14.00	2.12	0.12	0.08
Foot tapping (freq.)	27.12	27.11	26.99	0.05	0.94	0.02
Forward bend on a bench (cm)	44.62	44.38	42.71	3.90	0.02	0.16
Straddle split (cm)	114.21	112.66	107.56	12.19	0.00	0.29
Standing on two legs-across (s)	8.56	9.22	10.85	2.4	0.09	–0.13
Standing on one leg-along (s)	8.72	9.15	10.76	1.14	0.32	–0.09
Standing broad jump (cm)	112.92	108.67	104.57	7.26	0.00	0.20
Hand grip (kp)	11.36	11.16	11.21	0.26	0.76	0.02
Bent-arm hang (s)	6.83	6.19	6.57	0.34	0.71	0.00
Holding legs on a box (s)	21.86	22.92	18.11	2.01	0.13	0.15
Leg-lifting lying on the back (freq.)	18.38	15.65	14.69	5.70	0.00	0.11
Sit-ups (freq.)	8.94	9.58	8.94	0.21	0.81	0.02
15-meter dash (s)	4.12	4.14	4.27	4.69	0.01	–0.18
	F=5.39	p=0.00				
Group Centroids	0.747	0.556	–1.333		Can R=0.685*	

DF – structure of discriminative function, Can R – coefficient of canonic discrimination, *p<0.001

factor, quantitative differences showed the boys to achieve significantly better results in motor tests for estimation of explosive strength and gross body coordination of primary motor abilities, whereas girls performed better on flexibility tests.

Previous studies (Babin et al., 2001; Katić, 2003; Katić et al., 2004; Katić et al., 2005; Vlahović et al., 2007; Katić et al., 2008)[8–13] have shown that motor abilities generally follow a comparable pattern of development in 8-year-old male and female children, yet some sex specificities were observed. Sex differences in motor abilities that occur in preschool age (and even earlier) determine motor functioning of elementary school first-graders. On motor task performance, male children predominantly use strength and female children speed (and flexibility), i.e. the abilities potentially prevailing in either of them.

As the entire system of variables was statistically significant in discriminating the three study groups (p= 0.00), the results of ANOVA showed the kindergarten period to influence differences in all variables for predicting school readiness, and more than half of the motor variables applied were significantly better in children having attended kindergarten for a longer period (5-year and 3-year groups). Generally, male children performed better on motor tests, whereas school readiness tests were performed with comparable success by both male and female children, as also reported from previous studies.

Within the structure of canonical discriminant factor in both boys and girls, the most important were graphomotor abilities and speech comprehension, while reasoning and understanding amounts were less important. It is obvious that graphomotor abilities in preschool children are very important, as indicated by some other complex researches in that field (e.g., Del Giudice et al., 2000)[14].

According to the structure of canonical discriminant factor in boys and girls, it could be concluded that the general motor ability is in positive correlation with general school readiness. This conclusion is in agreement with other researches (Dolenec et al., 2002; Pistotnik et al., 2002; Planinšec, 2002)[15–17] reporting on positive and significant associations of motor and cognitive abilities in male and female children alike.

Oja and Jurimae (2002)[18] studied the relationships among physical activity, motor ability and school readi-

ness in 294 healthy 6-year-old children from Tartu (161 boys and 133 girls). The physical activity of children was reported by parents and teachers using the questionnaire of Harro. The motor ability of children was evaluated using various tests from the Eurofit test battery and 3-min shuttle run test. The Controlled Drawing Observation test was used as a predictor of school readiness and development of mental abilities. Indoor physical activities predicted 19%–25% of total variance in motor scores for these preschool children. Motor ability tests, which demand children's total attention and concentration, seem to be related to the measures of school readiness chosen.

Conclusion

Our study results suggested the entire education and motor activities at kindergarten to contribute significantly to the development of school readiness and motor abilities. The degree of this development depends on the length of kindergarten period. The best school readiness and motor abilities were recorded in children having attended kindergarten for a long period and worst in children having attended kindergarten for only one academic year (9 months) before enrollment in school.

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R. Katić

Faculty of Kinesiology, University of Split, Teslina 6, 21000 Split, Croatia
e-mail: ratko.katic@gmail.com

UTJECAJ DULJINE BORAVKA U PREDŠKOLSKIM VRTIĆIMA NA SPREMNOST ZA ŠKOLU I MOTORIČKE SPOSOBNOSTI

SAŽETAK

Četiri testa spremnosti za školu i 16 motoričkih testova primijenjeno je na uzorku od 660 predškolske djece (333 dječaka i 327 djevojčica) neposredno prije upisa u prvi razred osnovne škole, kako bi se procijenio utjecaj boravka u vrtiću na spremnost za školu i motoričke sposobnosti. Cjelokupni uzorak je podijeljen u šest skupina prema spolu i duljini boravka u vrtiću (5 godina, 3 godine ili 8–9 mjeseci). Rezultati su pokazali kako izobrazba i motoričke aktivnosti stečene u vrtiću značajno doprinose spremnosti za školu i motoričkim sposobnostima djece. Najviša razina spremnosti za školu zabilježena je kod djece koja su najduže pohađala vrtić, a najniža kod one djece koja su vrtić samo jednu školsku godinu ili kraće prije upisa u prvi razred osnovne škole.