



## The role of karate in preparing boys for school education

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### Abstract

Karate classes can positively affect the health of children and develop body and soul harmoniously. The purpose of the work is to examine the influence of physical education classes with a priority in application of oriental martial arts on the physical and psychophysical preparedness of preschool boys (n=71). Assessment of physical and psycho-physical preparedness for children was performed with the set of tests (standing long jump, throws of the ball against the wall and catching it, flexion and extension of arms lying on the floor, jumping with a rope to fatigue, raising of the body from the initial supine position, squats, writing the letter "O", claps, pronouncing of digits, keeping the "Flamingo" pose). The children from the experimental group (n=33) were trained by the program with the priority in application of karate. Children from control group had Physical Education classes according Ukrainian State program for preschooler children "Sure Start". The physical state and the level of psycho-physical fitness were rated as average. The implementation of the physical education program with the priority in application of karate has proven its higher efficacy compared to the traditional one. The program contributed significantly to raising the level of physical and mental fitness, overall assessment increased from 3.0 to 4.8 points in the experimental group. Better discipline, greater attention, higher mental capacity and less fatigue of children who attended the author's program confirm that the classes with the priority of karate application can promote the full readiness of children for school.

**Keywords:** martial arts, preschool age, physical education, school.

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## INTRODUCTION

The problem of adaptation a child to school is the first and most urgent task. Changes in the lifestyle of the child at the initial stage of education place put forward high demands to the adaptive capacity of the body and require strong physical and mental health, the ability to complex mental analytical and synthetic activity, cognitive activity, cognitive activity, and development of moral and volitional qualities. Among the factors that have a significant effect on adaptation to schooling and new environment, health plays an important role [1]. And at the same time, the period of pre-school childhood is considered important to the health formation and preservation in the future.

Karate classes can positively affect the health of children and develop body and soul harmoniously. From an early age, this training will promote upbringing and self-esteem [2,3]. Doing oriental martial arts contributes to the health improvement and harmonious physical development. Using oriental martial arts during the lessons of physical education develops speed, agility, and flexibility; creates socially important skills for a future student, high moral qualities; promotes the development of sensorimotor skills; triggers aesthetic emotions of children; satisfies children needs [2,4,5,6,7]. Martial arts have always attracted a large audience of spectators. The number of preschool children who are willing to do martial arts is increasing every year. Certain types of martial arts contain a wide range of varieties of motor activity – from hard full contact fights to completely contactless choreographic tools [8,9,10] that can be used in physical education from the youngest age.

The purpose of the work is to examine the influence of physical education classes with a priority in application of oriental martial arts on the physical and psychophysical preparedness of boys of preschool age.

## MATERIAL AND METHODS

### *Subject*

Teaching experiment was organized on the basis of 4 preschool establishments whose level of educational programs meets the requirements of Ukrainian state pre-school educational program. The experimental group consisted of 33 boys, in the control group was 38 boys. Passport age of all children at the beginning of the pedagogical experiment was 5 years old.

The children of the experimental group (EG) were trained by an authorial program with the priority in application of karate. The control group (CG) was trained according to the current state education program for preschool children "Sure Start".

### *Protocol*

Data and information obtained in the previous stages of research, allowed us to justify the content and structure of the program of physical training of preschool children with the priority in application of karate (Figure 1). In the author's program developed for the academic year there are 12 sessions per month, it is 144 sessions in total for the year.

The program is divided into four structural modules lasting 3 months each. Each module ends with a control exercise. During each module sessions a child had to learn the course material sequentially, to perform specific tasks according to the program. Each module is characterized by own specific tasks, tools, forms of physical education, criteria of efficiency, specific patterns; different principles and features of their implementation acquired significance.

The stable functional relationship existed between modules that ensures the integrity and consistency of physical education programs to improve psychomotor functions of preschoolers to ensure full readiness of children for school. Integrity of psychomotor preparation of preschool children in terms of physical training was determined by relatively stable sequence of components (modules).

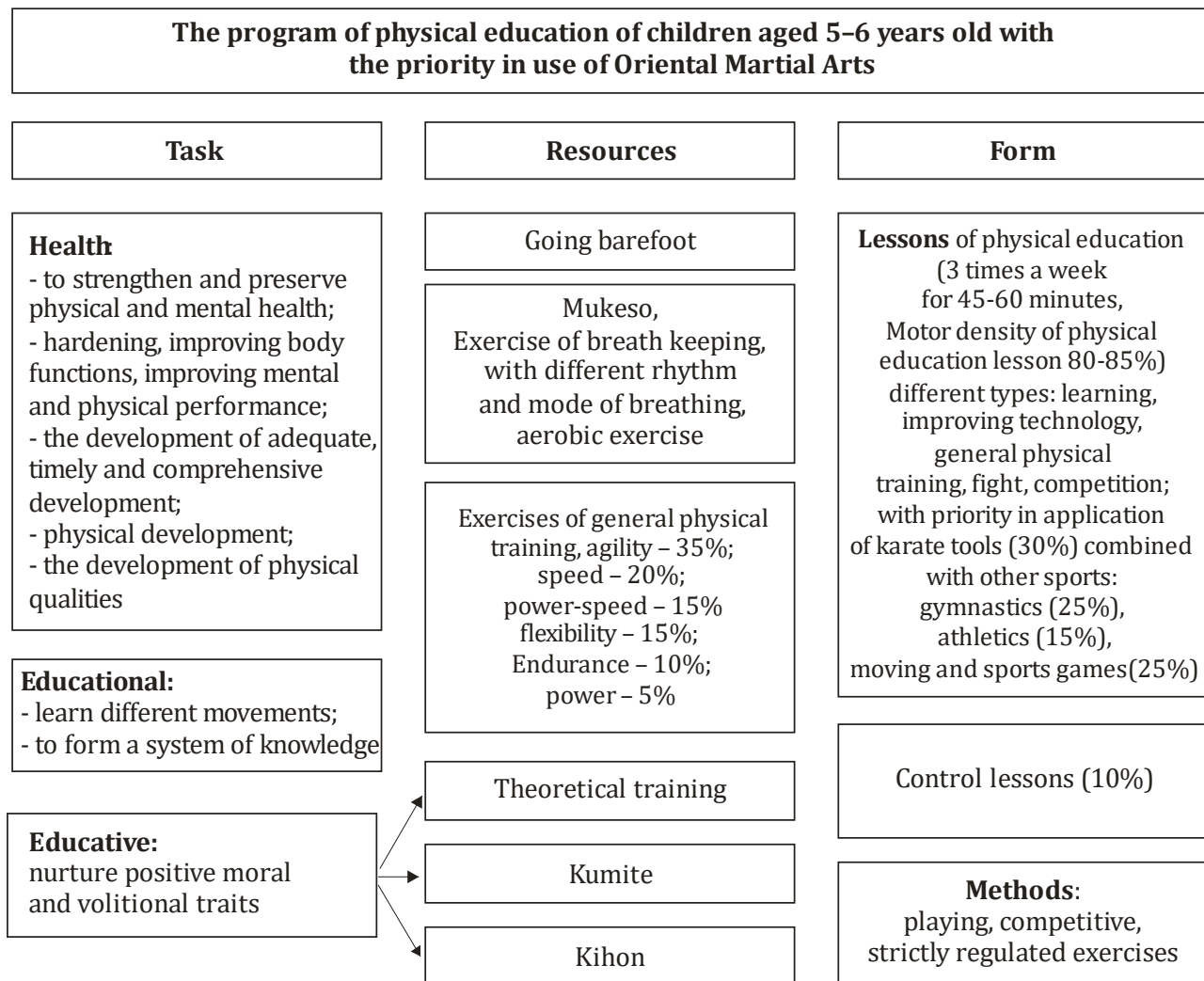


Figure 1. Schema of author's program with the priority in application of karate.

According to the scientific literature recommendation means of physical exercises according to annual increases of year indicators of physical readiness in a particular age gained the priority. Data obtained in the previous stage of research and the experience of own work were used to explain the rational ratio of means of different directions in the training program of preschoolers.

To achieve the objectives the following was used: data analysis and synthesis of the literature and empirical data of scientific researchers; teaching methods; biomedical methods; psychophysiological methods; statistical methods.

Assessment of the physical condition of children was carried out (table 1). The calculation of the mass-growth index and the posture index was carried out according to generally accepted methods [11].

Assessment of physical and psycho-physical preparedness for children was performed with the set of tests. For assessing of child's physical preparedness the following tests were used: standing long jump, throws of the ball against the wall and catching it, flexion and extension of arms lying on the floor, jumping with a rope to fatigue, raising of the body from the initial supine position, squats. To evaluate the psychophysical readiness of a child a series of special 10-second tests (writing the letter "O", squats, claps, pronouncing of digits) and keeping the "Flamingo" pose were used. Standards and scales for assessing of these tests are submitted in table 2–3.

Table 1. Scale of evaluation of children's physical condition.

Investigated indicators	Quantitative and scoring rates of physical condition				
	Low (L; 1 point)	Below average (BA; 2 points)	Average (A; 3 points)	Above average (AA; 4 points)	High (H; 5 points)
Biological age [units] $BA = HC/BL \times 100$	>51	49-51	44-48	43	<43
Body mass and growth index [g/cm]	<150	150-162	163-191	192-196	>196
The duration of acute respiratory infections during the year [days/year]	>24	19-24	7-18	5-6	<5
Heart rate [beats/min]	>101	98-101	88-97	76-87	<76
Shoulder arc [cm]	<33	33	34-36	37-38	>38
Respiratory rate [times/min]	>26	24-26	20-23	18-19	<18
Posture index [%] $PI = HA/SW \times 100$	<76	76-79	80-84	85-91	>91
Chest perimeter [cm]	<54	54-55	56-58	59-60	>60

where BA - an index of biological age, HC - head circumference [cm]; BL - body length [cm], PI - posture index; HA - shoulder arc (an arc distance between the shoulder points behind, cm), SW - shoulder width (distance between points in a straight shoulder front, cm).

Table 2. Standards of child's physical preparedness.

Numbers	Exercises	Standard
1	Standing long jump [cm]	100
2	Throws of the ball against the wall and catching it from a distance of 1 m for 30 seconds [times]	19
3	Flexion and extension of arms lying on the floor [times]	6
4	Jumping with a rope to fatigue [times]	24
5	Raising of the body from the initial supine position [times]	30
6	The maximum number of squats to fatigue [times]	40

Table 3. Scale for evaluation of child's psychophysical preparedness.

Rating	Number of writing the letter "O" in 10 seconds	Number of squats in 10 seconds	Number of claps in 10 seconds	Number of numerical digits pronounced by 10 seconds	Keeping the "Flamingo" pose, seconds
5	≥ 14	≥ 15	≥ 30	≥ 20	≥ 18
4	10-13	12-14	22-29	16-19	14-17
3	7-9	9-11	16-21	12-15	10-13
2	4-6	6-8	10-15	8-11	5-9
1	≤ 3	≤ 5	≤ 9	≤ 7	≤ 4

### Statistical analysis

The characteristics of subjects were described analyzed by mean value (M), mean square deviation (S), a coefficient of variation (V). The normal distribution of empirical rows was checked by the Shapiro-Wilk test. The results of the calculations made it possible to establish that the empirical distribution of practically all indicators does not correspond to the normal (an exception was the body mass index and throws and catching of a ball for 30 seconds). Therefore, for statistical verification of the hypothesis about the probability of differences between the indicators of different groups W-criterion of Wilcoxon was used. For all conducted tests, the level of significance was set at least to  $p < 0.05$ .

## RESULTS

Analysis of chest circumference (table 4) indicated a low level of physical indicators. Analysis of boy's respiratory rate in a state of relative calm testified lower than the average level of functional reserves of the respiratory system.

Table 4. Anthropometric indices and indices of physical development.

Indexes	Stage	Groups	M ± S	Level	V, %	t <sub>EG-CG</sub>	t <sub>CG</sub> (initial- endpoint)	t <sub>EG</sub> - (initial- endpoint)
Height [cm]	initial	EG	119.21±7.48	AA	6.28	0.820	0.278	0.2237
		CG	118.85±6.58	AA	5.54			
	endpoint	EG	121.03±4.85	AA	4.01	0.536		
		CG	120.29±5.27	A	4.38			
Body weight [kg]	initial	EG	22.79±4.53	AA	19.86	0.797	0.279	0.350
		CG	22.54±4.29	AA	19.05			
	endpoint	EG	23.60±2.24	AA	9.49	0.769		
		CG	23.42±2.89	AA	12.34			
Body mass and growth index [g/cm]	initial	EG	190.01±28.98	A	15.25	0.826	0.275	0.385
		CG	188.59±28.06	A	14.88			
	endpoint	EG	194.84±14.61	AA	7.50	0.952		
		CG	194.59±20.64	AA	10.60			
Chest circumference [cm]	initial	EG	54.24±7.65	AA	14.10	0.906	<b>0.000</b>	<b>0.007</b>
		CG	54.06±5.86	AA	10.84			
	endpoint	EG	58.43±4.48	A	7.67	0.734		
		CG	58.16±1.88	A	3.24			
Posture index [units]	initial	EG	80.91±7.04	A	8.70	0.339	<b>0.000</b>	<b>0.000</b>
		CG	79.35±7.19	BA	9.06			
	endpoint	EG	87.55±4.82	AA	5.50	<b>0.014</b>		
		CG	84.96±3.93	A	4.63			
Respiratory rate [acts/min]	initial	EG	23.06±2.26	A	9.81	0.866	<b>0.024</b>	<b>0.000</b>
		CG	23.15±2.31	A	9.99			
	endpoint	EG	18.09±3.64	AA	20.13	<b>0.059</b>		
		CG	21.16±5.36	A	25.33			
HR [beats/min]	initial	EG	94.06±2.61	A	2.77	0.966	0.858	<b>0.000</b>
		CG	94.09±2.47	A	2.62			
	endpoint	EG	87.19±3.06	AA	3.51	<b>0,000</b>		
		CG	93.82±9.95	A	10.61			
Biological age [units]	initial	EG	43.58±2.58	AA	5.87	0.999	0.435	0.184
		CG	43.58±2.47	AA	5.66			
	endpoint	EG	42.84±1.98	AA	4.62	0.497		
		CG	43.18±2.22	AA	5.13			
Index of physical development [units]	initial	EG	42.18±10.07	AA	23.88	0.971	<b>0.020</b>	0.112
		CG	42.25±8.11	AA	19.20			
	endpoint	EG	39.00±5.71	AA	14.64	0.815		
		CG	38.71±4.83	AA	12.47			
The level of physical development		EG	-	AA	-	-	-	-
		CG	-	AA	-	-	-	-

The values of the posture index (table 4) described the boys' level of physical condition as below average. None of the participants had a high level of performance, indicating a poor state of posture in males at the age of 5 years old.

The physical state was rated as average. However, almost every second child of older preschool age (43.85 % of boys) had lower than average level of fitness. By most measures of the physical condition significant intra ( $V \geq 15\%$ ) and inter-group differences were observed.

The level of psycho-physical fitness of children (table 5) rated as average (3.1 points on a 5-point scale).

A significant backlog from the level of state requirements was observed in the number of the letter "O" writing in 10 seconds and the duration of staying still in the "Flamingo" pose, the results of these exercises was evaluated as "unsatisfactory". The coefficients of variation indicate the contingent heterogeneity. From six standards of physical preparedness (table 8-9) children successfully completed only one. The results of full sit-up exercise and squatting on two legs were below the standard level by 52%. Considerable variation in individual indexes indicates to the poor results for large part of preschoolers. With the exercise technique "jumping with the rope" most children were unfamiliar. Only a few of them coped with the standard.

Table 5. Preschool boys' indicators of psychophysical preparation (significant p-values are bolded).

Indexes	Level	Group	X ± S	Rating	V [%]	t <sub>EG-CG</sub>	t <sub>CG</sub> (initial-endpoint)	t <sub>EG</sub> (initial-endpoint)
Writing the letter "O"	initial	EG	5.15 ± 2.21	2	42.89	0.731	<b>0.000</b>	<b>0.000</b>
		CG	5.32 ± 2.09	2	39.22			
	endpoint	EG	10.34 ± 1.92	4	18.60	<b>0.001</b>		
		CG	8.50 ± 2.71	3	31.87			
Squats in 10 seconds	initial	EG	10.18 ± 1.13	3	11.10	0.971	<b>0.000</b>	<b>0.000</b>
		CG	10.19 ± 1.19	3	11.69			
	endpoint	EG	15.17 ± 3.19	5	21.06	0.166		
		CG	14.03 ± 3.74	4	26.65			
Claps in 10 seconds	initial	EG	23.42 ± 5.88	4	25.10	0.439	0.167	<b>0.000</b>
		CG	24.49 ± 6.12	4	25.00			
	endpoint	EG	37.63 ± 4.39	5	11.67	<b>0.000</b>		
		CG	26.18 ± 4.81	4	18.39			
Numeral digits scoring in 10 seconds	initial	EG	18.18 ± 4.30	4	23.67	0.683	0.719	<b>0.000</b>
		CG	18.57 ± 4.15	4	22.33			
	endpoint	EG	26.06 ± 3.13	5	25.33	0,000		
		CG	18.92 ± 4.70	4	24.86			
Keeping the "flamingo" pose [sec]	initial	EG	8.88 ± 5.44	2	61.29	0.910	<b>0.018</b>	<b>0.000</b>
		CG	9.02 ± 5.61	2	62.21			
	endpoint	EG	34.91 ± 29.91	5	85.68	<b>0.000</b>		
		CG	11.29 ± 1.52	3	13.49			
Overall [scores]	initial	EG	-	3.0	-	-	-	-
		CG	-	3.0	-			
	endpoint	EG	-	4.8	-	-		
		CG	-	3.6	-			

Table 6. Preschool Boys' indicators of physical readiness (significant p-values are bolded).

Indexes	Stage	Group	X ± S	% of normal	V [%]	t <sub>EG-CG</sub>	t <sub>CG</sub> (initial-endpoint)	t <sub>EG</sub> (initial-endpoint)
Standing long jump [cm]	initial	EG	94.82±9.71	94.82	10.24	0.793	<b>0.003</b>	<b>0.000</b>
		CG	95.38±9.24	95.38	9.69			
	endpoint	EG	125.89±7.58	125.89	6.02	<b>0.000</b>		
		CG	101.39±8.89	101.39	8.77			
Throws and catching of a ball for 30 seconds	initial	EG	19.06±2.97	100.32	15.57	0.919	0.753	<b>0.002</b>
		CG	19.13±2.80	100.67	14.65			
	endpoint	EG	21.37±3.06	112.48	14.31	<b>0.010</b>		
		CG	19.34±3.47	101.80	17.92			
Push-up on the floor [times]	initial	EG	4.61±2.60	76.77	56.39	0.986	<b>0.000</b>	<b>0.000</b>
		CG	4.60±2.45	76.60	53.23			
	endpoint	EG	15.86±6.44	264.29	40.59	<b>0.000</b>		
		CG	6.58±1.59	109.65	24.13			
Jumping with the rope [times]	initial	EG	0.64±1.50	2.65	235.12	0.911	<b>0.000</b>	<b>0.000</b>
		CG	0.68±1.90	2.84	279.19			
	endpoint	EG	33.77±3.94	140.71	11.67	<b>0.000</b>		
		CG	3.13±3.02	13.05	96.56			
Lifting the body [times]	initial	EG	16.00±5.80	53.33	36.28	0.198	<b>0.000</b>	<b>0.000</b>
		CG	14.40±5.11	48.01	35.48			
	endpoint	EG	40.60±9.24	135.33	22.76	<b>0.000</b>		
		CG	18.58±5.16	61.93	27.75			
Two-leg squats [times]	initial	EG	20.21±4.85	50.53	24.01	0.177	<b>0.000</b>	<b>0.000</b>
		CG	18.81±4.31	47.02	22.90			
	endpoint	EG	56.63±14.04	141.57	24.80	<b>0.002</b>		
		CG	41.39±23.70	103.49	57.25			
The general level of physical preparedness	initial	EG	-	63.07	-	-	-	-
		CG	-	62.52	-	-	-	-
	endpoint	EG	-	153.38	-	-	-	-
		CG	-	81.88	-	-	-	-

## DISCUSSION

Initial result have shown insufficient level of anthropomorphic and physical development indices among tested participants. Underdevelopment of specified physical aspects may affect further growth of children, therefore special actions needs to be performed in order to counter this negative trend in society.

The implementation of the physical education program with the priority in application of karate has proven its higher efficacy compared to the traditional one (table 4-6). The total growth rate of physical condition of children in the control group were 102.97%, while the experimental group had twice as much – 228.65%. The use of authoring program contributed significantly to raising the level of physical and mental fitness, overall assessment increased from 3.0 to 4.8 points in the experimental group of children, while improving psychomotor outcomes of children in the control group was not as significant – from 3.0 to 3.6 points. The highest growth rates observed in children in the experimental group in keeping the “Flamingo” pose. This shows the positive impact of means provided by the author's program on balance. Clapping the hands for 10 seconds and writing of the letter “O” took the second place according to the growth, indicating the significant opportunities of the author to develop hands dexterity, including wrists. This impacted positively on children's mastering of writing.



From the level of child's readiness to school studying depends on its further success in educational activities, the ability to perform a variety of activities, and well-being which is greatly affected by mental and somatic health [1,12,13,14,15]. It is believed that the health of children is closely related to the indicators of aerobic and strength endurance, which affect the ability to work and adaptive capacity of the body, the flexibility that determines the status of the musculoskeletal system, as well as the coordination quality that determines the mastering of the curriculum [11]. Therefore, the use of tools that develop the different types of endurance, flexibility and coordination qualities is important for the formation of preschoolers' health. At junior school age, the highest rates of growth of speed abilities are observed. Achievement of a high level of speed development is in many respects determined by the mobility of the nervous processes, which determine the rate of reduction and relaxation of the muscles, the maximum rate of movements. From 4-5 to 13-14 years, the speed of single movements is significantly increasing with the contraction of various muscle groups.

It was found that in the structure of physical preparedness of 4-6-year-old children, there is also an increase in the rates of improvement of such physical qualities, such as coordination of movements (10-meter running between objects), flexibility, dynamic endurance (running with average speed), speed (jump in length from place) [11]. The high rates of growth of these physical qualities in the mentioned age period are explained by the fact that this age is sensitive to their development. Physical exercises effectively contribute to the development of different physical qualities, therefore, they can serve as one of the means of complete preparedness of preschoolers.

A number of experts [16,17] proved that it is possible to use elements of tourism for health and harmonious development of children during physical training in the conditions of a preschool educational institution. It is established that the use of tourism promotes effective development of physical qualities of children at the age of 5 and 6 years old and playing tourist activity creates conditions for the formation of the ability to build friendships with peers and help increase positive relations. On the basis of factor, variance and correlation analysis of the structure of motor and cognitive activity it was found that 5 and 6-year-old boys' coordinating qualities were most connected with mental ones [18]. This enables to apply types of motor activity aimed at coordination developing at physical education, specifically to promote the development of cognitive abilities of older preschoolers. One of such kinds of sport is karate.

A system of methods [5,19,20] of dosed running in combination with breathing exercises and hardening elements in physical education of preschool children who often suffer from acute respiratory infections was established [21]. However, experts are not taken into account that dose jogging and breathing exercises are low emotional means of physical education, and therefore uninteresting for children of preschool age. Instead, martial arts, having a respiratory recreational nature, attract children and are of interest to regular classes.

The problem referring to the role of karate in preparing boys for school education, presented in this work, makes a part of complex problematics that can be specified as martial arts classes can positively affect the health [22-24].

It was found that games skittles, badminton, hockey (on grass) and football promote the development of speed, agility, flexibility, endurance and strength of children aged 6-7 years [11]. The game teaches children to collective action and mutual submission, requires personal aspirations of each player to the common goal. Sports games contribute to the improvement of mental activity, improve speed reaction and orientation and contribute to creative thinking development. Application of karate in the form of games probably will serve as a comprehensive solution to all problems faced by the physical education of preschool children [2].

## CONCLUSIONS

Significantly larger increases in physical condition, and psychophysiological readiness in children who studied karate, after the finishing the experiment confirmed that the authoring program of physical education lessons with a priority in studying of karate is more effective compared to the traditional one. Better discipline, greater attention, higher mental capacity and less fatigue of children



who attended the author's program confirm that the classes with the priority of karate application can promote the full readiness of children for school.

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