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MORPHOFUNCTIONAL STATE OF 3-4 YEAR OLD CHILDREN WHO ENGAGE IN PHYSICAL CULTURE WITH BEGINNER JUDO EXERCISES

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Key words: morphofunctional state, pre-school children, physical culture, physical development, judo.

Annotation. Implementation of the program that includes elements of sports disciplines into pre-school institutions are aimed towards the enrichment of motor, functional and mental development of children. The aim of this study was to examine morphofunctional features of 3-4 year old children who engage in physical culture with beginner judo exercises. Results of observing these children, according to initial parameters of the functional status, are within limits of age-based physiological standards. 3-year-old girls differ from boys by greater dimensions of their body and vital capacity. After a year of physical culture classes with beginner judo exercises, 4-year-old boys were characterized by greater values of all indicators of the morphofunctional status. The greater positive changes include an increase in following parameters: length of arms and legs, lung capacity. Taking into account the study’s results, we developed scales with standard indicators for evaluating the morphofunctional state of 3-4 year old children who engage in physical culture with beginner judo exercises. These scales were later used in the hardware and software complex “Sports orientation of children to judo classes for comparing and forming test evaluations.

Introduction. Physical development, as an educational field, is an obligatory part of the main educational program of pre-school education of the Federal State Educational Standard. Morphofunctional features of children develop in an uneven manner. The pre-school age is a favorable period for developing main motor actions and certain motor qualities, i.e. dexterity and flexibility [1-4]. In order to define predisposition of children and reveal their athletic capabilities, many scientists research the ontogenesis of a certain age group of children to find out, at which age it is better for a child to start engaging in a certain type of sports [5]. Judo is a well-known type of martial arts that has an Olympic status. This type of sports differs by the fact that it requires a high movement coordination that is reasonable to

develop since the early childhood [6]. Therefore, registering features of the morphofunctional state of 3-4 year old children engaging in physical culture are the relevant issue of developmental physiology.

The purpose of our study was to examine morphofunctional features of children aged 3-4 years who engage in physical culture with beginner judo exercises.

Methods and organization. Within the context of the Russian Judo Federation project “Children’s judo”, implemented in Sochi, we examined 30 children aged 3-4 years who started visiting physical culture classes with beginner judo exercises, as well as 15 children who studied in this project for 1 year. Examination of morphofunctional features included an identification of the morphological state and main functional indicators. When identifying the morphological state, we used following anthropometric methods: registering chest girth on inhale, exhale and at rest, body length (height) and mass, wrist girth. In the course of the study, we used a stadiometer, a measuring tape and the OMRON BF 212 scales.

Examination of functional indicators included following procedures: identifying heart rate (HR), blood pressure (BP), vital capacity (LV), wrist and back dynamometry and time-constrained 50% wrist dynamometry. The HR was registered with the POLAR V800 pulsometer. The BP was examined using the OMRON blood pressure monitor. The LC was studied using the CareFusion spirometer (USA). The back and wrist dynamometry was identified using the DS 200 and EN 101 dynamometers.

In the course of the study, we complied with all standard requirements [7-9]. Parents (or legal representatives) gave a voluntary consent on processing and using personal data and carrying out the testing of the morphofunctional state of children.

We developed protocols, in which data on morphological and functional indicators was written (tables 1, 2).

Table 1

Morphological indicators

№	Indicator	Indicator value
1	Body mass, kg	
2	Height, cm	
3	Arm length, cm	
4	Leg length, cm	
5	Wrist girth, cm	
6	Chest girth, cm - at rest - on maximum inhale - on maximum exhale	

Table 2

Functional indicators		
№	Test name	Indicator score/value
1	BP, mm of Hg	
2	HR, beats/min	
3	LC, ml	
4	Wrist dynamometry, kg	
5	Back dynamometry, kg	

During the processing of statistical data, we used methods of descriptive (calculation of mean arithmetic values and sample errors) and parametric (comparison of mean values according to the Student's T-test) statistics.

Results and discussion. According to results, anthropometric indicators of children who started visiting physical culture classes with beginner judo exercises remained within limits of age-based physiological standards. The comparative analysis of morphological indicators of boys and girls aged 3-4 years revealed a tendency for greater values of all anthropometric indicators among girls. Value of the leg length was statistically higher ($p < 0,0006$) (table 3).

Table 3

Physical development indicators (morphological state) of 3-year-old children who started visiting physical culture classes with beginner judo exercises

№	Indicator	Boys M±m	Girls M±m	p<
1	Body mass, kg	17,6±2,0	18,3±2,5	-
2	Height, cm	106,4±5,7	108,4±6,0	-
3	Arm length, cm	43,9±2,9	44,9±2,6	-
4	Leg length, cm	53,7±3,7	56,5±3,9	0,0006
5	Wrist girth, cm	11,6±0,8	11,8±0,6	-
6	Chest girth at rest, cm	54,8±3,1	55,3±2,7	-
7	Chest girth on inhale, cm	57,6±3,6	58,3±3,1	-
8	Chest girth on exhale, cm	53,6±3,0	54,1±2,8	-

Table 4

Functional state indicators of 3-year-old children who started visiting physical culture classes with beginner judo exercises

№	Indicator	Boys M±m	Girls M±m	p<
1	sBP, mm of Hg	97,2±7,5	95,1±8,0	-
2	dBp, mm of Hg	61,6±4,3	62,2±4,3	-
3	HR, beats/min	100,7±9,5	100,3±8,9	-
4	LC, ml	790±18	800±18	-
5	Wrist dynamometry (right hand), kg	5,7±1,6	5,5±1,6	-
6	Wrist dynamometry (left hand), kg	5,2±1,6	5,1±1,4	-
7	Back dynamometry, kg	11,9±7,2	13,7±6,1	-

Functional indicators of boys and girls did not have statistically significant differences. However, a tendency was found for higher LC and back dynamometry values among girls and wrist dynamometry values among boys (table 4).

Due to the fact that after a year of physical culture classes, only a small amount of girls remained in groups of pre-school children, we carried out the morphofunctional features analysis before and after a year of classes for the boys' sample only. We connect changes that appeared in a year with not only physical culture classes, but also processes of selection and age development.

The comparative analysis of the morphological state of boys after a year of physical culture classes demonstrated greater values of all indicators. The arm ($p < 0,001$) and leg ($p < 0,05$) lengths increased significantly (table 5).

Table 5

Comparative indicators of the morphological state of 3-4 year old boys before and after a year of physical culture classes with beginner judo exercises

№	Indicator	Before classes M±m	A year after classes M±m	p<
1	Body mass, kg	17,6±2,0	20,3±1,0	-
2	Height, cm	106,4±5,7	113,2±2,2	-
3	Arm length, cm	43,9±2,9	59,3±2,0	0,001
4	Leg length, cm	53,7±3,7	46,3±2,2	0,05
5	Wrist girth, cm	11,6±0,8	12,3±0,5	-
6	Chest girth at rest, cm	54,8±3,1	56,1±2,1	-
7	Chest girth on inhale, cm	57,6±3,6	60,6±2,2	-
8	Chest girth on exhale, cm	53,6±3,0	54,9±1,8	-

According to functional indicators, after a year of classes, a tendency for an increase of wrist and back dynamometry appeared. Indicators of the functional state of the respiratory system, i.e. lung capacity ($p < 0,01$) and vital index ($p < 0,05$), also significantly improved (table 6).

Table 6

Comparative indicators of the functional state of 3-4 year old boys before and after a year of physical culture classes with beginner judo exercises

№	Indicator	Before classes M±m	A year after classes M±m	p<
1	sBP, mm of Hg	97±8	97±9	-
2	dBp, mm of Hg	62±4	61±7	-
3	HR, beats/min	101±10	110±16	-
4	LC, ml	790±18	1239±129	0,01
5	Vital index, ml/kg	45±5	61±6	0,05
6	Wrist dynamometry (right hand), kg	5,7±1,6	6,9±2,1	-
7	Wrist dynamometry (left hand), kg	5,2±1,6	6,0±2,0	-
8	Back dynamometry, kg	11,9±7,2	19,1±4,9	-

Following the study's results, we developed scales with standard indicators to assess the morphological state of 3-4 year old children who started visiting physical culture classes with beginner judo exercises. These scales were later used in the software and hardware complex "Sports orientation of children to judo classes" for comparing and forming the test's evaluations [10].

Conclusion. 3-year-old girls differ from boys by greater body dimensions and LC. 4-year-old boys after a year of physical culture classes with beginner judo exercises are characterized with greater values of all morphofunctional state indicators. Greatest changes include an increase of arm and leg lengths, lung capacity.

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