



# Hardware-software complex for sports orientation, selection and stage control: potential for judo and sambo

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## Abstract

**Objective of the study** was to develop and implement an information system – hardware-software complex for sports orientation, selection and stage control in judo and sambo.

**Methods and structure of the study.** The following methods were applied during the study: information technology based methods; spirometry; anthropometry, dynamometry, psychophysiological test methods; sports educational methods; non-parametric mathematical statistics methods. 240 children and junior athletes took part in testing the developed hardware-software complex.

**Results and conclusion.** Using the data from the theoretical analysis and author's research [3], an information testing system - hardware-software complex for sports orientation, selection and control in judo and sambo was developed. The hardware-software complex consists of the hardware facilities and software. The developed hardware-software complex includes four test blocks: morphological, functional, psychophysiological and physical fitness.

The hardware-software complex for sports orientation includes four test blocks to determine the morphological, functional, psychophysiological, and physical fitness rates. The testing of the hardware-software complex for sports orientation, selection and stage control in judo and sambo showed its effectiveness in determining the psycho-functional readiness of children for judo and sports orientation, selection and control in judo and sambo.

**Keywords:** *sports orientation, selection, stage control, functional diagnostics, fitness tests, psychophysiological testing, working capacity, judo, sambo.*

**Background.** According to the physiological classification, judo and sambo are related to martial arts which require athletes to solve complex motor tasks in a compressed time frame. At the same time, these are speed-strength and complex coordination sports that place high demands on such qualities of flexibility and dexterity. Currently, a large number of scientific studies have been carried out, mainly by foreign scientists, devoted to the most significant performance factors [2, 5, 6]. Factors or predictors of athletic performance are the most significant characteristics of the psychophysiological state of the body systems or motor skills, the determination of which can be used to address the problems of sports orientation, selection and control of the body condition of athletes in judo and sambo.

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**Results and discussion.** Using the data from the theoretical analysis and author's research [3], an information testing system - hardware-software complex for sports orientation, selection and control in judo and sambo [4] was developed. The hardware-software complex consists of the hardware facilities and software. The developed hardware-software complex

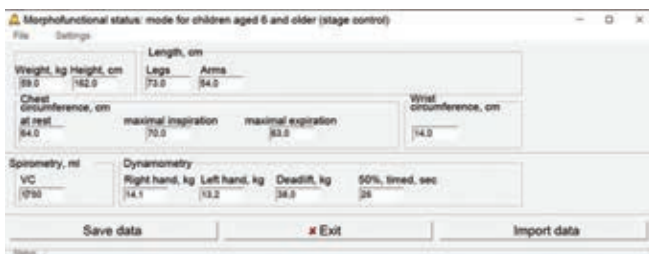
includes four test blocks: morphological, functional, psychophysiological and physical fitness. Figure 1 illustrates the main window of the software part of the hardware-software complex.



**Fig. 1.** Main window of the hardware-software complex for sports orientation, selection and control in judo and sambo.

The psychophysiological test block includes the Schulte test, simple visual and auditory sensorimotor reaction time test, complex sensorimotor reaction time test - choice reaction time and determination of the type of temperament and properties of the nervous system by a person-time unit. The morphofunctional test block includes measurement of body length, body mass, arm length, leg length, chest circumference, wrist circumference, vital capacity (VC), wrist dynamometry, deadlift dynamometry, duration of static tension of 50% of maximum using the wrist dynamometer.

Figure 2 illustrates the window of the hardware-software complex for sports orientation, selection and control in judo and sambo including the morphofunctional test block.

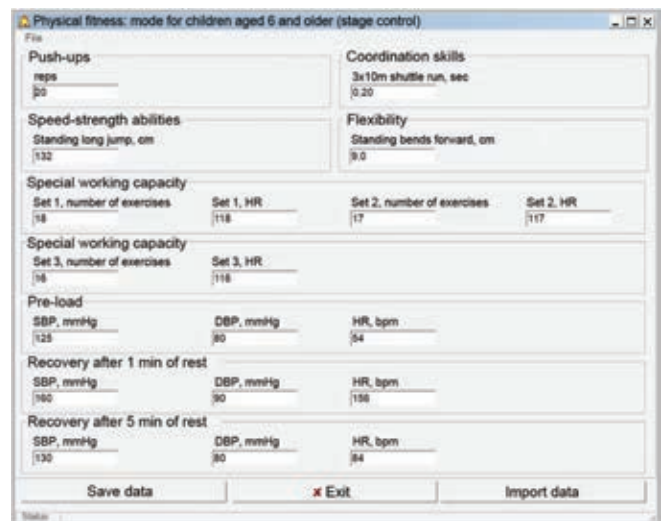


**Fig. 2.** Window of the hardware-software complex for sports orientation, selection and control in judo and sambo including morphofunctional test block.

The physical fitness test block includes a modified Boyko test to determine physical working capacity level [1], beep test, as well as tests to rate dexterity (3 10m shuttle run), flexibility (standing bends for-

ward), speed-strength abilities (standing long jump), strength endurance (push-ups). Figure 3 illustrates the window of the hardware-software complex for sports orientation, selection and control in judo and sambo including the physical fitness test block.

The test rates were used to develop a special scale for evaluating the results of 5-6 year-old children involved in physical education with the elements of judo and young athletes (9-10, 11-12 and 13-14 years old) practicing judo and sambo. The hardware-software complex was tested as part of the pilot project of the Russian Judo Federation "Children's Judo", Sochi, in the Municipal Budgetary Institution "Sports School of the Olympic Reserve in Martial Arts Discipline" in Essentuki, sports complex "Gymsportpremium" in Pyatigorsk, Municipal Budgetary Institution for Supplementary Education "Children's and Youth Sports School No. 1" in Kislovodsk, Municipal Public Institution "Fitness and recreation complex "Pobeda" of the Zolsky municipal district of the KBR. The psychophysiological, morphological, physical fitness, and working capacity rates were obtained, which made it possible to study and analyze the age-specific differences in children and adolescents engaged in judo and sambo.



**Fig. 3.** Window of the hardware-software complex for sports orientation, selection and control in judo and sambo including physical fitness test block.

The greatest differences in the physical development rates were detected in terms of body length, body mass, and leg length (see Table). Among the functional indicators, it was VC, wrist and deadlift dynamometry rates that underwent the greatest age-specific changes. The psychophysiological indicators improved to a greater extent in the preschoolers under 7 years old. At the same time, the complex sensorimo-



*Morphofunctional, psychophysiological and physical fitness rates in 5-14 year-old boys practicing judo*

Indicators	5-6 y.o. 1	7-8 y.o. 2	9-10 y.o. 3	11-12 y.o. 4	13-14 y.o. 5
Body length, cm	120,6±5,0 P1-2,3,4,5 <0,001	129,3±8,0 P2-3,4,5 <0,001	140,1±7,2 P3-4,5 <0,001	150,3±8,0 P4-5 <0,001	162,3±8,3
Body mass, kg	24,0±5,2 P1-2,3,4,5 <0,001	29,0±10,1 P2-3,4,5 <0,001	37,1±9,3 P3-4,5 <0,001	43,5±9,2 P4-5 <0,001	53,3±17,6
Leg length, cm	64,3±3,2 P1-2,3,4,5 <0,001	71,3±6,5 P2-5 <0,05	78,5±5,4	84,8±5,4	91,6±5,5
Arm length, cm	50,3±2,7 P1-2,3,4,5 <0,001	55,9±5,0 P2-5 <0,05	60,9±3,4 P3-5 <0,05	65,8±4,2	71,5±4,3
Wrist circumference, cm	12,7±0,9 P1-3,4,5 <0,05	13,2±1,1	14,2±1,1	15,3±1,1	16,0±1,3
Body-mass index, %	94,0±11,9	84,6±15,2	82,6±13,9	81,2±12,5	86,2±23,5
VC, ml	1462,2± 209,5 P1-3,4,5 <0,05	1721,9± 339,8 P2-3,4,5 <0,05	2179,7± 397,9 P3-4,5 <0,05	2632,3± 482,3	3276,1± 746,3
Deadlift dynamometry, kg	27,5±8,1 P1-5<0,05	39,2±12,0	51,5±14,3	58,8±15,0	75,3±20,7
Right hand dynamometry, kg	9,1±3,0 P1-5 <0,05	14,4±8,7	16,3±4,4	19,0±4,6	24,5±4,6
Left hand dynamometry, kg	8,8±3,0 P1-5 <0,05	13,1±7,4	15,5±4,5	18,5±4,7	24,1±4,8
Light response time, sec	0,41±0,02 P1-2,3,4,5 <0,05	0,35±0,01	0,33±0,06	0,31±0,08	0,30±0,07
Choice reaction time, sec	0,64±0,02 P1-2,3,4,5 <0,05	0,53±0,02 P2-4,5 <0,001	0,50±0,01	0,42±0,07	0,38±0,08
Efficiency (Schulte test), sec	181±21 P1-2,3,4,5 <0,001	90±28 P2-4,5 <0,001	78±22 P3-5 <0,001	54±15	45±9
Strength endurance (push-ups), reps	22,6±11,6 P1-2,3,4,5 <0,05	24,4±10,8	25,0±10,2	27,5±9,8	36,2±9,9
Speed-strength abilities (standing long jump), cm	122,1±15,0 P1-2,3,4,5 <0,05	136,3±10,9 P2-3,4,5 <0,05	150,8±10,2 P3-4,5 <0,05	167,0±16,5	197,0±18,0

tor reaction time, choice reaction time, and the effectiveness of mental work continued to improve up to 14 years. The dynamics of changes in the physical fitness rates in the boys and girls were very different. In the boys, there was an annual improvement in strength endurance and speed-strength abilities, special working capacity and a more significant increase in the func-

tional indicators of the cardiovascular system during the stress tests. In the girls, there was an increase only in the speed-strength rates, as well as an increase in the reactions of the cardiovascular system to loading.

**Conclusion.** The hardware-software complex for sports orientation includes four test blocks to determine the morphological, functional, psychophysi-



ological, and physical fitness rates. The testing of the hardware-software complex for sports orientation, selection and stage control in judo and sambo showed its effectiveness in determining the psycho-functional fitness of children for judo and sports orientation, selection and control in judo and sambo.

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