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OPTIONS FOR MONITORING THOSE ENGAGED IN PHYSICAL CULTURE AND MASS SPORTS

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Options for monitoring those engaged in physical culture and mass sports

Abstract. The authors substantiate the importance of the development of physical culture and mass sports in modern society, based on the real possibilities of organizing classes in different formats, taking into account the wishes of people of different age and gender. The article deals with different methods of receiving comprehensive objective information about physical fitness and development of physical qualities, about the reactions of the body of people who exercise in different volumes and intensities, about the body composition and its relationships with the age physical development and performance of physical loads of different orientation, the choice of tests to assess physical capabilities in a different age 6-80 years, the application of new methods of physical fitness of the body with a modern type of physical education and training.

Key words: control, testing, bioimpedance analysis, pulse zones, individual approach.

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Дене шынықтырумен және бұқаралық спортпен айналысушыларды бақылаудың нұсқалары

Аңдатпа. Авторлар әр түрлі жастағы және жыныстағы адамдардың тілектерін ескере отырып, сабақтарды әртүрлі форматта ұйымдастырудың нақты мүмкіндіктеріне сүйене отырып, қазіргі қоғамдағы дене шынықтыру мен бұқаралық спортты дамытудың маңыздылығын негіздейді. Мақалада физикалық дайындық және физикалық қасиеттердің дамуы туралы жан-жақты объективті ақпарат алудың әртүрлі әдістері, физикалық белсенділікке қатысушылардың денесінің көлемі мен қарқындылығына реакциясы, қатысушылардың дене құрамы және оның жасына байланысты физикалық дамумен және әртүрлі бағыттағы физикалық белсенділікті жүзеге асырумен байланысы, заманауи ақпараттық технологиялармен және қатысушылардың мүмкіндіктеріне жеке көзқараспен дененің физикалық жағдайын бағалаудың жаңа әдістерін қолдануы қарастырылған, 6-80 жас аралығындағы физикалық мүмкіндіктерді бағалау үшін тесттерді таңдау негізделген.

Түйін сөздер: бақылау, тестілеу, биоимпеданс талдауы, пульс аймақтары, жеке тәсіл.

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Варианты контроля за занимающимися физической культурой и массовым спортом

Аннотация. Авторы обосновывают значимость развития физической культуры и массового спорта в современном обществе, опираясь на реальные возможности организации занятий в различном формате с учётом пожеланий занимающихся различного возраста и пола. В статье рассматриваются различные методики получения всесторонней объективной информации о физической подготовленности и развитии физических качеств, реакции организма занимающихся на физические нагрузки, различные по объёму и интенсивности, о составе тела занимающихся и его взаимосвязи с возрастным физическим развитием и выполнением физических нагрузок различной направленности. Обосновывается выбор тестов для оценки физических возможностей в различном возрасте – 6-80 лет, применение новых методик оценки физического состояния организма современными организационными технологиями и индивидуальным подходом к возможностям занимающихся.

Ключевые слова: контроль, тестирование, биоимпеданский анализ, пульсовые зоны, индивидуальный подход.

Introduction. Physical culture and mass sports today solve many socio-economic problems of the state: the unification of society, the diversion of young people from bad habits, disease prevention and increased life expectancy, promoting a healthy lifestyle among different segments of the population and attraction to physical activity, creating conditions for self-realization, self-expression and development.

With the improvement of the well-being of the population, the economic boom, the physical passivity of the population grows. Currently, this problem is exacerbated by the conditions of forced restriction of space and distance learning of students due to the pandemic and coronavirus infection. The conditions of the forced introduction of distance learning technologies negatively affect the motor mode of the population and significantly affect the physical development and mental performance of citizens of different ages.

Each state has its own peculiarities of organizing work on the development of physical education and mass sports. In Germany and France this work is mainly done by state regional authorities, in the USA and Great Britain by public organizations and sport federations, in China, Kazakhstan and other CIS countries by regional self-government bodies, sport clubs and teenage organizations [1-4].

Funding for expenses is provided from the budget, private investments, sponsorships, etc. Classes are conducted with the involvement of coaches, athletes, physical education instructors and educators. Different countries have their own programs, taking into account local opportunities and conditions.

At the present stage of development of Kazakh society an important part of the state socio-economic policy is the development of physical culture and sport. The main goal of the state policy in the sphere of physical culture and sport is to improve the health of the nation, the formation of a healthy lifestyle for all segments of the population, the harmonious education of a healthy, physically developed generation, as well as the worthy performance of Kazakh athletes in the world arena. In order to develop physical culture and sports of the republic, to create favorable conditions for the formation of an effective model of public policy in the field of physical culture and sports the Concept of development of physical culture and sports of the Republic of Kazakhstan until 2025 has been approved and a comprehensive plan for the development of physical culture and mass sports for 2020-2025 has been adopted [5, 6].

Specialists of the Kazakh Academy of Sport and Tourism in the framework of the scientific project of the Ministry of Education and Science of the Republic of Kazakhstan “Organization of physical culture classes at the place of residence” conduct scientific research to improve the organization and methodology of physical exercise and sports at the place of residence. In the course of the project in 2021-2023 the following tasks are solved [7-10]:

- the methods used to organize physical exercise and mass sports activities at the place of residence are analyzed;

- citizens' opinions on the importance of physical exercise and the quality of exercise are studied;

- practical recommendations are developed to improve the efficiency of training activities by adjusting the content, load regulation and introduction of new physical exercises and sports according to the wishes of the participants;

- basic criteria for the modernization of existing sports grounds and the construction of new sports grounds are determined.

Therefore, today it is necessary to develop and substantiate methodological support for the organization and regulation of motor activity of the population of different ages.

An actual direction in increasing the effectiveness of physical exercise is the definition of various methods of assessing the physical state of the body, engaged in physical culture and mass sports, to systematically monitor the results of the impact of the proposed loads on the body of those involved.

The purpose of the study is to determine the significance of different types of control for assessing the physical condition of students and physical development.

Research Objectives:

- justify the choice of tests to monitor physical fitness;

- determine the role of bioimpedance analysis of body composition in the evaluation of physical development;

- to evaluate the body's response to exertion in different sports.

Methods and organization of the study: physical fitness was determined by tests; body composition was determined using a Tanita bioimpedance analysis device; heart rate was determined using a Polar H10 device during physical activity.

We determined the physical preparedness of those involved in various sports by testing the results of 5 tasks: running 10 meters for time; shuttle

run 3x5 meters; bending and unbending arms in a standing position for 10 times; raising the torso from the supine position 10 times for time; long jump from a place with 2 legs; standing bend on a bench. The tests were determined with consideration of accessibility for all ages involved in physical education and sports. A total of 617 persons aged 5-8 years-67; 9-10 years-177; 11-12 years-133; 13-14 years-152; 15-16 years-98; over 17 years-60 participated in the general physical fitness tests. The proposed physical fitness assessment tests turned out to be accessible for all participants from 6 to 80 years old and according to their results it is possible to give a conclusion individually to each participant both in physical education and in different kinds of sports. The tests allowed us to

estimate the speed capabilities (running 10 meters); coordination abilities (shuttle run (3x5 meters); strength capabilities of abdominal muscles (raising the trunk from lying on the back 10 times for a time) and upper shoulder girdle muscles (bending and unbending arms in a standing position 10 times for a time); flexibility in the spinal column (bending forward standing on a bench).

Results of the study and their discussion. In order to obtain objective information test participants children and adolescents were divided into ages 5-8 years; 9-10 years; 11-12 years; 13-14 years; 15-16 years, this is due to the fact that the body at this age is constantly growing and generalizing the results in the range of two years allowed us to get a real picture of increasing physical capacity or (Table 1).

Table 1 – Test results for general physical fitness (n=617)

Number of people examined	Age, years	Height, centimeters	Weight, kilograms	Test					
				Running 10 m, seconds	Shuttle run 3*5 meters, seconds	Flexion and extension of the arms at the stop 10 times, seconds	Lifting the torso 10 times, seconds	Long jump from a place with 2 legs, centimeters	Tilt on the bench, cm
5-8 years	67	127,5	27,7	3	7,3	9,3	18,4	126,4	7,5
9-10 years	107	134,8	31,2	2,9	6,4	8,4	14,4	147,9	7,9
11-12 years	133	147	41,6	2,6	5,7	8,8	13,2	160,6	6,7
13-14 years	152	159	49,2	2,5	5,4	8,2	12,1	183	5,9
15-16 years	98	169,5	59,2	2,5	5,5	8,4	11,3	201,8	7,5
17 >	60	170,4	65	2,5	5,6	8,1	10	207,9	10,5

Almost all indicators show improvement with increasing age: the 10-meter run from 3.0 seconds in 6-8 years old to 2.5 seconds in 15-16 years old;

– lifting the torso 10 times from 18.4 seconds at 6-8 years old to 11.3 seconds at 15-16 years old;

– flexion and extension of the arms at an emphasis 10 times from 9.3 seconds at 6-8 years old to 8.4 seconds at 15-16 years old;

– indoor jump from 2* feet from 126.4 cm at 6-8 years old to 201.8 at 15-16 years old;

– shuttle run 3x5 meters from 7.3 seconds at 6-8 years old to 5.5 seconds at 15-16 years old.

Analyzing the test indicators, as well as the data of height and weight, it is possible to give an objective assessment of the physical fitness of those involved and develop a program for further improvement individually for each, taking into account his preferences and real capabilities. We also used more modern methods for determining speed and cognitive abilities in the laboratory “PRO SPORT” (Table 2):

Table 2 – Testing of speed and cognitive abilities of an athlete

<u>Speedzone:</u>	T-test	Rack movement	In random order 30 sec.
<u>norm</u>	<u>8.50</u>	<u>18 sec</u>	18 points
A.A.	6.2	20.00 sec	17 points
<u>Opto Jump:</u>	Jump from a 90-degree squat	Jump with a squat	Tapping test 10 seconds
<u>norm</u>	<u>25 cm</u>	<u>30 cm</u>	100 repetitions
A.A.	28.4	30.0 cm	113 repetitions

Witty Sem: The test is passed, the level of cognitive function of the athlete

Very low	Low	Pretty good	Good	Excellent
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Recommendations:

Increase speed qualities, regularly stretch the muscles of the lower extremities

Speedzone: t-test; moving in a rack; in random order.

Opto Jump: 90-degree squat jump; undercounter jump; teping test of 10 seconds.

WittySem: test passed, the level of cognitive function of the athlete.

Recommendations:

New methods require significant financial

expenses, so for physical culture and mass sports today, their use is unlikely.

Classes in a particular sport include a physical fitness testing program, which includes tasks that reflect the specifics of the sport and the suitability of the student.

Bioimpedance analysis of body composition determined on the “Tanita” device allows to obtain the following indices: for children and teenagers – weight fat content in kg and %; muscle mass in kg and %; body mass index (Table 3).

Table 3 – Body composition indicators (Tanita)

Number of people examined	age, years	height, cm	weight, kg	Fat content, %	Fat content, kg	Weight without fat	Muscle mass	Water content, kg	Water content, %	Body mass index
5-8 years	80	127,4	27,1	18,4	5,2	21,9	20,7	16	59,8	16,4
9-10 years	104	138,3	34,2	17,4	6,3	27,6	26,1	20,1	60,4	17,5
11-12 years	131	150,3	42,2	17,3	7,7	34,4	32,6	25,2	60,5	18,4
13-14 years	130	161,1	50,9	14,6	7,7	42,9	40,7	31,4	62,5	19,4
15-16 years	89	170,2	60,4	14,3	9,0	51,4	48,8	37,5	62,6	20,7
17>	53	171,6	72,3	18	13,9	57,9	55	41,6	59	24,3

For persons 17 years old and over, water content in %, amount of visceral fat (in abdomen), amount of bone mass (but not bone density and condition), metabolic age.

We tested 535 children and adolescents, and those 17 years old and older – 53 people. According to the results of the research we found a deviation from the average statistical data of children of 5-8

years old, an excess in height by 7.9 cm, in weight by 4.2 kg, which can be explained by the diet and calorie-dense food. The excess weight for this age is quite significant, so it is necessary to make adjustments in the content of nutrition and increase physical activity.

At the age of 9 to 17 years, changes from the average standard values are insignificant in the range of height 1.1-3.4 cm; weight 0.6-1.9 kg.

Low weight indicators were observed in 97 children and adolescents, i.e., more than 18% had indicators below the normative.

The percentage of fat content was recorded in the range from 13.3% to 18.4%, it should be noted that the percentage of fat gradually decreases; 5-8 years – 18.4%; 9-10 years – 17.2%; 11-12 years – 17.3% 13-14 years – 14.2%; 15-16 years – 13.3%, we can assume that the main reasons for these figures are stable growth and slow weight gain, as well as increased motor activity in children and adolescents.

The mass index readings obtained with the Tanita instrument are mostly within the norm, but there is a tendency, especially at the age of 11-14 years, of weight discrepancy with growth, which can be explained by an accelerated increase in growth and lagging weight gain.

Over the age of 18, the device calculates the metabolic age, if it is higher than the passport age,

it is an indication that the subject needs to improve the metabolic level by increasing physical activity and muscle mass, resulting in a decrease in the metabolic age.

The use of bioimpedance analysis of body composition (“Tanita”) in the examinations of people engaged in physical culture and mass sports allows making adjustments to the content of training sessions taking into account objective information:

- corresponds to a person’s weight and height;
- body fat content, including visceral fat;
- body water content;
- body mass index.

When analyzing the results obtained, it is necessary to make a conclusion individually for each athlete, taking into account all his data, guided by averaged indices. This will make it possible to give recommendations on the level and content of physical activity, variants of weight control and evaluation of physical fitness.

We use the POLAR H10 heart rate monitor to assess the body’s adaptation to exercise. It allows you to monitor your heart rate during physical training and mass sports and regulate your physical activity. The heart rate monitor is attached to the chest, connected to a computer or tablet, and the screen monitors the body’s response. One of the researchers keeps a record of the training tasks (Table 4).

Table 4 – Protocol for recording the content of training tasks

time 17:00 – 18:30 training session, Date “26” 05. 2022.

Sport: Basketball age 11-16 years

№	Training session	Time	Intensity	Methodical instructions
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At the end of the exercise, a record is made of the heart rate during the exercise, the operating time

in each of the five zones, and the number of calories expended (Table 5).

Table 5 – Heart rate in volleyball training (11-16 years old)

Date: 08.06.2022 time 8³⁰-10⁰⁵

№	FULL NAME	height, cm	age, years	weight, kg	HR		Working area (min)					Expended calories, kcal
					AVG	MAX	1	2	3	4	5	
1	B.D.	154	12	44	152 73 %	191 92 %	09,03 10 %	26,35 28%	31,49 34 %	25,12 27 %	01,02 1 %	563
2	Ch.D.	163	16	77,2	141 68 %	181 87 %	16,50 18 %	33,54 36%	33,30 36 %	09,27 10 %	00,00 0 %	576
3	T.E.	173,5	12	50,1	128 62 %	159 76 %	40,48 44 %	37,24 40%	15,29 17 %	0,00 0 %	0,00 0 %	522
4	A.Sh.	150	11	38,3	153 73 %	198 95 %	04,23 5 %	24,56 27%	45,37 49 %	15,48 17 %	2,57 3 %	495

5	B. S.	145	12	35,7	141 68 %	160 77 %	06,07 7 %	47,15 50%	40,19 43 %	0,00 0 %	0,00 0 %	455
6	M.S.	144	11	33,8	134 64 %	171 82 %	29,00 31 %	39,06 42%	24,25 26 %	01,10 1 %	0,00 0 %	525
7	Y.Z.	162,5	11	46,7	151 72 %	188 90 %	05,49 6 %	29,29 31%	40,18 43 %	18,03 19 %	0,02 0 %	621
8	P.D.	159	14	59,8	129 63 %	164 80 %	39,11 42 %	29,58 32%	24,23 26 %	0,09 0 %	0,00 0 %	550

The individual POLAR protocol records the heart rate data during the entire session and the time of work in the five zones (Figure 1). Pulse zones are calculated individually as a percentage of the

maximum pulse value, so they are individual for each student. POLAR specialists distributed the zones as follows: maximum, heavy, medium, light, very light (Figure 2).

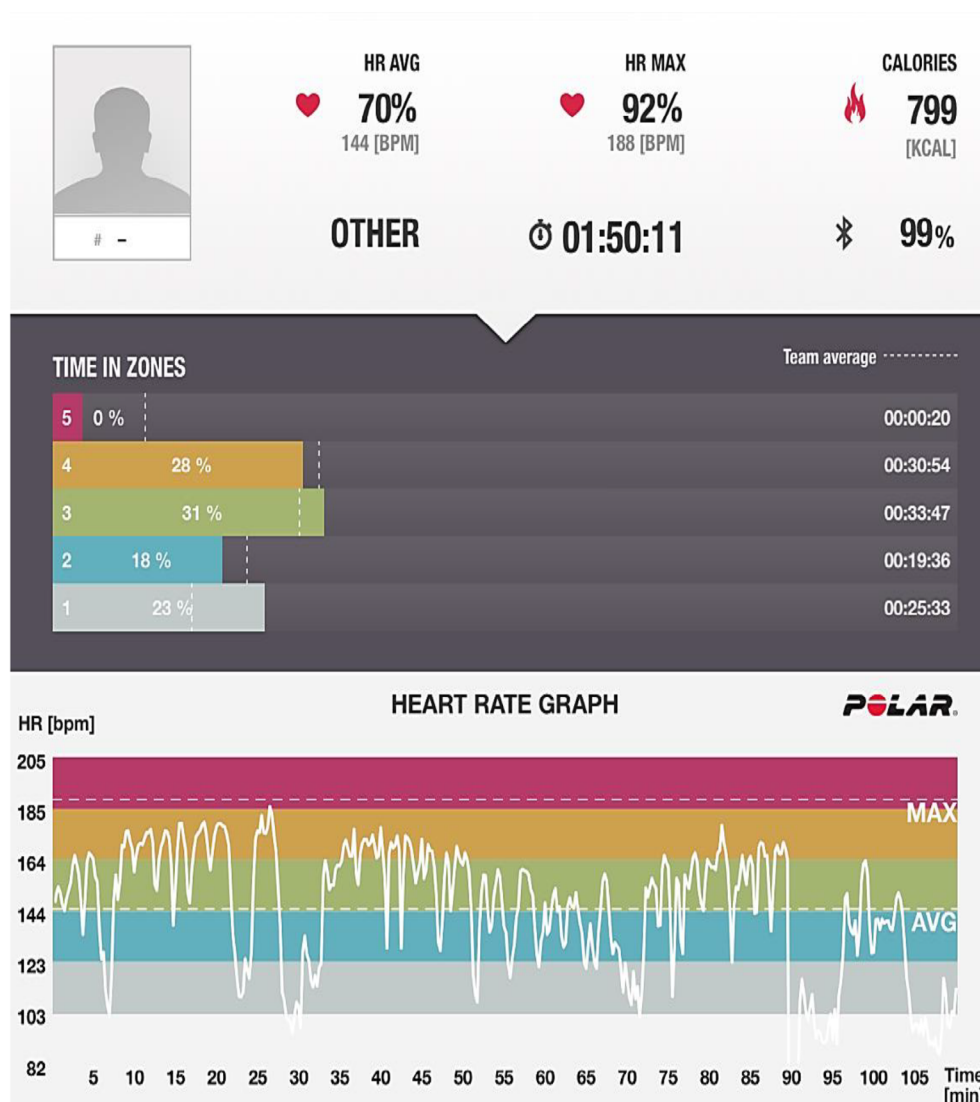


Figure 1 – Heart rate indicators during a volleyball training session

Target zone	Intensity, % of max. heart rate	Approximate will continue.	Training area
5 MAXIMUM	90-100% 171-190 beats/min	Less than 5 minutes	Pros: Develops maximum sprint speed Sensations: Severe muscle fatigue and heavy shortness of breath Recommended for: Experienced well-trained athletes
4 HEAVY	80-90% 152-171 beats/min	2-10 minutes	Pros: Increases anaerobic endurance Sensations: Muscle fatigue and difficulty breathing Recommended for: Experienced athletes
3 average	70-80% 133-152 beats/min	10-40 minutes	Pros: Improves aerobic power Sensations: Slight muscle fatigue, light breathing, moderate sweating Recommended for: Any person with standard workouts of average duration
2 easy	60-70% 114-133 beats/min	40-80 minutes	Pros: General endurance is strengthened and recovery of Sensation is facilitated: Easy breathing, low load on muscles, light sweating Recommended for: Any person with frequent workouts
1 ОЧЕНЬ ЛЕГКАЯ	50-60% 104-114 bpm	20-40 minutes	Pros: Strengthens health, increases the metabolic rate, facilitates the recovery of Sensation: Very low load

*HRmax = maximum heart rate (220 - age). Example: age 30 years, 220 - 30 = 190 beats/min

Figure 2 – Load distribution by intensity zones during heart rate registration during the training session (POLAR 2020)

Recommendations of POLAR specialists allow you to objectively assess the results obtained by the reaction of the body to training loads and compare them with the planned, to regulate the content of the training process to enter the planned zone, taking into account its capabilities and objectives.

The response of the heart rate to the intensity of training tasks depends on the physical condition and recovery level of the athlete's body, as well as on the actual conditions of the exercise. It is necessary to take into account that the circulatory system and heart rate adapt within 3-5 minutes during the transition from one zone to another.

The positive effect of engaging in physical education and mass sports depends largely on the regularity of their implementation, the professionalism of the coach or instructor and their ability to apply theoretical knowledge and practical skills in the organization of classes, the choice of tools and the distribution of physical activity.

No less important condition for quality physical exercise classes is to obtain timely, comprehensive and objective information about the physical condition of the body of the student, the level of physical fitness, the body's response to physical loads of different volume and intensity, their interest in doing physical exercises.

Summarizing the above information on the organization of control over the physical condition of the occupants, we made the following **conclusions**:

The most accessible way to assess the physical fitness of the students is testing, i.e. acceptance of control standards with a limited number of tasks and accessible to the majority of the students. We determined the control standards available to the students from 6 to 80 years old, both men and women. Test results made it possible to estimate speed capabilities (10-meter run), leg muscles speed and power abilities (long jump from place with two legs), speed and power abilities of the upper shoulder girdle muscles (bending and unbending arms in prone position), flexibility in the spinal column (inclination on a bench). A total of 617 people were tested

There are also modern testing methods, such as speed and cognitive tests, but they require expensive equipment and are not available to everyone. When conducting training sessions by sport, several additional tests can be identified to assess the physical abilities most relevant to a particular sport.

To determine the body composition of the trainees we used bioimpedance analysis determined by a Tanita device. We tested 535 children and teenagers and 53 people older than 17 years old. "The Tanita enables children and teenagers under the age of 17 to obtain the following indices: muscle mass in kg and %; body mass index; fat content in kg and %. Those older than 17 years old additionally get indices of water content in %, visceral fat, bone

mass (but not bone density and condition), metabolic age. By analyzing the results obtained it is possible to identify deviations in height, weight, lack or excess of fat and make adjustments in the content of the training process individual for each trainee.

The adaptation of the body to the physical load was determined using the heart rate recording program developed by POLAR. The trainees performed the training load with Polar H10 heart rate monitor and the heart rate readings during the training session were recorded on the screen. The developers divided load values into five intensity zones: very light 101-114 bpm; light 114-133 bpm; medium 133-152 bpm; heavy 152-171 bpm; maximum 171-190 bpm, and recommended approximate duration of exercise in each of the

five zones. In the process of training the protocol of training tasks is necessarily filled in, which allows you to evaluate the reaction of the body to the proposed loads of different intensities and, if necessary, adjust the content and physical load. It is necessary to take into account that the heart rate reaction to training intensity depends on the actual conditions of the class, physical condition of the trainee and recovery level, and during transition from one zone to another the circulatory system and heart rate are adapted within 3-5 minutes.

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