

# Assessment of functional preparedness of athletes specializing in the sprint, using new methodological approaches

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**Purpose:** study the character of the changes the level of functional preparedness of sportsmen in the autumn-winter preparatory period training cycle of one year.

**Material & Methods:** in the study to take part ten of athletes specializing in the sprint at the age of 19–23 years, and which have sports rank master of Sport and international master of sports. Methods: analysis scientific and methodical literature, pedagogical supervision, pedagogical experiment, methods for assessing functional training using computer technology, methods of mathematical statistics.

**Results:** is defined integrated quantitative value of the level functional of preparedness and her individual components using new methodical approaches.

**Conclusions:** it is shown that the conduct of the optimization functional of preparedness athletes is an important factor in enhancing the effectiveness of the training process.

**Keywords:** functional preparedness, the preparatory process, training process, microcycle.

## Introduction

The increases of the level of sports results, the considerable point of a competitive fight on the world scene in many Olympic sports demands the subsequent improvement of the training process of sportsmen.

According to the opinion of the leading experts in the branch of physical culture and sport, the search of new modern methodical approaches concerning an assessment of functional preparedness of organism of high-class sportsmen is one of the perspective directions of the increase of system effectiveness of sports preparation in different types of sports activity, and in particular in sprint [6; 8].

The analysis of scientific sources specifies also that studying and improvement of the process of formation and realization of functional preparedness of sportsmen in the course of their training and competitive activity is one of the most actual directions of modern sports science which is directed to the increase of efficiency of adaptation reactions to training and competitive load for the purpose of correction and optimization of the creation of different structural elements of the training process, – microcycles, microcycles, mesocycles, and also the purposeful use of integrated indicators of functional preparedness of organism of sportsmen when developing models which characterize morphological features of an organism and possibility of separate systems and their parts which provide a certain level of functional preparedness and competitive activity [1–4].

The relevance and the high practical importance of this problem served as the prerequisite for carrying out this research.

## Communication of the research with scientific programs, plans, subjects

The work performed within the state budgetary subject “The development of modern approaches of improvement of the system of renewal actions among sportsmen “ No. of the state registration – 1/15, IP 0115U000819 for 2015–2016.

## The purpose of the research

Studying of nature of changes of the level of functional preparedness of organism of sportswomen who specialize in sprint in the autumn and winter preparatory period of an annual cycle of preparation.

## Material and Methods of the research

Research methods: the analysis of scientifically-methodical literature, pedagogical supervision, pedagogical experiment, methods of an assessment of functional preparedness with a use of computer technologies, methods of mathematical statistics.

Within the experiment we conducted the examination of 10 sportswomen who specialize in sprint, of 19–23 years old and who have a sports rank of MS and MSIC.

The research was conducted in the course of their preparation for starts in the winter general period at the beginning and at the end of the autumn and winter preparatory period. The level of functional preparedness of organism and its separate components by means of the computer program were registered at all investigation phases at sportswomen [5]. Every-

body who were investigated, carried out the standard velo-ergometric test  $PWC_{170}$  and measured length (sm) and mass (kg) of a body for this purpose.

## Results of the research and their discussion

The assessment of the level of functional preparedness of organism of girls at the beginning of their preparation for a winter competitive season was provided at the first investigation phase (tab. 1). Sportswomen had characteristic average values of indicators which characterize their general, high-speed, high-speed and power endurance, profitability of the system of power supply of muscular activity, also reserve opportunities of this system on the basis of the obtained data at the beginning of the autumn and winter preparatory period.

So,  $oPWC_{170}$  and  $oMCO$  values which display the level of the general endurance of an organism made respectively  $19,13 \pm 0,54 \text{ kgm} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$  and  $60,37 \pm 1,27 \text{ ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$  that allowed to state the "average" level of the development of these functional indicators. Also indicators which characterize the level of profitability of the work of the system of power supply of an organism ( $PANO$ ,  $HR_{PANO}$ ,  $GMC$ ) which made respectively  $57,61 \pm 1,73\%$ ,  $154,55 \pm 4,69 \text{ b} \cdot \text{min}^{-1}$ ,  $187,54 \pm 4,24$  stand.units were registered within the "average" functional class.

Also indicators which characterize high-speed and power endurance of sportswomen were registered within the average values. Average values of  $LACp$  and  $LACc$  (respectively  $5,16 \pm 0,13 \text{ w} \cdot \text{kg}^{-1}$  and  $32,63 \pm 0,72$  stand.units.) served as a confirmation of it. It should be noted that indicators which characterize high-speed endurance were registered at the

"average" level, size of  $ALACp$  and  $ALACc$  made respectively  $5,42 \pm 0,18 \text{ w} \cdot \text{kg}^{-1}$  and  $35,92 \pm 1,06$  stand.units.

The obtained experimental data were used for the analysis of numerical scores by the levels of the general, high-speed, high-speed and power endurance of sportswomen and integrated numerical scores of the level of their functional preparedness. Results which are presented in the table 1 demonstrate that numerical scores of the general endurance, high-speed and power endurance and profitability of work of power supply of the work of muscular activity (respectively  $54,61 \pm 3,10$  points,  $55,18 \pm 2,0$  points and  $62,28 \pm 4,58$  points) were registered at the beginning of the autumn and winter preparatory period at sportswomen.

The level of high-speed endurance of sportswomen and reserve opportunities of their organism answered the functional classes "below the average" (respectively  $42,75 \pm 2,58$  points and  $48,90 \pm 2,47$  points).

The integrated numerical scores of the level of functional preparedness of sportswomen which made  $53,18 \pm 2,98$  points that answers the "average" level of functional preparedness of organism of sportswomen was calculated on the basis of an assessment of separate components of functional preparedness.

The received experimental data in our research in general are coordinated with the opinion of the leading experts [5–7] that carrying out optimization of functional preparedness of organism of sportswomen is one of the important factors of the increase of efficiency of the training process as in the preparatory and competitive periods of macrocycle, and in the

**Table 1**  
Indicators which characterize the level of functional preparedness and size of numerical scores by the level of functional preparedness of organism of sportswomen at the beginning of the autumn and winter preparatory period,  $\bar{X} \pm m$

Indicators	Size of indicators and numerical scores	Functional class
$oPWC_{170}$ , $\text{kgm} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$	$19,13 \pm 0,54$	average
$oMCO$ , $\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$	$60,37 \pm 1,27$	average
$ALACp$ , $\text{w} \cdot \text{kg}^{-1}$	$5,42 \pm 0,18$	average
$ALACc$ , stand.units.	$35,92 \pm 1,06$	average
$LACp$ , $\text{w} \cdot \text{kg}^{-1}$	$5,16 \pm 0,13$	average
$LACc$ , stand.units.	$32,63 \pm 0,72$	average
$PANO$ , %	$57,61 \pm 1,73$	average
$HR_{PANO}$ , $\text{b} \cdot \text{min}^{-1}$	$154,55 \pm 4,69$	average
$GMC$ , stand.units.	$187,54 \pm 4,24$	average
General endurance, points	$54,61 \pm 3,10$	average
High-speed endurance, points	$52,75 \pm 2,58$	average
High-speed and power endurance, points	$55,18 \pm 2,0$	average
Profitability of power supply of an organism, points	$62,28 \pm 4,58$	average
Reserve opportunities of an organism, points	$48,90 \pm 2,47$	below the average
Level of functional preparedness, points	$53,18 \pm 2,98$	average

**Note.**  $oPWC_{170}$  – relative aerobic power,  $oMCO$  – maximum consumption of oxygen,  $ALACp$  – alactate power,  $ALACc$  – alactate capacity,  $LACp$  – lactate power,  $LACc$  – lactate capacity,  $PANO$  – threshold of an anaerobic exchange,  $HR_{PANO}$  – heart rate at the level of  $PANO$ ,  $GMC$  – general metabolic capacity.

system of long-term sports improvement. Therefore the experimental data became the subsoil for carrying out the optimization of functional preparedness of organism of sportswomen are presented. The correction of the training process was directed to the increase of the general level of functional preparedness and its separate components which provide the achievement of high sports results in sprint.

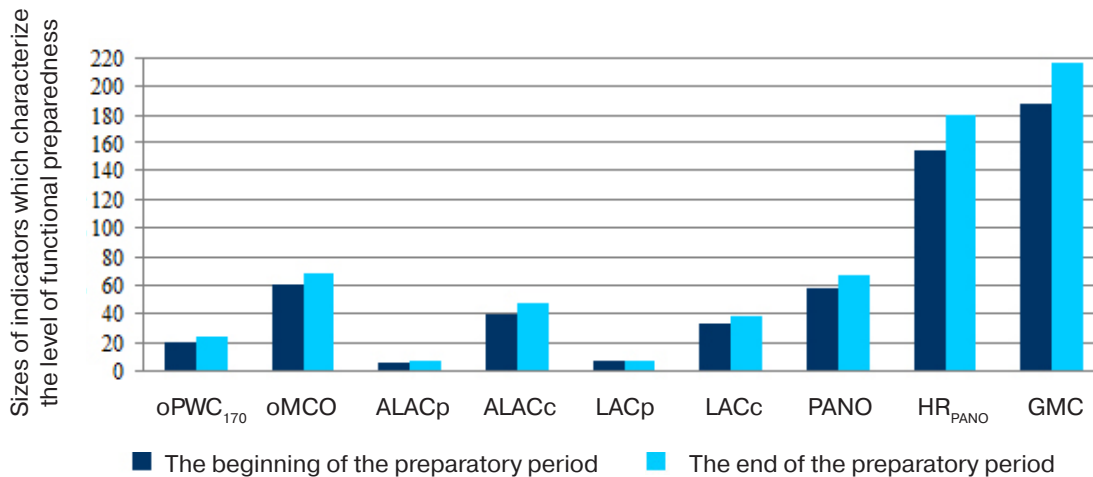
The repeated examination of sportswomen was conducted at the end of their period of preparation for a winter competitive season. Results which are presented in pic. 1, demonstrate that the correction of the training process of sportswomen promoted the expressed optimization of structural components of functional preparedness of their organism.

It should be noted that the reliable improvement practically of all parameters which characterize functional preparedness of organism of sportswomen was observed at the end of the autumn and winter preparatory period.

So, authentically statistical gain of  $\sigma PWC_{170}$  to  $23,97 \pm 1,52$   $\text{kgm} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$  (or for 19,07% in comparison with the be-

ginning of the preparatory period),  $\sigma MCO$  – to  $67,89 \pm 2,56$   $\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$  (or for 12,46%),  $ALACp$  – to  $6,94 \pm 1,78$   $\text{w} \cdot \text{kg}^{-1}$  (or for 28,04%),  $ALACc$  – to  $47,25 \pm 3,89$  stand. units. (or for 21,40%),  $LACp$  – to  $6,92 \pm 0,85$   $\text{w} \cdot \text{kg}^{-1}$  (or for 17,49%),  $LACc$  – to  $38,23 \pm 3,44$  stand.units (or for 17,58%),  $PANO$  – to  $67,01 \pm 1,54$  (or for 16,32%),  $HR_{PANO}$  – to  $180,25 \pm 6,80$   $\text{b} \cdot \text{min}^{-1}$  (or for 16,67%),  $GMC$  – to  $215,87 \pm 8,12$  stand.units (or for 15,20%) was registered till the end of the preparatory period. Also results of the analysis of numerical scores became the confirmation to the above-stated data for levels of functional preparedness of organism of sportswomen at the end of the preparatory period (tab. 2).

The reliable increase of numerical scores was watched the level of the general endurance (to  $68,53 \pm 6,19$  points or for 25,49% that answered “above the average” to the functional class), the level of high-speed endurance (to  $73,54 \pm 5,04$  points or for 39,41%, “above the average), level, high-speed and power endurance (to  $77,87 \pm 5,23$  points or for 41,20%, “above the average”), profitability of work of the system of power supply of muscular activity (to  $85,14 \pm 6,47$  points or for 36,71%, “high”), reserve opportunities of an organism



**Pic. 1.** Indicators which characterize the level of functional preparedness of organism of sportswomen at the beginning and at the end of the autumn and winter preparatory period

**Table 2**  
Sizes of numerical scores by the level of functional preparedness of organism of sportswomen at the beginning and at the end of the autumn and winter preparatory period

Indicators	The beginning of the preparatory period	The end of the preparatory period	% incremental rate
General endurance, points	54,61±3,10	68,53±6,19*	25,49±6,22
High-speed endurance, points	52,75±2,58	73,54±5,04**	39,41±8,25
High-speed and power endurance, points	55,18±2,0	77,87±5,23**	41,20±6,21
Profitability of power supply of an organism, points	62,28±4,58	85,14±6,47*	36,71±6,32
Reserve opportunities of an organism, points	48,90±2,47	72,58±6,59**	48,42±8,69
Level of functional preparedness, points	53,18±2,98	74,90±6,82**	40,84±7,25

**Note.** \* –  $p < 0,05$  \*\* –  $p < 0,01$  in comparison with the beginning of the preparatory period.

(to 72,58±6,59 points or for 48,42%, “above the average”), and also the level of functional preparedness (to 74,90±6,82 points or for 40,84%, “above the average” the functional class) on the basis of the experimental data which are presented in tab. 2 at the end of the preparation period at sportswomen.

It should be noticed that the greatest relative gain was noted at indicators which characterize reserve opportunities of an organism, which can demonstrate that sportswomen executed the large volume of a training load of different orientation in the autumn and winter preparatory period, which makes a positive contribution to the sports result.

The relative gain raised rather evenly – from 36,71% till 40,84% that demonstrates a harmonious use of a training load in other parameters of the general functional preparedness.

## Conclusions

It is determined on the basis of the conducted research that the complex studying of features of dynamics of functional preparedness of organism of sportswomen in the course of sports improvement by means of new methodical approach-

es, is the perspective direction of the increase of system effectiveness of sports preparation, in particular in sprint. It will allow to create as necessary conditions for the rational management of physical condition of sportsmen, which provides the compliance of the level of preparedness of organism of the sportsman with the set sports result, and to carry out timely correction of programs of training loads in the different periods of a macrocycle. The integrated quantities of the level of functional preparedness of an organism and its separate components, which were received by means of new methodical approach, can be also used for the development of models, which characterize the main parties of preparedness of sportsmen and provide effective competitive activity. The obtained experimental data allowed to state a rather high informational content of the used computer program in work in the autumn and winter preparatory period of an annual cycle of preparation.

**Prospects of the subsequent researches** in this direction consist in the subsequent studying of the dynamics of the level of functional preparedness of organism of sportswomen who specialize in sprint.

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