MORPHOFUNCTIONAL STATUS OF ELITE FEMALE SKI RACERS

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Annotation. Current changes in the development of ski racing at the present stage due to the intensification of the competitive process, increased competition on the international arena, reinforcement of anti-doping events and tendency to the universalization of ski racer's training dictate the relevance of updating and supplementing information about the specifics of the morphological and functional indicators of athletes in ski racing. The purpose of this study is to determine quantitative indicators characterizing the morphological and functional status of elite female racers. The morphological and functional status of female racers was determined, taking into account their sports performance. The information obtained can be used to optimize biomedical control in the training process of female skiers.

Introduction. It is known, that certain morphotypical and morphofunctional features are typical for representatives of different sport types, which are attributable to the specificity of physical loads [1, 4, 5, 6, 11]. Manifestation of these features determines the morphological status of an athlete and appears as a result of not only the effect on specific motor loads but also the consequence of the selection, during which athletes, who do not have profound potential for being successful in specific sport, are eliminated either at the stage of initial selection or at later stages. Therefore, getting information on the morphological status of athletes at different stages of training allows optimizing the biomedical control and making appropriate corrections into the process of training.

The study of specificity of individual and typological features of athletes in various types of ski sports draws attention of many researchers [4, 5, 6, 9, 10, 11]. Current changes in the development of ski racing on the modern stage, attributable to the intensification of competitive process, increased competition on the international arena, reinforcement of anti-doping events and tendency to the universalization of ski racer's training [2, 3, 7, 11] are dictating the need for an update and addition of information of specificity of morphofunctional indicators of athletes in ski racing.

The purpose of this study is to determine quantitative indicators characterizing the morphofunctional state of elite female ski racers.

Methods and organization. The study was carried out on the base of the Department of Natural Sciences of the Siberian State University of Physical Culture and Sports, 20 female ski racers with sports qualifications of Candidate Master of Sports and Master of Sports participated in the study. Following methods were used: anthropometry, spirometry, morpofunctional indexes method, method of mathematical statistics. Indicators of physical development (body length and mass, thickness of body fat, volume of muscle and fat tissue, chest girth, chest expansion, body mass index, Broca index, chest proportion index (Erismann index), index of the percentage ratio of muscle power to the body mass of athletes, index of the ratio of back strength to body mass and mass fraction of a muscle component) were analyzed. In order to compute and evaluate anthropometric features, functional reserves of the neuromuscular system and the external respiration system, level of physical development of elite female ski racers, the software "Composition of a human's body mass" was used [8].

Results and discussion. The study was constructed in order to obtain quantitative values of indicators of the morphofunctional status of elite female ski racers, to examine dynamics of these indicators within the training process and to identify and analyze differences in the level of morphofunctional indicators of female ski racers, who has a various level of sports performance. Therefore, two tests were carried out: results of the first one was obtained at the beginning of the preparatory period in the annual cycle of training (May), the second one was carried out at the end of the preparatory period (September) to evaluate the morphofunctional status of female athletes at the stage of pre-competition fitness. The analysis of indicators was carried out taking sports performance into account, then a leading group was formed, which included female athletes, who succeeded the most according to indicators of previous and current seasons.

After the conducted study, it was revealed that all female ski racers, regardless of the level of sports performance, belong to the normosthenic type of constitution and are characterized by an average level of height parameters. Significant differences between indicators of morphological parameters of female racers of the leader group and other female racers were not registered (Table 1). Female ski racers with higher level of sports performance have significantly higher values of morphofunctional indicators, characterizing power abilities and functions of the respiratory system.

The analysis of dynamics of morphofunctional indicators during training allowed revealing a significant growth in certain indicators both in female ski racers of the leading group and in less successful female athletes. However, the amount of such indicators, as well as the growth value, are higher in the group of female ski racers with high level of sports performance (Table 1). It gives an opportunity to

include indicators of VC (vital capacity), of power-related indexes (index of the percentage ratio of muscle power to the body mass of athletes, %, index of the ratio of back strength to body mass, %) and the indicator of the mass fraction of a muscle component to the most significant morphofunctional indicators, which in some way determine the achievement of high sports performance.

Table 1

Morphofunctional indicators of elite female ski racers during the preparatory period ($\bar{x} \pm \sigma$)

Parameter	First group of female race skiers (n=16 people)		Leading group (n=4 people)	
	May	September	May	September
Age, years	20,3±2,2	20,3±2,2	24±2	24±2
Body length, cm	166±4	166±4	169±2	169±2
Body mass, kg	60±2,6	59±2,1	62±2	62±2
Constitution type	normosthenic	normosthenic	normosthenic	normosthenic
Chest girth (at rest)	87±2,7	87±3,2	89±2	91±2
Chest expansion	7±2	8±2	9±1	10±1
LC, ml	3732±358	3978±370*	4140±165	4380±250**^
BMI index g/cm	351±17,1	350±16,4	365±9	365±9
Broca index, %	104,5±5,2	103±4,8	106±4	106±4
Back strength, kg	92±6,3	110±8,9*	98±7,5^	123±9,3**^
Index of the per. ratio of muscle power to the body mass, %	50,5±6,3	53,3±6,9	62±5	63±9^
Index of the ratio of back strength to body mass, %	155±24	171±19*	188±47^	192±43**^
Mass fraction of a muscle component (M1), %	53,9±3,2	54,1±3	59±7^	56±4

Note: * - statistically significant differences were registered at various stages of testing of the first group of female skiers at P≤0,05; ** - statistically significant differences were registered at various stages of testing of the leading group of female skiers at P≤0,05; ^ - statistically significant differences were registered at various stages of testing of the leading group leading group of female skiers and less successful female athletes at P≤0,05

The analysis of the conducted study indicates the fact that female ski racers with higher level of sports performance demonstrate higher tempo of growth rate in morphofunctional indicators during the training process (at the preparatory stage of the macro cycle).

Conclusion. During the study, qualitative values characterizing the morphofunctional status of female ski racers with the Candidate Master of Sports and Master of Sports qualifications were obtained. Obtained data is recommended to use for biomedical control during the process of training of elite female ski racers, as well as at earlier stages of training. By navigating given values of morphofunctional indicators, an approximate value of expected shifts of indicators

during training can be planned; the training process can also be individualized and corrected.

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