



# Building a training process highly qualified ski racers At the final stage of preparation for the XXIV winter Olympic games in beijing

UDC 796.92



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## Abstract

**Objective of the study** was to determine the methodological direction of building the structure and content of the training process of highly qualified ski racers specializing in distance racing at the site of the final stage of preparation for the main start of the season.

**Methods and structure of the study.** The work was attended by five cross-country skiers with qualifications from Master of Sports (MS) to Honored Master of Sports (WMS), who were on centralized training for 18 days in the conditions of the middle mountains (Passo de Lavace pass, altitude 1800-2000 m, Italy) at the final stage of preparation for the XXIV Winter Olympic Games 2022 in Beijing (China).

The methodological basis for the construction of the training process was the assumption that the participation of leading athletes in a series of Tour de Ski races, followed by a five-day microcycle of a restorative character ensures the preservation of the effect of pre-stay in hypoxia conditions, which allows after 1 microcycle (MCC) of a retracting nature to begin high-intensity muscle activity of a developing nature already in 2 MCC.

**Results and conclusions.** It has been established that when staying in mid-mountain conditions, an increase in the efficiency of the training process is achieved due to the complex effect of the following factors: 1) functional systems of the body that provide muscle activity; 2) systemic application of strength-oriented training in the gym, preceding the performance of speed-strength and strength-oriented loads in special skiing vehicles; 3) increase in the share of high-intensity muscular work in the 2nd and 3rd MCC.

**Keywords:** highly qualified cross-country skiers, the final stage of training, high-intensity muscular activity, adaptation to mid-mountain conditions, training loads, intensity.

**Introduction.** The current level of development of cross-country skiing places increased demands on the search for new methodological approaches to building the training process both in long-term and annual training cycles. Of particular importance in modern science and practice is the assessment of the effectiveness of building a training process based on the use of high-intensity training loads, as well as their combination with loads of moderate and low intensity in athletes of various qualifications and ages at various stages of the annual training cycle [1-3]. At the same time, one of the most important places is given to the study of the final stage of preparation (FSP) for the main start of the season [4], taking into account the peculiarities of the chronobiological and climatic-geographic adaptation of athletes to the competition

venue [5-7]. However, the problematic positions associated with the algorithm for distributing the parameters of training loads by means and intensity zones, in relation to the conditions of the venue for the FSP before the XXIV Winter Olympic Games in 2022 in Beijing (China), have not been studied and require systematic study with a view to Lew scientific substantiation of planning the training of athletes.

**Objective of the study** was to determine the methodological direction of building the structure and content of the training process of highly qualified ski racers specializing in distance racing at the site of the final stage of preparation for the main start of the season.

**Methods and structure of the study.** The work was attended by five ski racers aged 24 to 31 years, with qualifications from Master of Sports to Honored



Master of Sports, who were on central training for 18 days in mid-altitude conditions (accommodation at an altitude of 2000 m, training at an altitude of 1800 m) at the final stage of preparations for the XXIV Winter Olympic Games 2022 in Beijing (China), two of whom took part in the individual race for 15 km (classic style) and 50 km (skating style) at the Olympics.

For athletes, a program of the final stage of preparation (FSP) was developed, which included three microcycles: 1MCC retracting, 2MCC developing (shock) and 3MCC developing (transforming to achieve a high level of implementation readiness).

The study was carried out as part of the research work "Research on the chronobiological and climatic-geographic adaptation of highly qualified athletes in cyclic sports" for 2021-2022.

**Results of the study and their discussion.** A systematic study of the methodological orientation of building a training process on the FSP at the Passo de Lavace pass (height 1800-2000 m, Italy) for the Olympic Games of ski racers participating in the experimental study was carried out on the basis of establishing the ratio of the total volume of cyclic load (TVCL) by training means and its distribution by intensity zones (see table).

Analysis of the presented data of the total volume of cyclic load by means of training and intensity zones made it possible to establish the following features:

- for the final stage of preparation, the amount of work in special vehicles for skiing in classic and skating styles clearly prevails, while the ratio of work in different styles is balanced;
- the ratio of the amount of work performed in the intensity zones clearly prevails in zones I-II over III-V zones (88:12), reflecting the specifics of cross-country skiing as a type of muscular activity with priority de-

velopment of endurance, provided mainly by oxidative energy supply (aerobic possibilities).

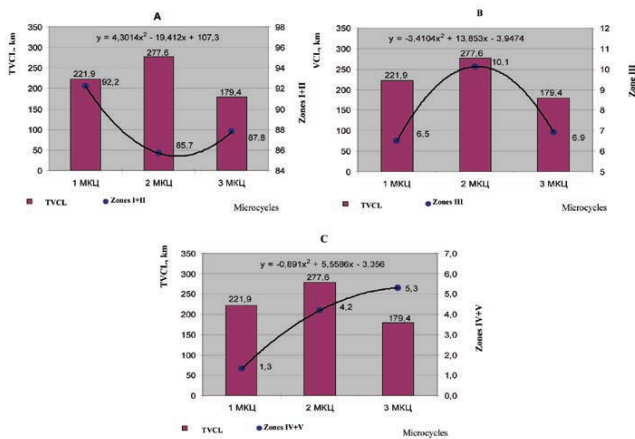
It should be noted that an even more complete picture of the methodological orientation of building the training process on the FSP was obtained by establishing the proportion (in percent) of the volume of the load performed in the intensity zones in relation to the TVCL in each microcycle, combined according to the metabolic orientation of the impact on the systems energy supply (see Figure A, B, C).

The presented data indicate that in the study group:

- the partial volume of load in zones I and II (aerobic orientation) in relation to the TVCL in the MCC was exponential, reaching a maximum level in the 2 MCC, in terms of the absolute value of the cyclic load -  $237.8 \pm 52.7$  km, while its share in the ROCF was 85.7%, reflecting the redistribution of the load towards high-intensity muscle work performed in zones III, IV and V (14.3%) (see Fig. A);
- the partial volume of load in zone III (mainly work at the level of AT) in relation to the TVCL (see Fig. B) was exponential, reaching a maximum level in the 2 MCC in terms of the volume of cyclic load -  $28.1 \pm 6.2$  km and its share in the TVCL is 10.1%, reflecting the developmental nature of the 2 MCC;
- partial volume of load in zones IV and V ("mixed" mode of energy supply with a dominant anaerobic glycolysis, Fig. C) in relation to the TVCL was of an increasing nature (ascending part of the exponent) with the dominance of the work performed in 2nd and 3rd MCC ( $11.7 \pm 3.8$  km and  $9.5 \pm 3.2$  km, respectively), with the largest share in the 3 MCC (5.3%), reflecting the orientation of the training process (the transforming nature of the 3 MCC), which forms a stable level of functioning of energy systems and their implementation readiness, after the "shock" load in the 2 MCC.

*Distribution of the total volume of cyclic load in microcycles at the final stage of preparation for the main start (average group data)*

| Indicators training process |                         | 1 MCC            | 2 MCC            | 3 MCC            | Total volume     |
|-----------------------------|-------------------------|------------------|------------------|------------------|------------------|
|                             |                         | mean             | mean             | mean             |                  |
| Training process            | Number of training days | 6,0±0,5          | 6,0±0,4          | 4,0±0,5          | 16               |
|                             | Number of workouts      | 9,0±1,9          | 10,8±1,1         | 7,8±3,5          | 28               |
|                             | Number of competitions  | 0                | 1                | 0                | 1                |
| Means                       | Running, km             | 5,8±4,7          | 9,1±5,70         | 4,2±0,3          | 19,1±11,6        |
|                             | Skiing classic, km      | 123,1±26,4       | 119,3±12,8       | 101,5±16,0       | 343,9±33,6       |
|                             | Ski skate, km           | 92,9±20,5        | 149,2±28,1       | 73,8±18,8        | 315,9±47,1       |
| TVCL, km                    | 1st zone                | 158,8±35,5       | 170,7±29,9       | 122,9±36,5       | 452,4±90,2       |
|                             | 2nd zone                | 45,8±10,8        | 67,1±14,8        | 34,6±12,0        | 147,5±30,7       |
|                             | 3rd zone                | 14,4±2,1         | 28,1±8,3         | 12,4±2,5         | 54,9±15,8        |
|                             | 4th zone                | 2,7±2,0          | 9,8±1,9          | 6,8±1,5          | 19,2±9,8         |
|                             | 5th zone                | 0,2±             | 1,9±0,9          | 2,7±1,1          | 4,9±1,7          |
|                             | Total                   | 221,9±46,7       | 277,6±30,0       | 179,4±34,6       | 678,8±85,7       |
| TVCL, hour                  |                         | 15:21:00±2:58:43 | 18:56:48±1:46:48 | 12:46:00±2:15:11 | 47:03:48±3:46:59 |



*Dynamics of partial volumes of cyclic load in the MCC at the final stage of preparation (A - zone I + II; B - zone III; C - zone IV + V)*

**Conclusions.** The results of the study show that when you are in the mid-mountain conditions at the Passo de Lavace (Italy), an increase in the efficiency of the training process, taking into account the target setting, focused on preparing for distance sports (skiathlon, individual race for 15 km, relay race and marathon) of competitive activity, was provided with a developed version of the methodological orientation of building the training process, the structural elements of which had the following content content: the total volume of cyclic load was  $678.8 \pm 85.7$  km, the total volume of cyclic and acyclic load in hours was  $55:53:45 \pm 5:30:24$  h, maintaining the balance of work in the zones of aerobic and anaerobic orientation in three microcycles 88:12% between I-II and III-V zones of intensity, providing achieving a high sustainable level of physical performance by the end of the 3rd MCC in the period between the 16th and 18th days of stay at a given height (with the variant being studied again 1st stay on the top after participating in the Tour de Ski).

The presented data allow a detailed approach to solving issues related to the influence of the following factors on adaptation processes:

- performing training loads at an altitude of 1800 m, and living at a higher altitude - 2000 m, which has an additional hypoxic effect on the functional systems of the body that provide muscle activity (by analogy with the principle of "live high-train low" (LHTL));

- systemic application of strength-oriented training in the gym (with weights of different weights, static-dynamic nature, on simulators, stabilization exercises), preceding the performance of speed-strength and strength-oriented loads in special skiing vehicles.

*The research was carried out within the framework of the state task of the FGBU FNTs VNIIFK No. 777-00005-21-00 (subject code No. 001-21/2).*

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