

# Analysis of the volume of competitive loads of leading foreign riders in modern cycling-highway

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## Abstract

**Objective of the study** was to identify the parameters of the volume of competitive load among the leading foreign racers in different age periods.

**Methods and structure of the study.** In the course of the study, the results of the performances of foreign athletes (men) in road cycling in competitions included in the schedule of the International Cycling Union (UCI) for the period 1997-2021 were analyzed. The final sample included data from leading foreign athletes from 13 countries with different racing roles (n=31). The following parameters were taken as the main studied parameters (VCL): the total number of competition days - TNCD; the total distance (length) of the competitive load, expressed in kilometers, - TDCL.

**Results and conclusions.** The result of the study was the determination of the confidence zones of the optimum volume of competitive load in cycling-highway for each age of athletes in the range from 18 to 33 years, which should be reflected in the federal standards of sports training in cycling. The authors recommend that, when forming the calendar plan of All-Russian and interregional highway cycling competitions (and its financial support), provide athletes with such a volume and nature of competitive starts that will **allow them to fulfill the volumes of competitive loads** recommended by the results of the study and get closer in this component of sports training to the leading cyclists of the world.

**Keywords:** *cycling-highway, sports competition, competitive load, volume of competitive loads.*

**Introduction.** The main component of the system of training athletes in almost any sport is physical activity. The concept of "load" in the classical interpretation of L.P. Matveeva (1991) means an additional degree of functional activity of the body compared to rest, brought by the performance of an exercise (or exercises) [1], which is also true for road cycling. High physiological and psychological demands are placed on cyclists due to significant amounts of training loads and a large number of competitions: the sports season of professional road cyclists, namely, from their composition, a pool of elite athletes is currently being formed, begins around the end of October - beginning of November, and some of the first races start as early as January. A professional cyclist residing in Europe annually performs a volume of cyclic load from 30,000 to 35,000 km, this includes about 90-100 competition

days [2]. Therefore, high-quality and regular monitoring of various aspects of the training process of athletes becomes one of the goals of the modern cyclist training system, and careful control over the course of training is necessary to ensure a balance between the physical load received by the athlete and the rehabilitation measures used as part of the training plan.

Currently, the development of the federal standard for sports training in cycling is carried out without taking into account information about the volume of competitive loads (hereinafter referred to as VCL) in professional road cycling, which does not allow the formation of a system of goals justified by the best practices of world road cycling in the long-term process of training Russian cyclists and thereby ensure the high competitive level of the Russian national team at major international competitions.

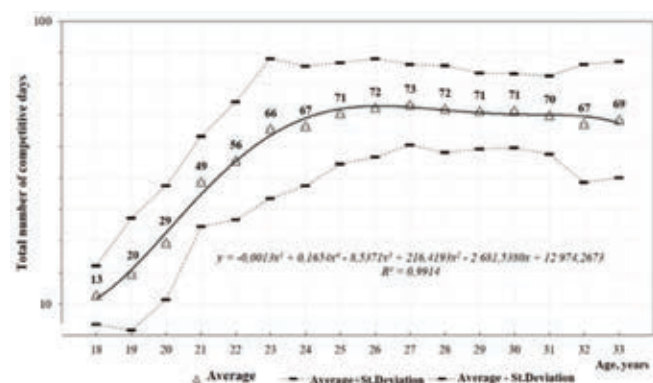
**Objective of the study** was to identify the parameters of the volume of competitive load among the leading foreign racers in different age periods.

**Methods and structure of the study.** In the course of scientific work, the results of the performances of foreign athletes (men) in road cycling in competitions included in the schedule of the International Cycling Union (UCI) for the period 1997-2021 were collected and analyzed. The data source was the official protocols of the competitions posted on the UCI website and the information resource <https://www.procyclingstats.com/index.php>. The final sample included data from leading foreign athletes from 13 countries with different racing roles (n=31), including eight champions and prize-winners of the Olympic Games, 14 winners and prize-winners of the world championships, eight winners of multi-day Grand Tour races in the general classification, 23 Grand Tour winners. Athletes in different years of their sports careers occupied high positions in the UCI ranking: 19 of them were among the top ten cyclists in the world, five more athletes were in the top twenty and three were in the top thirty in the UCI ranking. The volume of the formed data sample was limited to the age period of 18-33 years, while some athletes had a sports career of 40 years or more. Data from sports seasons in which the number of competition days was significantly reduced due to an athlete's injury or illness were excluded from the analysis matrix. In total, 1218 values of the competitive load volume parameters were analyzed.

The following parameters were taken as the main studied parameters VCL:

- total number of competition days - TNCD;
- total distance (length) of the competitive load, expressed in kilometers - TDCL.

Data processing was carried out according to the method of time series analysis, the elements of which are:



*Growth dynamics of the total number of competition days depending on from the age of leading foreign male athletes in road cycling (n=31)*

- 1) athlete's age (calendar)
- 2) the numerical value of the parameter VCL.

**Results of the study and their discussion.** During the analysis of the “total number of competition days” parameter, a two-component growth trend was revealed depending on the age of the athletes (see figure).

Starting from the age of 18 years and up to and including 23 years, there is a gradual increase in the annual indicator of TNCD from 13 to 66 days. A statistically significant difference in the values of TNCD (at a significance level of 0.95) is observed only in the age period of 20-21 years. In all other cases, the differences are not statistically significant. Starting from the age of 24-25 years, the “age - TNCD” schedule of highly qualified cyclists reaches a plateau - 71 competition days per season, which is almost 20% of the duration of the full annual training cycle.

The maximum number of competitive days per season - 100 - was shown by two athletes. Another seven athletes scored TNCD in 90 days or more, and four athletes reached this level more than once during their sports career. In total, nine athletes out of 31, or almost a third of the sample group - 29%, reached the level of the TNCD indicator “90 days or more”. Thus, in the structure of the annual cycle of the sports training system for this group of athletes, the type of training “competitive training” in terms of days takes a share of 25-27% of the total duration of the annual cycle.

The analysis of the “total distance of the competitive load” parameter showed that in the long-term aspect, the dynamics of changes in the TDCL of the leading foreign athletes in road cycling also has two periods: starting from the age of 18 years, there is a period of almost linear increase in the TDCL parameter, which lasts up to 23 years. In the age range of 18-23 years, each subsequent value of TDCL (average for the year) differs statistically significantly from the previous one (at a significance level of 0.95). Further, the dynamics of the growth of the TDCL parameter slows down, but nevertheless shows a positive growth trend up to 28 years of age inclusive, however, starting from 23-24 years of age, the differences in the values of TDCL are no longer statistically significant. In general, it can be noted that the period of relative stabilization of the values of TDCL begins at the age of 24, which lasts for foreign athletes up to 33 years inclusive.

The maximum length of the competitive load in the studied group of foreign athletes was 15,590 km. At the same time, five out of 31 athletes exceeded the annual ODSN of 15 thousand kilometers, one of them



*Confidence zones of the optimum volume of competitive load in road cycling for each age of athletes in the range of 18-33 years*

Age, years	Volume of competitive load			
	Total number of competition days		Total distance of competitive load, km	
	Lower optimum	Upper optimum	Lower optimum*	Upper optimum*
18	0	23	0	2 440
19	8	36	950	4 770
20	17	49	2 400	7 100
21	27	62	3 850	9 430
22	36	75	5 300	11 760
23	45	85	6 750	14 100
24 and older on average (but not more than 33 years old)	56	86	8 770	13 700

Note: \* – rounding up to 10.

exceeded this milestone twice and another three times.

The given maximum values of TDCL should be taken into account as the maximum allowable, since they are, most likely, not so much the result of the desire of athletes to set local records in their competitive activities, but rather the result of a combination of the characteristics of the functional systems of the athlete's body, the highest degree of their development in a particular sports season and the provided the leadership of professional teams of the opportunity to perform for this athlete in the largest possible number of races. Based on the data obtained, when planning the volume of competitive loads of Russian racers, their increase in junior age should be gradual and consistent with reaching the peak by the age of 23-24 years. This will help to avoid regimes of forcing loads, to accumulate and preserve the potential of young athletes for its implementation at a more mature age. Therefore, it would be more expedient and justified from the point of view of using it in practical work with cyclists to determine a confidence "corridor" of the values of the volumes of competitive loads for different ages - the optimum zone (see table).

It should be especially emphasized that the confidence zones of the optimal volume of competitive load in road cycling presented in the table were obtained

on the basis of data on the participation of athletes in international competitions only under the auspices of the UCI. Taking into account the probable participation of the same athletes in the continental championships, the boundaries of the VCL optimum zone indicated above can be increased by two or three days and by 300-400 km.

**Conclusions.** The result of the study was to determine the confidence zones of the optimum volume of competitive load in road cycling for each age of athletes in the range of 18-33 years, which should be reflected in the federal standards of sports training in cycling.

In order to ensure the fulfillment of modern requirements for the level of preparedness of Russian athletes in road cycling and increase their competitiveness at international sports competitions, when compiling sports training programs, one should be guided by the parameters of the volume of competitive loads applicable among the world's leading cyclists. To do this, when forming the calendar plan of all-Russian and interregional competitions in road cycling (and its financial support), it is necessary to provide athletes with such a volume and nature of competitive starts that will allow them to fulfill the volumes of competitive loads recommended by the results of the study and to approach the leaders in this component of sports training. cyclists of the world. At the same time, athletes must gain at least 75 percent of the competition days during multi-day races.

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