

# Relationship of special and functional preparedness of freestyle wrestlers at different stages of sports training

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*The presented experimental data indicate that at all stages of the long-term training of freestyle wrestlers between the ages of 11–12 years old and 17–18 years old there are reliable relationships between the indicators of special and functional readiness. The greatest numbers of reliable relationships have tests on special preparedness – "rushing on the wrestler's bridge in 1 minute", "coups on the wrestler's bridge in 1 minute". The conducted studies confirm the reliably high interconnection of the components of special and functional preparedness when training adolescents and young men in wrestling. Separate components of these types of training change the information content depending on the stages of preparation, require changes in the total and selective amounts of training loads.*

**Purpose:** *explore the relationship of the main components of the special and functional preparedness of adolescents and young men engaged in freestyle wrestling at different stages of many years of sports training.*

**Material & Methods:** *the study is organized on the basis of the Olympic College of Ivan Poddubny with the participation of 90 athletes aged 11 to 18 years. In the course of the experiment, the following methods were used: theoretical analysis, synthesis of practical experience, pedagogical testing, pulsometry, reflexometry, heat measurement, mathematical statistics, correlation analysis.*

**Results:** *the interrelation of special and functional preparedness of freestyle wrestlers from 11 to 18 years old, studying at different stages of sports training, is established.*

**Conclusions:** *the study of the problem of the relationship of special and functional preparedness of freestyle wrestlers requires the development of an integrated methodology using the idea of a systems approach. At all stages of athletic training for teenagers and young men aged 11–12 years old to 17–18 years old engaged in freestyle wrestling, there are reliable relationships between the components of special and functional preparedness. According to the informativeness of these indicators vary from the stage of preparation; it requires changes in the volume of training loads of selective and general orientation.*

**Keywords:** *wrestling, interrelation of types of training, informativeness of components of preparedness, informativeness of components of functional preparedness, complex research methodology.*

## Introduction

The functionality of an athlete, in the modern sense, [12; 16; 17] are considered as integral characteristics of the functions of human qualities, which directly or indirectly determine the effectiveness of competitive activity and constitute the content of the functional (auxiliary) training. Determining the role and influence of means and methods of functional training [12], the ratio of components of functional training in conjunction with the special at different stages form the basis for the development of multi-year planning of training loads of both general and selective orientation, this applies to all sports, including freestyle wrestling.

To achieve positive results, competitive activity requires the participation of all body systems from an athlete. But depending on sports, when performing competitive exercises, there are systems that play a major role and supporting auxiliary.

According to scientists [9; 12; 14; 16], the most frequently functional state is determined by the central nervous system, which accompanies any activity, including sports. Such conclusions in sporting martial arts are confirmed by the studies of V. Volkov [12], V. Klychko [10], V. Yagel [17]. The studies performed are important for sports practice, but, as far as freestyle wrestlers are concerned, they are episodic and do not carry information about all stages of many years of sports training.

The analysis [4; 7; 12; 17] shows that a significant role in the training and competitive activities of athletes, including freestyle wrestlers, has a functional state of the cardiovascular system, the level of which largely determines the health, performance and adaptive abilities of athletes to physical stress.

The lack of necessary information about the relationship of special preparedness and functionality of the cardiovascu-

lar system of freestyle wrestlers requires research, have both theoretical and practical importance not only for wrestling, but also for other sports.

**Purpose of the study:** explore the relationship of the main components of the special and functional preparedness of adolescents and young men engaged in freestyle wrestling at different stages of many years of sports training.

## Material and Methods of the research

The studies were organized on the basis of the Olympic College of Ivan Poddubny with the participation of 90 athletes aged from 11 to 18 years.

All athletes for college went through a preliminary stage of preparation and completed the youth category in freestyle wrestling.

During the experiment, the following methods were used [8; 13; 15]: theoretical analysis, generalization of practical experience, pedagogical testing, pulsometry, reflexometry, heat measurement, mathematical statistics.

In studies in determining the functional capabilities of the nervous system, the device "ДПФІ-1М" was used, and the cardiovascular system – the Harvard step test and special wrestling tests.

Analytical and graphical methods were used to analyze the correlation matrices, which allowed to determine reliable relationships between the components of the special and functional preparedness of freestyle wrestlers who study at different stages of sports training.

## Results of the research

**1. The relationship of indicators of special preparedness and reflexometry (LTMR).** In previous studies [7], it was determined that the most informative indicator of the functioning of the nervous system of freestyle wrestlers (great weakness) is the dynamics of the latent time of the motor reaction (LTMR) to sound.

According to research data [3; 8; 10, 11; 17], "strength" and, accordingly, "weakness", as the second pole of this property, manifests itself in the degree of endurance of the nervous system for long-term actions and strong short-term stimulus.

The determination of these indices of the nervous system in freestyle wrestlers was carried out using the device "ДПФІ-1М", in the program of which 10 measurements of the LTMR indices in dynamics with different intervals were laid. The results of the experiment and became the subject of the analysis (Table 1, Figure 1).

**Initial training, 11–12 years.** The analysis of the correlation matrix of the LTMR functional indicators for the sound of freestyle wrestlers at the initial sports training stage was reli-

ably interconnected ( $r=0,62$ ) with the 7th LTMR indicator and the component of special preparedness, measured by the "rushing on the wrestler's bridge in 1 minute" test. It should be noted that all the values characterizing the level of special preparedness of wrestlers at this stage are reliably related to each other at the level of  $r=0,50-0,98$ . At such a high and reliable correlation level ( $r=0,50-0,90$ ), indicators characterizing the functional capabilities of the cardiovascular system are interrelated.

So, the analysis of the correlation matrix allows, first of all, to note the high correlation interrelation of all ten LTMR dynamics indicators, as well as the indicators characterizing the recovery after the wrestling tests.

From the 10 indicators of LTMR, the 2nd, 4th and 7th dimensions have the greatest information content (the number of reliable relationships) (Table 1, Figure 1).

**Preliminary basic training, 13–14 years.** Biological processes that are characteristic of adolescents 13–14 years of age largely affect not only the activity of the development of individual body systems, but also the indicators of the formation of physical [4; 10; 17], including the functional capabilities of the growing organism.

This process requires considerable energy [3; 7; 15], which is reflected in the indicators of the interrelationships of the functional and special preparedness of the young wrestlers. So, if in the previous, initial stage, we observe a significant amount of reliable interrelationships of LTMR indicators and their significant informativeness, then at the next stage of basic training of free-style wrestlers (Table 1) these interrelations disappear. This year, the 2nd, 4th, 6th, and  $\bar{X}r$  measurements have a significant impact on interrelations with other indicators.

As in the previous stage of preparation, reliable relationships are characteristic of indicators characterizing recovery processes (HR, beats  $\text{min}^{-1}$ ) both after the wrestling test and the Harvard step test.

So, for this stage of training of young wrestlers, it is characteristic of the fact that the relationship between the LTMR indicators and the components of special preparedness is significantly reduced; a decrease is also observed between the 10th dimensions of the LTMR.

**Specialized basic training, 15–16 years.** At all stages of sports training, we observe significant changes in the interrelations of all types of free-style wrestling training.

If at the previous stage of preparation (13–14 years), reliable interrelations between all components of special and functional readiness decreased, then at the stage of specialized basic training these interrelations spread.

Thus, the  $\bar{X}r$  LCHRR indicators (Table 1) become the most informative, reliably associated with other dimensions of LTMR for sound, and the 4th, 6th and 3rd dimensions of LTMR have

the greatest informativeness.

It should be noted the reliable relationship between the indicators of special preparedness and recovery indicators (HR, beats min<sup>-1</sup>) after performing a special wrestling test "throws for 1 min".

It should be noted the reliable relationship between the indicators of special preparedness and recovery indicators (HR, beats min<sup>-1</sup>) after performing a special wrestling test "throws for 1 min".

**In-depth specialized training, 17–18 years old.** Free-style wrestlers who undergo a training process at the stage of in-depth specialized training (Table 1) – these are athletes of high qualification, masters of sports, reflected on the results of correlation analysis and informativeness of all components of preparedness.

LTMR indicators are interrelated with components of special preparedness - wrestling tests, and with indicators that indicate the dynamics of the recovery of the body after perform-

ing a special wrestling test "coups on the wrestler's bridge in 1 minute". This test, for its part, is interconnected with another wrestling test "rushing on the wrestler's bridge in 1 minute" (r=0,89).

Regarding the dynamics indicators of LTMR, most of them are interconnected at the level of r=0,60–0,90, and the highest number of reliable relationships and a high level of information content are the 1st, 4th, 6th and  $\bar{X}r$  indicators.

The research results are confirmed (Figure 1) with a special analysis of the age characteristics of interrelations at the level of r=0,60 LTMR indicators and components of the special preparedness of wrestlers at various stages of many years of sports training.

**2. Interrelation of indices of special preparedness and tapping metrics (maximum rate of movements).** Indicators of the maximum rate of movement, according to many researchers [8; 9; 15] and sports practice [3; 7; 10; 11], allow us to obtain data on the strength of the nervous system. This test, according to Professor E. P. Ilyin [8], allows us to determine the endurance of the nervous system, and in connection with this mandatory condition for the execution of this test is the maximum rate.

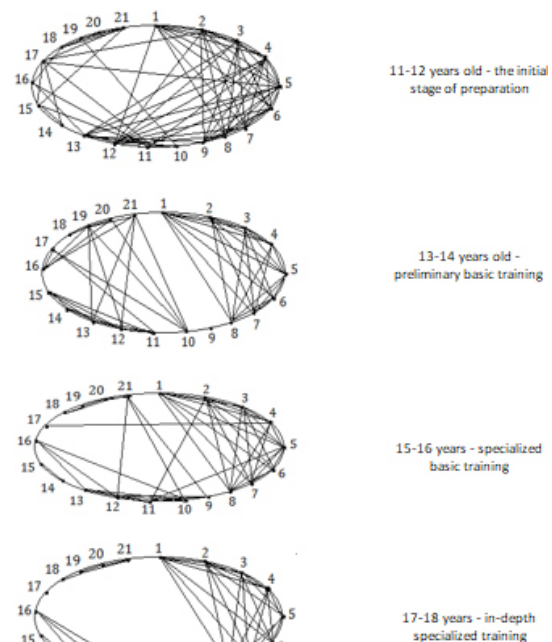
The results of the analysis of the correlation matrices indicate that at the initial preparation stage, the 2nd and 5th indicators of tapping metrics are in a reliable relationship with the special wrestling test "throws for 1 min" (r=0,55, r=0,59).

**Table 1**  
**Summary table of interrelations and informatively of reflexometry indicators (LTMR for sound) and special preparedness of freestyle wrestlers at various stages of preparation**

№ i/o	Indicators	Initial, 11-12 years			Preliminary basic, 13-14 years		
		Inform. Xr	Place selective	Commo n place	Inform. Xr	Place selective	Commo n place
1	1 Dimension	44	VII	VII	15	VII	XI
2	2 Dimension	58	I	I	24	III	VI
3	3 Dimension	53	V	V	23	IV	VII
4	4 Dimension	57	II	II	24	III	VI
5	5 Dimension	51	VI	VI	22	V	VIII
6	6 Dimension	56	III	III	24	III	VI
7	7 Dimension	58	I	I	27	II	IV
8	8 Dimension	54	IV	IV	15	VII	XI
9	9 Dimension	57	II	II	16	VI	X
10	10 Dimension	53	V	V	15	VII	XI
11	Xr	58	I	I	32	I	II
12	Rushing on the wrestler's b	35	I	VIII	25	IV	V
13	Coups on the wrestler's brid	20	VII	XIII	22	VI	VIII
14	HR, beats in 1 minute	26	IV	XI	30	II	III
15	Throws for 1 minute	27	III	X	23	V	VII
16	Recovery after throws HR beats min	32	II	IX	18	VII	IX
17	1 Recovery HR beats/min	25	V	XII	34	I	I
18	2 Recovery HR beats/min	16	VIII	XIV	27	III	IV
19	3 Recovery HR beats/min	24	VI	XII	30	II	III

№ i/o	Indicators	Specialized basic, 15-16 years			In-depth specialized, 17-18 years		
		Inform. Xr	Place selective	Commo n place	Inform. Xr	Place selective	Commo n place
1	1 Dimension	30	VIII	IX	43	IV	IV
2	2 Dimension	43	IV	IV	43	IV	IV
3	3 Dimension	43	IV	IV	19	IX	XII
4	4 Dimension	48	II	II	46	II	II
5	5 Dimension	42	V	V	32	VIII	IX
6	6 Dimension	47	III	III	49	I	I
7	7 Dimension	40	VI	VI	43	IV	IV
8	8 Dimension	26	IX	XI	41	VI	VI
9	9 Dimension	22	X	XII	35	VII	VIII
10	10 Dimension	38	VII	VII	42	V	V
11	Xr	51	I	I	45	III	III
12	Rushing on the wrestler's b	29	V	X	39	I	VII
13	Coups on the wrestler's brid	32	III	VIII	30	III	X
14	HR, beats in 1 minute	10	VII	XV	24	IV	XI
15	Throws for 1 minute	12	VII	XIV	13	VII	XIV
16	Recovery after throws HR beats min	40	I	VI	18	VI	XIII
17	1 Recovery HR beats/min	38	II	VII	35	II	VIII
18	2 Recovery HR beats/min	30	IV	IX	19	V	XII
19	3 Recovery HR beats/min	19	VI	XII	18	VI	XIII



**Fig. 1. Age features of interrelations (r>0,6) of functional indicators of LTMR and special preparedness of wrestlers at various stages of preparation:**  
1–10 – measurements; 11 –  $\bar{X}r$  LTMR; 12 – "rushing on the wrestler's bridge in 1 minute"; 13 – "coups on the wrestler's bridge in 1 minute"; 14 – HR, beats·min<sup>-1</sup>; 15 – the number of throws; 16 – recovery after throws; 17–19 – recovery.



This test also has a high degree of informational content with another wrestling test – "rushing on the wrestler's bridge in 1 minute" ( $r=0,52$ ) and "coups on the wrestler's bridge in 1 minute" ( $r=0,88$ ). Consequently, this fact confirms the interrelation of the indicators of tapping metrics with the indicators of the special preparedness of freestyle wrestlers of 11–12 years.

The determination of the informativeness of the indicators of tapping metrics, according to the results of the analysis of the correlation matrix (Table 2), makes it necessary to recognize the 5th dimension (21–25 s) as the most significant in the study. This conclusion is also confirmed by further studies, which determined the age characteristics of interrelations ( $r>0,6$ ) and indicators of the functional and special preparedness of wrestlers at various stages of preparation (Figure 2).

At the stage of preliminary basic training (13–14 years), the young wrestlers, like all adolescents, begin puberty, affecting the whole growing organism.

The changes are reflected in the results of the correlation analysis of the indicators of tapping metrics and the special preparedness of young wrestlers. There are no significant changes in the relationship, as in the previous age, all the indicators of heating metrics at the level of  $r=0,70-0,90$ .

Of the indicators of special preparedness, the highest correlations among themselves are "coups and rushing on the wrestler's bridge in 1 minute". In addition, it should be noted that these indicators of special preparedness are interconnected with the results of recovery (HR, beats  $\text{min}^{-1}$ ) after performing the Harvard step test.

The 1st (1–5 s), 5th (21–25 s), and 3rd (11–13 s) measurements have the greatest information content (Table 2) of the indicators of tapping metrics. The correlation of the recovery (HR, beats  $\text{min}^{-1}$ ) when performing the Harvard step test shows high informational content.

At the stage of specialized basic training (15–16 years), the number of interrelations of high correlation dependence is significantly reduced (Figure 2), and their information content also changes (Table 2). The only exceptions are the interrelationships of the indicators of heating measurements, which testify to their high informativeness ( $r=0,60-0,90$ ) and the 4th indicator (16–20 s), which at the level of  $r=0,50$  is interrelated with the indicator of special preparedness "throws for 1 min".

At this stage of sports training, reliable connections are at the level of  $r=0,91$  "rushing on the wrestler's bridge in 1 minute" and "coups on the wrestler's bridge in 1 minute". Significant information (Table 2) at this stage have indicators of recovery (HR, beats  $\text{min}^{-1}$ ) after performing the Harvard step test (2,3 minutes) and the special wrestling test "throws for 1 minute".

It should be noted that at the stage of specialized basic training, the indicators of "coups and rushing on the wrestler's

**Table 2**  
**Summary table of interrelations and informative indicators of tapping metrics and special preparedness of freestyle wrestlers at various stages of preparation**

№ f/o	Indicators	Initial, 11-12 years			Preliminary basic, 13- 14 years		
		Inform. Xr	Place selectiv	Comm. n place	Inform. M.	Place selectiv	Comm. n place
1	1. 1-5 s	42	VII	VII	37	I	I
2	2. 6-10 s	47	III	IV	34	IV	IV
3	3. 11-15 s	45	V	V	35	III	III
4	4. 16-20 s	51	II	II	33	V	V
5	5. 21-25 s	53	I	I	36	II	II
6	6. 26-30 s	46	IV	V	32	VI	VI
7	?	44	VI	VI	33	V	V
8	Xr	44	VI	VI	33	V	V
9	HST index	45	V	V	21	VII	XII
10	HR, beats (n 1 minute)	35	IV	X	28	IV	VIII
11	1 Recovery HR beats/mfn	40	III	VIII	30	III	VII
12	2 Recovery HR beats/mfn	46	II	V	35	II	III
13	3 Recovery HR beats/mfn	48	I	III	37	I	I
14	Rushing on the wrestler's b	29	V	XIV	20	V	XIII
15	Coups on the wrestler's b	32	III	XII	23	IV	XI
16	HR, beats (n 1 minute)	35	I	X	28	I	VIII
17	Throws for 1 minute	33	II	XI	16	VI	XIV
18	Recovery after throws HR, beats/mfn	24	VII	XVII	15	VII	XV
19	1 Recovery HR beats/mfn	26	VII	XVI	25	III	X
20	2 Recovery HR beats/mfn	27	VI	XV	28	I	VIII
21	3 Recovery HR beats/mfn	30	IV	XIII	26	II	IX

№ f/o	Indicators	Specialized basic, 15-16 years			In-depth specialized, 17- 18 years		
		Inform. Xr	Place selectiv	Comm. n place	Inform. Xr	Place selectiv	Comm. n place
1	1. 1-5 s	30	VII	VIII	37	II	II
2	2. 6-10 s	39	III	III	36	III	III
3	3. 11-15 s	40	II	II	29	VII	VIII
4	4. 16-20 s	26	IX	X	33	IV	IV
5	5. 21-25 s	44	I	I	31	V	VI
6	6. 26-30 s	36	IV	IV	41	I	I
7	?	35	V	V	30	VI	VII
8	Xr	34	VI	VI	30	VI	VII
9	HST index	28	VIII	IX	20	VIII	XIV
10	HR, beats (n 1 minute)	26	IV	X	19	IV	XV
11	1 Recovery HR beats/mfn	35	I	V	32	I	V
12	2 Recovery HR beats/mfn	33	II	VII	27	II	IX
13	3 Recovery HR beats/mfn	30	III	VIII	26	III	X
14	Rushing on the wrestler's b	17	VII	XV	29	I	VIII
15	Coups on the wrestler's b	16	VI	XIV	23	IV	XIII
16	HR, beats (n 1 minute)	20	V	XIII	19	V	XV
17	Throws for 1 minute	21	IV	XII	13	VII	XVII
18	Recovery after throws HR, beats/mfn	21	IV	XII	18	VI	XVI
19	1 Recovery HR beats/mfn	25	III	XI	25	II	XI
20	2 Recovery HR beats/mfn	28	II	IX	24	III	XII
21	3 Recovery HR beats/mfn	30	I	VIII	23	IV	XIII

bridge in 1 minute" show reliable and high correlations with recovery (HR, beats  $\text{min}^{-1}$ ) after performing the Harvard step test and a special wrestling test.

Further changes in the relationship of special and functional preparedness of freestyle wrestlers are observed at the next stage of preparation - the stage of advanced specialization (Table 2, Figure 2).

Analyzing the correlation matrix, it should be noted that, as in the previous stages of preparation, the indicators of tapping metrics are interconnected at a high correlation level ( $r=0,60-0,80$ ), and the 6th is the most informative (26–30 s) 1st (1–5 s) and 2nd (6–10 s) indicators. From the indicators of the special preparedness of "coups and rushing on the wrestler's bridge in 1 minute", which are reliably interconnected at the level of  $r=0,90$ .

Correlation analysis shows that the recovery (HR, beats  $\text{min}^{-1}$ ) after performing the Harvard step test and the special wres-

ting test "throws for 1 min" are significantly interrelated.

According to the results of the Harvard step-test, recovery (HR, beats  $\text{min}^{-1}$ ) has the most informative indicators of the functional status of the cardiovascular system of freestyle wrestlers who study at the in-depth stage of sports training.

## Conclusions / Discussion

Practical application is carried out in the conditions of the training process of young wrestlers during training in children's youth sports schools and the educational process of students in higher education institutions of physical culture.

The theoretical and experimental studies on the problem of the relationship of special and functional fitness of adolescents and young men engaged in freestyle wrestling at different stages of many years of sports training, allowed us to draw the following conclusions:

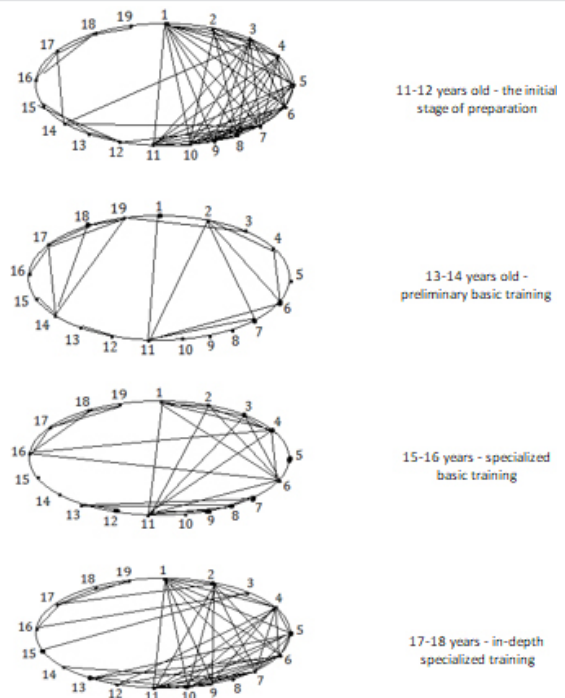
- studying the problem of the relationship of special and functional preparedness of athletes, including representatives of wrestling, need an integrated methodology using the ideas of a systems approach;

- to solve the set tasks, a complex methodology was developed, the contents of which included: pedagogical experiment, pedagogical testing, pulsometry, reflexometry, tapping metrics, methods in mathematical statistics;

- results of the research show that at all stages of sports training for adolescents and young people aged 11–12 years old to 17–18 years old engaged in freestyle wrestling, there are reliable interrelations between the components of special and functional preparedness;

- the highest informational content and a greater number of reliable interrelations from the components of special preparedness have the indicators "rushing on the wrestler's bridge in 1 minute" and "coups on the wrestler's bridge in 1 minute";

- depending on the stage of preparation, from the indicators of tapping metrics, the following measurements have the largest number of reliable relationships with the indicators of special preparedness: initial training – 5 (21–25 s), 4 (16–20 s), 2 (6–10 s); previous basic training – 1 (1–5 s), 3 (11–15 s), 5 (21–25 s); specialized basic training – 3 (11–15 s), 2 (6–10 s), 5 (21–25 s); depth specialization – 1 (1–5 s), 2 (6–10 s), 6



**Fig. 2. Age features of interrelations ( $r > 0,6$ ) of tapping metrics and special preparedness of wrestlers at various stages of preparation:**

1 – 1–5 s; 2 – 6–10 s; 3 – 11–15 s; 4 – 16–20 s; 5 – 21–25 s; 6 – 26–30 s; 7 –  $\Sigma$ ; 8 –  $\bar{X}r$ ; 9 – HST index; 10 – HR, beats  $\text{min}^{-1}$ ; 11–13 – recovery; 14 – "rushing on the wrestler's bridge in 1 minute"; 15 – "coups on the wrestler's bridge in 1 min"; 16 – HR, beats  $\text{min}^{-1}$ ; 17 – number of throws; 18 – recovery after throws; 19–21 – recovery.

(26–25 s).

It should be noted that at all stages of the preparation of free-style wrestlers, the recovery indicators (HR, beats  $\text{min}^{-1}$ ) after performing the Harvard step test and the special test ("throws for 1 min") are reliably associated with components of special preparedness. The carried out researches allow to assert that during long-term employment by freestyle wrestling there are reliable interrelations between indicators of special and functional readiness. By informativeness, these indicators vary depending on the stage of preparation, it needs to change the volume of training loads, selective and general orientation.

**Further research** will focus on the development of multi-year planning of means for special, auxiliary and general training, the ratio depending on the stages of preparation and the age of freestyle wrestlers.

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