MODEL CHARACTERISTICS OF THE STRUCTURE PHYSICAL TRAINING FIGHTERS QUALIFICATIONS

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Annotation. Studied the structure of the relationship of physical fitness level fighters with physical disabilities and special performance. It is studied 147 athletes Ukraine qualifications in Greco-Roman and freestyle wrestling, judo. Applied the methods of anthropometry kaliperometrii, teacher testing, testing of a special performance. It is shown that the qualification defines the relationship and the relationship of morphometric and speed-power performance, the level of special performance athletes. With the advanced training of fighters increased level of speed, force readiness, increase the size Spigot neck, hips, chest, shoulders, reduced the percentage of fat component, increases muscular component, the index increased muscle development. Morphometric parameters with the most skilled fighters and cross-linked Spigot size of the body of the speed and power - explosive power, strength and speed-strength endurance, speed.

Key words: fighters, qualifications, physical readiness, relationships, models.

Introduction

Physical preparedness of qualified wrestlers is one of the most important components of the whole structure of their preparedness, which determines the level of their special workability [1, 2, 3, 8, 11].

In spite of different approaches, methods of researches and testing of sportsmen's physical preparedness, most of works, devoted to wrestling, are of analytical character, do not reflect to full extent interactions of motion abilities with physical level, special workability, functional and technical preparedness of sportsmen (Martínez-Abellán, A. Factores Anaeróbicos Predictores del Éxito en Lucha Olímpica// A. Martínez-Abellán, J. García-Pallarés, J. López-Gullón, X. Muriel, V. Morales, A. Martínez-Moreno // Cuadernos de Psicología del Deporte, 2010. – vol 11. – núm. Suplemento. – pp.17-23.) [5-7].

Analytical researches do not sufficiently elucidate the structure of physical preparedness (SPP) of wrestlers from systemic positions, i.e., from positions of hierarchy, correlation and interaction of its components for ensuring of special workability's high level of different weight categories, qualification, age, sex, stage of training sportsmen (women) [2-4, 10, 11].

In this connection, at present, evaluation of wrestlers' physical preparedness can not be regarded as sufficiently effective – the criteria are not grounded, flexible normative differentiated evaluation scales are absent as well as model characteristics, the place of physical preparedness in whole structure of preparedness of different weight categories, qualification, age, sex, stage of training wrestlers is not determined, there are no criteria of their functional reserves' differentiating [2, 7, 9].

Insufficient elucidation of most of these problems, their importance for the theory and practice of sports witness about urgency of the studied problem and served the basis for determination of purpose and tasks of the present research.

Purpose, tasks of the work, material and methods

The purpose of the work is development of model characteristics of structure and interconnections of qualified wrestlers' special workability.

The methods and organization of the research. In the present work we studied speed-power abilities, morpho metrical indicators of physical development and wrestlers' special workability, their correlation and interconnections. Special workability was evaluated in tests with throws of partners of equal weight by 1 arm with bent (3-5 series, 15 throws in each at maximal rate). 147 wrestlers of different qualification were tested, including members of Creco-Roman style, freestyle and judo combined teams of Ukraine.

For comparison of different qualification wrestlers' SPP and studying of orientation of examined indicators in the process of sportsmen's skillfulness's rising, the sample of the tested was divided into groups: in one variant – into two groups (first group – candidate masters of sports (CMS), the second group – masters of sports (MS), international masters of sports (IMS) and Honored masters of sports (HMS); in second variant – into three groups (the first group – CMS, the second – MS and the third – IMS and HMS).

For solving of our tasks at the stages of pre-competition training of annual cycle, we organized several stages, on which pedagogical observations were carried out and natural open experiment was conducted, with using of complex of pedagogical testing methods and instrumental methodic [2, 4].

Results of the research

Analysis of wrestlers' physical preparedness's structure resulted in obtaining the data, which witnessed that highly qualified wrestlers excel the wrestlers of lower qualification in speed (in 30 meters run ($P<0, 01$)), speed-power (in chin ups for 10 seconds ($P<0, 05$), pressing ups ($P<0, 05$), long jumps ($P<0, 01$), rope climbing) qualities, in level of special workability (when fulfilling 3 series of throws by one arm with bent ($P<0, 001$)).

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Table 1

Indicators of physical preparedness of wrestlers of high qualification (MS, IMS, HMS) and relatively low qualification (CMS)

Indicators	HMS, IMS, MS (1)			CMS (2)			Confidentiality of differences	
	$\overline{X}$	±m	n	$\overline{X}$	±m	n	t_{1-2}	p
Age, years	23. 1	0. 36	110	19. 0	0. 35	36	8. 15	<0, 01
Weight, kg	78. 4	1. 75	110	76. 1	2 78	36	0. 70	>0.05
30 m run, sec.	4.33	0. 02	106	4. 44	0. 03	36	2. 62	<0, 01
High jump, cm	54. 0	0. 96	61	54. 2	1. 69	16	0. 08	>0.05
High jump, cm.p.kg	0. 77	0. 02	59	0. 74	0. 06	16	0. 57	>0.05
Long jump, cm	249. 6	2. 87	42	236. 1	4. 03	20	2. 73	<0, 01
Rope climbing, 4 m, sec.	6. 04	0. 17	101	6. 84	0. 34	36	-2. 11	<0, 05
Chin ups during 10 sec. q-ty times	9. 9	0. 12	103	9. 0	0. 31	36	2. 63	<0, 01
Pressing ups during 10 sec. q-ty times	19. 4	0. 23	87	18. 0	0. 69	29	1. 92	>0.0
Squatting with partner, q-ty times	23. 4	0. 88	100	20. 9	1. 92	36	1. 20	>0.05
Chin ups, q-ty times	35. 4	0. 88	103	30. 5	2. 31	36	1. 96	<0, 05
Pressing ups, q-ty times	72. 8	1. 74	103	60. 6	3. 16	36	3. 39	<0, 01
1 series of throws, sec.	29. 2	0. 50	105	35. 0	1. 01	36	5. 11	<0, 01
2 series of throws, sec	29. 2	0. 58	105	35. 6	1. 19	36	4. 78	<0, 01
3 series of throws, sec	29. 7	0. 68	105	38. 5	1. 48	36	5. 45	<0, 01
Coefficient of special workability	1. 061	0.004	112	1. 058	0. 01	35	0. 32	>0.05
Pulse in lying position $b.p.m^{-1}$	55. 6	0. 88	44	61. 0	0. 7	8	4. 79	<0, 01
800 run, minutes	2. 48	0. 03	45	2. 58	0. 1	10	0. 96	>0, 05

It is interesting that advantage of highly qualified sportsmen is expressed to the highest extent in test for special workability (difference of 23.8%, p<0, 01), with difference of pressing ups 16, 8 %, p<0, 01 and rope climbing for speed - 13, 2 %, p<0, 05)

Comparison of three qualified groups showed (see table 2) that orientation of wrestlers' motion function's improvement is manifested as increasing of speed and intensity of throws' fulfillment with nearly unchanged indicators of workability's reduction. C.

Table 2

Time characteristics of fulfillment of 15 throws in 3 series and coefficient of special workability (CSW) in specialized test for wrestlers of different qualification

Qualification		Series of throws, sec.			Total time of throws, sec.	CSW*		Time of 1 throw, sec
		1	2	3		Index	% of workability reduction	
HMS IMS	$\overline{X}$	25.00	25. 00	25. 28	75. 28	1. 064	6. 40	1. 67
	±m	0.60	0. 75	0. 93	2. 21	0. 006	0. 611	0. 048
	n	36	36	36	36	36	36	36
MS	$\overline{X}$	31. 29	31. 26	31. 32	93. 87	1. 060	6. 01	1. 98
	±m	0. 61	0. 75	0./ 85	2. 13	0. 005	0. 52	0. 07
	n	76	76	76	76	76	76	80
CMS	$\overline{X}$	34. 69	34. 80	37. 89	107. 37	1. 058	5. 83	2. 39
	±m	1. 16	1. 33	1. 62	3. 99	0. 01	0. 83	0. 09
	n	35	35	35	35	35	35	35

Note: CSW* - coefficient of special workability

Testing of sportsmen by 5 series of throws at maximal rate showed that more durable of highly intensive work results in increasing of time of movements' fulfillment in series, reducing of special workability with reaching the fifth series (see fig.1).

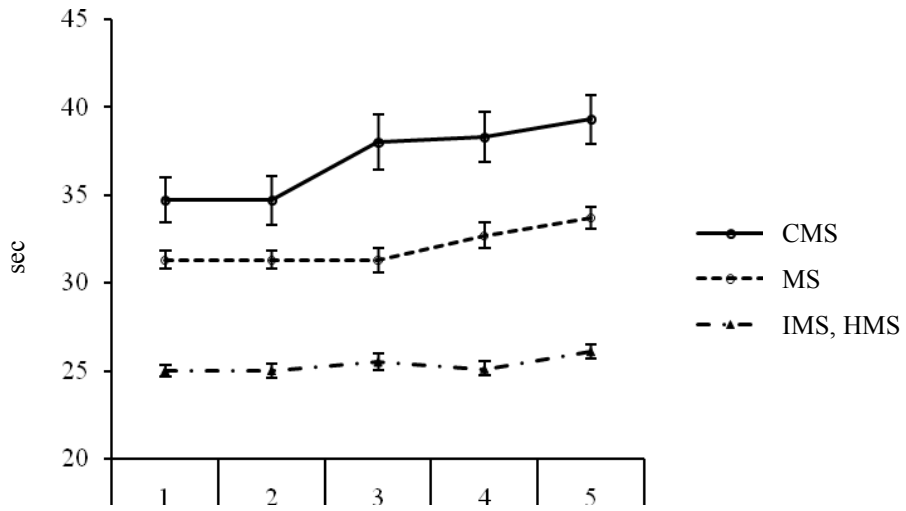
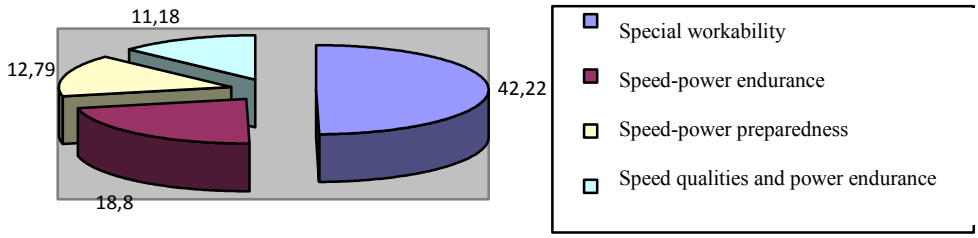


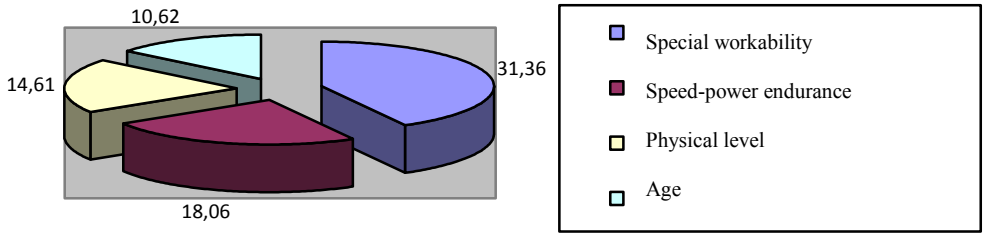
Fig.1. Dynamics of time of 15 throws fulfillment in 5 series by wrestlers of different qualification

The highest shifts were shown by sportsmen of relatively low qualification by the fifth series. In three series testing the advantage of highly qualified wrestlers was expressed less brightly.

Factor analysis of speed power component of wrestlers' SPP showed that, in spite of different level of power, speed, speed-power qualities by sportsmen of different qualification, factor of special workability is the most important for determination of their physical conditions (42, 22% - in CMS group and 31, 36 % - in HMS, IMS and MS group)as well as speed-power endurance (18, 81% and 18, 06%,correspondingly) (see fig.2).



a) CMS



b) MS, IMS, HMS

Fig.2. The most important factors of wrestlers' physical preparedness structure of relatively low (CMS) and high(MS, IMS, HMS) qualifications

At the same time the third and forth factors are different in compared groups: if for CMS SPP the third by significance factor is speed-power endurance (12, 79 % of total dispersion), the forth – speed qualities and power endurance (11, 18% of total dispersion), than fro sportsmen of high qualification the third place by contribution in total

dispersion of PP is taken by factor of physical level (14, 61%), and the forth – age factor (10, 62%), which, in this group of sportsmen reflects their experience.

As a result of obtained data's processing correlation and regressive analysis was carried out in order to reveal forms, degrees and orientation of interconnections between most important indicators of motion qualities of different qualification's wrestlers as components of their SPP.

Correlation analysis showed that parameters of special workability (r=0, 570-0, 770, P<0, 01) and speed-power indicator – speed rope climbing (r=-0, 440, P<0, 01) are most closely connected with the level of qualification.

Highly qualified wrestlers manifest bigger quantity of statistically significant interconnections of their special workability with the level of speed-power endurance.

Relatively low but statistically significant interconnections with the level of special workability are manifested in the group of highly qualified sportsmen in 30 m run speed indicators, quantity of pressing ups, chin ups and squatting with partner.

The method of step-by-step regression permitted to determine the most important SPP indicators of wrestlers, which determine result in test for special workability (see table 3).

Table 3

Regressive models of SPP test results dependence on the most important speed-power indicators of wrestlers

№	Equation of regression	Correlation coefficient p
1.	$y=87.2+0.31x_1+0.564x_2+0.32x_3+2.66x_4-0.186x_5-4.62x_6\pm12.6$	0. 754, p<0, 001
2.	$y=155.48-3.624x_6$	-0. 570, p<0, 01

Notes: y – total time, spent for fulfillment of throws in three series, sec.; x_1- speed of rope climbing, sec.; x_2 – quantity of squatting with partner; x_3 – sportsman's weight, kg; x_4 – quantity of chin ups; x_5 – quantity of pressing ups; x_6, – pressing ups speed (quantity per 10 sec.).

Three parameters, which characterize manifestation of motion abilities: quantity of speed pressing ups (per 10 sec.), rope climbing speed (4 m) (x_1) and quantity of squatting with partner (x_2), - influence to the highest extent on time of fulfillment of 15 throws over back by bent in 3 series (y). Mass of sportsman (x_3), maximal quantity of chin ups (x_4) and pressing ups (x_5) also were included into regressive model, but the degree of their influence on test results is less.

Analysis of morpho metric indicators of wrestlers' physical level showed that with rising of sportsman's qualification the percentage of fat component reduces, there appears a trend to reduction of bone component, index of muscular level increases (see table 4).

Table 4

Indicators of physical level of high qualification wrestlers (MS, IMS, HMS) and relatively low qualification – CMS

Groups of parameters	Indicators	CMS			MS, IMS, HMS			P
		$\overline{X}$	±m	n	$\overline{X}$	±m	n	
	Weight, kg	71. 44	1. 80	32	72. 72	1. 72	27	P>0. 05
	Height, cm	169. 5	0. 82	32	169. 1	1. 37	27	P>0. 05
Circumferences, cm	Of neck	38. 20	0. 24	32	39. 43	0. 44	14	P<0. 05
	Of chest in rest	94. 06	0. 94	32	98. 52	1. 37	19	P<0. 05
	Of chest at inhale	96. 00	0. 96	32	101. 2	1. 52	19	P<0. 01
	Excursion of chest	4. 38	0. 24	32	5. 81	0. 62	19	P<0. 05
	Of strained shoulder	32. 48	0. 49	32	34. 54	0. 50	27	P<0. 01
	Of thigh	54. 19	0. 61	32	59. 07	1. 50	27	P<0. 01
Folds of fat, mm	Under shoulder blade	12. 50	0. 62	32	10. 48	0. 45	27	P<0. 05
	Front side of shoulder	5. 88	0. 41	32	4. 63	0. 24	27	P<0. 05
	Back side of shoulder	12. 13	0. 70	32	9. 74	0. 65	27	P<0. 05
	On forearm	9. 13	0. 71	32	7. 21	0. 56	14	P<0. 05

	On thigh	10. 25	0. 76	32	8. 29	0. 35	14	P<0. 05
Composition of body, %	Muscular component	49. 98	0. 53	32	51. 31	0. 75	13	P>0. 05
	Fat component	17. 20	0. 74	32	13. 79	0. 50	14	P<0. 001
	Bone component	17. 42	0. 26	32	16. 66	0. 37	14	P>0. 05
Physical level	Ketle's index	390. 3	7. 50	32	427. 3	7. 88	27	P<0. 01
	Muscular level index	6. 76	0. 68	32	9. 17	0. 76	27	P<0. 05

The data reflect specificity of adapting reconstructions in morphological component of wrestlers' SPP with rising of their qualification in the process of many year training.

It is interesting that such morpho metric indicators of physical level as cross and circumferential body sizes (r=0. 51±0. 06, (P<0. 01) statistically confidently correlate with qualification of sportsmen. From them the most strong correlation is of neck (r=0. 62, P<0. 01), chest (r=0. 70, P<0. 01), relaxed (r=0. 63, P<0. 01) and strained r=0. 64, P<0. 01) shoulder, forearm (r=0. 58, P<0.01) and thigh (r=0. 60, P<0. 01) circumferences.

With increasing of muscular component and index of muscular development, highly qualified wrestlers have statistically confident reduction of fat folds thickness on cheeks, under shoulder blades, on forearm, on shoulder and on thigh.

Negative interconnection of muscular and fat components (r = -0. 565, p=0. 0008) is presented in the form of the following mathematical model:

$$y=44,596-0,572x,$$

where **y** – fat component, %; x – muscular component, %.

It witnesses that one of mechanisms, which are in the base of change of body components' correlation with increasing of sportsmen's skillfulness, is reduction of fat and increasing of muscular components.

Probably, it can also explain the presence of negative interconnection between fat and bone components (r = -0. 469, p = 0. 007; y = 19. 3 – 0. 134x, where **y** – bone component, %, **x** – fat component, %) and positive interconnection between muscular and bone components (r = 0. 421, p = 0. 01; y = 33. 94+1. 004x, where **y** –muscular component, %, **x** –bone component, %), as well as between bone component and index of muscular development (r = 0. 514, p = 0. 003; y = 1. 148x-12. 62, where **y** – index of muscular development, %, **x** – bone component, %) with changing of correlation of body components of qualified sportsmen's body composition.

We have developed regressive models, which reflect dependence of special workability test results on most important morpho-metric indicators of wrestler preparedness's structure (see table 5).

Table 5

Mathematical models of special workability's dependence on most important morpho-metric indicators of highly qualified wrestlers

№	Equation of regression	Correlation coefficient p
1.	$Y = 302.05+6.012x_1-3.77x_2-4.15x_3 \pm 11.7$	0. 727, p<0. 0002
2.	$Y= 249.2 + 4.58\ x_1 -4.09\ x_2 \pm 12.7$	r = 0. 650, p = 0. 0001
3.	$Y=213.4+78.5x_6+3.3x_1+1.12x_7+122.4x_8+19,5x_9-5,96x_3-3,45x_2-76,3x_{10}\pm 42,5$	r = 0, 976. p = 0. 00001
4.	$Y=4.9+0.35x_4+0.04x_{11}-0.029x_{12}-0.021x_5-0.097x_3-0.07x_2 \pm 0.19$	r = 0. 919, p = 0. 00001

Notes: Y – total time spent for fulfillment of throws in three series, 15 throws in each, sec., x_1 –circumference of thigh, cm; x_2 – circumference of chest in rest, cm; x_3 – circumference of neck, cm; x_4- circumference of forearm, cm; x_5 –circumference of head, cm; x_6 – circumference of relaxed shoulder, cm; x_7 – fat layer under shoulder blade, mm; x_8 – area of body; x_9 – index of muscular development; x_{10} – circumference of strained shoulder, cm; x_{11} – fat layer on thigh, mm; x_{12} – fat layer on chin, mm.

The presented in models coefficients witness that from morpho-metric indicators the most influential (on special workability) are circumference sizes of body: chest, shoulder,, forearm, neck, head, thigh. Also SPP is influenced by index of muscular development, fat layer under shoulder blade, on thigh, under chin.

It was found out that prognostication significance of the models is ambiguous. The most informative are 3rd and 4th models: there found strong dependences of special workability' level on correlation of important morpho-metric parameters of physical development (r=0. 919-0. 976, p=0. 000001). However, certain bulkiness of the last models reduces their practical value in comparison with more convenient for receiving urgent information models. On the other hand, complex equations permit to simulate more precisely different variants of ensuring of high special workability. The fact that these models are of linear type simplifies the work with them.

Summary

Results of the carried out researches have shown that with rising of qualification in general structure of wrestlers' preparedness, their speed-power level also increases as well as circumference sizes of neck, shoulder, chest, thigh, as well as reduction of percentage of fat component and increasing of muscular component, body surface area and index of muscular development take place.

From speed-power indicators, explosive power, power and speed power endurance, quickness are connected most closely with qualification of wrestlers; from somatic indicators – cross and circumferential body sizes.

In the whole the results witness that wrestlers of relatively low qualification have less reserves for realizing of specialized motion activity.

The developed models reflect orientation of improvement of wrestlers' preparedness structure as per most important indicators of their physical level and physical preparedness in the course of long-term adapting process.

Model characteristics of highly qualified wrestlers' preparedness structure are the basis for development of normative evaluation scales, simulating and prognostication of possible correlations of their parameters in the process of ensuring of sportsmen's specialized activity.

Further researches are offered to be carried out in studying of other problems of physical preparedness of highly qualified wrestlers.

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