

COMPARATIVE CHARACTERISTICS STRUCTURE PHYSICALLY PREPARED FIGHTERS HIGH QUALIFICATION LIGHT, MEDIUM AND HEAVY WEIGHT CATEGORY

Pryimakov O.O.
Uniwersytet Szczecinski

Annotation. *Purpose:* study of the structure of physical preparedness (PP) highly skilled fighters of different weight categories. *Material:* 147 athletes surveyed in separate weight classes. Recorded 26 indicators PP. *Results:* It was found that the mass of fighters is an important determinant of the level of development, value and structure of the phase relationship indicators. Informative indices PP interrelated with weight category fighters are: Runtime 45 shots in a specialized test, the number of pull-ups in the maximum rate of 10 seconds and the maximum number is not limited to a run-time while climbing a rope to a height of 4 m, height of jumps up to space. With the increase in the weight category of fighters dropping speed, relative strength, speed and power endurance, reduced muscle explosive quality, the level of special performance. Same relationship PP indicators reflecting its structure changed insignificantly. *Conclusions:* The developed regression models should be used for modeling and prediction of individual athletes sides PP light, medium and heavy weight categories, construction of group regulatory assessment scales.

Keywords: structure, physical, preparedness, weight, weight, category, relationship, wrestlers.

Introduction

Physical fitness (PF) of wrestlers is an important component of sportsmen's general fitness alongside with technical-tactic, functional and psychological fitness in combination ensuring the level and specificity of sport form, special workability and sport result [6, 7, 9-14, 16, 19, 20].

At the same time, specificity of structure of wrestlers' physical fitness (SPF) is determined by level of development, correlation and interconnections of motion qualities, first of all – speed-power qualities and level of special endurance [4, 6, 7].

Analysis of works, devoted to wrestling, showed that they insufficiently elucidate correlation and interconnections of SPF components both between each other and with other components of general structure of sportsmen's fitness [1, 3, 8].

Analytical character of most of works, describing different sides of wrestlers' PF [1, 5, 15, 17, 18], did not permit for researchers to reflect its structure and elucidate partial role and interconnections of every component in general structure of PF of different qualifications', weight categories' sex's, period of training's sportsmen.

Extreme importance and insufficient elucidation of this problem conditioned our choice of research of exactly this problem.

Purpose, tasks of the work, material and methods

The purpose of this work is studying of physical fitness's structure of highly qualified wrestlers of different weight categories.

The methods of the research: strain dynamometry, calipometry, tapping metering, methods of pedagogic evaluation and testing of speed-power fitness and special workability of wrestlers, computer graphic analysis and mathematical statistic.

We tested 147 sportsmen- from 15 to 35 wrestlers in certain (from 7) weight categories. In the process of the research we registered morphological metric indicators of physical condition, speed-power qualities and special endurance of wrestlers.

Special endurance was evaluated in test with throws of partner of equal weight by 1 hand with bent – 3-5 series (15 throws in every series).

For researching of physical fitness dynamic in process of weight category's growing and for determination of the most variable parameters all tested were distributed by mass of body into 7 weigh groups, accepted in wrestling.

For studying of specific features of physical fitness's structure of wrestlers, who differ by body mass, all sample of the tested was conventionally divided in 3 groups: light (62.05 ± 0.56 kg), middle (73.74 ± 0.69) and heavy (96.78 ± 1.85 kg).

For processing of experimental material we used different methods of variation statistic, including methods of correlation, regressive, dispersion and etc. methods of statistic analysis in system *STATISTICA* in Windows [2].

Results for the researches

Analysis of physical fitness of 7 weight categories showed that by most of parameters there exists rather expressed dependence of speed-power qualities on mass of sportsmen, which varies with changing of weight category.

In fig.1 we presented the most informative PF indicators, which reflect dynamic of progressing of quickness, strength, speed-power endurance of wrestlers in process of increasing of weight with changing of 7 weight categories.

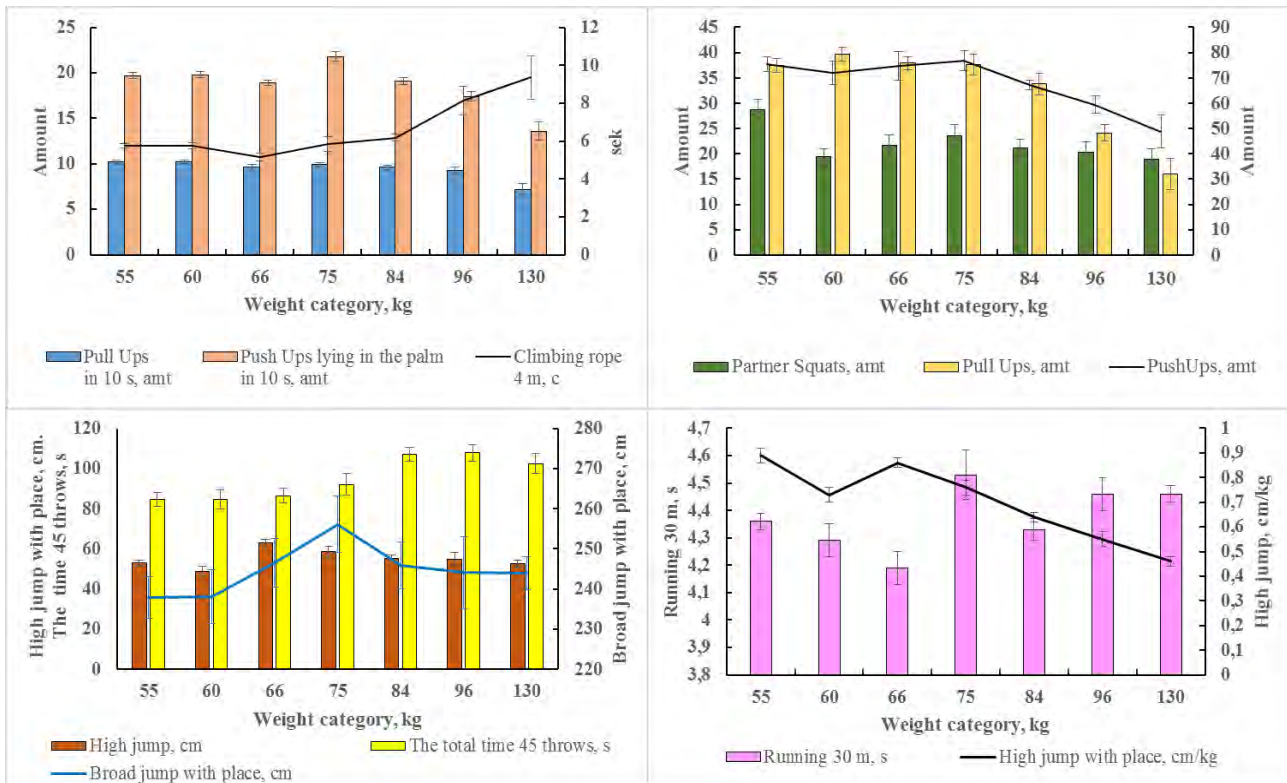


Fig.1 Some indicators of physical fitness of wrestlers of different weight categories

The character of these curves witnesses that there is no linear dependence on change of sportsmen's weight categories in variation of most studied indicators.

Quantity of chin ups ($p < 0.01$) and squatting with partner of equal weight, relative values of high jump from the spot ($p < 0.01$): are close to linear dependence; with increasing of weight category result in the mentioned tests reduces.

Change of long jump's results, speed of climbing rope have expressed curvilinear character: with increasing of weight category result of long jump from the spot first reaches the highest values among sportsmen of 75 kg weight category, then among wrestlers of 3 the heaviest categories it gradually reduces. Time of climbing rope first reduces, reaching the least values for wrestlers of 66 kg category, the increases by exponent, reaching maximum for wrestlers of heavy weight.

Results of 30 meters' run, chin ups for quickness, high jumps from the spot change a little with increasing of weight category.

Analysis of variability of the tested indicators showed that in values of a number of them there exists significant individual variance in dynamic of changes of 7 weight categories (from 55 to 130 kg): high jump from the spot– 22.4 %, in chin ups– 27.5 %, in pressing ups – 15.2 %, in quickness of throws in specialized tests – 11.2-13.2 %.

In fig.2 we presented correlation coefficients (r), which reflect interconnection of some speed-power indicators with wrestlers' weight categories.

They reflect rather high interconnection of most of the tested parameters with sportsmen's weight category. Interconnection of 30 meters' run, high and long jumps results with body mass of wrestlers is rather weak.

In connection with the fact that wrestlers of little weight categories are as a rule of small height, for excluding of this factor's influencing on high jumps results and for objective evaluation of lower limbs muscles' contracting abilities of sportsmen of different weight categories, we calculated relation of jump height to sportsmen's height. The calculated coefficients showed contracting abilities of lower limbs' muscles of light weigh wrestlers in this test are also higher then the same of heavy weight sportsmen.

The greatest dependence on weight category were in results of chin ups, climbing rope for quickness, high jump in relation to mass of body during test for special endurance: with increasing of weight category results in these tests worsen.

In table 1 we presented regressive models of speed-power indicators' dependence on wrestlers' weight category.

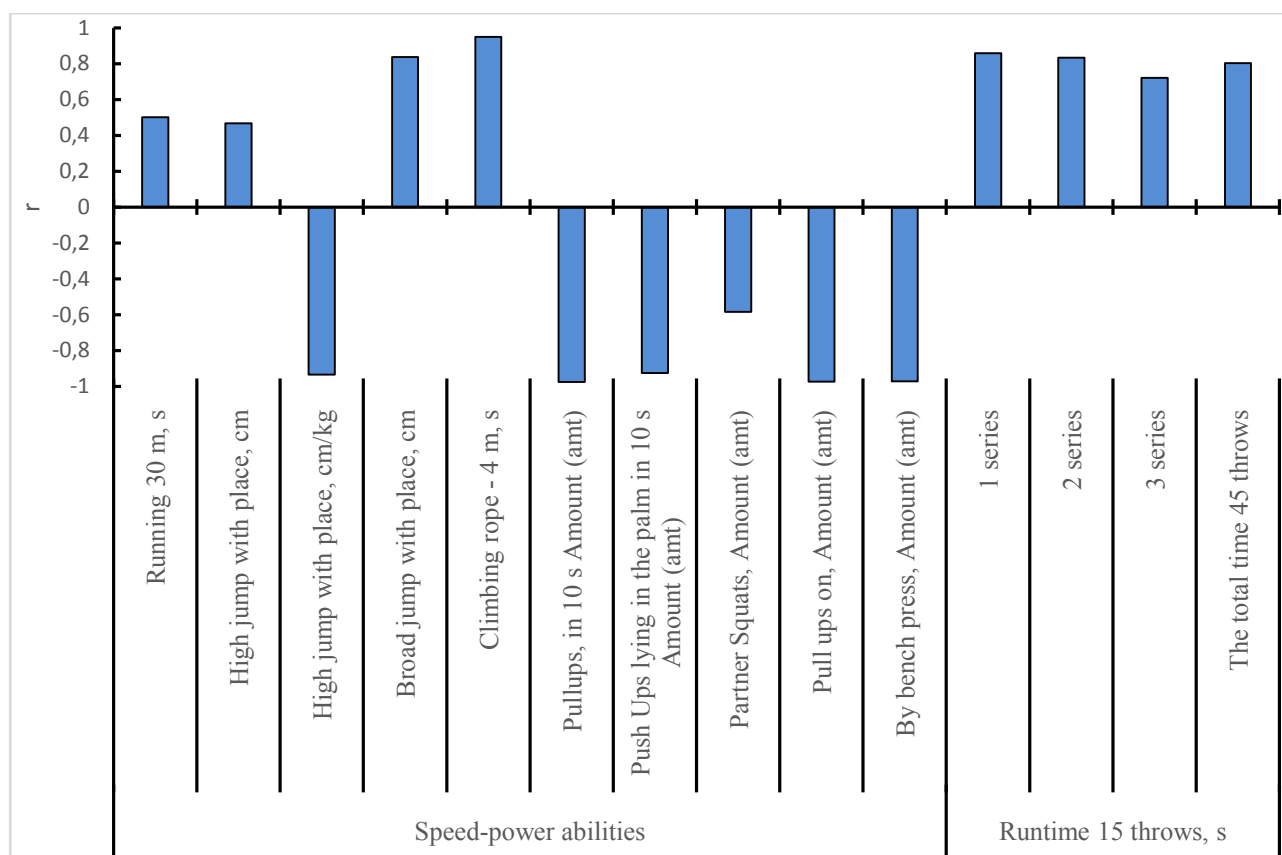


Fig.2. Interconnections of speed-power endurance's indicators with weight categories of highly qualified wrestlers

Table 1

Regressive models of speed-power indicators' dependence on wrestlers' weight category

Indicators	Equations of regression*	Coefficients of determination (d) and correlation (r), P
Squatting (q-ty)	$38.8+0.0014x^2-0.33x$	d = 0.34 (r=-0.583), >0.05
Chin ups (q-ty)	$33.55+0.3274x-0.004x^2$	d = 0.944 (r=-0.972), <0.001
Pressing ups (q-ty)	$69.23+0.357x-0.0045x^2$	d = 0.940 (r=-0.970), <0.001
Chin ups for 10 sec. (q-ty)	$7.25+0,0945x-0.0008x^2$	d =0.950 (r=-0.975), <0.001
Pressing ups for 10 sec. (q-ty)	$8.4+0.34 x-0.0025x^2$	d =0.856 (r=-0.925), <0.001
Climbing rope, sec.	$6.81+0.0007x^2 - 0.0652x$	d =0.901 (r=0.949), <0.001
30 meters' run, sec.	$0.0027x + 4.1649$	d=0.251 (r=0.501), >0.05
High jump from the spot, cm/kg	$2E-05x^2 - 0.0101x + 1.36$	d=0.872 (r=-0.934), <0.001
High jump from the spot, cm	$24.52 + 0.766x -0.0045x^2$	d=0.218 (r=0.467), >0.05
Long jump, cm	$0.0005x^3 - 0.1414x^2 + 12.64x - 117.1$	d=0.701 (r=0.837), <0.01

Notes: * x – wrestlers' weight category, kg

The worked out by us equations are model characteristics of determined dependences. Most of them are statistically confident, have high coefficients of determination (d) and correlation (r) and that is why they can be used for construction of norms' scales for certain indicators of speed-power fitness of wrestlers of different weight categories.

For determination of more exact dependences between mass of sportsmen and different motion qualities, with future analysis sportsmen of seven weight categories were combined in 3 weight groups: 1) light; (63.23 ± 0.54 kg); 2) middle (80.05 ± 0.74 kg); and heavy (105.9 ± 2.05 kg).

The increased scopes of samples permitted to fulfill factorial, correlation and regressive analysis of SPF in every of three groups of wrestlers separately, to ground and work out differentiated methods of testing, evaluation and training of light, middle and heavy weight categories' sportsmen.

Analysis of the received results showed that "light group" has advantage in respect to "heavy group" by most of speed, speed-power and strength (in respect to own weight) indicators, by level do speed-power endurance and special workability; in climbing rope for quickness, in quantity of chin ups, pressing ups and squatting with partner of the same weight, in quickness of 15 throws of partner of the same weight by one arm.

We did not registered any statistically significant differences between sportsmen of light and middle categories by most of the tested parameters, with the exception of long and high jumps' results, in which sportsmen of middle categories have expressed advantage.

Sportsmen of middle category have advantage in respect to heavy weight category by most of the tested parameters.

Results of factorial analysis (see fig.3) reflect certain similarity and differences in structure of physical fitness of 3 weight groups' categories:

- in all weight groups we found 4 leading factors, determining wrestlers' SPF;
- leading factor of SPF in every of compared groups is factor of special workability.

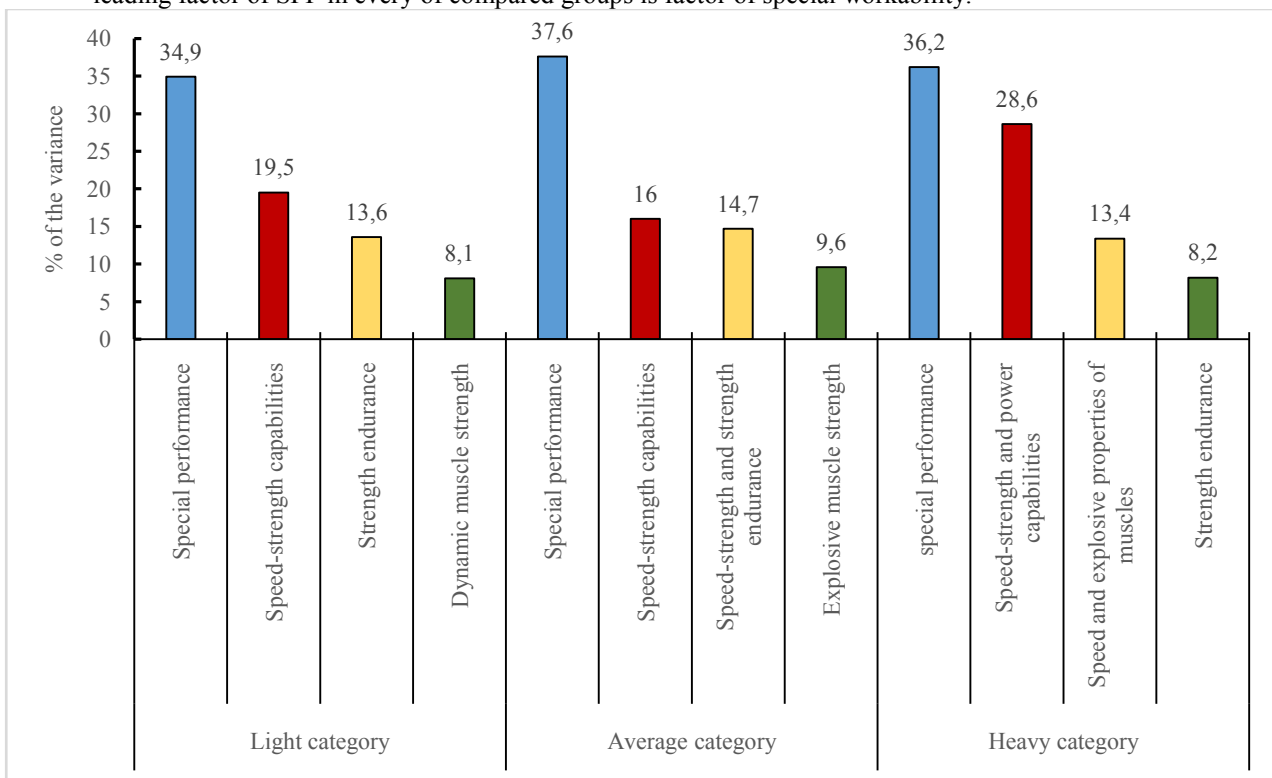


Fig.3. Factorial structure of physical fitness of 3 weight groups' wrestlers

The second factor of all the "heaviest" indicators included speed-power indicators, and in third – the maximally heaviest group, also – power potentials of upper limbs' muscles.

The fourth factor of 1st group's (63.23 ± 0.54 kg) and 3rd (105.9 ± 2.05 kg) sportsmen included indicators, characterizing power endurance condition.

Concerning sportsmen of 2nd weight group (80.05 ± 0.74 kg) the fourth factor included as the "heaviest" indicators, which characterizes explosive contraction abilities of upper limbs' muscles.

For sportsmen of 3rd group the third factor of SPF is the factor of speed and explosive abilities of sportsmen's lower limbs' muscles (13.4 %).

Testing results of wrestlers, divided by weight into light (61.7 ± 1.5 kg) and heavy (86.8 ± 1.7 kg) groups witness that nearly by all absolute power indicators sportsmen of heavy categories have advantage (see table 2). In relative power indicators of static endurance (determined by time of keeping on backbone dynamometer force 80% from maximal) and speed indicators light weight sportsmen have advantage.

Table 2

Testing results of power and some speed potentials of light and heavy weight sportsmen

	Weight, kg	Jump-test		Hand dynamometry		Backbone dynamometry			Latent time, msec	Tapping test	
		Fmax, H	J, H/c	Strength of right hand, H	Strength of left hand, H	Fmax, H	Fmax /macca, H	Static endurance, Sec.		Quantity for 1 sec	Time 1 Of movement sec.
\bar{X}	61.7	1999.2	3603.5	396.9	372.4	1445.5	22.6	13.1	142.5	6.52	0.154
$\pm m$	1.5	141.12	312.62	15.68	13.72	36.26	0.49	1.8	6.0	0.12	0.003
n	30	35	35	16	16	16	16	16	12	14	14
\bar{X}	86.8	2536.2	4118.0	614.5	600.7	1796.3	20.29	7.9	169.8	5.83	0.172
$\pm m$	1.7	168.56	350.84	14.7	13.72	29.4	0.784	0.7	4.1	0.07	0.002
n	2.	27	27	12	12	12	12	12	12	14	14
t	10.91	2.44	1.09	10.12	11.77	7.52	-2.54	2.70	3.75	4.93	4.78
P	<0.01	<0.01	>0.05	<0.01	<0.01	<0.01	<0.,01	<0.01	<0.01	<0.01	<0.01

Discussion:

Numerous researches of different authors as well as our earlier researches showed that physical fitness of highly qualified wrestlers is an important component of general structure of sportsmen's fitness, [3, 4, 6, 7, 17], alongside with technical tactic, functional, psychological and will-moral components. However, up to present time in literature problems of systemic organization of sportsmen's fitness structure, considering partial role, correlations and interconnections of all components, determining to different extent special workability and sport results, have been elucidated insufficiently [6, 7, 9, 15, 20]. Also SPF of different weight categories' wrestlers has been described insufficiently [4, 6, 7, 17, 20].

Insufficient solution of problems of highly qualified different weight categories wrestlers' SPF, from point of view of correlation and interconnection of different components served as the ground for our research.

The conducted researches and application of modern mathematics permitted to determine the most variable SPF indicators of wrestlers of different weight categories, which reflect their special workability, speed, speed-power and strength abilities: time of fulfillment of 45 throws in specialized tests, quantity of chin ups at maximal rate for 10 sec. and their maximal quantity without limitation of time, climbing of 4 meters rope, height of jumps from the spot.

It was determined that with increasing of weight category level of sportsmen's physical fitness reduces: with increasing of wrestlers' mass, quickness, relative force, speed and speed-power endurance decrease, explosive potentials of muscles, special workability reduce.

In spite of the fact wrestlers of light and middle weight categories have advantage in respect to heavy wrestlers by most of speed-power indicators; structure of their physical fitness as correlation and interconnection of its separate components vary, with it, to less extent.

Most of worked out by us equations of regression reflect mainly linear form of dependence of speed-power indicators on sportsmen's weight categories; they have high coefficient of determination that witness about their high information characters. In this connection they can be used as mathematical models for simulation, prognostication and evaluation of different sides of physical fitness of the tested groups of sportsmen.

Alongside with it leading factor of special workability (1st factor), which is characteristic for structure of physical fitness of all tested groups, we found certain differences between three groups in indicators of 2-4 factors, which determine in total more than 50% of dispersion of the tested indicators. Specific character of SPF of every group is connected with them.

With testing in conditions, which level differences in mass of body, wrestlers of heavy weight categories yield to more light sportsmen by most of the tested parameters of physical fitness. In absolute values of power indicators, which to certain extent are determined by mass of sportsmen, they have clear advantage.

The found informative indicators of physical fitness's structure of highly qualified wrestlers, we recommend mathematical models for construction of norm evaluation scales, differentiated for sportsmen of light, middle and heavy weight categories.

Conclusions:

1. Mass of sportsman is an important system-forming factor, which determines level of development, correlation and interconnection of parameters of sportsmen's physical fitness structure.
2. The most variable indicators of physical fitness's structure of different categories' wrestlers are: time of fulfillment of 45 throws in specialized test, quantity of chin ups at maximal rate for 10 sec. and maximal quantity of chin ups without limitation of time, climbing 4 meters' rope, height of high jumps from the spot.
3. With increasing of weight category of wrestlers, quickness, relative strength, speed and speed-power endurance, reduce; explosive abilities of muscles, level of special workability weaken.
4. The worked out by us regressive models can be used as mathematical models for simulation, prognostication and construction of norms' evaluation scales for sportsmen of light, middle and heavy weight categories.

References:

- 1 Bojko V.F., Dan'ko G.V. *Fizicheskaia podgotovka borcov* [Physical training fighters], Kiev, Olympic Literature, 2004, 225 p.
- 2 Borovikov V.P., Ivchenko G.I. *Prognozirovanie v sisteme STATISTICA v srede Windows* [Forecasting in the STATISTICA for Windows], Moscow, Finance and Statistics, 2006, 275 p.
- 3 Karelin A.A. *Sportivnaia podgotovka borcov vysokoj kvalifikacii* [Sports training fighters qualifications], Novosibirsk, 2002, 479 p.
- 4 Kolenkov O.V., Prijmakov O.O., Pristins'kij V.M., Osipcov A.V. *Modeliuvannia strukturi special'noyi fizichnoyi pidgotovlenosti borciv visokoyi kvalifikaciyi na etapi maksimal'noyi realizaciyi individual'nikh mozhlivostej* [Modeling the structure of the special physical fitness skilled fighters on the stage of maximum realization of individual features], Donetsk, Noulidzh, 2012, 165 p.
- 5 Novikov S.P. *Teoriia i praktika fizicheskoy kul'tury* [Theory and practice of physical culture], 1987, vol.6, pp. 39-40.
- 6 Prijmakov A.A., Kolenkov A.V., Machaidze E.P. *Pedagogika, psihologia ta mediko-biologichni problemi fizichnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2006, vol.2, pp. 99-103.
- 7 Prijmakov A.A., Kolenkov A.V. *Fiziceskoe vospitanie studentov tvorceskih special'nostej* [Physical Education of the Students of Creative Profession], 2006, vol.5, pp. 51-60.
- 8 Iushkov O.P., Savchuk A.N. *Teoriia i praktika fizicheskoy kul'tury* [Theory and practice of physical culture], 1985, vol.8, pp. 23-24.
- 9 Iagello Vladislav, Tkachuk Vladimir, Blakh Veslav. *Fiziceskoe vospitanie studentov tvorceskih special'nostej* [Physical Education of the Students of Creative Profession], 2004, vol.2, pp. 36.
- 10 Blais L., Trilles F., Lacouture P. Validation of a specific machine to the strength training of judokas. *Journal of Strength & Conditioning Research*, 2007, vol.21, pp. 409-412.
- 11 Bromber K., Krawietz B., Petrov P. Wrestling in Multifarious Modernity. *The International Journal of the History of Sport*. 2014, vol.31(4), pp. 391-404. doi:10.1080/09523367.2013.869217.
- 12 Çolak T., Bamaç B., Çolak S. The Influence of a Single Bout of Wrestling Exercise on Serum Levels of Ischemia-modified Albumin. *Journal of Exercise Science & Fitness*. 2010, vol.8(2), pp. 67-72. doi:10.1016/S1728-869X(10)60010-X.
- 13 Eklund R.C. A Season-Long Investigation of Competitive Cognition in Collegiate Wrestlers. *Research Quarterly for Exercise and Sport*. 1994, vol.65(2), pp. 169-183. doi:10.1080/02701367.1994.10607612.
- 14 Jaric S. Role of body size in the relation between muscle strength and movement performance. *Exercise and Sport Sciences Reviews*, 2003, vol.31(1), pp. 8-12.
- 15 Martínez-Abellán A García-Pallarés. J., López-Gullón J., Muriel X., Morales V., Martínez-Moreno A. Factores Anaeróbicos Predictores del Éxito en Lucha Olímpica. *Cuadernos de Psicología del Deporte*, 2010, vol.11, pp. 17-23.
- 16 Parola F., Musso E. Market structures and competitive strategies: the carrier-stevedore arm-wrestling in northern European ports. *Maritime Policy & Management*. 2007, vol.34(3), pp. 259-278. doi:10.1080/03088830701343369.
- 17 Schmidt W.D., Piencikowski C.L., Vandervest R.E. Effects of competitive wrestling season on body composition, strength, and power in national collegiate athletic association division III college wrestlers. *Journal of Strength and Conditioning Research*, 2005, vol.19, pp. 505-508.
- 18 Vardar S.A., Tezel S., Ozturk L., Kaya O. The relationship between body composition and anaerobic performance of elite young wrestlers. *Journal of Sports Science and Medicine*, 2007, vol.6, pp. 34-38.
- 19 Zaccagni L. Anthropometric characteristics and body composition of Italian national wrestlers. *European Journal of Sport Science*. 2012, vol.12(2), pp. 145-151. doi:10.1080/17461391.2010.545838.
- 20 Zen-Pin L., Ryder C.E. The study of physiological factors and performance in welter weight taekwondo athletes. *Sport Journal*, 2004, vol.7(2), pp. 34-40.

Information about the author:

Pryimakov O.O.: ORCID: 0000-0003-0351-486X; apim@bk.ru;
Uniwersytet Szczeciński; ul. Jedności narodowej 22a, 70-453, Szczecin,
Poland.

Cite this article as: Pryimakov O.O. Comparative characteristics structure physically prepared fighters high qualification light, medium and heavy weight category. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014, vol.9, pp. 47-53. doi:10.5281/zenodo.10128

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedagogy.org.ua/html/ahive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 10.04.2014
Published: 05.04.2014