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Relationship between physical development and physical readiness among skilled wrestlers

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Purpose: *to determine the relationship between physical development and physical readiness among qualified wrestlers.*

Material & Methods: *in the study involved thirty qualified wrestlers, aged 19–22 years. For the purpose of analyzing indicators of physical development and physical preparedness, pedagogical testing.*

Results: *the results of the study testify to the homogeneity of the indices of physical development of the athletes under study, the coefficient of variation is in the range from 2,43% to 10,93%. It is revealed that the indices of physical readiness of qualified wrestlers are characterized mainly by small variation in the testing of speed-strength qualities, coordination abilities, general and strength endurance, and average – in the results of special endurance.*

Conclusion: *it is determined that the most informative indicators of physical development are the weight of the wrestler's body, which has a connection with 15 physical preparedness tests, followed by a vital index (12 statistically reliable relationships) and a strength index (11 interrelations).*

Keywords: *qualified wrestlers, correlation, physical development, physical preparedness.*

Introduction

One of the most pressing problems of modern sports science is the search for effective ways to achieve high results provided that athletes develop harmoniously and maintain their health. A successful solution to this problem is significantly hampered by the intense professionalization of sports activities, a notable trend of increasing volumes and intensity of the load [6; 10].

Modern sports of higher achievements make high demands on all sides of the athlete's preparedness, in addition, the main problem of the sport of higher achievements is the impossibility of an infinite increase in training loads, which leads to the need for further searching for new, more effective pedagogical tools and methods in the system of training highly qualified athletes [1; 2; 9; 11].

The main source of information for the preparation of athletes for competitions is the complex control of their condition after the fulfillment of certain loads. The increasing importance of the methodology of comprehensive control of the preparedness of athletes and the management of the training process is due to many reasons that are typical for modern sport, among them: a significant complication of the system of training athletes; lagging the quality of complex control from the requirements for organizing sports training as a controlled process; increase in the number of measured indicators recorded during training and competitions; Increase of requirements to metrological maintenance of gathering and the analysis of the information on readiness of athletes [5; 7].

Relationship of research with scientific programs, plans, themes. The work was carried out according to the plan of research of the Kharkov State Academy of Physical Culture.

Purpose of the study: to determine the relationship between physical development and physical readiness among qualified wrestlers.

Objectives of the study:

– to reveal the level of physical development and physical readiness of qualified wrestlers;

– to establish the degree of correlation between the indicators of physical development and the level of physical preparedness of qualified fighters.

Material and Methods of the research

Research methods: analysis of scientific and methodological information, generalization of best practical experience, pedagogical testing, methods of mathematical statistics.

Results of the research and their discussion

Based on the analysis of scientific and methodological information and generalization of best practical experience, it has been established that one of the main tasks of the wrestling training process is the development of physical qualities and the enhancement of the functional capabilities of the athlete's organism at all stages of long-term preparation [12].

Pedagogical testing was carried out for the purpose of analyzing indicators of physical development and physical preparedness.

Table 1 presents the average indicators of the physical development of qualified Greco-Roman wrestlers.

For the homogeneity of sample observations, the coefficient

Table 1

Model indicators of the physical development of qualified Greco-Roman wrestlers (n=30)

№ i/o	Indicators	$\bar{X}$	δ	V, %	m
1.	Age (years)	20,9	1,33	6,36	0,24
2.	Body length (cm)	176,13	4,28	2,43	0,78
3.	Body weight (kg)	73,70	7,55	10,24	1,38
4.	Quetelet index (kg m^{-1})	23,71	1,66	7,00	0,30
5.	Volume of lungs (dm3)	4,30	0,47	10,93	0,10
6.	Life index (ml kg^{-1})	58,54	6,29	10,75	1,15
7.	Dynamometry of the right hand (kG)	46,07	4,60	9,99	0,84
8.	Dynamometry of the left hand (kG)	44,20	4,47	10,11	0,82
9.	Strength index (%)	63,02	5,60	8,89	1,02

of variation was used. It is believed that if the coefficient of variation does not exceed 10%, then the sample can be considered homogeneous [4]. The obtained data testify to the homogeneity of the indices of physical development of the athletes under study, since the coefficient of variation lies in the range from 2,43% to 10,93% (Table 1).

Physical training of wrestlers has its own specific features, which must be taken into account when constructing the training process and load distribution [3; 8]. It is necessary to observe the correspondence between the capabilities of the organism and the requirements presented to it when choosing the means and methods of training, therefore we used various methods of testing the coordination abilities, power endurance, speed-strength qualities, general and special endurance for assessing the physical preparedness of wrestlers. On the basis of these data, the indicators of the physical readiness of the qualified wrestlers of the Greco-Roman style were obtained (Table 2).

The fluctuations of the mean group values of the indices of physical readiness of qualified wrestlers were estimated from the value of the coefficient of variation (V, %). Variability is considered small if the coefficient of variation is in the range from 0% to 10%, medium - from 11% to 20% and high – more 21% [4].

It is revealed that the indices of physical readiness of qualified wrestlers are characterized by predominantly low variability in testing the speed-strength qualities, coordination abilities, general and strength endurance, and the average in the results of special endurance. This gives grounds for the fact that in the training process of qualified wrestlers Greco-Roman style more time was devoted to the development of special endurance.

The informative nature of the relationship between physical development and physical readiness was determined by the method of correlation analysis (Table 3). According to the indicators of the table, the critical value of the sample correlation coefficient for the sample n=30 is equal to r=0,361.

The correlation analysis of the relationship between physical development and physical fitness showed that the age of wrestlers interacts with speed-strength abilities in tests: standing long jump (r=0,41), throwing a ball (3 kg) from behind the head with both hands (r=0,39), pull-ups for 20 s (r=0,40), push-ups for 20 s (r=0,44), lifting the trunk from the supine position on the back for 20 s (r=0,41) and strength endurance in the test, the maximum number of sit-ups with the partner (r=0,36).

Table 2

Model indicators of physical readiness of qualified Greco-Roman wrestlers (n=30)

№ i/o	Indicators	$\bar{X}$	δ	V, %	m
	Speed-strength abilities				
1.	Running on 30 m (s)	4,98	0,31	6,23	0,06
2.	High jump from the spot (cm)	50,97	4,79	9,40	0,87
3.	Standing long jump (cm)	219,20	8,94	4,08	1,63
4.	Hip-roll 10 times (s)	28,13	2,22	7,89	0,40
5.	Suplex 10 times (s)	30,90	2,29	7,41	0,42
6.	Throw the stuffed ball (3 kg) back with both hands (cm)	9,89	0,72	7,28	0,13
7.	Throw a stuffed ball (3 kg) forward from behind the head (cm)	8,89	0,67	7,54	0,12
8.	Climbing a rope without the feet (s)	6,70	0,72	10,75	0,13
9.	Pull-ups for 20 seconds (number of times)	15,57	1,15	7,39	0,21
10.	Push-ups for 20 s (number of times)	30,90	2,33	7,54	0,43
11.	Bending the body lying on the back for 20 seconds (number of times)	18,77	1,33	7,09	0,24
	Strength endurance				
12.	Lifting the legs on the gymnastic wall (number of times)	18,47	1,50	8,12	0,27
13.	Squatting with a partner of equal weight (number of times)	22,23	2,38	10,71	0,43
14.	Pull-ups (number of times)	30,43	4,06	13,34	0,74
15.	Push-ups(number of times)	64,43	4,34	6,74	0,79
16.	Flexion-extension of hands on the uneven bars (number of times)	49,83	4,44	8,91	0,79
17.	Partner's uplift of the trunk from behind (number of times)	15,90	1,35	8,49	0,25
	Coordination abilities				
18.	Running on the "bridge stand" (5 – to the left, 5 – to the right) (s)	15,09	1,35	8,95	0,25
19.	10 somersaults forward (s)	12,15	1,17	9,63	0,21
20.	Turnovers on the "bridge stand" 15 times (s)	34,83	2,06	5,91	0,38
	General endurance				
21.	Running on 800 m (s)	155,83	5,65	3,63	1,03
22.	Running 2x800 m (1 min rest) (s)	320,33	10,27	3,21	1,88
	Special endurance				
23.	1 series 15 hip-roll (s)	32,13	3,34	10,40	0,61
24.	2 series 15 hip-roll (s)	32,83	4,06	12,37	0,74
25.	3 series 15 hip-roll (s)	35,97	5,46	15,18	1,00
26.	Sum of three series of hip-roll (s)	100,93	12,09	11,98	2,21

The length of the athletes' body has interrelationships with the speed-strength abilities in the tests: running at 30 m (r=0,39), jumping from the ground (r=0,37), jogging (r=0,44), climbing on rope 5 m without feet (r=0,45); strength endurance in the test, the maximum number of pull-ups on the crossbar (r=0,51); (r=0.47), 15 running on the "bridge stand" (r=0,51) and special endurance (1 series of 15 hip-roll (r=0,42) and the sum of three series of 15 hip throw (r=0,36)).

Body mass has a relationship with the speed-strength abilities (running at 30 m (r=0,37), joggling (r=0,62), hip-roll (r=0,54), rope climbing 5 m without feet (r=0.45), pull-ups for 20 s (r=0,40), push-ups for 20 s (r=0,44), lifting the trunk from the supine position on the back for 20 s (r=0,38)); (r=0,64), the maximum amount of pull-ups (r=0,49), the maximum number of flexing-extension of the arms in the restraint on the bars (r=0,49)); (r=0,43), 10 somersaults forward (r=0,68), 15 – running on the "bridge stand" (r=0,49), and special endurance (1 series of 15 hip-roll (r=0,41) and the sum of three series of 15 throws across the back (r=0,38)).

The Quetelet index has interrelations with the speed-strength abilities in tests: joggling (r=0,58), suplex (r=0,54), pull-ups for 20 s (r=0,43), push-ups for 20 s (r=0,45); (r=0,57), the maximum amount of push-ups (r=0,48), the maximum number of flexing-extension of the arms on the uneven bars (r=0,47) and coordination abilities in the tests: running the "bridge stand" (r=0,44), 10 somersaults forward (r=0,67).

The results of the study showed that the volume of the lungs has an average statistical relationship with the speed-strength abilities (suplex (r=0,37), climbing on a 5 m rope without the help of the feet (r=0,44), lifting the trunk from the supine position on the back for 20 s (r=0,39)); (endurance of the partner by the capture of the trunk from standing on parallel benches (r=0,44)) and general endurance (run 2x800 m (r=0,39)).

The life index has interrelations with the strength endurance in the tests: lifting the legs to the grip with the hands in the vise on the gymnastic wall (r=0,51), the maximum number of squats with the partner (r=0,40), the maximum amount of pull-ups (r=0, 43), the maximum amount push-ups (r=0,37), the partner's ascents by the trunk grip from behind, standing on the parallel benches (r=0,60); coordination abilities in the tests: running the "bridge stand" (r=0,43), 15 coups on the "bridge stand" (r=0,37); total endurance in the tests: run 800 m (r=0,54) and run 2x800 m (r=0,58) and special endurance (in the second (r=0,45), third series (r=0,57) and

Table 3

Relationship between physical development and physical readiness among qualified Greco-Roman wrestlers(n=30)

Indicators		1	2	3	4	5	6	7	8	9
	10	0,33	**0,39**	**0,37**	0,27	0,19	–0,12	0,08	0,02	–0,33
	11	**–0,41**	**0,37**	0,30	0,18	0,25	0,00	**0,45**	0,30	0,11
	12	–0,28	0,24	0,18	0,10	0,20	0,06	**0,48**	0,32	0,28
	13	0,13	**0,44**	**0,62**	**0,58**	**0,37**	–0,16	0,08	0,18	**–0,59**
	14	0,21	0,36	**0,54**	**0,54**	0,33	–0,15	0,03	0,16	**–0,54**
Speed-strength abilities	15	**–0,39**	–0,26	–0,22	–0,13	0,05	0,28	0,02	–0,01	0,25
	16	–0,28	–0,12	–0,04	0,05	0,10	0,16	0,20	0,11	0,25
	17	0,14	**0,49**	**0,45**	0,30	**0,44**	0,08	0,14	0,28	–0,32
	18	**–0,40**	–0,23	**–0,40**	**–0,43**	–0,25	0,10	0,14	0,06	**0,59**
	19	**–0,44**	–0,27	**–0,44**	**–0,45**	–0,14	0,25	0,06	0,04	**0,55**
	20	**–0,41**	–0,29	**–0,38**	–0,34	**–0,39**	–0,08	0,07	–0,08	**0,46**
	21	0,02	–0,26	–0,26	–0,18	0,20	**0,51**	–0,31	–0,25	–0,02
	22	**–0,36**	–0,04	–0,11	–0,11	0,26	**0,40**	0,11	0,11	0,23
	23	–0,26	**–0,51**	**–0,64**	**–0,57**	–0,17	**0,43**	–0,20	–0,18	**0,51**
Strength endurance	24	0,29	–0,33	**–0,49**	**–0,48**	–0,09	**0,37**	–0,19	–0,11	**0,39**
	25	0,20	–0,33	**–0,49**	**–0,47**	–0,10	0,35	–0,17	–0,06	**0,42**
	26	0,05	–0,13	–0,07	0,01	**0,44**	**0,60**	–0,29	–0,23	–0,23
	27	0,16	0,29	**0,43**	**0,44**	0,00	**–0,43**	–0,11	–0,22	**–0,67**
Coordination abilities	28	0,24	**0,47**	**0,68**	**0,67**	0,32	–0,28	0,00	0,00	**–0,77**
	29	0,15	**0,51**	**0,49**	0,36	0,10	**–0,37**	0,02	–0,04	**–0,58**
General endurance	30	–0,35	0,27	0,18	0,05	–0,31	**–0,54**	0,31	0,23	0,06
	31	–0,15	0,26	0,12	–0,03	**–0,39**	**–0,58**	**0,42**	0,28	0,27
	32	0,13	**0,42**	**0,41**	0,29	0,05	–0,35	**0,41**	**0,36**	–0,01
Special endurance	33	0,13	0,34	0,36	0,28	–0,08	**–0,45**	0,33	0,26	–0,03
	34	–0,01	0,30	0,32	0,26	–0,22	**–0,57**	**0,39**	0,23	0,04
	35	0,07	**0,36**	**0,38**	0,29	–0,11	**–0,51**	**0,40**	0,29	0,01

Remark. 1–9 – indicators of the physical development: *1 – age (years), 2 – body length (cm), 3 – body weight (kg), 4 – Quetelet index (kg m^{-1}), 5 – volume of lungs (dm^3), 6 – life index (ml kg^{-1}), 7 – dynamometry of the right hand (kG), 8 – dynamometry of the left hand (kG); 9 – strength index (%),* ***10–35 – indicators of physical readiness :*** *10 – running on 30 m (s), 11 – high jump from the spot (Abalakov method) (cm), 12 – standing long jump (cm), 13 – hip throw10 times (s), 14 – suplex 10 times (s), 15 – throw the stuffed ball (3 kg) back with both hands (m), 16 – throw a stuffed ball (3 kg) forward from behind the head (m), 17 – climbing a rope 5 m without the feet (s), 18 – pull-ups for 20 seconds (number of times), 19 – push-ups for 20 s (number of times), 20 – bending the body lying on the back for 20 seconds (number of times); 21 – lifting the legs on the gymnastic wall (number of times), 22 – squatting with a partner of equal weight (number of times), 23 – pull-ups (number of times), 24 – push-ups(number of times), 25 – flexion-extension of hands on the uneven bars (number of times), 26 – partner's uplift of the trunk from behind (number of times); 27 – running on the "bridge stand" (5 – to the left, 5 – to the right) (s), 28 – 10 somersaults forward (s), 29 – turnovers on the "bridge stand" 15 times (s); 30 – running on 800 m (s), 31 – running 2x800 m (1 min rest) (s); 32 – 1 series 15 hip-roll (s), 33 – 2 series 15 hip-roll (s), 34 – 3 series 15 hip-roll (s), 35 – sum of three series of hip-roll (s).*

the sum of three series (r=0,51) of hip-roll).

The right-hand dynamometry has interrelationships with speed-strength abilities (standing long jump (r=0,48) and high jumps (r=0,45)); general endurance run 2x800 m (r=0,42) and special endurance (in the first (r=0,41), third series (r=0,39) and the sum of three series of hip-roll (r=0,40)).

The analysis of the left hand dynamometry indices revealed one statistically significant relationship with the first series of throws through the back (r=0,36), which characterizes the special endurance of wrestlers. Probably, qualified wrestlers play a crucial role in competitive actions on the right hand, so wrestlers in training sessions should pay attention to the strength of the left hand.

The power index is influenced by such indicators of physical readiness as speed-strength qualities (suplex (r=0,59), hip-roll (r=0,54), pull-up for 20 seconds (r=0,59), push-ups for 20 s (r=0,55), lifting the trunk from the supine position on the back for 20 s (r=0,46)); (r=0,51), the maximum amount of push-ups (r=0,39), the maximum number of flexing-extension of the arms on the uneven bars (r=0,42)); coordination abilities in the tests: running on the "bridge stand" (r=0,67), 10 somersaults forward (r=0,77), 15 coups on the "bridge stand" (r=0,58).

Conclusions

The results of the study testify to the homogeneity of the indices of physical development of the athletes under study, since the coefficient of variation lies in the range from 2,43% to 10,93%.

It is revealed that the indices of physical readiness of qualified wrestlers are characterized by predominantly low variability in testing the speed-strength qualities, coordination abilities, general and strength endurance, and the average in the results of special endurance. This gives grounds for the fact that in the training process of qualified wrestler's Greco-Roman style more time was devoted to the development of special endurance.

The materials of the research showed that the most informative indicators of physical development are the weight of the wrestlers body, which has connections with 15 tests of physical fitness, followed by a vital index (12 statistically reliable relationships) and a power index (11 interrelations).

Next on the informative indicators are the body length and the Quetelet index, they have 9 reliable correlation links, then follows the age and the right hand dynamometry – 6 statistically reliable interrelations, and the volume of the lungs - 5 reliable correlations.

An analysis of the left hand dynamometry revealed one statistically significant relationship. Probably, qualified wrestlers play a crucial role in competitive actions with their right hands, so fighters in training sessions need to pay more attention to the strength of the left hand.

Further research will be aimed at determining the relationship between psycho-physiological indicators and the special physical preparedness of wrestlers.

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References

1. Holokha, V.L. (2017), "Problems of increasing the special endurance of judoists", *Edynoborstva*, No. 4, pp. 56-61. (in Ukr.)
2. Dagbaev, B.V. (2013), *Podgotovka bortsov volnogo stilya s uchetom sovremennykh pravil sorevnovaniy: monografiya* [Training of freestyle wrestlers taking into account modern rules of competitions: monograph], Buryat State university Publishing House. (in Russ.)
3. Kamaev, O.I., Tropin, Yu.N. & Kostyukov, Ya.E. (2017), "Special endurance as an integral part of the training of wrestlers", *Yedinoborstva*, No. 3, pp. 40-43. (in Russ.)
4. Nachinskaya, S.V. (2005), *Sportivnaya metrologiya: uchebnoe posobie dlya studentov vysshikh uchebnykh zavedeniy* [Sports Metrology: a textbook for students of higher educational institutions], Izdatelskiy tsentr "Akademiya", Moscow. (in Russ.)
5. Novikov, A.A. (2012), *Osnovy sportivnogo masterstva* [Fundamentals of Sporting Excellence], VNIIFK, Moscow. (in Russ.)
6. Pervachuk, R.V., Tropin, Yu.N., Romanenko, V.V. & Chuev, A.Yu. (2017), "Modeling characteristics of sensorimotor reactions and specific perceptions of skilled wrestlers", *Slobozans`kij naukovo-sportivnij visnik*, No. 5, pp. 84-88, doi: 10.15391/snsv.2017-5.015. (in Russ.)
7. Romanenko, V.V. & Golokha, V.L. (2017), "Assessment of the level of special endurance and functional capabilities of qualified Taekwondo", *Yedinoborstva*, No. 4, pp. 69-73. (in Russ.)
8. Tropin, Yu.N. (2017), "Model characteristics of physical fitness in sports wrestling", *Slobozans`kij naukovo-sportivnij visnik*, No. 2, pp. 98-101, doi: 10.15391/snsv.2017-2.017. (in Russ.)
9. Iermakov, S., Podrigalo, L., Romanenko, V., Tropin, Y., Boychenko, N. & Rovnaya, O. (2016), "Psycho-physiological features of sportsmen in impact and throwing martial arts", *Journal of Physical Education and Sport*, Vol. 16(2), pp. 433-441.
10. Latyshev, S., Korobeynikov, G. & Korobeinikova, L. (2014), "Individualization of Training in Wrestlers", *International Journal of Wrestling Science*, Vol. 4, No. 2, pp. 28-32.
11. Miarka, B. (2016), "Technical-tactical and physiological demands of wrestling combats", *Revista de Artes Marciales Asiőticas*, Vol. 11, No. 1, pp. 18-31.
12. Zhumakulov, Z.P. (2017), "Education Technology of Primary Training Sport Wrestling", *Eastern European Scientific Journal*, No. 5, pp. 29-35.

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