SIMULATION OF MORPHOLOGICAL-FUNCTIONAL PROFILES OF ELITE SPORTSMEN, WHO SPECIALIZE IN BREASTSTROKE SWIMMING AT DIFFERENT DISTANCES

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Abstract. *Purpose:* development of morphological functional models of elite sportsmen, specializing in breaststroke swimming at different length distances. *Material:* in the research 25 swimmers –finalists of Championships and Cups of Ukraine in breaststroke at distances of 50, 100 and 200 meters participated. *Results:* it was found that sportsmen's morphological-functional profile has its peculiar features. It was determined that degree of morphological-functional indicators' correlation with sport result depends on change of competition distance length. With increasing of competition distance length the role of vital capacity of lungs' indicators increase as well as body length, shin length, width of hand. In its turn significance of circumferential body sizes, foot width and heart beat rates (in lying position for 10 sec.) reduces. *Conclusions:* determination of sportsman's individual characteristics' correspondence to morphological-functional status can permit to correctly choose distance specialization of swimmer and open his potentials to the fullest.

Key words: breaststroke, sportsmen, distances, morphological-functional characteristics, interconnection, model.

Introduction

Modern level of swimming dictates need in seeking gifted sportsmen, who could be able to achieve world level results. It can be possible only under condition of selection and orientation system's correspondence to min components of competition functioning structure and to swimmers' special fitness. It permits to realize choice of distance length, which would maximally meet individual characteristics of every swimmer [3, 9, 13, 17–21].

Significant role in system of sport orientation is played by morphological functional indicators [2, 4, 7, and 14]. In order to prognosticate correctly future sport achievements of a swimmer it is necessary to assess his potentials, meaning body constitution, functional characteristics and etc.

As many years practice has shown sportsman's not compliance even with only one indicators of model profile forces him to compensate this not compliance at the account of other systems. Such compensation forces organism to be in extreme tension. It, in its turn, results in exhaustion of his reserves and finally in different chronic diseases. In this connection it became obvious that the more individual corresponds to sport model of functioning and the less is level of limiting factors, the higher is reliability of biological system and the longer is sport longevity [7].

In sport swimming (since 70-s of the past century) great attention has been paid to model characteristics with usage of anthropometric data [1]. As a result of multiple researches, in scientific-methodic literature there appeared rather fully worked out models of sportsmen, who perform in different swimming styles [3, 5, 7, 10, 11, 12, 22–25]. Specialists proved that compliance of sportsmen with their genetically determined morphological-functional indicators of definite specialization significantly increases effectiveness of training process and improves sport result [5, 6, 8, 15, 26–29].

As on to day there have been still a number of aspects, requiring careful attention and profound study. For example, there is a demand in more careful research of parameters of sportsmen, specializing in different swimming styles at different distances. Besides, constant growth of sport achievements and changing training methodic require constant correction of earlier developed model characteristics.

Purpose, tasks of the work, material and methods

The purpose is to work out morphological functional models of elite sportsmen, specializing in breaststroke swimming at different length distances

As the main *tasks of the research* we formulated the following:

1. To determine degree of morphological-functional indicators' correlation with sport result in breaststroke swimming at different distances.
2. To work out model morphological-functional characteristics of sportsmen, specializing in breaststroke swimming at 50, 100 and 200 meters' distances.

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The researches were conducted in periods of Championships and Cups of Ukraine in swimming since 2012 to 2015.

In the research swimmers, specializing in breaststroke at distances of 50, 100 and 200 meters participated. Total quantity of the tested was 25 persons. All sportsmen were of high class.

Results of the researches

Analysis of 34 morphological-functional parameters permitted o build model of breaststroke swimmer independently on his distance specialization (see fig.1).

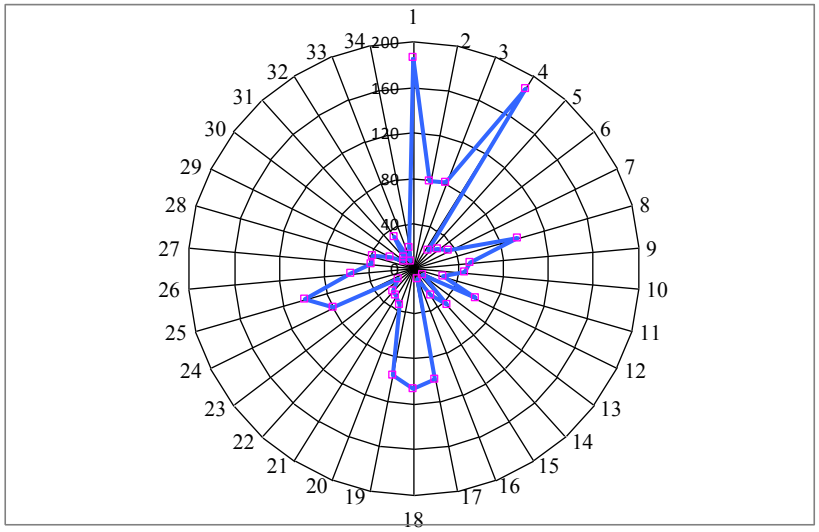

Fig.1. Morphological-functional profile of sportsemn, specializing in breast stroke swimming:
1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

The received morphological-functional profile of sportsmen complies with available literature data [1, 3, 5, and 16]. As we can see in fig.1, higher values of hip and buttocks' circumferences, higher body weight, average circumference of upper limbs are most characteristic for breaststroke swimmers. The sportsmen of this specialization have relatively not long body, have long "dry" shin, long foot and so on.

We put forward a hypothesis that significance of one and the same morphological-functional indicators at 50, 100, and 200 meters' distances is different in breaststroke swimming. We conducted correlation analysis. On the base of the received data we constructed petal diagrams (see figs. 2, 3, 4).

As we see in fig.2, at 50 meters' distance the most important are he following parameters: circumference of relaxed arm (r = 0.91); width of foot (r = 0.84); circumference of buttocks, knee, wrist, forearm, shin and waist ((r is respectively 0.77, 0.73, 0.73, 0.69, 0.64, 0.54); HBR in lying position for 10 sec. 10 c (r = 0.61); length of arm, foot, shoulder (accordingly 0. 58, 0.56, 0.53); width of pelvis (r = 0,56); HBR after load during 10 seconds (r = 0.53).

In its turn at 100 meters' distance for breaststroke the most important parameters are: circumference of forearm, shin, waist and arm (in relaxed state) (r is respectively 0.73, 0.52, 0.52 and 0.46); VCL (r = 0.6); HBR after load during 10 seconds (r = 0.6); width of pelvis (r = 0.5) and width of foot (r = 0.49) (see fig. 3).

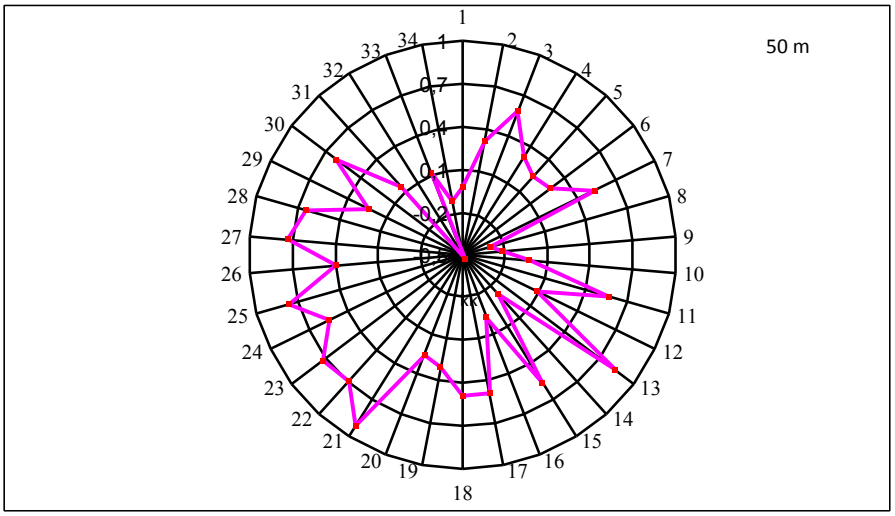

Fig.2. Correlation of elite sportsmen's morphological functional indicators with results of 50 meters' breaststroke: 1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

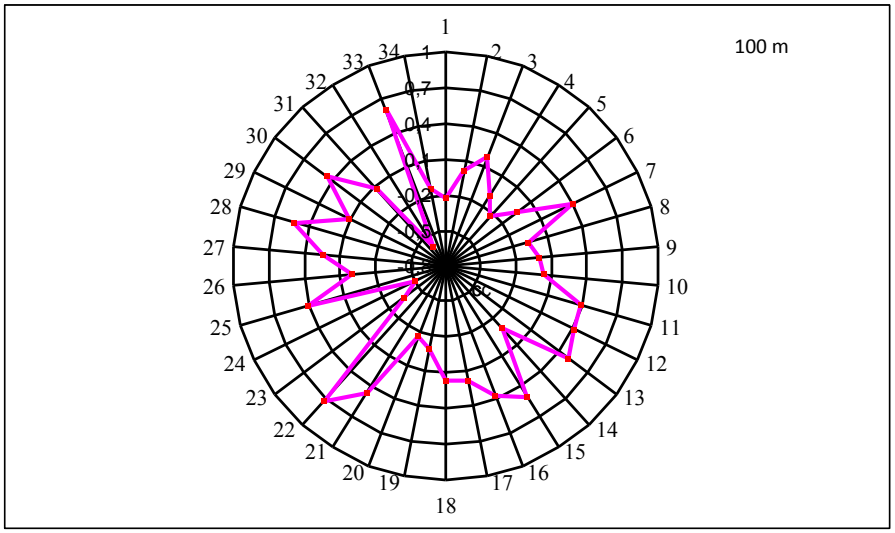

Fig. 3. Correlation of elite sportsmen's morphological functional indicators with results of 100 meters' breaststroke:
1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats

rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

200 meters' results correlate to the fullest extent with the following indicators: VCL (r = 0.87); width of hand (r = 0.64); length of torso, shin, foot, forearm and arm (r is 0.55, 0.54, 0.52, 0.48, and 0.46 respectively); width of foot and pelvis (r = 0.51); circumference of waist (r = 0,5) (see fig. 4).

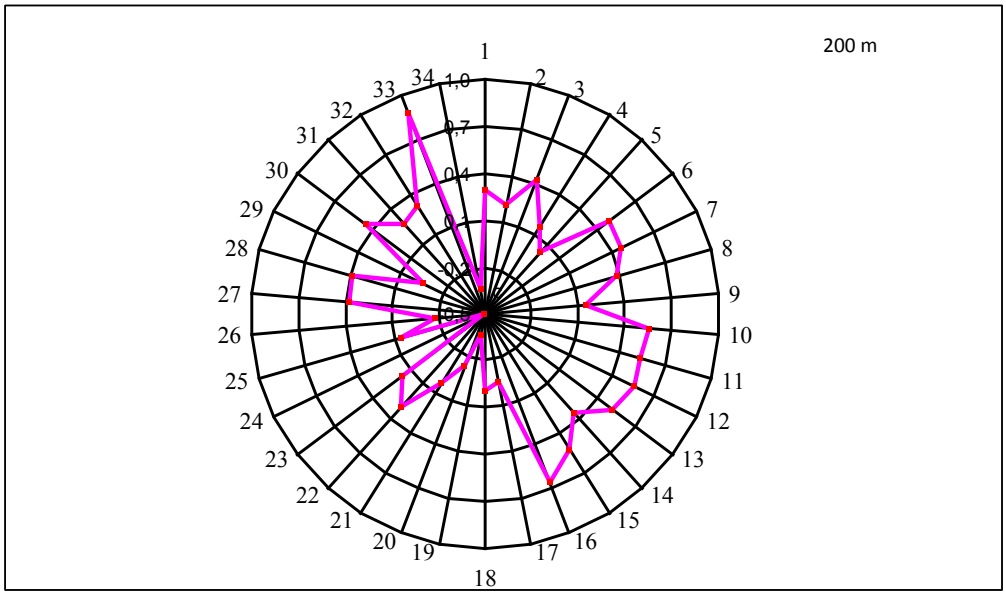

Fig. 4. Correlation of elite sportsmen's morphological functional indicators with results of 200 meters' breaststroke:
1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

Having analyzed the change of the marked indicators' significance, we received the following picture (see table 1).

Table 1. Significance of breaststrokers' morphological functional indicators, depending on competition distance length

№	Indicators	Correlation of parameter with sport result (r)		
		50 m	100 m	200 m
1	Circumference of relaxed arm	0.91	0.46	0.03
2	Foot width	0.84	0.49	0.51
3	Circumference of buttocks	0.77	0.41	0.05
4	Circumference of knee	0.73	0.24	0.37
5	Circumference of waist	0.73	0.36	0.16
6	Circumference of forearm	0.69	0.73	0.30
7	Circumference of shin	0.64	0.52	0.38
8	HBR in lying position for 10 sec.	0.61	0.45	0.44

№	Indicators	Correlation of parameter with sport result (r)		
		50 m	100 m	200 m
9	Arm length	0,.58	0.19	0.41
10	Foot length	0.56	0.38	0.52
11	Width of pelvis	0.56	0.50	0.51
12	Circumference of waist	0.54	0.52	0.50
13	Length of shoulder	0.53	0.38	0.46
14	HBR after load during 10 seconds	0.53	0.60	0.30
15	VCL	0.12	0.60	0.87
16	Torso length	0.08	0.41	0.55
17	Width of hand	0.03	0.37	0.64
18	Shin length	0.03	0.03	0.54
19	Forearm length	0.27	0.05	0.48

As we can see in table 1, all regarded indicators can be conventionally divided into four groups:

1) Parameters, which increase their influence on result with increasing of distance length (VCL, torso length, shin length, width of hand);
2) Indicators, whose role reduces with increasing of distance length (circumference of shoulder, buttocks, wrist, forearm, shin, width of foot, HBR in lying position for 10 sec.);
3) Criteria, influence of which on result does not change with change of distance length (width of pelvis, circumference of waist);
4) Indicators, correlation of which with results of 50, 100 and 200 meters' distance, have waving character (circumference of knee, length of arm, foot, shoulder and forearm, HBR after load during 10 seconds).

Thus, morphological functional profiles of sportsmen – breaststrokers at 50, 100 and 200meters' distances have peculiar features.

On the base of analysis of the received numerical material we worked out model morphological-functional characteristics of breaststroke swimmers, who perform at different distances (see tables 2, 3, 4).

The created model characteristics can serve as bench marks of morphological-functional status, correspondence to which will permit to correctly choose sportsman's distance specialization and open his potentials to the fullest.

Table 2. Model morphological-functional characteristics for 50 meters' breaststrokers

Length of arm (cm)	Length of shoulder (cm)	Length of foot (cm)	Width of foot (cm)	Width of pelvis (cm)	Circumference of relaxed arm (cm)	Circumference of forearm (cm)	Circumference of wrist (cm)	Circumference of waist (cm)	Circumference of buttocks (cm)	Circumference of knee (cm)	Circumference of shin (cm)	HBR in lying position for 10 sec. (beats)	HBR after 10 sec. Load (beats)
81.2	34.5	27.6	10.6	28	30.1	27.2	16.7	78.7	98.5	37.2	37.3	9.9	30.1

Table 3. Model morphological-functional characteristics for 100 meters' breaststrokers

Width of foot (cm)	Width of pelvis (cm)	Circumference of relaxed arm (cm)	Circumference of forearm (cm)	Circumference of waist (cm)	Circumference of shin (cm)	HBR after 10 sec. Load (beats)	VCL (l)
10.6	28.1	29.3	27.4	78	37.2	31.1	6.4

Table 4. Model morphological-functional characteristics for 200 meters' breaststrokers

Length of forearm (cm)	Length of shoulder (cm)	Length of shin (cm)	Length of foot (cm)	Torso length (cm)	Width of foot (cm)	Width of pelvis (cm)	Width of hand (cm)	Circumference of waist (cm	VCL (l)
27.8	34.9	45.2	27.6	61.1	10.9	29	10.8	79.4	6.3

Discussion

Analysis of scientific-methodic literature permitted to come to conclusion that selection and orientation systems shall be based on the whole complex of indicators. Among these indicators important role is played by morphological-functional parameters of sportsmen [1, 4, 5, 7, and 12].

In works by N.Zh. Bulgakova et al., V. Yu. Davydov, V. N. Platonov et al., it is noted that sportsmen of different swimming styles have their peculiar features of morphological-functional development. The conducted by us researches confirm the data about significance of longitudinal and circumferential sizes of body, as well as indicators of functional status for achievement of high results in breaststroke swimming.

The authors of this article have supplemented information about role of morphological-functional indicators, depending on competition distance length for breaststrokers. Besides, we worked out model morphological-functional characteristics, which can help in choosing of sportsmen's distance specialization.

Conclusions:

1. At modern stage of swimming development one of promising direction in perfection of selection and orientation systems is creation of model characteristics of sportsmen, specializing in different swimming styles at different distances.
2. Degree of elite sportsmen's morphological-functional indicators' correlation with sport results at 50, 100, and 200 meters' distances of breaststroke is different. With increase of competition distance length, role of VCL, torso length, shin length, width of wrist indicators also increases. In its turn significance of body circumferential sizes, foot width and HBR in lying position for 10 sec. reduces.
3. Morphological-functional profiles of breaststroke at different distances sportsmen have their own peculiar features.
4. Determination of sportsman individual characteristics' correspondence to morphological-functional status will permit to correctly choose distance specialization of swimmer and to open his potentials to the fullest extent.

The prospects of further researches imply working out of model psycho-physiological and technical-tactic characteristics of breaststroke swimmers, specializing in distances of different length.

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Conflict of interests

The authors declare that there is no conflict of interests.

References

1. Bulgakova NZh. *Otbor i podgotovka iunykh plovcov* [Selection and training of junior swimmers], Moscow, Physical culture and sport; 1986 (in Russian).
2. Bulgakova NZh, Kashkin AA, Popov OI, Smirnov VV, Solomatin VR, Chebotareva IV. *Traektoriia razvitiia morfofunkcional'nykh pokazatelej kak kriterii identifikacii talanta v sportivnom plavanii* [Trajectory of morphological-functional indicators' development as criteria of identification of talent in sport swimming]. Plavanie 2003;1:153 – 161. (in Russian).
3. Bulgakova NZh, Chebotareva IV. *Osobennosti teloslozheniia iunogo plovca kak kriterij specializacii vnutri vida* [Characteristics of junior swimmer's body constitution as specialization criterion inside this kind of sports]. Plavanie 2003;1:167–170. (in Russian).
4. Volkov LV. *Teoriia sportivnogo otbora* [Theory of sport selection], Kiev: Veza; 1997 (in Russian).
5. Ganchar IL. *Plavanie: teoriia i metodika prepodavaniia sportivno-pedagogicheskogo sovershenstvovaniia* [Swimming: theory and methodic of teaching of sport-pedagogic perfection], Odessa: Druk; 2007 (in Russian).
6. Davydov V, Kudinov A, Petryaev A, Kleshnev I. Influence of morphofunctional parameters of juvenile female swimmers' development on their performance in 100 meter race by different strokes. *Swimming. Research, training, hydrorehabilitation* 2005;1:125 – 129.
7. Davydov VIu, Avdienko VB. *Otbor i orientaciia plovcov po pokazateliam teloslozheniia v sisteme mnogoletnej podgotovki* [Selection and orientation of swimmers by body constitution indicators in system of many years' training], Moscow: Soviet sport; 2014. (in Russian).
8. Zakolodnaia EE. Tip konstitucii kak faktor specializacii i vysokikh sportivnykh dostizhenij v plavanii [Type of body constitution as factor of specialization and high sport achievements in swimming]. *Uchenye zapiski* 1997;1:117–126. (in Russian).
9. Pilipko OA, Polit'ko EV. *Modelirovanie vybora sportivnoj specializacii plovcov na osnove analiza struktury sorevnovatel'noj deiatel'nosti i special'noj podgotovlennosti sportsmenov* [Simulation of sport specialization choice by swimmers on the base of analysis of competition functioning and sportsmen's special fitness structure], Kharkiv, HDAFK; 2010. (in Russian).
10. Pilipko OA. *Modelirovanie profilia vysokokvalificirovannykh sportsmenok, specializiruiushchikhsia v plavanii sposobom krol' na grudi* [Simulation of elite sportswomen, specializing in crawl on breast, profiles]. Science Rise 2014;3(1, 3):78 – 86. (in Russian).
11. Pilipko OA. Modelirovanie struktury sorevnovatel'noj deiatel'nosti i special'noj podgotovlennosti kvalificirovannykh sportsmenov, specializiruiushchikhsia v plavanii sposobom krol' na spine na distanciiakh 50 i 100 metrov na osnove analiza ikh morfofunkcional'nykh, tekhniko-takticheskikh i psikhofiziologicheskikh osobennostej [Simulation of competition functioning and special fitness structure of sportsmen, specializing in crawl on back at distances of 50 and 100 meters on the base of analysis of their morphological-functional, technical-tactic and psycho-physiological characteristics]. *East European Scientific Journal* 2015;2:58 – 64. (in Russian).
12. Platonov VN. *Plavanie* [Swimming], Kiev: Olympic literature; 2000 (in Russian).
13. Platonov VN. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev, Olympic literature; 2004 (in Russian).
14. Sergiienko LP. *Sportivnij vidbir* [Sport selection], Ternopil: Educational book – Bogdan; 2009 (in Ukrainian).
15. Solomatin VR. Model'nye kharakteristiki i normativnye trebovaniia special'noj rabotosposobnosti vysokokvalificirovannykh plovcov [Model characteristics and normative requirements to special workability of elite swimmers]. *Vestnik sportivnoj nauki* 2009;3:17–20. (in Russian).
16. Platonov VN. *Sportivnoe plavanie* [Sport swimming], Kiev: Olympic literature; 2012 (in Russian).
17. Shinkaruk OA. *Vidbir sportsmeniv i oriientaciia ikh pidgotovki v procesi bagatorichnogo vdoskonalennia. Doct. Diss.* [Selection of sportsmen and orientation of their training in process of many years' perfection. Doct. Diss.], Kiev; 2011 (in Ukrainian).
18. Shustin BN. *Modelirovanie v sporte vysshikh dostizhenij* [Simulation in elite sports], Moscow, RGAFK; 1995 (in Russian).

19. Costa L, Mantha VR, Silva AJ, Fernandes RJ, Marinho DA, Vilas-Boas JP. Computational fluid dynamics vs. inverse dynamics methods to determine passive drag in two breaststroke glide positions. *Journal of Biomechanics*. 2015;48(10):2221–6.
20. Drogomeretsky VV, Kondakov VL, Gorelov AA. Application of improving swimming to the correction of joint and ligament students. *Physical Education of Students* 2013;5:46–54. http://dx.doi.org/10.6084/m9.figshare.771046
21. Furman YM, Hruzevych IV. Improved general physical fitness of young swimmers by applying in the training process of endogenous hypoxic breathing techniques. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2014;10:57–61. http://dx.doi.org/10.5281/zenodo.10493
22. Jendrysek Marek, Nowosielska-Swadzba Danuta, Zwolinska Danuta, Podstawski Robert. Body composition of young people aged 17–18 years, practicing and not practicing swimming, with the use of the bioelectrical impedance method. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;11:67–72. http://dx.doi.org/10.15561/18189172.2015.1110
23. Keiner M, Yaghobi D, Sander A, Wirth K, Hartmann H. The influence of maximal strength performance of upper and lower extremities and trunk muscles on different sprint swim performances in adolescent swimmers. *Science & Sports*. 2015;30(6):e147–54.
24. Lauer J, Olstad BH, Minetti AE, Kjendlie P-L, Rouard AH. Breaststroke swimmers moderate internal work increases toward the highest stroke frequencies. *Journal of Biomechanics*. 2015;48(12):3012–6.
25. Leblanc H, Seifert L, Chollet D. Arm–leg coordination in recreational and competitive breaststroke swimmers. *Journal of Science and Medicine in Sport*. 2009;12(3):352–6.
26. Martens J, Figueiredo P, Daly D. Electromyography in the four competitive swimming strokes: A systematic review. *Journal of Electromyography and Kinesiology*. 2015;25(2):273–91.
27. Nakashima M, Terauchi H, Wakayoshi K. Simulation analysis of the influence of breathing on the performance in breaststroke. *Procedia Engineering*. 2012;34:736–41.
28. Payton CJ, Bartlett RM. A kinematic analysis of the breaststroke pulling patterns of national and international level swimmers. *Journal of Biomechanics*. 1994;27(6):682.
29. Seifert L, Leblanc H, Herault R, Komar J, Button C, Chollet D. Inter-individual variability in the upper–lower limb breaststroke coordination. *Human Movement Science*. 2011;30(3):550–65.

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