

Correlation of morphological and functional indicators with sports results among qualified athletes specializing in freestyle swimming at distances of various lengths

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Purpose: determine the degree of correlation between morphological and functional indicators and athletic performance among qualified athletes specializing in freestyle swimming at distances of various lengths.

Material & Methods: analysis of literary sources, timekeeping, anthropometric and physiological measurements, methods of mathematical statistics. The contingent of the examined was composed of qualified athletes specializing in freestyle swimming at sprint, middle and stayer distances.

Results: the authors formed a morphological and functional profile of qualified athletes specializing in freestyle swimming at distances of various lengths, studied the differences that occur in indicators of the level of morpho-functional development of athletes depending on their distance specialization, determined the degree of correlation between morpho-functional performance and sport result among qualified swimmers specializing in sprinting, middle and stayer distances.

Conclusions: determining the degree of relationship between morphological and functional indicators and sports results at different distances in freestyle can be used to improve the selection and orientation of qualified swimmers.

Keywords: swimmers, freestyle, distances, morphological and functional indicators, differences, relationship.

Introduction

The constant growth of competition in sports swimming dictates the need for a continuous search for ways to optimize the training system for swimmers, aimed at achieving an increasingly high level of competitive activity indicators [8; 9 et al.].

It is well known that the swimming speed in various ways and at different distances is determined by the physique, physical and functional preparedness of athletes.

As a result of numerous studies conducted by experts in the field of sports swimming, the practice of sports has been enriched with the characteristics and regulatory requirements of physical development and special preparedness of swimmers of various qualifications and specializations [1; 4; 5; 6; 7, 12; 13 et al.].

However, as modern world practice shows, previously developed model characteristics today require constant correction.

The modern literature contains quite a lot of information regarding the study of the components of the structure of physical, technical, tactical, psychological and integral preparedness that affect the sports result [2; 3; 9; 11; 14; 15 et al.].

At the same time, the study of the relationship between morphological and functional indicators and athletic performance in qualified athletes of various distance specializations does not lose its relevance.

A detailed study of this direction opens up new prospects for improving the training process of swimmers based on the identification of the most significant indicators that affect the result..

Purpose of the study: to determine the degree of relationship between morphological and functional indicators and athletic performance in qualified athletes specializing in freestyle swimming at distances of various lengths.

Objectives of the study:

1. To characterize the morpho-functional profile of qualified athletes specializing in freestyle swimming at distances of various lengths.
2. To study the differences that occur in indicators of the level of morphological and functional development of athletes, depending on their distance specialization.
3. Determine the degree of correlation between morphological and functional indicators and athletic performance in qualified swimmers specializing in sprinting, middle and stayer distances.

Material and Methods of the research

To solve the tasks, the following methods were used: analysis of literature, timekeeping, anthropometric and physiological measurements, methods of mathematical statistics.

The surveyed group consisted of a number of qualified athletes specializing in freestyle swimming at sprint, middle and stayer

distances. All of them were participants in the championships and championships of Ukraine in swimming. The sports qualification of the examined contingent corresponded to the level of Candidate Master of Sports – Master of Sports.

Results of the research

Among the main morphological and functional indicators of athletes specializing in freestyle swimming at distances of various lengths, we determined: body length and weight, VC, arm span, trunk length, shoulder width, pelvis, hands, longitudinal and girth sizes of upper and lower extremities and their segments, girth of the chest at rest, on inhalation, on exhalation, mobility in the shoulder joints, leaning forward.

The obtained digital material allowed us to form a morphological and functional profile of swimmers specializing in sprinting, middle and stayer distances (Fig. 1–3).

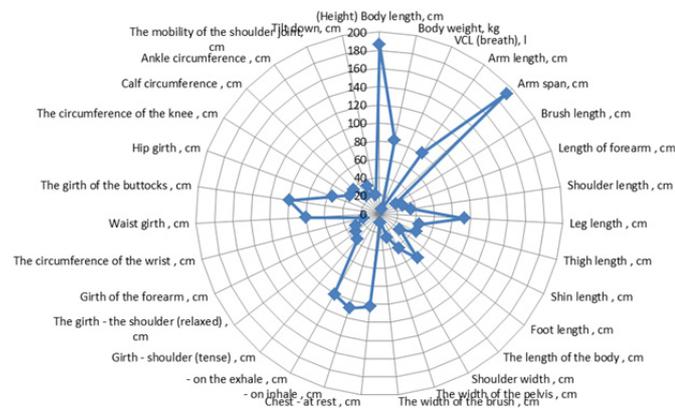


Fig. 1. Morphological and functional profile of qualified athletes specializing in freestyle swimming at sprint distances

As can be seen from Figure 1, sprinter swimmers are characterized by high growth ($186,17 \pm 6,11$ cm), large weight ($83,00 \pm 8,92$ kg), long limbs and their segments, and well-developed muscles.

Significant girth sizes of the chest are noted in them (at rest, the values are at the level of $102,42 \pm 6,14$ cm, while inspiration and exhalation are $108,58 \pm 5,68$ cm and $100,83 \pm 7,08$ cm, respectively).

They are also distinguished by the large among representatives of other remote specializations the value of the circumference of the shoulder ($36,42 \pm 2,42$ cm in tension, $32,42 \pm 2,46$ cm in relaxed state), hips ($54,67 \pm 1,60$ cm) and waist ($80,00 \pm 4,05$ cm).

Athletes who specialize in middle-distance freestyle swimming have high values for body length ($188,33 \pm 3,67$ cm), weight ($82,33 \pm 4,55$ kg), chest girth (alone – $101,00 \pm 5,18$ cm, on inspiration – $107,75 \pm 5,74$ cm, on exhalation – $98,92 \pm 6,97$ cm) and limbs (arm lengths are $84,65 \pm 2,52$ cm, legs – $98,00 \pm 5,10$ cm) (Figure 2).

Stayer swimmers are characterized by the smallest in comparison with the fins, acting at short and medium distances, height ($184,71 \pm 6,21$ cm) and weight ($74,14 \pm 8,28$ kg).

They are also distinguished by small circumferential sizes

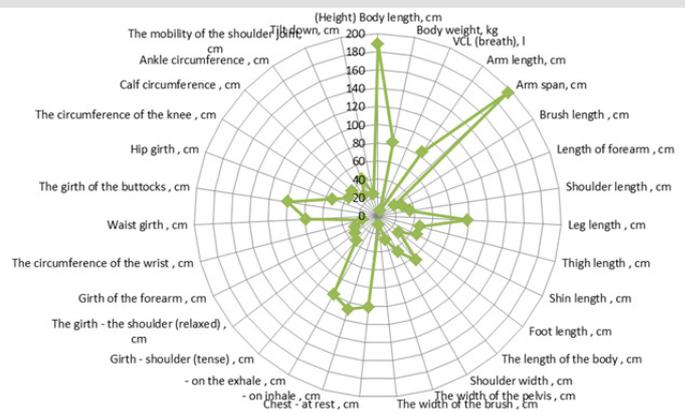


Fig. 2. Morphological and functional profile of qualified athletes specializing in freestyle swimming at middle distances

(chest circumference at rest – $99,50 \pm 6,90$ cm, on inspiration – $105,21 \pm 6,10$ cm, on exhalation – $97,64 \pm 6,56$ cm; circumference of the shoulder in strained and relaxed: $33,64 \pm 2,73$ cm and $29,86 \pm 2,63$ cm, respectively; waist – $77,07 \pm 7,31$ cm, lower legs – $35,93 \pm 2,98$ cm, ankles – $23,57 \pm 2,35$ cm, etc.) (Fig. 3).

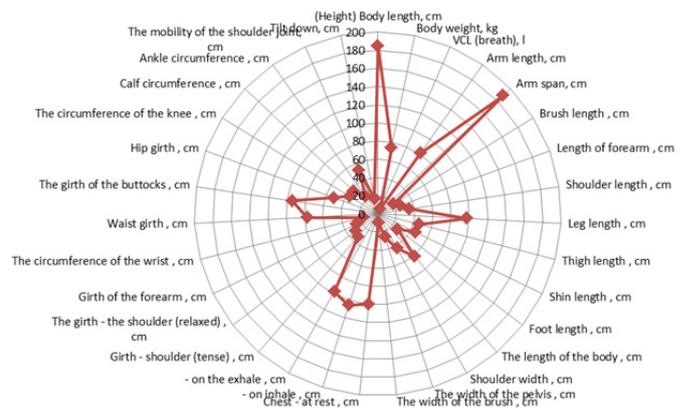


Fig. 3. Morphological and functional profile of qualified athletes specializing in freestyle swimming at stayer distances

Having examined the differences in the level of morphological and functional development of athletes depending on their distance specialization, we got the following picture.

Athletes specializing in middle-distance swimming are ahead of sprinters and styers in all longitudinal body sizes (values of body length, arm span, linear dimensions of the hand, forearm, shoulder, leg, thigh, lower leg, foot and trunk). Also, swimmers of this distance specialization have the largest transverse dimensions (width of the shoulders, pelvis, and hand).

In turn, sprinters are heavier compared to styers and middle (their weight averages $83,00 \pm 8,92$ kg), they also have large absolute values of girth sizes, because in comparison with representatives of other distance specializations they are more muscular mass due to the performance of work requiring maximum manifestation of muscle effort.

The advantage of mid-size athletes in terms of the circumferential size of the lower leg and ankle is due to the significant requirements that apply to leg work at distances of a given

length.

It is worth noting that as the distance increases, the absolute values of the circumferential dimensions of the body decrease. This is due to significant requirements for hydrodynamic performance swimmers-styers.

Representatives of stayer swimming have the most developed mobility in the shoulder joints.

Such an indicator of functional development, as VC, is large in absolute values among athletes specializing in swimming at medium distances.

Thus, distance specialization leaves its mark on the absolute values of the indicators of the morphological and functional development of swimmers.

The correlation analysis revealed that the following parameters are most related to sports results for sprinters: hip circumference ($R=0,62$), thigh length ($R=0,58$) and forearm ($R=0,58$), shoulder girth in stress ($R=0,54$), mobility in the shoulder joints ($R=0,45$).

In middle-aged swimmers, they most affect the athletic performance: hip circumference ($R=0,96$), height ($R=0,95$), lower leg ($R=0,95$), wrist circumference ($R = 0,95$), hand length ($R=0,89$), arm length ($R=0,86$), weight ($R=0,86$), forearm length ($R=0,84$), foot length ($R=0,70$), arm span ($R=0,50$).

Among the significant morphological and functional indicators for the styers are: the length and width of the hand (R is $0,84$ and $0,70$, respectively), the circumference of the chest at rest ($R=0,56$), the width of the shoulders ($R=0,55$) and wrist girth ($R=0,52$).

Mobility in the shoulder joints is important for all athletes who specialize in freestyle swimming, regardless of distance specialization.

Summarizing the obtained data, we determined the parameters that can be used as important for rabbit swimmers when choosing the length of the competitive distance for further narrow specialization. These are: height, weight, leg length, length and width of the hand, forearm length, length and circumference of the thigh Figures 4-10 show the values of the correlation coefficients of these indicators with the sports result at distances in sprinting, styer swimming and at medium distances.

Thus, the index of the length of the forearm is most significant for demonstrating high results at medium distances ($R=0,84$), it affects the performance of sprinters to a lesser extent ($R=0,58$), the smallest coefficient R is fixed in styers (Figure 4).

The length of the thigh most affects the result in sprinters ($R=0,58$), its significance in the middle-distance is slightly less ($R=0,31$). In styers, the correlation coefficient is $0,26$ (Fig. 5).

It is noteworthy that with the increase in the length of the competitive distance, the influence of this indicator on the performance of swimmers decreases.

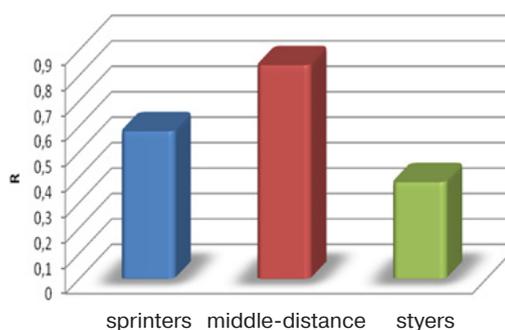


Fig 4. Degree of correlation between the indicator "length of the forearm" and sports results for sprinting, middle and stayer distances in freestyle swimming

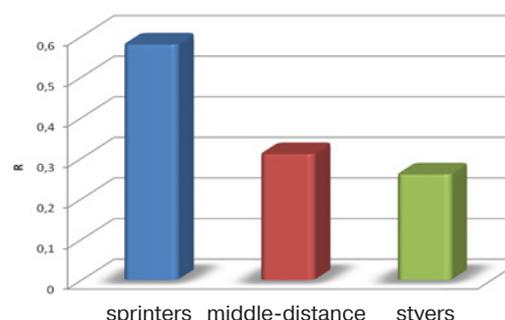


Fig. 5. Degree of correlation of the indicator "hip length" with sports results at sprinting, middle and stayer distances in freestyle swimming

Mobility in the shoulder joints prevails in importance in the styers ($R=0,54$). To a lesser extent, it affects the athletic performance of sprinters and middle-distance (R is $0,45$ and $0,43$, respectively) (Figure 6).

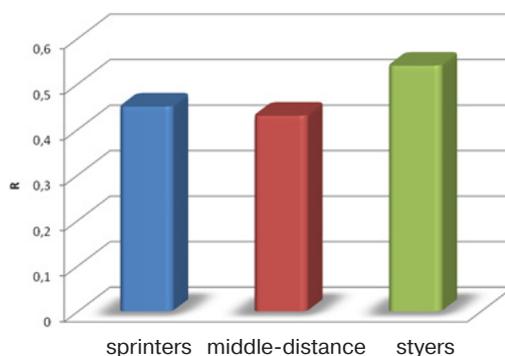


Fig. 6. Degree of correlation of the indicator "mobility in the shoulder joints" with sports results for sprinting, middle and stayer distances in freestyle swimming

The significance of growth indicators for the effective overcoming of average distances is at the level of $R=0,95$. In turn, in sprinter and styer swimming this dependence is not significant (R is $0,36$ and $0,07$, respectively) (Figure 7).

The same tendency also occurs with an indicator of the tibia length (R for and middle-distance, sprinters, and styers is $0,95$, $0,13$, and $0,06$, respectively) (Figure 8).

When swimming at medium and long distances, the length of the hand has a significant effect on sports results (R is between $0,89$ and $0,84$) (Figure 9).

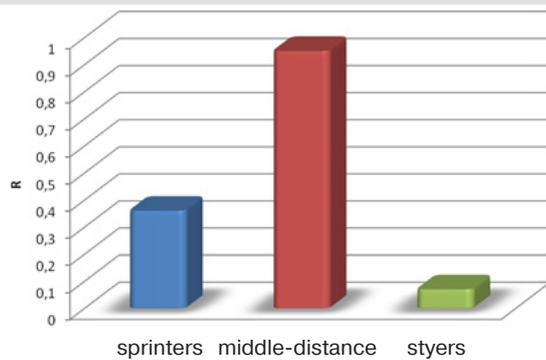


Fig. 7. Degree of correlation between the indicator "body length" with sports results for sprinting, middle and stayer distances in freestyle swimming

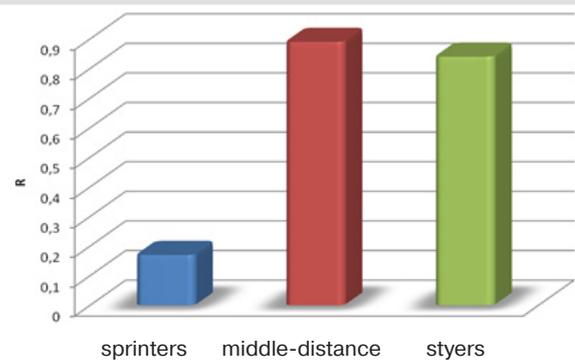


Fig. 9. Degree of correlation of the indicator "brush length" with sports results for sprinting, middle and stayer distances in freestyle swimming

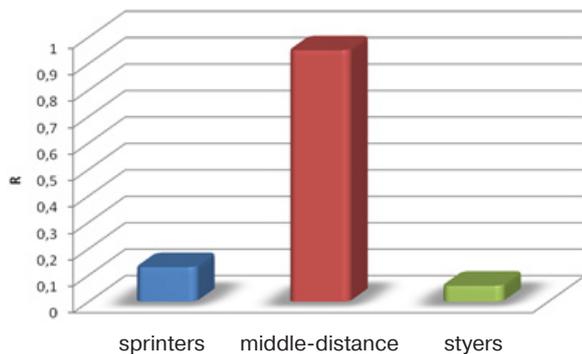


Fig. 8. Degree of correlation between the "length of the tibia" indicator and sports results for sprinting, middle and stayer distances in freestyle swimming

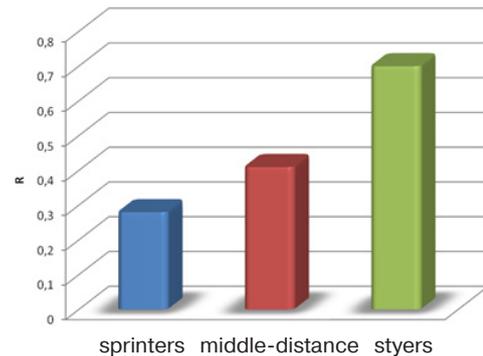


Fig. 10. Degree of correlation between the indicator "width of the brush" with sports results for sprinting, middle and stayer distances in freestyle swimming

Significant for styers such an indicator as the "width of the brush" ($R=0,7$). To a lesser extent, the influence of this parameter is felt in the middle-distance ($R=0,41$) and sprinters ($R=0,28$) (Figure 10).

It is noteworthy that with an increase in the length of the competitive distance, the relationship of this indicator with sports results is growing.

Thus, the analysis made it possible to obtain information on the degree of correlation between morphological and functional indicators and sports results at various distances in freestyle, which can be used to improve the selection and orientation of qualified swimmers.

Conclusions / Discussion

The results of the behavioral research confirm the prevailing opinion that the morphological and functional profile of qualified swimmers has features depending on distance specialization. The results obtained allowed us to conclude that the most informative guidelines for selection and specialization in the method of swimming crawl on the chest are: height, weight, leg length, length and width of the hand, forearm length, length and circumference of the thigh, mobility in the shoulder joints.

We found that in sprinters the following indicators are most interconnected with sports results: forearm length ($R=0,58$), hip length and girth (R values are between 0,58 and 0,62), shoulder girth in tension ($R=0,54$). For athletes who specialize in swimming at medium distances, the most affecting sports results are: height ($R=0,95$), weight ($R=0,86$), arm length ($R=0,86$), arm span ($R=0,50$), the length of the hand, forearm, lower leg and foot (R is 0,89, 0,84, 0,95, 0,70, respectively), the circumference of the wrist and thigh (R values are 0,95 and 0,96). Among the significant indicators of morphological and functional development for sportsmen-styers, one can single out: the length and width of the hand (R is 0,84 and 0,70), the circumference of the chest at rest ($R=0,56$), and the width of the shoulders ($R=0,55$), wrist girth ($R=0,52$).

Thus, the determination of distance specialization in the method of swimming the crawl on the chest should be carried out taking into account the indicators of the morphological and functional profile that are most interconnected with the end result.

Prospect of further research is to study the degree of correlation of morphological and functional indicators with sports results in qualified athletes specializing in back crawl swimming at distances of various lengths.

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