

Technical and tactical action modeling of highly trained athletes specializing in breaststroke swimming at various length distances

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Purpose: definition of model parameters of technical and tactical actions of highly trained athletes specializing in breaststroke swimming at various length distances.

Material & Methods: analysis of literary sources, video shooting, timing, methods of mathematical data processing. The contingent of the surveyed was made up of athletes who specialized in distances of 50, 100 and 200 meters in breaststroke swimming and had the level of sports qualification of master of sports of Ukraine, Master of Sports of International grade.

Result: authors found that the technical and tactical actions of highly trained athletes during the swim of distances of 50, 100 and 200 meters by the breaststroke have their own characteristics; degree of influence of speed, pace and "step" of the strokes cycle on the result of swim distances of 50, 100 and 200 meters is determined; developed their model characteristics.

Conclusion: the definition of distance specialization in breaststroke swimming should be carried out taking into account the compliance of individual indicators of technical and tactical actions of athletes to model parameters.

Keywords: breaststroke, athletes, distance, technical and tactical actions, correlation, model parameters.

Introduction

Successful performance at competitions – is the result of a directed training process, the effectiveness of which is determined by the level of theoretical knowledge of the trainers, their possession of the subtleties of technical, tactical, psychological and functional perfection of athletes, taking into account their individual capabilities [9; 11].

Finding ways to improve the competitive activities of athletes is the focus of professionals working in the field of competitive swimming, long ago. Currently, the scientific and methodological literatures are well represented improvements related to the study of factors affecting athletic performance [2; 3; 8; 10; 12]. Specialists detail the components of the structure of competitive activity, revealed the role of morpho-functional indices in swimming, the characteristic of technical and tactical operations of swimming athletes at distances of different lengths, etc. [1; 4; 5; 6; 7 etc.].

However, despite the level of knowledge of the problem, a number of its aspects require further specification. Thus, studies on indicators of technical and tactical skill of the athletes were concerned primarily with ways to swim front crawl and butterfly stroke, while the nuances of overcoming distances of varying lengths breaststroke and front crawl ways on the back were studied in fragments.

Given that a detailed and comprehensive analysis of the structure of competitive activities and special preparedness of athletes of various specializations will contribute to improving the quality of the training process, and orientation to model characteristics will allow to identify individual reserves of further growth of the skill of a particular athlete, it becomes clear the relevance of scientific work in this direction.

Relationship of research with scientific programs, plans, themes. Studies were conducted in accordance with the theme of the Consolidated Plan of Research in the field of physical culture and sports for 2011–2015: "Modeling of technical and tactical actions of qualified athletes in swimming and speed-strength disciplines of track and field athletics".

Purpose of the study: definition of model parameters of technical and tactical actions of highly trained athletes specializing in breaststroke swimming at various length distances.

Objectives of the study:

1. Characterize the dynamics of the speed, pace and "step" of the cycle of strokes in high-skilled athletes when they overcome distances of 50, 100 and 200 meters in the way of breaststroke swimming.
2. Determine the degree of influence of technical and tactical indicators on the result of the swim of distances of 50, 100 and 200 meters in the way of breaststroke swimming.
3. To develop model characteristics of technical and tactical actions of high-qualification athletes specializing in swimming at a distance of 50, 100 and 200 meters in the way of breaststroke swimming.

Material and Methods of the research

To solve the set tasks, the following methods were used in the work: analysis of literary sources, video shooting, timing, methods of mathematical processing of numerous data.

The research was conducted during the Ukrainian National Swimming Championships among men and women, as well

as at the Ukrainian Championships among adults and youth (2014–2016).

The surveyed group consisted of participants in the semifinal and final swimmers at distances of 50, 100 and 200 meters in a breaststroke swimming.

All the athletes who participated in the experiment were candidates and members of the Ukrainian national swimming team, had the level of sports qualifications of the MS and MSIG.

Results of the research and their discussion

The main technical and tactical indicators of our highly skilled athletes have been identified: speed, pace, and “step” cycle of strokes movements, which are valued areas:

- start – out of water;
- out of water – 15 meters;
- distance swimming at intervals of 15–25 meters, 25–35 meters, 35–45 meters, 65–75 meters and etc.;
- turning plot: 5 meters to the turn and 15 meters after the turn;
- finish line is 5 meters.

Dynamics of technical and tactical parameters of qualified athletes in the process of overcoming them by a distance of 50 meters in the way of breaststroke swimming is reflected in Figures 1–3.

As can be seen from Figure 1, the highest speed of all athletes is noted in the starting line. Its high values are due to the specifics of swimming activities in this area of the distance, namely, the execution of movements under water.

In the course of overcoming the competitive distance, the speed indicators gradually decrease, reaching the lowest value at the final 45–50 meters ($1,13 \text{ m}\cdot\text{s}^{-1}$).

When swimming a distance of 50 meters in the way of breaststroke swimming, athletes demonstrate great differences in the “step” of the cycle of strokes (Figure 2).

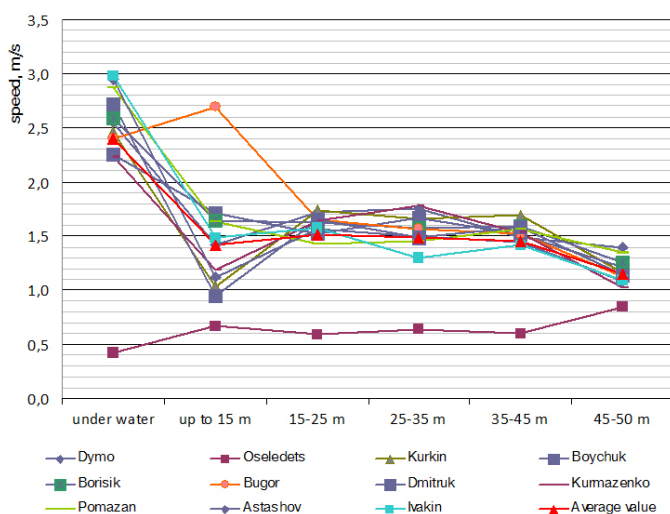


Fig. 1. Dynamics of speed indicator in the process of swimming by athletes distance of 50 meters by way of breaststroke swimming

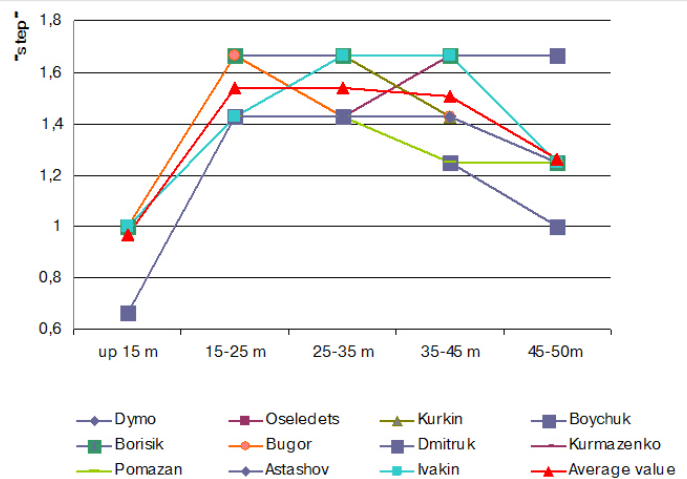


Fig. 2. Dynamics of “step” indicator of the cycle of strokes in the process of swimming by athletes distance of 50 meters by way of breaststroke swimming

At the same time, the general trend of the dynamics of this indicator is characterized by an increase in its numerical values in the “start – 25 meters” section, preservation at a relatively equal level in remote navigation areas and a decrease in the last (finishing) meters of the distance.

From Figure 3 we see that the highest rate of movement is seen on the starting segment ($91,85 \text{ cycle}\cdot\text{min}^{-1}$). In the process of overcoming the distance, its value does not change significantly (from $63,4 \text{ cycle}\cdot\text{min}^{-1}$ to $61,7 \text{ cycle}\cdot\text{min}^{-1}$), at the finish line there is a decrease in the tempo to the mark $56,7 \text{ cycle}\cdot\text{min}^{-1}$.

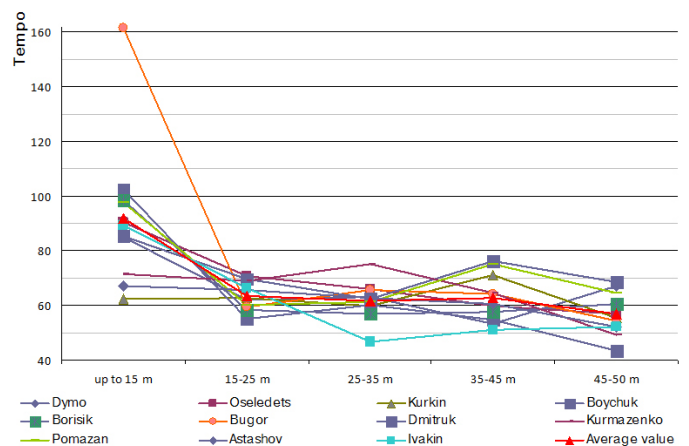


Fig. 3. Dynamics of tempo of strokes indicator in the process of swimming by athletes distance of 50 meters by way of breaststroke swimming

Dynamics of technical and tactical parameters of qualified athletes during the swimming at the distance of 100 meters by the way the breaststroke swimming is somewhat different.

As can be seen from Figure 4, the speed indicator on the starting segment has a maximum value ($2,3 \text{ m}\cdot\text{s}^{-1}$), after which it gradually decreases to the level $1,2 \text{ m}\cdot\text{s}^{-1}$. After the turn, the speed increases to the level of $1,7 \text{ m}\cdot\text{s}^{-1}$ and in the future the athletes try to support it without significant fluctuations. On the finish line (95–100 m), the swimming speed slows down,

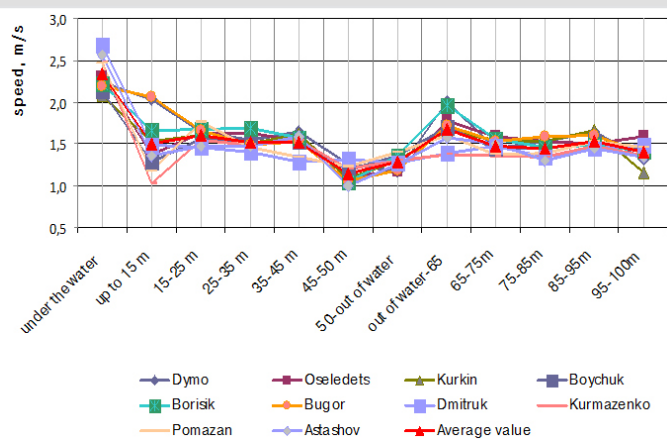


Fig. 4. Dynamics of speed indicator in the process of swimming by athletes distance of 100 meters by way of breaststroke swimming

reaching average values $1,4 \text{ m}\cdot\text{s}^{-1}$.

Dynamics of the “step” of the cycle of strokes at a distance of 100 meters is characterized by insignificant fluctuations, namely, an increase in its numerical values at the “15–25 meters” (2,2 m) section, systematic decrease as it approaches the turntable (1,6 m), small growth and preservation at one level on the segment “65–95 m” (1,9 m), a decrease in the last meters of the competitive distance (1,7 m) (Figure 5).

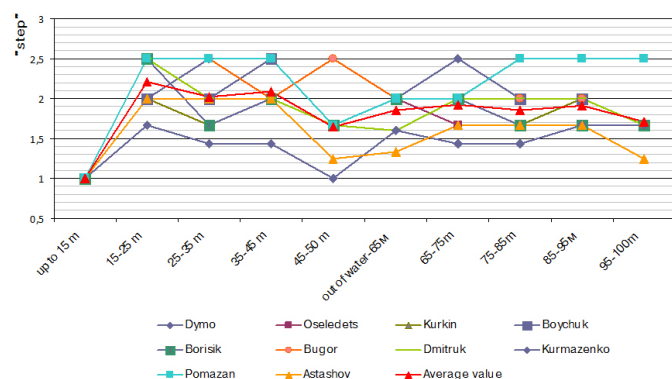


Fig. 5. Dynamics of “step” indicator of the cycle of strokes in the process of swimming by athletes distance of 100 meters by way of breaststroke swimming

At the same time, differences in individual terms “step” in different parts of the distance from the athletes quite significant.

Having considered the dynamics of the speed and “step” of the cycle of strokes, it can be concluded that both indicators are characterized by a decrease in values at the end of the race distance.

Accordingly, the tempo of strokes after a significant decrease in the first 25 meters is characterized by relative stabilization on the segments of the remote swimming (Figure 6).

The first half of the race is overcome by the athletes at the level of indicators $44,17\text{--}44,86 \text{ cycle}\cdot\text{min}^{-1}$. On the “out of water – 65 m” segment, the tempo values reach the level of $54,9 \text{ cycle}\cdot\text{min}^{-1}$. Then the swimmers try to maintain and even

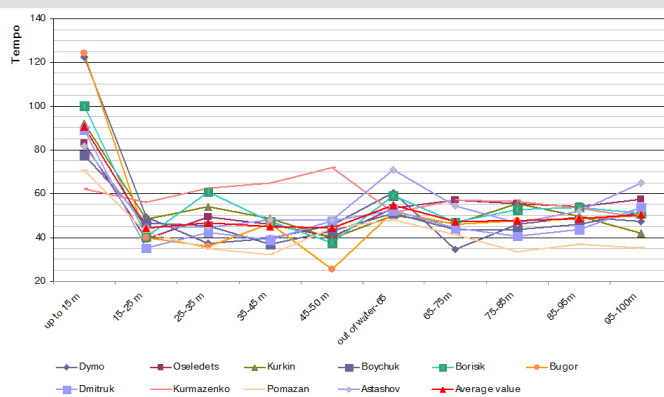


Fig. 6. Dynamics of tempo of strokes indicator in the process of swimming by athletes distance of 100 meters by way of breaststroke swimming

increase it to the finish.

It should be noted that in the course of overcoming the distance, each of the athletes have individual “peaks” of the tempo of strokes.

Dynamics of technical and tactical parameters of qualified athletes during swimming a distance of 200 meters by way of breaststroke swimming is reflected in Figures 7–9.

It is seen from Figure 7 that athletes overcome the distance of 200 meters from the relatively stable performance speed (except for the passage of turning areas). The greatest speed rises are noticeable on the segments “out of water – 65 meters”, “out of water – 115 meters”, “out of water – 165 meters”. After these “peaks” during the course of the race, there is a gradual decrease in speed to the average mark $1,1 \text{ m}\cdot\text{s}^{-1}$. At the finish, most athletes slow down their movements.

It should be noted that the greatest differences in the values of the indicator studied among athletes take place at the starting segment.

The analysis of Figure 8 allows us to state that at the starting segment all the athletes have an increase in the “step” of the cycle of strokes with its subsequent content in the areas of remote navigation. Before the turn most athletes reduce the length of the stroke (up to 1,9 m, 2,1 m and 1,7 m respectively), while after pushing away from the turntable the “step” of the cycle of strokes increases again. At the finish line, the average length of the stroke decreases to 1,6 meters.

Attention is drawn to the fact that each athlete has its own stroke length and these disagreements are quite significant.

In turn, the pace of execution of movements after a rapid decline on the starting segment (from $77,2 \text{ cycle}\cdot\text{min}^{-1}$ to $37,6 \text{ cycle}\cdot\text{min}^{-1}$) is further characterized by a relative uniformity (Figure 9).

A slight increase in this indicator is noted at the beginning of every 50 meters of the distance. This is especially noticeable in the areas “out of water – 115 meters” and “out of water – 165 meters” (up to $43,6 \text{ cycle}\cdot\text{min}^{-1}$ and $44,9 \text{ cycle}\cdot\text{min}^{-1}$ respectively). After overcoming the mark of 165 meters, the tempo grows and reaches $45,3 \text{ cycle}\cdot\text{min}^{-1}$ at the finish line,

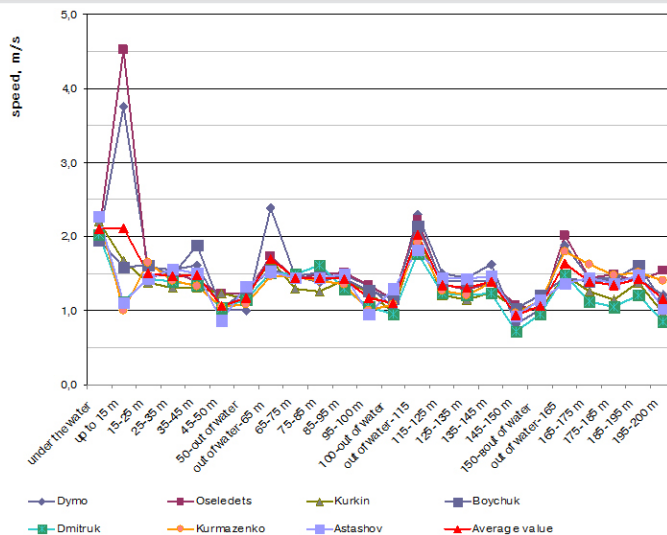


Fig. 7. Dynamics of speed indicator in the process of swimming by athletes distance of 200 meters by way of breaststroke swimming

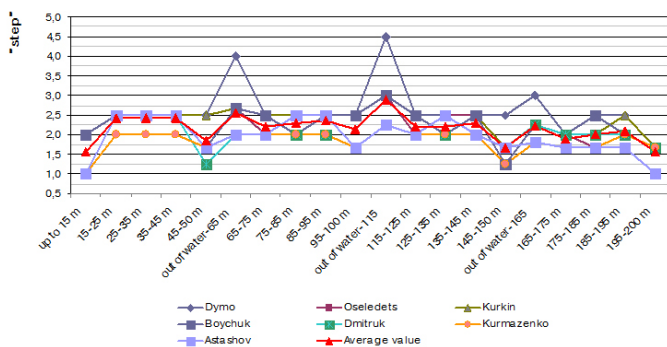


Fig. 8. Dynamics of "step" indicator of the cycle of strokes in the process of swimming by athletes distance of 200 meters by way of breaststroke swimming

reaching its maximum values at a competitive distance of 200 meters.

Thus, the technical and tactical actions of highly skilled athletes during the swimming of distances of 50, 100 and 200 meters by way of breaststroke swimming have their own characteristics.

Investigation of the degree of interrelation between the main indicators of technical and tactical skill of high-qualified athletes and the athletic result at a distance of 50, 100 and 200 meters during the swimming by way of breaststroke swimming allowed determining the following.

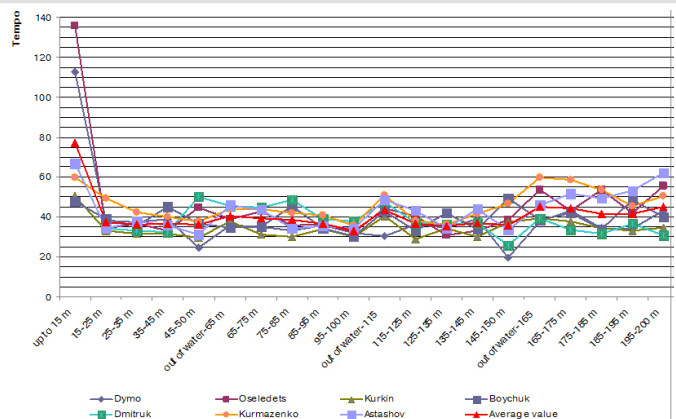


Fig. 9. Dynamics of tempo of strokes indicator in the process of swimming by athletes distance of 200 meters by way of breaststroke swimming

As a result, swimming of a distance of 50 meters is largely affected by the magnitude of the "step" of the cycle of strokes on the section "15–25 meters" ($r = -0,65$).

At a distance of 100 meters, the speed indicator on almost all segments significantly correlates with the final result (the value of r oscillates from $-0,52$ to $-0,93$). In turn, the correlation relationship between the tempo and the "step" of the cycle of strokes with the final result is less pronounced (Table 1).

At a distance of 200 meters when swimming by way of breaststroke, as well as at a distance of 100 meters, the speed is a more significant indicator than the tempo and "speed" of the cycle of strokes.

Speed indicators at almost all segments of the race distance correlates with the final result at a level of $r > 0,60$, while the relationship between the tempo and the "step" of the cycle of strokes with the final result is less pronounced ($r > 0,54$) (Table 2).

Obtained digital material allowed to develop the model characteristics of technical and tactical indicators of athletes specializing in swimming at the distance of 50, 100 and 200 meters by way of breaststroke (Table 3, 4).

In turn, an important model parameter of technical and tactical actions at a distance of 50 meters by the way breaststroke swimming is the "step" of the cycle of strokes on the section "15–25 meters", which is 1,5 m.

Developed model characteristics can serve as reference points for determining the distance specialization of athletes in swimming by the way breaststroke.

Table 1
Degree of correlation between the most significant indicators of technical and tactical actions and the sporting result at a distance of 100 meters when swimming by way of breaststroke

Indicator	Speed					"Step"				Tempo		
	Start – entrance	Before 15	15–25	25–35	35–45	Out of water – 65	65–75	75–85	85–95	Out of water – 65	Before 15	45–50
Correlation coefficient (r)	0,74	-0,58	-0,61	-0,82	-0,61	-0,93	-0,54	-0,81	-0,52	-0,72	-0,58	0,57

Table 2

Degree of correlation between the most significant indicators of technical and tactical actions and the sporting result at a distance of 200 meters when swimming by way of breaststroke

Indicator		Speed										
Stage, m	Before 15	25–35	35–45	85–95	Out of water – 115	115–125	125–135	135–145	165–175	175–185	185–195	195–200
Correlation coefficient (r)	-0,68	-0,76	-0,60	-0,86	-0,80	-0,79	-0,71	-0,79	-0,63	-0,87	-0,65	-0,68

Indicator		«step» of the cycle of strokes movements					Tempo of strokes movements					
Stage, m	Before 15	Out of water – 65	85–95	95–100	Out of water – 115	125–135	135–145	Before 15	35–45	Out of water – 65	95–100	195–200
Correlation coefficient (r)	-0,57	-0,60	-0,65	-0,57	-0,60	-0,64	-0,57	-0,57	-0,54	0,60	0,55	-0,55

Table 3

Model indicators of technical and tactical actions of athletes who specialize in swimming by way of breaststroke at a distance of 100 meters

Indicator	Speed, m·s ⁻¹						«Step», m
Stage, m	Start-out of water	15–25	25–35	35–45	Out of water – 65	75–85	Out of water – 65
Model indicators	2,3	1,6	1,5	1,5	1,7	1,5	1,8

Table 4

Model indicators of technical and tactical actions of athletes who specialize in swimming by way of breaststroke at a distance of 200 meters

Indicator	Speed, m s ⁻¹						
Stage, m	25–35	85–95	Out of water – 115	115–125	125–135	135–145	175–185
Model indicators	1,5	1,4	2,03	1,3	1,3	1,4	1,3

Indicator	«Step», m			Tempo, cycle·min ⁻¹					
Stage, m	Out of water – 65	85–95	Out of water – 115	125–135	135–145	Before 15	Out of water – 65	95–100	195–200
Model indicators	2,6	2,4	2,9	2,2	2,3	77,2	40,4	33,2	45,3

Conclusions

1. The main goal of rational training of high-class swimmers is to identify the key factors of competitive activity and special preparedness, taking into account the individual characteristics of a particular athlete.
2. Technical and tactical actions of highly qualified athletes during the swimming of the 50, 100 and 200 meter by the breaststroke way have their own characteristics.
3. When swimming the 100 and 200 meter distances in the breaststroke way, the greatest variations in speed, tempo and «step» of the cycle of strokes occur on the rotary segments.
4. Breaststroke-athletes have significant individual differences

es in the «step» of the cycle of strokes.

5. With the increase in the length of the competitive distance increases the number of significant indicators of technical and tactical skills.
6. Definition of distance specialization in the way breaststroke swimming should be carried out taking into account the compliance of individual indicators of technical and tactical actions of athletes to model parameters.

Prospect for further research there are certain degrees of correlation between the psychophysiological indicators of the swimmers of high qualification and the sports result at distances of 50, 100 and 200 meters in the way breaststroke swimming.

Conflict of interests. The authors declare that no conflict of interest.
Financing sources. This article didn't get the financial support from the state, public or commercial organization.

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Received: 16.06.2017.

Published: 31.08.2017.

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