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Search for indicators that determine the effectiveness of overcoming acyclic sections at 50, 100 and 200 meters in freestyle swimming

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Purpose: *to establish the most significant indicators affecting the athletic performance of highly skilled swimmers during the overcoming of acyclic sections at 50, 100 and 200 meters in freestyle swimming.*

Material & Methods: *theoretical analysis and synthesis of scientific and methodical literature, pedagogical observation, video filming, timekeeping, methods of mathematical statistics. The surveyed group (n=24) consisted of highly qualified swimmers (MS, MSIG, HMS), take on at a distance of 50, 100 and 200 meters freestyle.*

Results: *the peculiarities of overcoming starting and turning sections at distances of 50, 100 and 200 meters of freestyle were studied. The level of significance of the underwater phase after performing starts and turns relative to the 15 m mark is established. The degree of correlation relationship between time, speed and distance for the underwater phase for the speed of passage of various segments of distance is revealed.*

Conclusion: *improvement of starting and turning techniques, due to the increase in speed and distance of the underwater phase, is one of the reserves for the further growth of the skill of swimmers who specialize in freestyle.*

Keyword: *swimming, freestyle, start, turns, underwater phase.*

Introduction

Today, there is an increased interest of scientists and practitioners to study the structure of the competitive activity of swimmers, in which movements of a cyclical and acyclic nature are distinguished. Cyclic work regardless of the length of the distance at 70–80% determines the sports result. The effectiveness of overcoming the start and turn is determined by the technique of their performance, the capabilities of the swimmer, which often has a decisive influence on the sporting result [2–6]. Depending on the length of the course, the role of acyclic work in the structure of the swimmer's competitive activity varies.

After the start and turn, most swimmers on the world stage try to swim most of the distance under water, up to the 15-meter mark permitted by international competition rules, performing powerful wave-like dolphin legs. Overcoming the underwater phase – "exit", allows the swimmer to reach a speed 10–15% higher than the distance, because when swimming under water, the resistance to wave formation disappears [2; 3; 9].

The analysis of the special literature showed that today there are different approaches to determining the length of individual sections at different distances. There are discrepancies in the length of the starting segment of 10 m or 15 m, the segment of swimming 5 m or 7,5 m, repulsion from the rotation of 5 m or 10 m, the finishing section of 5 m and 10 m [1–3; 5; 7]. Limiting the length of diving sites to 15 meters makes it a convenient point for determining the effectiveness of overcoming acyclic sections [4; 7; 8; 9]. In turn, issues related to the study of the characteristics of the underwater part of the distance ("exit") by swimmers remain insufficiently studied.

Purpose of the study: to establish the most significant indicators affecting the sports result of highly skilled swimmers during the overcoming of acyclic sections at distances of 50, 100 and 200 meters in freestyle swimming.

Objectives of the study:

1. Determine the features of the overcoming of acyclic sections at distances of 50, 100 and 200 meters in freestyle.

2. Identify the most important indicators of acyclic areas that affect on the athletic performance in freestyle distances of varying lengths.

Material and Methods of the research

Data collection was carried out in the period from 2016–2018. during the championships and cups of Ukraine in swimming in 50-meter pools. The surveyed group (n=24) consisted of highly qualified swimmers (Master of Sports, Master of Sports of International grade, Honored Master of Sports), performing at 50, 100 and 200 meters freestyle. The processing of the video of the swims made it possible to identify indicators of the speed of the starting and turning sections, to establish the length of the slide and the "exit" after their execution. Were fixed: the length of the segment from the starting stand before the athlete appeared on the surface of the water, the time and speed of swimming at the level of 15 m for each 50-meter segment of distance, the length of the dive after pushing away from the rotary shield of the pool.

Results of the research

The analysis of the structure of competitive activity of highly qualified swimmers during the overcoming of 50 m in free style allowed to determine the characteristics of the start segment (the length and speed of the "exit", as well as the speed at 15 m) of athletes (Table 1).

On average, the length of the "exit" after the start for athletes is 11,28±0,96 m, which is 22,56% of the total length of the course, and the time for underwater work is 3,86 seconds (17,46%). At the same time, the leaders of the world swimming at a distance of 50 m reach the "exit" after the start: at Cйsar Cielo – 11 m, at Ronald Schumann – 12,5 m, and at Florent Manad – 13 m. performance of the start, an increase in the length of the "exit" at a 50-meter distance may contribute to the further growth of skills of domestic swimmers-sprinters.

The study also established the level of significance of the underwater phase after the start, the length of the "exit" (L), relative to the 15-meter start segment. Thus, the ratio of the lengths of the "exit" and the reference mark of 15 m is 75,22%, and the ratio of time is 70,98% (Figure 1).

Using the method of correlation analysis, the degree of influence of the parameters of time, speed and distance for the underwater phase on the speed of the 15-meter ($V_{15\ m}$) and 50-meter ($V_{50\ m}$) distance segment was revealed. It was established that the speed of the "exit" after the start has the greatest correlation with the indicators $V_{15\ m}$(r=0,96) and the average degree of correlation with $V_{50\ m}$ (r=0,67). In addition, $V_{15\ m}$ affects $V_{50\ m}$ (r=0,81). Also indicators of time $t_{15\ m}$ correlate with $t_{50\ m}$ (r=0,85).

The length of the "exit" after the start correlates with $V_{15\ m}$ (r=0,69), has an inverse relationship with $t_{15\ m}$ (r=–0,75) and has a significant effect on $V_{50\ m}$ (r=0,76), i.e. the final sports result at this distance.

At a distance of 100 m in the freestyle swimming among athletes there were differences when overcoming acyclic sections (Table 1). The length of the "exit" after the start and turn is significantly different (11,17 and 6,43 m, respectively).

The percentage ratio of the length of the underwater phase at the start and the reference mark of 15 m is 74,44%, and in time – 68,55%. The ratio of the length of the "exit" after turning to the mark of 15 m is 42,89%, and the time – 36,60% (Figure 1).

Correlation analysis allowed us to establish the degree of influence of the parameters of time, speed and distance for the underwater phase on the speed of passage of various segments of the distance. Thus, the speed of the "exit" after the start has a sufficient relationship with the indicators $V_{15\ m}$ (r=0,76) and a high degree of relationship with $V_{50\ m}$ (r=0,95). $V_{50\ m}$ m is influenced by the speed of passing the 15-meter mark (r=0,73). Indicators of the length of "exit" after the start correlate with t "exit" (r=0,77).

The speed of the "exit" after turning has a high correlation with the speed indicators in the area "50–65 m" (r=0,96), and in the area "50–100 m" only 0,69. The length of the "exit" after rotation correlates with the t "exit" (r=0,70) and the speed of the second 50-meter segment (r=0,74).

At a distance of 200 m in freestyle swimming, differences were noted during the passage of acyclic sections. The length of the "exit" after the start (9,39 m) and each subsequent turn gradually decreases (4,56 m, 4,36 m and 4,13 m, respectively). Under the influence of growing fatigue, the same trend is observed in terms of swimming speed (Table 1).

The percentage ratio of the "exit" length indicators after the start and the 15 m mark is 62,58%, and the time – 57,27%. The ratio of the length of the exit after the 1st turn to the mark of 65 m is 30,42%, and time – 24,10%. The exit length after the 2nd and 3rd turns to the mark of 115 m and 165 m is 29,08% and 27,50% respectively (Figure 1)

At a distance of 200 m, the correlation analysis showed a different degree of interrelation of indicators of time, speed and distance for the underwater phase to the speed of passage of various segments of the distance. Thus, the speed of the "exit" after the start has an average relationship with the indicators $V_{15\ m}$ (r=0.59) and $V_{50\ m}$ (r=0,57). $V_{50\ m}$ is influenced by the speed of passing the 15-meter mark (r=0,78). The length of the "exit" after the start correlates with $V_{15\ m}$ (r=0,61).

The length of the "exit" after the 1st turn has a high correlation with the speed in the area "50–65 m" (r=0,94) and the speed of the second 50-meter segment (r=0,90). The speed

Table 1

Indicators of technical actions of athletes in acyclic areas in freestyle swimming at distances of 50, 100 and 200 m, $\bar{X}\pm\sigma$

Segments	L exit, m	t exit, s	V exit, m·s⁻¹	t 15 m, s	V 15 m, m·s⁻¹	t on 50 m, s	V 50 m, m·s⁻¹	Result
50 m								
Start – 50 m	11,28±0,96	3,86±0,33	2,93±0,31	5,43±0,48	2,78±0,24	22,11±0,92	2,26±0,09	22,11±0,92
100 m								
Start – 50 m	11,17±0,61	3,71±0,44	3,03±0,23	5,42±0,27	2,77±0,14	23,66±0,82	2,12±0,07	23,66±0,82
Turn –100 m	6,43±1,36	2,41±0,51	2,71±0,37	6,58±0,48	2,29±0,16	25,74±0,60	1,94±0,05	49,40±1,24
200 m								
Start – 50 m	9,39±0,94	3,65±0,36	2,73±0,37	6,37±0,47	2,37±0,18	26,98±1,18	1,86±0,08	26,98±1,18
1st turn – 100 m	4,56±0,69	1,80±0,31	2,57±0,38	7,45±0,57	2,02±0,16	29,20±1,25	1,71±0,07	56,19±2,36
2 nd turn – 50 m	4,36±0,61	1,70±0,41	2,78±1,13	7,83±0,55	1,92±0,13	30,17±1,49	1,66±0,08	86,36±3,72
3 rd turn – 00 m	4,13±0,74	1,66±0,41	2,61±0,76	7,84±0,59	1,92±0,15	30,63±2,27	1,64±0,12	116,99±5,52

$V_{65\ m}$ after the turn correlates with the speed indicators on the second 50-meter segment (r=0,96). The length of the "exit" after the 2nd turn correlates with the speed in the segment "100–115 m" (r=0,85) and the speed of the segment "100–150 m" (r=0,95). The speed of the segment "100–115 m" has a high correlation with the speed indicators in the section "100–150 m" (r=0,90). The length of the "exit" after the 3rd turn is interconnected with the speed on the section "150–165 m" (r=0,83) and the speed of the segment "150–200 m" (r=0,56).

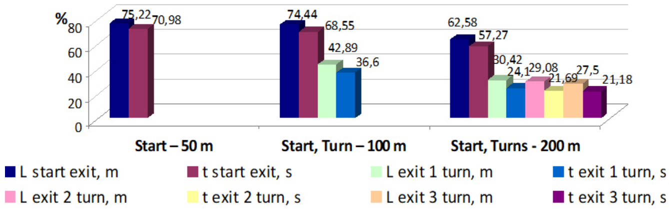

Figure 1. The ratio of the length and time of the underwater phase to the 15-meter mark at distances of 50, 100 and 200 m freestyle

Conclusions / Discussion

The analysis of the overcoming of various competitive distances of 50, 100 and 200 meters in freestyle allowed us to reveal that with increasing length of the distance, the length of the "exit" after starts, turns and speed of overcoming them decreases, as does the ratio of indicators of the length of "exit" and time relative to the mark 15 m.

The speed of overcoming of 15-meter segments of swimmers has a high dependence on the length of the "exit". At the same time, the degree of interrelation between the "exit" speed and the speed of passing 15-meter segments decreases with increasing length of the distance.

One of the reserves for improving the results of athletes in freestyle swimming at distances of various lengths is to improve the technique of performing starts and turns, by increasing the length and speed of overcoming the underwater sections.

Prospects for further research are related to a comparative analysis of swimmers' performance when overcoming acyclic sections of other competitive distances.

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References

1. Petryaev, A.V. (2006), "A Modern Approach to the Scientific and Methodological Provision of Training Athletes in Cyclic Sports", *Uchenye zapiski universiteta im. P.F. Lesgafta*, No. 22, pp. 51-57 (in Russ.).
2. Platonov, V.N. (2000), *Plavanie* [Swimming], *Olimpiyskaya literatura*, Kiev. (in Russ.).
3. Platonov, V.N. (2011), *Sportivnoe plavanie: put k uspekhu: v 2-kh kn.* [Sports swimming: the path to success: in two books], Olimpiyskaya literatura, Kiev. (in Russ.)
4. Politko, E.V. (2014), "Simulation of competitive activity as a basis for the individualization of training of athletes-swimmers", *Fizichna kultura, sport ta zdorov'ya: materiali XIV Mizhnarodnoï naukovo-praktichnoï konferentsiï*, KhSAPC, Kharkiv, pp. 127-130. (in Russ.), available at: http://hdafk.kharkov.ua/docs/konferences/konf_10_12_2014.pdf
5. Politko, E. (2016a), "Interconnection of model technical, tactical and morphofunctional characteristics of highly skilled swimmers specializing in the 50 m butterfly stroke", *Slobozans`kij naukovo-sportivnij visnik*, No. 3 (53), pp. 89-94, doi: 10.15391/snsv.2015-3.017. (in Russ.)
6. Politko, E.V. (2016b), "Peculiarities of overcoming underwater areas by swimmers of various qualifications at distances of 50, 100, 200 meters butterfly stroke", *Fizichna kultura, sport ta zdorov'ya: materiali XVI Mizhnarodnoï naukovo-praktichnoï konferentsiï*, KhSAPC, Kharkiv, pp. 182-186, available at: http://hdafk.kharkov.ua/docs/konferences/ konf_8_12_2016.pdf. (in Russ.)
7. Politko, E.V. (2017), "Analysis of the passage of acyclic sections of the 100 m freestyle swimmers of high qualification", *Fizichna kultura, sport ta zdorov'ya: materiali XVII Mizhnarodnoï naukovo-praktichnoï konferentsiï*, KhSAPC, Kharkiv, pp. 214-217, available at: http://journals.uran.ua/ksapc_conference/issue/ view/7038/showToc. (in Russ.)
8. Zuozene, I.Yu. & Skirene, V. (2009), "Search for indicators that determine the effectiveness of overcoming the starting segment in swimming", *Pedagogika, psikhologiya ta mediko-biologichni problemi fizichnogo vikhovannya i sportu*, No. 1. pp. 64-69. (in Russ.)
9. Cossor, J. & Mason, B. (2001), "Swim start performances at the Sydney 2000 Olympic Games", *Proceedings of the XIX. Symposium on Biomechanics in Sport*, University of California at San Francisco, San Francisco, pp. 70-74.

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