DEVELOPMENT OF SPORTS PERFORMANCE IN WOMEN SWIMMING IN THE YEARS 2009-2013

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- swimming,
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Abstract:

The aim of the paper is to compare results of female swimmers reached in competitions during swimming world championships in 2009, 2011 and 2013. To assess sport level, results of final competitions in freestyle, butterfly, backstroke and breaststroke were used.

The results were analyzed in two groups: winners and finalists at distances 50, 100, 200, 400, 800 and 1500 meters in freestyle, 50,100,200 meters in backstroke, butterfly and breaststroke.

The results achieved in the World Championships in Barcelona in 2013 in comparison to Rome in 2009, showed the increase of results level among women in breaststroke competitions, 800, 1500 meters freestyle and 50 meters in butterfly.

INTRODUCTION

The sports result of swimming largely consist of such factors as: genetic predisposition of the swimmer, determining not only the innate morpho-physiological characteristics useful for the sport, but also the ability to improve them through training. Further factors are: properly implemented training both in terms of its nature and amount, methods and means of its implementation, climate training, state of health diagnostics of athletes during training units, measures accelerating the process of biological regeneration and the health, nutritional and psychological status of the swimmer. [1, 6, 11]. In swimming, substantial role in the preparation of the swimmer is played by fully individualized training loads, controlling training and competition disposal, adjusting the number of starts to the age and specialization, improving the elements of technique and tactics of overcoming distance and specialized preparation on land [8, 10].

The development of sports performance in swimming largely depends also on the wider use of non-traditional means of training. These include various utensils and equipment: including training simulators, the use of hydrodynamic pools of variable water flow speed and prophylactic and therapeutic agents, allowing fuller use of the functional reserve of the body, exceeding the previously achieved level of development of motor characteristics [1, 4, 8, 11].

It is likely that further progress in swimming performance will depend not only on the use of more recent technological developments, but also predicting the development trend of dynamic training, on the basis of the results achieved by swimmers. Thanks to them, you can determine the current state of swimming and anticipate further progress of sports performance and assume the result which should guarantee promotion to the final group or success in the fight for medals. Success at major sporting events is primarily determined by the training program, taking into account the developmental tendencies in the competition, as developed and implemented by trainers with the support of a team of specialists.

In 2007 - 2009 there was an explosive increase in the level of performance in swimming, caused mainly by swimmers using more and more high-tech swimsuits. The

impact of "technological doping" on the level of athletic performance is confirmed by the 25 world records set during the Beijing Olympics in 2008 and the 43 world records at the World Championships in 2009 in Rome. However, currently, due to the amendment of the provisions introduced by the World Swimming Federation from 1 January 2010, the choice of an appropriate training program, optimal for the swimmer, again plays the most important role. [2, 5, 11].

The aim of this paper is to present the development of the level of swimmers' performance in the years 2009 - 2013.

MATERIAL AND METHOD

To assess the level of sports performance the results of the final women's free, backstroke, classic and butterfly style competitions from the world championships in swimming in Rome in 2009, Shanghai in 2011 and Barcelona in 2013 were used. The results are taken from the official websites: www.swimrankings.net and www.omegatiming.pl

Results have been analyzed in two groups: the winners and finalists at distances of 50, 100, 200, 400, 800, and 1500 meters freestyle, 50, 100, 200 meters backstroke, 50, 100 and 200 meters classic style and 50, 100 200 meters butterfly.

To develop the material the following statistical formula were used: arithmetic mean, and also the formulas for calculating the differences in seconds and percentages.

RESULTS

Freestyle

At the World Championships in Shanghai in 2011, a decrease in the level of sports performance ranging from 0.32% to 2.58% for winners and from 0.34% to 2.23% was found in the group of finalists, with respect to the results obtained by the swimmer two years earlier, at the World Championships in Rome. The largest decrease was recorded in the 50, 100 and 200 meters freestyle, the smallest in the 800 and 1,500 meters competition. The next World Championships in Barcelona in 2013 brought an increase in the level of sports results in all of the competitions and analyzed groups. The increase ranged from 0.37% to 2.12% at the winners and 0.04 to 0.57% in the group of finalists. The competition of 200 meters was an exception, the finalists received a slightly weaker result, of 0.2 s (0.11%), compared with the average result obtained by the finalists in Shanghai (Tab. 1).

Analyzing the level of women' sports in freestyle competitions in the years 2009 - 2013 decreased levels of results over the distances of 50, 100, 200, 400 meters freestyle were found. The largest decrease in performance was observed on the shortest distance, it amounted to 1.3% in the case of the winners and 1.63% in the case of the finalists. In contrast, there was an increase in the level of the winners' performance over the distance of 800 and 1,500 meters, respectively 0.4% and 0.9% (the results of these were new world records in these competitions) and the finalists in the 1500 meters competition by 0.55% (Tab.1).

Backstroke

In backstroke competitions at the World Championships in Shanghai a decrease in the level of results in all of the competitions was found, with respect to the results obtained by the swimmers in 2009. The greatest, amounting to 2.62%, was observed in the winners at a distance of 50 meters and the smallest at a distance of 200 meters. At the World Championships in Barcelona improvement of the results of the winners in backstroke competitions was noted,1.8% over a distance of 50 m, 1.07% over a distance of 100 m and 0.4% over a distance of 200 meters. In the group of finalists, slight improvement was found over the distance of 50 m, in other competitions there was a decrease of results (Tab. 2).

The analysis of the level of sports performance in backstroke competitions in 2009-2013 showed a decline amounting to 0.84% of the winners and 0.51%, respectively, at distances of 50 and 100 meters, and in the group of finalists by about 1%. Only the gold medalist, at the distance of 200 m achieved a slight increase in the level of sports performance in the period (Tab. 2).

Table 1. Comparison of the sport level in freestyle in the years 2009-2013

		Rome	Shanghai			Barcelona			Difference 2009-2013	
Competition	Place	$\bar{x}$	$\bar{x}$	d(s)	d%	$\bar{x}$	d(s)	d%	d(s)	d%
50 m Freestyle	I	23,73	24,14	-0,41	1,70	24,05	0,09	0,37	-0,32	1,3
	I-VIII	24,08	24,63	-0,55	2,24	24,48	0,15	0,61	-0,4	1,63
100 m Freestyle	I	52,07	53,45	-1,38	2,58	52,34	1,11	2,12	-0,27	0,51
	I-VIII	53,26	53,77	-0,51	0,95	53,53	0,24	0,44	-0,27	0,51
200 m Freestyle	I	1:53,0	1:55,8	-2,58	2,23	1:54,81	1	0,57	-1,8	1,02
	I-VIII	1:56,2	1:56,6	-0,4	0,34	1:56,4	0,2	0,11	-0,2	0,11
400 m Freestyle	I	3:59,2	4:01,97	-2,77	1,14	3:59,82	2,2	0,9	-0,6	0,25
	I-VIII	4:02,7	4:05,04	-2,34	0,96	4:04,9	0,14	0,05	-2,2	0,89
800 m Freestyle	I	8:15,9	8:17,51	-1,61	0,32	8:13,86	3,69	0,72	2	0,4
	I-VIII	8:22,2	8:25,7	-3,5	0,69	8:23,1	2,6	0,51	-0.9	0,17
1500 m Freestyle	I	15:44,9	15:48,6	-3,7	0,39	15:36,5	12,1	1,29	8,4	0,89
	I-VIII	16:00,0	16:00,0	0	0	15:54,7	5,3	0,55	5,3	0,55

Table 2. Comparison of the sport level in backstroke in the years 2009-2013

		Rome	Shanghai			Barcelona			Difference 2009-2013	
Competition	Place	$\bar{x}$	$\bar{x}$	d(s)	d%	$\bar{x}$	d(s)	d%	d(s)	d%
50 m Backstroke	I	27,06	27,79	-0,73	2,62	27,29	0,5	1,8	-0,23	0,84
	I-VIII	27,49	28,05	-0,56	1,9	27,78	0,27	0,97	-0,29	1,04
100 m Backstroke	I	58,12	59,05	-0,93	1,57	58,42	0,63	1,07	-0,3	0,51
	I-VIII	59,05	59,40	-0,35	0,58	59,51	-0,11	0,18	-0,46	0,77
200 m Backstroke	I	2:04,8	2:05,2	-0,4	0,31	2:04,7	0,5	0,4	0,1	0,08
	I-VIII	2:07,0	2:078	-0,8	0,62	2:084	-0,6	0,46	-1,4	1,09

Breaststroke

In the competition of 50 and 100 meters breaststroke at the World Championships in Shanghai a decrease in the level of sports performance was found around 1% in both groups, and the lowest (0.36%) decrease was found in the case of the winner at the distance of 50 m. In the case of the 200 meters competition, the winner showed a small, of 0.1 sec, increase in sports performance and a significant reduction in the level of performance was found at the finalists (1.5%).

During the next, World Championships in Barcelona an increase in the level of sports performance was found in the case of the winner, amounting to 2.3% in the 50 meters competition, 1.7% at a distance of 100 m and 1.5% at 200 meters classic style. A similar increase was observed in the group of finalists (Tab. 3).

The analysis of the level of classic style competitions in 2009-2013 showed a significant increase in the level of sports performance. In the case of the winner, at a distance of 50 m, an improvement of 1.93% was recorded, 0.8% over 100 m and 1.57% at the distance of 200 m. The final of 50 meters breaststroke was the fastest in the history of the competition, four athletes achieved the result of less than 30 seconds. In all of the classic style competitions, new world records were established, the world record at the distance of 50 meters was improved twice, first by Y. Efimowa while qualifying, she improved her own world record set at the world championships in Rome, and subsequently, by R. Meilutyte in the semi-final race.

Table 3. Comparison of the sport level in breaststroke in the years 2009-2013

		Rome	Shanghai			Barcelona			Difference 2009-2013	
Competition	Place	$\bar{x}$	$\bar{x}$	d(s)	d%	$\bar{x}$	d(s)	d%	d(s)	d%
50 m Breaststroke	I	30,09	30,2	-0,11	0,36	29,52	0,68	2,3	0,57	1,93
	I-VIII	30,44	30,83	-0,39	1,26	30,16	0,67	2,22	0,28	0,92
100 m Breaststroke	I	1:04,9	1:05,5	-0,6	0,91	1:04,4	1,1	1,7	0,5	0,77
	I-VIII	1:06,1	1:06,9	-0,8	1,19	1:06,1	0,8	1,19	0	0
200 m Breaststroke	I	2:21,6	2:21,5	0,1	0,07	2:19,4	2,1	1,5	2,2	1,57
	I-VIII	2:22,6	2:24,8	-2,2	1,5	2:22,6	2,2	1,54	0	0

Butterfly

At the World Championships in Shanghai, athletes in both groups reported a decrease in the level of results in all of the butterfly style competitions. The difference ranged from 0.89% in the case of the winner at the distance of 50 m to 1.8% in the group of finalists at the distance of 200 meters. At the World Championships in Barcelona, there was an increase in the level of results in the group of winners, the biggest amounting to 1.86% at the distance of 50 meters. In the group of finalists, at the distances of 100 and 200 meters, there was a slight decrease in the level of results and an increase in the 50 meters competition, by 1% (Tab. 4).

The analysis of the level of butterfly style sports competition in the years 2009-1013 showed that, only in the case of a gold medal at a distance of 50 meters an increase in the level of sports was found. In the competitions of 100 and 200 meters a decrease in the level of performance was found by about 0.9%. Similarly, in the group of finalists, there was a significant decrease of the sports performance level of about 0.8% over a distance of 50 meters and 2.2% in the competitions over 100 and 200 meters (Tab. 4).

Table 4. Comparison of the sport level in butterfly in the years 2009-2013

		Rzym	Szanghaj			Barcelona			Difference 2009-2013	
Competition	Place	$\bar{x}$	$\bar{x}$	d(s)	d%	$\bar{x}$	d(s)	d%	d(s)	d%
50 m Butterfly	I	25,48	25,71	-0,23	0,89	25,24	0,47	1,86	0,24	0,95
	I-VIII	25,57	26,05	-0,47	1,8	25,78	0,26	1	-0,21	0,81
100 m Butterfly	I	56,06	56,87	-0,81	1,42	56,53	0,34	0,6	-0,47	0,83
	I-VIII	56,83	57,42	-0,58	1,01	57,3	-0,12	0,26	-0,73	1,26
200 m Butterfly	I	2:03,5	2:05,6	-2,2	1,75	2:04,6	1	0,79	-1,1	0,88
	I-VIII	2:04,8	2:06,1	-1,3	1	2:06,3	-0,2	0,15	-1,5	1,18

DISCUSSION

Since 2007, there has been an explosive increase in the level of sports performance in swimming. The reason for such a significant and dynamic performance improvement was the use of "new generation" swimsuits, the first one of this type was introduced by Speedo LZR Racer [5]. During the Olympic Games in Beijing in 2008 25 world records were established and, in 2009, at the World Championships in Rome, as many as 43 world records and hundreds of national records were beaten. For comparison, it is good to show that, after the ban on the swimsuits, at the World Championships in Shanghai in 2011 only two world records were improved and only 9 at the Olympic Games in London. According to the researchers, due to swimsuits made of such materials as polyurethane or neoprene, swimmers were able to increase their buoyancy and suppress muscle vibration, thus reducing the front resistance, which resulted in an increase in their speed of 1.9-2.2%. [5]. Confirmation of this theory may be, inter alia, the results obtained by Federica Pellegrini or Cesar Cielo Filhno who won both in Rome and Shanghai. Pellegrini's result during the World Championships in 2011, over a distance of 200 m freestyle was weaker by 2.23% and at 400 m by 1.14%. A

similar relationship was found in the case of Cielo, who won over a distance of 50 m both in Rome and in Shanghai, his result in 2011 were lower by 2.04%. Lowering the level of performance at the World Championships in Shanghai was associated with the change of rules introduced by the World Swimming Federation and the ban, from 1 January 2010, on the use of Speedo LZR Racer or Arena X - Glide swimsuits made of polyurethane or neoprene.

Comparing the results obtained by women at the World Championships in Barcelona in 2013 in relation to the results recorded in Rome in 2009, a decrease in the level of performance of women in competitions 50, 100, 200 meters freestyle was found as well as in 50, 100 meters backstroke and 100 and 200 meters butterfly in both groups - the winners and the finalists. The increase in the performance at the World Championships in Barcelona in relation to the results obtained in Rome observed in all of the classical style competitions at the distances of 800 and 1500 meters freestyle in both groups was found. In addition, significant improvement in the case of the result of the winner of the 50 meters butterfly competition was observed and a small one in the case of the 200 meters backstroke competition.

Since 2010, due to changes in legislation and the ban on the use of swimsuits made of polyurethane or neoprene, leading, in the opinion of many specialists and trainers, to "technological doping", there was a significant decrease in the level of sports performance, especially for shorter distances - 50, 100, 200 meters, as using the new generation swimsuits resulted primarily with increasing the speed of swimmers. Also, in the opinion of many athletes, the world records achieved in the years 2007 - 2009 were more an effect of the use of the swimsuits than swimming itself, because they definitely improved high body position in the water, very important in swimming, which helped especially technically weaker swimmers. After the end of the World Championships in Shanghai, there were opinions that the effect of the decision of the World Swimming Federation will be a slowdown in the growth of the sports performance. However, the cessation of the use of these swimsuits did not significantly influence the level of swimming longer distances, as evidenced by the world records set by swimmers in the 1500 meters competition, Sun Yang, and 200 meters variable style by Ryan Lochte, at the World Championships in Shanghai. Just two years later, at the World Championships in Barcelona in 2013, there was a significant increase in the performance of women competing in classic style, world records in all of the three distances were improved, new records over 50 and 100 meters were established by Ruta Meilutyte and, at 200 meters, by Rikke Moller Pedersen. The Final competition over 50 meters breaststroke was the fastest in the history of the competition, four athletes established time under 30 seconds. The great performance of the titled 21-year-old athlete, Efimowa, is worth mentioning, she improved her best results from the World Championships in Rome, winning two gold medals at the distances of 50 and 200 meters and a silver one over the 100-meter classical style distance. Also Pedersen, the world record winner over the distance of 200 meters, improved her result from Shanghai by 7.45 s (5.35%), although she swam slower in the final, winning the 2nd place. The winner of the freestyle 800, 1500 meters competition, 16-year-old Katie Ledecký, established two new world records, in addition, winning also the gold medal at the distance of 400 meters. It is interesting that all of the world records, except for the 200 m classic style, were established by very young athletes, not having previously competed in polyurethane swimsuits. In the case of the classic style, concerns about the decrease or stagnation of results were unfounded, as already 3 years later, after the introduction of the ban on the use of swimsuits, world records at all of the distances were improved. This indicates the possibility of obtaining very high speed without the use of the new generation swimsuits and a confirmation of the thesis that, currently, individualization of

training processes and individual swimmers' abilities, technical preparation and properly selected and applied training again play the greatest role in achieving maximum results [2, 7].

CONCLUSIONS

1. A significant decrease in the level of sports performance in freestyle, backstroke, classic and butterfly competitions in the years 2009-2011 was found.
2. An increase in the level of performance in free and classic style competitions was found in 2009-2013.
3. The largest increase in women results in 2009-2013 was found in the 50, 100 and 200 meters classic style competitions.
4. The largest decrease in the level of performance in 2009-2013 was found in the 50 meters freestyle and backstroke competitions.
5. At the World Championships in Barcelona, in women's competitions, five new world records were established.

REFERENCES

1. Bartkowiak E (1999). *Swimming sports*. [In Polish] Centralny Ośrodek Sportu.
2. Costa M.J., Marinho D.A., Reis V.M. Silva A.J., Marques M.C., Bragada J.A., Barbosa T.M. (2010) Tracking the performance of world-ranked swimmers. *Journal of Sports Science and Medicin.* 9, p. 411-417.
3. Karpiński R., Opyrchał C. (2005). Changes in the training of top-class athletes. [In Polish] *Sport Wyczynowy*, 5-6, p. 25-32.
4. Karpiński R., Opyrchał C. (2008) Swimming at the Olympic Games in Beijing analyze the level of sport, age and construction of somatic swimmers. [In Polish] *Sport Wyczynowy,* 10 – 12, p. 7-23.
5. Karpiński R. (2009). Acceleration in swimming – the limits of technological support. [In Polish] *Sport Wyczynowy*, 3, p. 130-136.
6. Maglischo E.W. (2003). *Swimming fastest*. Human Kinetics.
7. Opyrchał Cz., Karpiński R., Sachnowski K. (2005). The process of long-term of training high-class swimmers. [In Polish] *Sport Wyczynowy*, 9-10, p. 56-67.
8. Platonov V.N. (2004). *System of the athletes preparation in Olimpian sport. General theory and her practical uses*. Olimpijskaja Literatura. Kiev.
9. Płatek Ł, Stachura A., Skóra M. (2008). Comparative assessment of sports level in junior women swimming in Poland and Germany in 2004 and 2007. *Science in swimming II: Part five: Water sports and history of swimming* / ed. by K. Zatoń and M. Jaszczak., AWF Wrocław.
10. Rakowski M. (2010). *Sports Training Swimming*. [In Polish]. Londyn.
11. Sachnowski K., Opychał Cz., Karpiński R. (2005). Particular problems of selection in the long-term process of training in high-class swimmers. [In Polish]. *Sport Wyczynowy*, 11-12, p. 6-15.
12. Socha S., Rejdych W., Socha T. 2(012). World and European swimming at the turn of the first and second decade of the twenty-first century. [In Polish] *Sport Wyczynowy*, 4, p. 41-57.
13. Stanula A., Maszczyk A., Roczniok R., Pietraszewski P., Ostrowski A., Zając A., Strzała M. (2012). The development and Prediction of Athletic Performance In Freestyle Swimming, *Journal of Human Kinetics* volume 32, p. 97-107.

Websites: www.swimrankings.net www.megatiming.pl