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Differences in Split Times between the Elite Breaststroke Swimmers

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Abstract

The aim of this research was to determine the differences between the finalists and semifinalists of the 2019 World Championships in the 100 m breaststroke. The total sample of subjects included in the study consisted of 23 male participants of the 2019 World Swimming Championships, who were divided into two groups. The first group consisted of finalists (24.75 ± 1.58 years; n = 8), and the second group of semifinalists (25.00 ± 3.38 years; n = 15). The results are taken from the official website of the International Swimming Federation (FINA). The variables analyzed in this study are: Split 1 - first passing time of the 100 m breaststroke, Split 2 - second passing time of the 100 m breaststroke, T100 - total time of the 100 m breaststroke. All data were processed by statistical analysis one-way ANOVA. The results of the research showed that there are no statistically significant differences between the final and semifinal groups in any of the examined variables, but there are evident numerical differences that are more pronounced in the Split 2 (F = 2.063; p = .166). Based on these results, it can be concluded that swimmers who excel in their abilities in the other 50 m of the race, or achieve better times in this segment of the race, will achieve a better final result.

Keywords: *World Championships, Finalists, Semifinalists, Swimming*

Introduction

When we talk about swimming competitions, we must mention that water sports, as well as swimming, are in charge of the International World Organization called FINA (Fédération Internationale de Natation Amateur), which was founded on July 19, 1908 during the Olympic Games in London by representatives of swimming sports federations from Belgium, Denmark, Germany, Finland, England, Sweden and Hungary. The World Championships in water sports have been held since 1973, organized by FINA. The first official world championship was held in Belgrade, at the swimming pool "Tasmajdan". The championships were held in the range of two, three, four, and even five years, but since 2001, the decision has been made to hold in the range of two year. The composition of this championship includes five sports: swimming, water polo, diving, synchronized swimming and long-distance swimming. The last championship was held in 2019 in Gwangju (Gwangju, South Korea), which is the 18th World Championships in swimming. Next World Championships were originally scheduled to be held in 2021, but when the Tokyo 2020 Summer Olympics were postponed due to the COVID-19 pandemic the dates clashed, so the Championships dates were changed. The new dates are May 13–29, 2022. There are several disciplines: freestyle, backstroke, breaststroke, butterfly, individual medley and as well as individual medley relays. Over 2,200 athletes from more than 190 countries competed at the 2019 Water Sports World Championships, and athletes compete in 6 sports and a total of 76 disciplines: swimming (42 disciplines), long-distance swimming (7 disciplines), synchronized swimming (10 disciplines), diving (13 disciplines), free diving (2 disciplines) and water polo (2 disciplines). Swimming competitions took place in a total of 42 disciplines, 20 disciplines in men's events as well as women's events and two more disciplines in mixed relay competition. 87 competitors from 80 countries applied for the men's 100 m breaststroke event, and each of the countries was entitled to a maximum of two competitors in this discipline. All races were held at the swimming pool of the Nambu University Municipal Aquatics Center.

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Race analysis with a measurement of time during different part of a swimming race provides information about the swimmer effectiveness during the different part of a swimming race (Wakayoshi, Yoshida, Ikuta, Mutoh, & Miyashita, 1993). To assess those abilities used by elite swimmers, most of researchers have analyzed technical, tactical and kinematic characteristics during swimming competitions to determine their relationship with race performance. The analysis of swimmer specific motor abilities by analyzing the recorded race become a necessary tool for coaches, athletes, sport scientists (Jorgić, Okičić, Stanković, Dopsaj, & Thanopulos, 2011). Thompson, Haljand, & MacLaren (2000) in their paper investigated the kinematic variables that influence the race performance of 100 m and 200 m breaststroke swimmers and found that the better breaststroke swimmers demonstrate greater competency in the kinematic variables, except stroke kinematics, which were unique to each individual. In swimming, basic kinematical characteristics are represented by appropriate technique characteristics i.e. spatial temporal parameters such as stroke length, stroke rate, stroke effectiveness, stroke index, start time, swimming speed, turn time and other parameters (Okičić, 1999). The aim of this paper was to determine the differences between split times in elite breaststroke swimmers, the obtained results will help coaches and swimmers in planning and programming training process.

Methods

The sample of participants

The sample of respondents consisted of 23 swimmers, 8 finalists (average age 24.75 ± 1.58 years) and 15 semifinalists (average age 25.0 ± 3.38 years) swimmers who was participated in the World Swimming Championship held in 2019 in the South Korean city of Gwangju. All respondents swam the 100 m breaststroke race and based on the swam times were ranked in the semifinal and final group. All methods and procedures of this investigation were approved by the ethical committee of the University of Niš, Faculty of Sport and Physical Education, Serbia, and they conformed to the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Procedures

The World Swimming Championships were held in 2019 in South Korea city of Gwangju in a 50 m long pool. All results are taken from the official website (FINA World Championship, 2019).

The following variables were used to evaluate the results in swimming: the first passing time of the finalists of the 100 m breaststroke – Split 1 Final (s); second passing time of the finalists of the 100 m breaststroke – Split 2 Final (s); total time of the finalists of the discipline 100 m breaststroke - T100 Final (s); the first passing time of the semifinalists of the 100 m breaststroke - Split 1 Semifinals (s); second passing time of the semifinalists of the 100 m breaststroke – Split 2 Semifinals (s); total time of the semifinalists of the discipline 100 m breaststroke – T100 Semifinals (s).

Statistical Analyses

For all the variables, the basic parameters of descriptive statistics were calculated. For data analysis, one-way ANOVA design was used to determine differences between the finalists and semifinalists of the 2019 World Championships in the 100 m breaststroke. The mean and standard deviation were determined for each variable. All the statistical operations were performed using software SPSS 19.0. (Chicago, IL, USA) and the level of significance was set at $p \leq 0.05$.

Results

Table 1. shows the results of the descriptive statistical parameters for used variables.

Table 1. Basic descriptive statistical parameters and the results of the ANOVA of the applied variables in the 100-m breaststroke

Variables	Groups	N	Mean	SD	CV	Min	Max	ANOVA	
								F	p
Yr	Final	8	24.75	1.58	6.4%	22.00	27.00	.039	.846
	Semifinals	15	25.00	3.38	13.5%	21.00	33.00		
Split 1	Final	8	27.60	.42	1.5%	26.60	27.94	.228	.638
	Semifinals	15	27.68	.38	1.4%	26.63	28.21		
Split 2	Final	8	31.12	.33	1.0%	30.54	31.49	2.063	.166
	Semifinals	15	31.37	.44	1.4%	30.25	31.98		
T100	Final	8	58.71	.69	1.2%	57.14	59.19	1.294	.268
	Semifinals	15	59.05	.67	1.1%	56.88	59.79		

Legend: Groups – groups of swimmers, N – number of participants, Mean – means; SD – standard deviation, CV – coefficient of variation, Min – minimal results, Max – maximal results, ANOVA F – F statistic, ANOVA p – level of significance, Yr – age of participants, Split 1 - first passing time of the 100 m breaststroke, Split 2 - second passing time of the 100 m breaststroke, T100 - total time of the discipline 100 m breaststroke.

By analyzing the values of the variation coefficient (CV) we can see that they were below 30%, which indicates that the results were confident and can be used for further analysis (Dopsaj & Bratuša, 2003). The ANOVA results indicate that there is no statistically significant difference in all applied variables (Split 1, F = .228; p = .638; Split 2, F = 2.063; p = .166; T100, F = 1.294; p = .268). Given that these are elite swimmers, it could be expected that there will be no large oscillations among swimmers in terms of statistical differences, but certainly that the numerical differences, which are clearly visible in certain variables (Table 1), will be important for further analysis as well as for the result at the end of the race. If we look at the medal winners, we can see that the differences between them are very small, especially between the bronze and silver medal winners (58.63 s vs. 58.46 s). The bronze medal winner had a slower time in the 100 m breaststroke event by 0.17 s compared to the silver medal winner, which supports the fact that the differences between the medal winners are minimal. Also, minimal differences (0.01 s) can be seen between the 8th and 9th swimmers (59.21 s vs. 59.22 s), i.e. the swimmer who entered the finals and the swimmer who was dropped out of the final group. Observing the results from Table 1. it can be seen that for each of the variables there is a certain numerical difference between the semifinals and final group of competitors. In variable Split 1 we can see that the final group has a transit time of 27.59 ± 0.42 s, while the semifinals groups has a transit time of 27.67 ± 0.57 s, which shows that there is a certain difference between the groups,

and this difference has a value of 0.08 s. The variable Split 2 shows the values of the transit time in the final group (31.11 ± 0.33 s) and the values of the semifinal group (31.37 ± 0.44 s), which indicates that there is a numerical difference between the groups and it is 0.26 s. With the total time on the 100 m breaststroke section, we can see that the result of the final group (58.71 ± 0.69 s) and the semifinal group (59.05 ± 0.67 s) differs by 0.34 s. If we look at the F values, it can be noticed that the numerical differences between the finalists and semifinalists in the variable Split 2 (F = 2.063) are larger compared to Split 1 (F = .228), which speaks in favor of the fact that better ranked swimmers have the ability to swim faster second part of the race.

Discussion

The results of the conducted research show that there is no statistically significant difference in split times between the semifinals and final groups, but there is a numerical one, which tells us that swimmers with better abilities dominate in the second part of the race, which allows them to achieve better swimming results. Previous research has proven that the result in swimming is influenced by the speed of clean swimming, the reaction time at the start, the strokes frequency and the strokes length (Marković, Pašić, & Kulundžić, 2014). Observing the results of the research of Olstad et al. (2020) which was conducted on a sample of 15 top level male swimmers, it can be seen that the turns times contributed the most to the results (44.30 ± 0.58%), followed by clean swimming (38.93 ± 0.50%), start time (11.39 ± 0.22%) and finish time (5.36 ± 0.18%), respectively. Marković & Trivun (2012) came to the same conclusion with the addition that the start time, the split time at 50 m and the stroke length have no significance for the final result. The results of the conducted research are in accordance with the results of Marković & Trivun (2012), on the basis of which it can be said that a higher values swimming speed is needed to achieve a better result, and the faster turn time and finish time. Observing the results of Jorgić et al. (2011) conducted on a sample of 14 elite swimmers can be seen that specific motor skills (stroke efficiency, stroke rate, stroke length) statistically significantly affect the final results (R = 0.99, R 2 = 0.98, F = 134 , 30, p = 0.000). The obtained results of the research conducted within this paper tell us that the final result of the 100 m breaststroke depends on the time achieved in the second fiftieth of the race, but the results obtained by Dopsaj (2009) investigating the model tactics of elite swimmers of both sexes in race of 100 m, differ in relation to our results and he states that with the breaststroke swimming technique, there is a probability that the male swimmer who turns first in the final race will win with a probability of 43.45%, while with female swimmers this probability is significantly higher and amounts to 77.18%. Šiljeg, Leko, & Mikulić (2011) found that there was a statistically significant improvement in total time (1.55 s) which was mainly achieved based on a faster start and turn time. In individual parameters, there is a statistically significant difference in the start time, on the 25 m and 75 m, as well as in the time required for the turn. In the conducted research, there is no statistically significant difference in split times between swimmers of the final and semifinal group who participated in the 2019 World Championships in the variables: Split_1, p = .638), Split_2 (p = .166) and T_100 (p = .268). The highest F value occurred with the variable Split_2 (F = 2.063) which shows that the biggest changes between the finalists and semifinalists occur in the second part of the race, therefore it is the key moment at which individuals stand out, and those with better abilities have predispositions that the second part of the race swim faster and thus comes to victory.

By analyzing the results, we can conclude that there are evident numerical differences between finalists and semifinalists in the second split time, these differences are 0.26 s, while in the first fiftieth they are 0.08 s. This data gives us the right to conclude that regardless of the fact that statistical differences in this discipline are not significant, numerical are those that separate swimmers and these differences are most noticeable in the second part of the race, or the last 50 m race, when those better swimmers stand out with their specific motor abilities and thus come to more noticeable results. Based on the obtained information, it can be concluded that the parameters that affect the result in swimming are numerous and that depending on these parameters, the result in swimming also depends, and superior swimmers who have better specific motor skills will certainly achieve better results. When summarizing previous research, we can say that some of the most important parameters in swimming on the 100 m section are the following: clean swimming, stroke frequency, stroke length, start time, turn time and finish time. These results provide coaches with a broader picture of the quality of performance in this discipline, as well as feedback on the effective performance of parts of the race that will later be treated through the training process and help develop these specific motor skills. These facts suggest that coaches should implement all of the kinematic components in training season and that they should attempt to identify the swimming speed, stroke rate to stroke length ratio most appropriate for the swimmers.

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Conflict of Interest
The authors declare that there is no conflict of interest.

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