INFLUENCE OF BASIC AND SPECIFIC MOTOR ABILITIES ON SWIMMING RESULTS

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Abstract

Sports or competitive swimming is one of cyclic sports in which the form and manner of performance are dominated by relatively simple movements, which are always the same and which are alternately repeated during swimming a certain technique. Since swimming is the movement or motor activity of man, it is necessary to study the influence of certain motor skills on the results in swimming. ***The aim*** *of this study was to determine the influence of certain basic and specific motor abilities on the results in swimming the 100-meter crawl technique for swimmers aged from 9 to 12 years. The sample consisted of 30 swimmers who are members of the swimming club "Niš 2005" from Niš, with swim experience of at least two years. Thirteen tests were used for the assessment of motor skills (predictor's variables), 8 for evaluation of basic and 5 to assess specific motor abilities. The result of swimming in the 100 meter crawl was criterion variable. Regression analysis was used to determine the influence. Based on the results of basic motor skills it can be concluded that the whole system of applied variables have statistically significant effect on the result of the crawl, and variables: throw medicine ball in the prone position-MBAC, long jump from a standing-MSKD and deep bend-MDPR have a single statistically significant influence. When it comes to specific motor abilities, a whole system of applied variables also has statistically significant influence on the result in crawl, while individually statistically significant influence have variables: the absolute speed of swimming- SABR and swimming rate-STP. It can be concluded, based on these results that working with young swimmers require planning of trainings for the development of motor abilities of which the result depends on.*

Key words: *motor skills, young swimmers, influence, crawl*

Introduction

The swimming represents ability of man to keep in place in water or to move on the water surface by horizontal movements of his own locomotion (Pivač, 1999). When it comes to sports, or competitive swimming it can be said that swimming is one of cyclic sports in which the form and manner of performance is dominated by relatively simple movements, which are always the same and which are alternately repeated during swimming a certain technique (Okičić, Ahmetović, Madić, Dopsaj & Aleksandrović, 2007). Swimming techniques are ways of cyclical movements of a swimmer during swimming, which are determined by the competition rules. In sports there are four basic swimming techniques, such as: crawl, breaststroke, backstroke and butterfly (Kapus, Štrumbelj, Kapus, Jurak, Pincolič, et al., 2002). The goal of every sports training is an increase of anthropological characteristics and abilities which the success in certain sports or discipline depends on (Malacko, 1991). Since swimming represents the movement or motor activity of man, it is necessary to study the influence of certain motor skills on the results in swimming. Lokken (1998) in his research among other things, states that the result of swimming in the 25 meters crawl, 86% is affected by swimmers strength and the ability to turn it into work, while the influence of strength on the result of swimming on sections of 100 meters and 200 meters crawl is 74% and 72%. Zahorjević (1990) explored the influence of motor abilities on results in swimming in young swimmers aged 8 to 10 years. Leko (2001) explored the effects of motor abilities on the swimming results in the 100m crawl for swimmers aged from 9 to 12 years in his doctoral dissertation. Leko & Grčić-Zubčević (2004) conducted a research in order to determine the battery of tests for selection of children in swimming. Nine tests had been used for the assessment of motor skills, and a study was conducted on swimmers aged 9 and 10 years. Okičić (1996) explored the impact of flexibility on swimming results in swimmers aged from 9 to 12 years. Zenić, Antulov & Čavar (2007) applied 10 motor tests to determine the impact of motor abilities on the results in swimming with swimmers aged 12 to 13 years. Strzala, Tyka & Krezalek (2007) have performed research in order to determine the factors affecting the results of the crawl at distances of 400, 100 and 25 meters in elite young swimmers aged 14 and 16 years. The authors used eight tests which included tests for specific motor abilities evaluation of swimmers, including: stroke rate, stroke length and arms coordination index. Stroke rate and stroke efficiency were some of the tests that were used in research to evaluate the success in swimming. (Klika & Thorland, 1994). Popo (2010) researched the influence of latent anthropological dimensions, (which included four motor dimensions) on swimming results in young swimmers. Hsu & Hsu (1997), Vidović (2000), Jorgić, Aleksandrović, Okičić & Madić (2009) have also explored the influence of motor abilities on the swimming results in swimmers but senior category. Motor skills can be divided into: basic and specific. Basic motor skills are the basis of every motor learning and are an elementary value in total area of the man's motor. Specific motor skills are acquired and are influenced by the specificity of the training process of the sports field.

They consist of ability that directly influences sport performance, because their structure, nature and intensity of load are very close to the activities carried out in competitions and shows most closely associated with achieved sport success (Malacko & Rađo, 2004). *The aim* of this study was to determine the influence of certain basic and specific motor abilities on swimming results in the 100-meter crawl in swimmers aged from 9 to 12 years.

Methods

The sample consisted of 30 swimmers aged from 9 to 12 years. All respondents were members of the swimming club "Niš 2005" from Niš, with swim experience of at least two years. The sample of variables consisted of 13 predictor and one criterion variable. The following eight tests were used for evaluation of basic motor skills (criterion variable): throw medicine ball in the prone position-MBAC, long jump from a standing-MSKD, pushups-MSKL, foot taping-MTAPN hand taping-MTAPR, flex-bat MIPAL, depth reach-MDPR and retroflexion hands-MRFR. Methods and procedures for carrying out tests for the evaluation of basic motor skills are taken from (Metikoš, Prot, Hoffman, Pintar, & Oreb, 1989; Šoše & Rađo, 1998). Five following tests were used for the evaluation of specific-motor skills (criterion variable): the start-up time to 10m SVS10, the absolute speed of swimming-SABR, stroke rate-STP, stroke length-SDZ and stroke power - SSZA. Specific motor abilities tests are taken from (Costill & Maglischo, 1992; Okičić, 1999; Okičić et al., 2007). Criterion variable was the result of swimming in the 100m crawl-VP100K. All research was carried out in the 50 meters pool in SRC "Čair". Basic motor skills were measured in the morning while specific motor skills and swimming time in 100m crawl technique were measured in the afternoon. All results were analyzed with statistical program Statistica 6.0. Basic descriptive parameters were calculated for all the variables: A-Mean, R-range, MAX-maximum score, Min-minimum score, SD-standard deviation. Results distribution symmetry was evaluated based on the values of Skewness (Skew) and results distribution uniformity based on the values of kurtosis (Kurt). By using the Kolmogorov-Smirnov test it was determined whether the distribution of results in applied variables has a statistically relevant variation from the normal distribution (max D i K-S test) (Bala, 1990). For determining the influence of the whole predictor system onto the criteria variables the regression analysis was used and following statistical parameters obtained: multiple correlation coefficient (R), determination coefficient, (R^2), F-test result (F), statistical significance (p). For determining the influence of each individual variable in regression analysis we calculated: partial correlation coefficients (Part-R). Correlation coefficients (R), standardized coefficients of partial regression (Beta), t-test results (t) and statistical significance (p). For statistical significance we used the significance level up to 0.05 ($p \leq 0.05$).

Results

Table 1. Descriptive statistics for the basic motor skills

Varijable	Mean	Std.Dev.	Min	Max	Range	Skew	Kurt	max D
MBAC	6,14	1,03	4,5	8,56	4,06	0,97	0,83	0,21
MSKD	26,8	4,69	18	38	20	0,59	0,37	0,22
MSKL	24,47	6,75	12	46	34	1,16	3,34	0,24
MTAPN	29,5	2,87	24	38	14	0,89	1,68	0,23
MTAPR	45,23	3,98	33	53	20	-0,83	2,11	0,14
MIPAL	44,36	13,91	0	70	70	-0,82	3,06	0,19
MDPRE	22,67	4,83	13	35	22	0,54	0,76	0,21
MRFR	17,8	11,88	2	62	60	2,05	6,11	0,26

Table 2. Descriptive statistics for the specific motor skills and result in the 100m crawl

Varijable	Mean	Std.Dev.	Min	Max	Range	Skew	Kurt	max D
SVS10	5,95	0,66	4,34	7,35	3,01	0,17	0,77	0,17
SABR	8,03	0,83	6,76	10,91	4,15	1,45	3,91	0,21
STP	9,29	0,93	7,25	11,15	3,9	-0,15	0,11	0,11
SDZ	12,33	1,74	9,09	16,9	7,81	0,68	1,32	0,18
SSZA	46,35	7,99	32,4	64,79	32,39	0,54	0,62	0,21
VP100K	86,75	7,89	68,71	101,27	32,56	-0,36	0,1	0,17

Table 3. Regression analysis of basic motor skills and result in the 100m crawl

Varijable	R	Partial R	Beta	t(21)	p
MBAC	-0,45	-0,43	-0,31	-2,16	**0,04**
MSKD	-0,38	-0,47	-0,37	-2,43	**0,02**
MSKL	-0,55	-0,15	-0,1	-0,67	0,50
MTAPN	-0,21	-0,19	-0,12	-0,87	0,39
MTAPR	-0,41	0,079	0,06	0,36	0,71
MIPAL	0,33	-0,032	-0,03	-0,14	0,88
MDPRE	-0,62	-0,58	-0,53	-3,30	**0,00**
MRFR	-0,47	-0,14	-0,13	-0,65	0,52
R = 0.85, **R^2** = 0.61, **F**(8.21) = 6.7, **p** = **0.00**					

Table 4. Regression analysis of the specific-motor skills and result in the 100m crawl

Varijable	R	Partial R	Beta	t(24)	p
SVS10	0,88	0,03	0,03	0,16	0,87
SABP	0,82	0,51	0,40	2,93	**0,01**
STP	0,88	0,46	0,48	2,54	**0,02**
SDZ	0,76	0,05	0,03	0,22	0,83
SSZA	-0,68	-0,17	-0,10	-0,85	0,40
R = 0.94, $\mathbf{R^2}$ = 0.88, **F**(5.24) = 34.34, **p** = **0.00**					

Tables 1. and 2. show the values of basic parameters of descriptive statistics, then the value of Skewness´s, Kurtosis´s and Kolmogorov-Smirnov´s test for all studied variables. The values of Kolmogorov-Smirnov test indicate that in all applied variables the distribution of results do not have a statistically relevant variation from normal distribution, since the greatest difference between the relative and the theoretical cumulative frequency in each variable (max D) is lower than the constant (K-S test) which is 0.29 for significance level 0.01. This enables using the obtained results for further analysis.

Results of regression analysis in Table 3. indicate a statistically significant influence of the whole system of basic motor predictor variables on the swimming results for the 100-meter crawl (p = 0.00). This is confirmed by high coefficient of multiple correlation (R = 0.85), where the common variance is explained with 61% (R2 = 0.61). Statistically significant influence on the criterion variable, individually from all predictor variables has: throw medicine ball in the prone position-MBAC (p = 0.04), long jump from a standing-MSKD (p = 0.02) and depth reach-MDPR (p = 0.00). Results of regression analysis in Table 4. indicate a statistically significant influence of the whole system specific motor predictor variables on the outcome swimming the 100-meter crawl (p = 0.00). This is confirmed by high coefficient of multiple correlation (R = 0.94), where the common variance is explained with 88% (R2 = 0.88). Statistically significant influence on the criterion variable, individually from all predictor variables has: the absolute speed of swimming-SABP (p = 0.01) and swimming rate-STP (p = 0.02).

Discussion and conclusion

The results of the research show that explored basic motor skills have statistically significantly influence on the swimming results in the 100m crawl for swimmers aged from 9 to 12 years. Individually statistically significant influence on the swimming results, have strength, measured by tests MBAC and MSKD, and flexibility measured by test MDPR.

The results correspond to the anthropological analysis of swimming which is explored and explained by Volčanšek (1996). According to this author the maximum and explosive strength are required for swimming in all swimming techniques at 50, 100 and 200 meters. The results are partially consistent with the results (Leko, 2001; Leko et al., 2004) which also determine effect on the results in swimming, but with only one test (long jump from a standing), of the five tests that were used for strength estimation. When it comes to flexibility, the results are consistent with the results (Okičić, 1996), which has also determined the influence of flexibility on the results in swimming. Zenić et al. (2007) in their study also determined the influence of strength and flexibility on the swimming results.

Working with young swimmers requires developing basic motor skills of which the result in swimming depends. Among those skills it is necessary work on developing strength and flexibility, because in this, as in many other studies, is shown that they have a significant influence on swimming performance. When it comes to specific motor abilities, the results also indicate that the studied specific motor abilities had a statistically significant effect on the result in swimming the 100-meter crawl. Individually statistically significant effect has the absolute speed of swimming (SABP) and swimming rate STP.

The results of this research are consistent with the results Strzala et al. (2007) who found in their study that the swimming rate along with stroke length as individual variables affect the results of the crawl. Klika et al. (1994) in their study did not determine the individual influence of variable swimming rate on the results of swimming in contrast to the results obtained in this study. Specific motor abilities directly affect the result of swimming, so they should be exercised and improved along with practicing and improving swimming technique.

In this group of swimmers all of these specific motor skills should be improved and in particular the absolute swimming speed (SABP) and swimming rate (STP), because they made the greatest influence on their performance of swimming. Based on the results of this study and their discussion it can be concluded that planning and programming of training process require planning of training for the development of motor abilities of swimmers.

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UTJECAJ BAZIČNIH I SPECIFIČNIH MOTORIČKIH SPOSOBNOSTI NA PLIVAČKE REZULTATE

Sažetak

Sportsko ili natjecateljsko plivanje spada u red cikličnih sportova u kojem prema obliku i načinu izvođenja dominiraju relativno jednostavni pokreti, koji su stalno isti i koji se naizmjenično ponavljaju u toku plivanja određene tehnike. Obzirom da plivanje predstavlja kretnu odnosno motornu aktivnost čovjeka, potrebno je proučavati utjecaj određenih motoričkih sposobnosti na rezultate u plivanju. Cilj ovog istraživanja je utvrditi utjecaj određenih bazičnih i specifično-motoričkih sposobnosti na rezultate u plivanju na 100 metara tehnikom kraul kod plivača starosti od 9 do 12 godina. Uzorak ispitanika je činilo 30 plivača koji su članovi plivačkog kluba "Niš 2005" iz Niša, sa plivačkim iskustvom od najmanje dvije godine. Za procjenu motoričkih sposobnosti (prediktorske varijable) korišteno je 13 testova, 8 za procjenu bazičnih i 5 za procjenu specifičnih motoričkih sposobnosti. Kriterijska varijabla je bila rezultat plivanja na 100 metara kraul. Za utvrđivanje utjecaja korištena je regresijska analiza. Na temelju dobivenih rezultata za bazične motoričke sposobnosti može se zaključiti da cijeli sustav primjenjenih varijabli ima statistički značajan utjecaj na rezultat u kraulu, a pojedinačno statistički značajan utjecaj imaju varijable: bacanje medicinke iz ležećeg položaja-MBAC, skok u dalj s mjesta-MSKD i duboki pretklon-MDPRE. Kod specifično-motoričkih sposobnosti također cijeli sustav primjenjenih varijabli ima statistički značajan utjecaj na rezultat u kraulu, dok pojedinačno statistički značajan utjecaj imaju varijable: apsolutna brzina plivanja-SABR i tempo plivanja-STP. Na temelju dobivenih rezultata može se zaključiti da je u radu s mladim plivačima potrebno u trenažnom procesu planirati treninge za razvoj motoričkih sposobnosti od kojih najviše ovisi rezultat.

***Ključne riječi**: motoričke sposobnosti, mladi plivači, utjecaj, kraul*

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