

THE IMPACT OF MOTOR ABILITIES AND MORPHOLOGICAL CHARACTERISTICS ON THE SUCCESSFULNESS IN FREE STYLE SWIMMING

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Abstract

The aim of this research is to determine the impact of motor abilities and morphological characteristics on the successfulness in free style swimming, before and after the realization of a swimming course. The research was conducted on the sample of 90 pupils, females, age 11-12, in the fifth grade of elementary schools from the Municipality New Town, by means of 12 motor, 7 morphological variables and 1 criteria variable. By analyzing the presented results of the regressive analysis we can establish the fact that after the initial-start in measuring, among the motor variables as a whole prediction system, the most significant impact on the criteria variable OCJTEH (swimming in 25 m lap using a free technique) has to be attached to these variables: standing on the right leg horizontally on the balance bench with eyes open (MBADNU) and deep squats (MRSDCU). On the other hand, the prediction system of morphological variables has not proved to have a statistically significant impact on the criteria variable OCJTEH. After the final-ending measurement, among the motor variables as a whole prediction system, the most significant impact on the criteria variable has to be attached to these variables: deep squats (MRSDCU) and the coordination with a stick (MKOPRP). On the other hand, again, even after the final measurement, the prediction system of morphological variables has not had any significant impact on the criteria variable.

Key words: *girls, motor, morphologies, variables, influence, swimming, regression analysis*

Introduction

Pivač et al., (1995), on a sample of 87 female students aged 20-24 years were analyzed the influence of basic-motoric abilities in the learning process and the overbuilding of the techniques of sports of swimming (front crawl, back crawl, breaststroke). Based on regression analysis for successful learning sport techniques of swimming front crawl and back crawl stroke requires a good coordination, speed and flexibility of the shoulder belt and the foot in dorsal flexion and plantarnej. When breast stroke techniques from applied basic predictor set-motor skills are only significantly affect the dimensions of flexibility in defining the criterion variable. When comparing the structure of the abilities that have an impact on the efficiency of swimming on the applied research with a sample of the swimming population, it is evident that there is no significant difference, except that in swimming the population dynamic strength has much more influence, as in the above research has not been obtained. Rađo (1998), on a sample of 109 students from the Faculty of Physical Education, male, comes to the conclusion that: "The function of success in swimming, the most contributing variables of coordination, explosive and dynamic strength, speed, flexibility and speed nerve-muscle reactions to the sight." Redžić (2004), a sample of 35 male students of physical education and sport at the University of Tuzla, conducted a research on the connection between the general and situational motor in anthropological space that is significantly expressed the results in front crawl swimming technique. The study applied five variables of general motor coordination in areas relevant to swim freestyle and four situational variables from

the motor. By using regression analysis attempted to determine the size of the general impact predictor system, which is represented by a general motor rhythm in the criterion system which is opportunistic motor. At the time of swimming 50 yards front crawl technique investigated variables affecting general motor with 20% in explaining the results, while the other 80% in explaining the influence the other variables: general motor, anthropometry. That could include talk about the importance of motor abilities, morphological characteristics of these children, their learning outcome (coping) in a kinesiological activity, in this case swimming (free style), it is primarily familiar with the basic structure of movement in a given activity, and main characteristics of morphology and some motor skills and their mutual influence (Bonacin et al., 2008). Swimming as a sport or activity in general as movement specific in that it takes place in an aqueous environment, which has certain physical characteristics that greatly influence the character of human movement and motion, and thus the realization of his motor skills. In such circumstances, then the child has to be adapted so that their motor skills exhibited at the highest level possible in order to achieve the highest possible results and learned to swim as soon as possible.

Problem and objective research

Working with children at this age is very responsible, because the overall development of the child is still not finished, and therefore, because it is a beginner, this is the obligation of teachers is greater. The problem of this research is whether and to what extent the selected motor abilities and

morphological characteristics influence successful learning freestyle swimming, performed before and after the training program of swimming, the goal is to determine the influence of motor abilities and morphological characteristics on the success of learning freestyle swimming, before and performed after the training program of swimming.

Methods

The sample was homogenized by sex. So for the purposes of this study entered 90 pupils, female, aged from 11-12 years, fifth-graders from elementary schools in the Municipality of Novi Grad. All students are measured with 20 variables to well-conceived cover the motor and morphological manifestations. Selection of measuring instruments was based on standards, recommendations, and the extensive literature on the way to the measured results, it can get the most useful information on the occurrence in children. For the assessment of motor abilities was used 12 variables to well-conceived cover the area of primary motor dimensions: variable to assess coordination (agility in the air - MKOOUZ, switching the ball from hand to hand over his head - MKOPRP); variables for assessment of dynamic strength (push-ups - MRSSKL, deep squats - MRSDCU, lifting the hull from lying - MRSDTZ); variables for assessing the flexibility (lateral - MFLCSP, side pouch - MFLBSP, bend while sitting on a bench with both feet - MFLPRK), the variables for assessment of balance (standing on right leg lengthwise on the bench for balance with your eyes open - MBADNU, standing on left leg lengthwise on the bench for balance with your eyes open - MBALNU, standing on two feet lengthwise on the bench for balance with your eyes open - MBAOBN). To assess the morphological characteristics of the respondents used the 7 variables, namely: variable to assess longitudinal dimension of the skeleton (body height - AVISTJ, sitting height - ASJVIS, leg length - ADUŽNO, arm length - ADUŽRU) variables to estimate the volume and body weight (range chest - AOPGRK, body weight - ATEŽTJ, upper arm girth-prone - AOPNAD) and 1 criterion variable to assess the success of a free style swimming (Votes techniques - OCJTEH).

Table 1. Criteria for assessment

GRADE:	LEVEL OVERCOME TECHNIQUES:
5 (A)	Techniques that are implemented with an optimal angle of attack (front crawl), the proper coordination of movements with proper breathing.
4 (B)	Satisfactory performance art crawl, with small errors in terms of coordination of arm and leg.
3 (C)	Semmi-swimmer. There are obvious errors in the performance of the coordinating elements of freestyle technique, and disrupted breathing techniques.
2 (D)	Buoy. There are large errors in the execution of coordinating elements of freestyle techniques and the complete absence of breathing techniques.
1 (E)	A complete non-swimmers.

The work program was implemented in this research has been done on the principles in theory and practice which treats the methods of work with beginners. Essentially the program encompass the activity: time period (four months, stim as respondents in this period were divided into two groups of 45 students, for a period of two months per group), the number of the training unit of training: 16 hours per block group (2 times a week), duration of a block of teaching hours: 90 minutes, with the aim of determining the size of the influence of motor abilities and morphological characteristics on the success of learning freestyle swimming, performed before and after the training program of swimming (Table 1).

Table 2. Initial and final results

Initial measurements		
Ratings	Total	Percentage
1-E	41	46%
2-D	24	27%
3-C	24	27%
4-B	1	0%
5-A	0	0%
Total number: 90		
The percentage of swimmers: 27%		
The percentage of non-swimmers :		

Final measurements		
Ratings	Total	Percentage
1-E	0	0%
2-D	25	28%
3-C	31	34%
4-B	25	28%
5-A	9	10%
Total number: 90		
The percentage of swimmers: 72%		
The percentage of non-swimmers:		

Data obtained in this study were analyzed using SPSS 16.0 software package. Regression analysis was applied to determine the influence of motor abilities and morphological characteristics of students aged 11-12 years on the success of learning freestyle swimming, performed before and after the training program of swimming.

Results and discussion

Regression analysis is used to determine the influence of motor abilities and morphological characteristics, selected as the input or predictor set, the success in swimming, marked as an exit or criterion variable. On the basis of multiple regression (R) is the common variance explained (R Square) only if it is statistically significant.

Rather high coefficient of multiple correlation R = 0.857 indicates a statistically significant effect of the whole system of motor predictor variables on the criterion, which means that success in swimming can be predicted through the entire motor system predictor variables, but looking at it individually.

Table 3. Variables for as. of motor skills (initial – initial)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,86	,73	,69	,37
a. Predictors: (Constant), MKOOUZ, MFLCSF, MBAOBN, MKOPRL, MFLPRK, MRSSKL, MRSDCU, MRSDTZ, MKOPRP, MFLBSP, MBALNU, MBADNU				

Table 7. Regression analysis

	Beta	t	Sig.
ATEŽTJ	-0.14	-0.29	,770
AVISTJ	0.34	1.09	,278
ADUŽRU	-0.24	-1.03	,305
ADUŽNO	-0.04	-0.18	,859
AOPGRK	0.17	0.60	,553
AOPNAD	0.03	0.09	,927
ASJVIS	-0.04	-0.26	,796
Dependent Variable: OCJTEH			

Table 4. Regression analysis

	Beta	t	Sig.
MBADNU	0.41	2.96	,004**
MBALNU	0.00	0.02	,986
MBAOBN	0.01	0.10	,919
MFLPRK	-0.02	-0.24	,814
MFLCSF	0.10	0.90	,372
MFLBSP	-0.03	-0.29	,772
MRSDTZ	0.04	0.41	,682
MRSSKL	0.18	1.86	,067
MRSDCU	0.24	2.41	,018*
MKOPRP	0.03	0.29	,771
MKOPRL	0.04	0.39	,699
MKOOUZ	0.05	0.51	,609
Dependent Variable: OCJTEH			

Table 8. ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	1.01	7	0.15	0.3	0.946
	Residual	37.89	82	0.46		
	Total	38.90	89			
a. Predictors: (Constant), ASJVIS, AOPNAD, ADUŽNO, ADUŽRU, AOPGRK, AVISTJ, ATEŽTJ						
b. Dependent Variable: OCJTEH						

Rather low coefficient of multiple correlation $R = 0.161$ indicates that the predictor system of morphological variables, no statistically significant effect on the criterion variable OCJTEH ($Sig. = 0.946$), and the interpretation of the results will be made.

Table 5. ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	28.54	12	2	18	0.000
	Residual	10.36	77	0.14		
	Total	38.9	89			
a. Predictors: (Constant), MKOOUZ, MFLCSF, MBAOBN, MKOPRL, MFLPRK, MRSSKL, MRSDCU, MRSDTZ, MKOPRP, MFLBSP, MBALNU, MBADNU						
b. Dependent Variable: OCJTEH						

The largest and statistically significant effect on the criterion variable OCJTEH motor have the following predictor variables: - MBADNU (BETA) = 0.406, which is significant at $p = 0.004$ MRSDCU (BETA) = 0.241, which is significant at $p = 0.018$

Table 6. Variables for assessment of morphological characteristics (initial – initial)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.161	.026	-.057	.680
a. Predictors: (Constant), ASJVIS, AOPNAD, ADUŽNO, ADUŽRU, AOPGRK, AVISTJ, ATEŽTJ				

Table 9. Variables for assessment of motor skills (final – final)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.935	0.874	0.854	0.364
a. Predictors: (Constant), MKOOUZ, MFLBSP, MRSDTZ, MFLCSF, MRSSKL, MFLPRK, MBAOBN, MKOPRL, MRSDCU, MKOPRP, MBALNU, MBADNU				

Table 10. Regression analysis

	Beta	t	Sig.
MBADNU	,191	1,932	,057
MBALNU	,060	,637	,526
MBAOBN	,077	,813	,419
MFLPRK	-,016	-,313	,755
MFLCSF	-,034	-,752	,454
MFLBSP	,016	,360	,720
MRSDTZ	,016	,366	,715
MRSSKL	,098	1,862	,066
MRSDCU	,220	3,137	,002**
MKOPRP	,236	2,826	,006**
MKOPRL	,122	1,792	,077
MKOOUZ	,125	1,868	,066
Dependent Variable: OCJTEH			

Table 11. ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	70.79	12	5.90	44.55	.000
	Residual	10.20	77	.13		
	Total	81.00	89			
a. Predictors: (Constant), MKOOUZ, MFLBSP, MRSDTZ, MFLCSF, MRSSKL, MFLPRK, MBAOBN, MKOPRL, MRSDCU, MKOPRP, MBALNU, MBADNU						
b. Dependent Variable: OCJTEH						

Rather high coefficient of multiple correlation $R = 0.935$ indicates a statistically significant effect of the whole system of motor predictor variables on the criterion, which means that success in swimming can be predicted through the entire motor system predictor variables, but looking at it individually. The largest and statistically significant effect on the criterion variable OCJTEH motor have the following predictor variables: - MRSDCU (BETA) = 0.22, which is significant at $p = 0.002$ - MKOPRP (BETA) = 0.236, which is significant at $p = 0.006$.

Conclusion

Regression analysis was applied to determine effects of motor and morphological variables on the success of learning freestyle swimming. As a criterion in this analysis was used one variable, OCJTEH (swimming section 25 m freestyle technique). Based on the presented results of regression analysis before and after implementation of swimming can be determined that there is a rather high multiple correlation coefficient of the system of motor variables and the criterion variable, which indicates that the predictor variables of the motor system has a significant influence on the criterion variable.

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Based on the presented results of regression analysis before and after implementation of swimming can be determined that there is a rather low coefficient of multiple correlation system of morphological variables and the criterion variable, which points to the fact that the predictor system of morphological variables, no statistically significant effect on the criterion variable, and the reason that can be seen from a given table (Tabele 2).

Table 12. Classification based on the ABOMAI

Classification based on the ABOMAI	Initial measurement	Final measurement
Malnutrition	70%	76%
Ideal weight	28%	21%
Overweight	2%	3%
Total	100%	100%

After examining the calculated value of BMI led to the conclusion that the majority of children found in the category of malnutrition, as seen from a given table. However, it was expected, because it was a population of children who were in that age period was present accelerated growth, and slower growth. Finally we can conclude that the better results achieved those students who have developed motor skills, because they had a great influence on the criterion variable OCJTEH before and after implementation of swimming.

This is important information for those who wish to engage in training children in swimming, you know they should pay great attention to developing motor skills.

UTJECAJ MOTORIČKIH SPOSOBNOSTI I MORFOLOŠKIH KARAKTERISTIKA NA USPJEŠNOST UČENJA SLOBODNOG STILA PLIVANJA

Sažetak

Cilj ovog istraživanja je utvrđivanje utjecaja motoričkih sposobnosti i morfoloških karakteristika na uspješnost učenja slobodnog stila plivanja, prije i nakon realiziranog programa obuke plivanja. Istraživanje je provedeno na uzorku od 90 učenika, ženskog spola, u starosnoj dobi od 11-12 godina, petih razreda iz osnovnih škola sa Općine Novi Grad, uz pomoć 12 motoričkih, 7 morfoloških varijabli i 1 kriterijske. Analizirajući prezentirane rezultate regresijske analize može se konstatirati da su nakon inicijalnog-početnog mjerenja od motoričkih varijabli kao cijelog prediktorskog sistema statistički najznačajniji utjecaj na kriterijsku varijablu OCJTEH (plivanje dionice 25 m slobodnom tehnikom) imale varijable: stajanje na desnoj nozi uzdužno na klupici za ravnotežu sa otvorenim očima (MBADNU) i duboki čučnjevi (MRSDCU). Dok prediktorski sistem morfoloških varijabli nije imao statistički značajan utjecaj na kriterijsku varijablu OCJTEH. Nakon finalnog-završnog mjerenja od motoričkih varijabli kao cijelog prediktorskog sistema statistički najznačajniji utjecaj na kriterijsku varijablu su imale varijable: duboki čučnjevi (MRSDCU) i koordinacija s palicom (MKOPRP). Dok opet i nakon finalnog mjerenja prediktorski sistem morfoloških varijabli nije imao statistički značajan utjecaj na kriterijsku varijablu OCJTEH.

Ključne riječi: *djevojčice, motorika, morfologija, varijable, utjecaj, plivanje, regresijska analiza*

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