

**ORIGINAL SCIENTIFIC PAPER****Milomir Trivun<sup>1</sup>, Željko Panić<sup>2</sup> Zsolt Németh<sup>3</sup>**<sup>1</sup> Faculty of Physical Education and Sport, University of East Sarajevo<sup>2</sup>Swimming c Olimp Banja Luka<sup>3</sup> Department of Theory and Practice of Sports, Institute of Sport Science and Physical Education, Hungary**UDK: 797.2.4****DOI: 10.7251/SIZEN1802041T****SUCCESS RATE OF RESULTS IN SWIMMING 400m FREESTYLE DEPENDANT OF TIME TRIALS BY SECTIONS****SUMMARY**

*For the purpose of this research, sample of 36 participants was divided into three sub-samples of 12 swimmers, participants in Open Championship of Bosnia and Herzegovina in 2017 and 2018, as well as rally at 25<sup>th</sup> International memorial race “Ante Lambaša” in Belgrade in 2017. Data was obtained from entries for time trials as well as final results of competition in 400m freestyle swimming. Research was conducted with the aim of establishing the influence of sections (50m, 100m, 150m, 200m, 250m, 300m and 350m) as predictor set of variables and influence on criterion variable of success rate of results in 400m freestyle swimming. Results obtained using the regression analysis lead to conclusion that there is statistically significant connection between the set of variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) and criterion variable of 400m freestyle swimming.*

*Values of coefficient of multiple correlation which determine the influence of the set of of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) to criterion variable of 400m freestyle swimming are respectively: for 50 m 42%, 100 m 52%, 150 m 65%, 200 m 67%, 250 m 67%, 300 m 68%, 350 m 43% of the common variance of swimmers who took part in rally “Olimp Banja Luka” in 2018.*

*Values of coefficient of multiple correlation which determine the influence of the set of of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) to criterion variable of 400m freestyle swimming are respectively:for 50 m 58%, 100 m 59%, 150 m 71%, 200 m 70%, 250 m 71%, 300 m 70%, 350 m 41% of the common variance of swimmers who took part in rally “Olimp Banja Luka” in 2017.*

*Values of coefficient of multiple correlation which determine the influence of the set of of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) to criterion variable of 400m freestyle swimming are respectively:for 50 m 58%, 100 m 65%, 150 m 62%, 200 m 84%, 250 m 67%, 300 m 89%, 350 m 76% of the common variance of swimmers who took part in rally 25<sup>th</sup> International memorial race “Ante Lambaša” in 2017 in Belgrade.*

*Conclusion: set of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) of freestyle swimming has significant percentage of influence to criterion variable 400m freestyle swimming for swimmers who took part in rally 25<sup>th</sup> International memorial race “Ante Lambaša” in Belgrade in 2017 in Seerbia when compared to the same one for swimmers who took part in Open Championship of Bosnia and Herzegovina in 2017 and 2018.*

**Key words:** rally, freestyle swimming, Olympic pool, regression analysis

## INTRODUCTION

In course of research conducted for the purpose of this paper we used the results obtained in following competitions: rally in banja Luka in 2017 and 2018. Organiser was swimming club “Olimp” from banja Luka on 26<sup>th</sup> and 27<sup>th</sup> May 2018 and 27<sup>th</sup> and 28<sup>th</sup> May 2017. Competition was held at swimming pool “GOB” in Banja Luka, with dimensions 50m by 10 lanes. Absolute rally record was 3:55.18 set by Stjepanović Velimir UAE Banja Luka on 31<sup>st</sup> May 2015. Organiser of 25<sup>th</sup> International memorial race “Ante Lambaša” was swimming club “Baracuda”, it was held in Serbia (Novi Beograd, 4<sup>th</sup> and 5<sup>th</sup> March 2017).

### Contemporary research

By structure of movement swimming is in the group of cyclic sports and by form and manner of performance relatively simple movements which are constantly the same (Eighth International Conference “Sport science and health” 2018.235) which periodically repeat in course of swimming using certain technique (Madić, Okičić & Aleksandrović, 2007; Jevtić, 2011; Marković, 2017). Basic aim of in sport swimming is swimming specific section in the shortest amount of time using specific swimming technique (Ahmetović, 1994). Success in any sport activity, swimming included, depends of large number of anthropological characteristics and abilities, as well as their mutual connection. Importance of influence of specific characteristics to success in swimming is not the same for all the characteristics. It is certain that the individual with anthropological abilities at higher level will achieve better results if connections between them are at the optimal level. In addition to motor, functional, cognitive and conative characteristics which can have influence on results in swimming there are also morphological characteristics (Malacko, 1991). Many researchers dealt with the influence of specific segments of anthropological space to success rate in terms of results achieved. Influence of basic motor abilities in swimming provides information on which abilities have the greatest influence on results and should be accordingly monitored and developed in the training process. Lokken (1998) established in his research the influence of strength to results in disciplines 100m and 200m crawl by 74% and 72% respectively. Establishing the influence of parameters of specific motor abilities to success rate of results in swimming can be performed on seniors as well as young swimmers, as in research performed by (Jurimae, Halljaste, Cicchela, Latt, Purge et al., 2007; Latt, Jurimae, Maestu, Purge, Ramson, et al., (2010). Zahorjević (1990) performed research on influence of motor abilities to results in swimming of young swimmers aged 8–10. Leko (2001) performed research on the influence of motor abilities to results in swimming 100 m crawl of young swimmers aged 9–12. Okičić (1996) performed research on influence of flexibility to results in swimming of young swimmers. Influence of certain basic and specific motor abilities to results in sport discipline 100m stroke of young swimmers. Sample consisted of 30 swimmers aged 9–12 who are in the category of young pioneers (Okičić et al., 2012).

## METHODS

### Sample of participants

Total sample (36) is divided into three sub-samples by 12 who are in absolute category of swimming 400 m achieved results during rallies and open championships: 26<sup>th</sup> and 27<sup>th</sup> May 2018, banja Luka, Bosnia and Herzegovina; second part: Rally Olimp Banja Luka 2017; third: Rally International memorial race “Ante Lambaša” 2017 held in Belgrade. Sample was taken from the ranking list of first 12 participants with the best achieved results in the course of competition.

### Sample of variables – Procedures

#### Predictor variables

In connection to swimming following sections: 50m, 100m, 150m, 200m, 250m, 300m and 350m.

Criterion variables were in connection to success rate of results in 400 m freestyle swimming.

#### Data processing methods

All the data was processed in program "Statistica 10". The following parameters were calculated and presented (in tables) for all the applied variables:

- Mean value (Mean),
- Minimum (Min),
- Maximum (Max),
- Standard deviation (Std. Dv).

In order to determine the influence of time trials by sections (50m, 100m, 150m, 200m, 250m, 300m and 350m) to success rate of results achieved in 400 m freestyle swimming, a number of regression analysis was applied in a manner that each variable of the predictors was observed as single predictor in swimming results.

Explanation of regression analysis symbols:

- (R) – coefficient of multiple correlation;
- ( $R^2$ ) – coefficient of determination;
- (Beta) – beta-values;
- F – significance of t-test value (t);
- p-level – significance level.

Statistical analysis

"Hypotheses:  $H_0$ : Between the regressional (explained) and residual (unexplained) part of total variance of multiple regression there is no statistically significant difference.

In order to render the regression model usable during the prognosis of dependent variable in line with the data on independent variables, it is necessary to establish the level of statistical significance of the calculated coefficients of regression. For that purpose are used several procedures. One of the most frequently used is the above explained procedure of calculating the corrected coefficient of multiple determination. The second procedure which also deals with analysis of joint influence of independent variables to dependant one is the analysis of variance of multiple regression. Using these two procedures it is therefore not possible to determine separate influence of independent variables. For that purpose testing the evaluated parameters of regression is frequently used in multiple regression analysis. Using the T-test in this procedure we can establish separate influence of independent variables on defining the dependant variables. Variance analysis used for multiple regression lines shows great analogy with the procedure used for testing simple linear regression. Three characteristic values used for this purpose are: original data of dependent variable (Y) which indicate vertical disagreement with regression plane; adjusted values ( $Y_p$ ) directly on the regression plane and arithmetic mean of original data of the dependent variable ( $M_y$ ). They are used for calculation of three already explained characteristic variables: total, explained (so called regressional) and unexplained (residual). When each of these three variables is divided by corresponding number of degrees of freedom we get the three variances of regression line: total, regression and residual. For the purpose of testing the significance of regression line only regressional ( $V_y$ ) and residual ( $VR$ ) variance are relevant and from their umeric relationship we obtain characteristic, previously explained F-value. Therefore, in the language of mathematics, F value is calculated as quotient of regression and residual value. Value obtained in that manner is compared with corresponding table f-value read from Table 4 according to the number of degrees of freedom by comparing the variances. In header of Table 4 are degrees of freedom of regression variance ( $df_1$ ) which is determined as  $n-1$  (where  $n$  was total number of observed variables including dependent and independent variables and in first column degree of freedom of residual variance ( $df_2$ ) calculated as  $N-n$ . In the cross-section of coordinates drawn from corresponding values of degrees of liberty ( $df_1$  and  $df_2$ ) are read table (limit) values for desired level of significance ( $p$ ). According to the same analogy zero hypothesis is established as well as its testing using calculated and table value. Calculated F-value on the level of significance of 0.01 overcomes the corresponding table value – f-value, and in line with that we may conclude that the regression (explained) variability is statistically significantly greater than residual (unexplained) variability ( $F > f$ ). Such conclusion automatically guarantees statistical significance of regression line. Therefore, the information provided by coefficient of high determination ( $R^2$ ) is confirmed. Calculated coefficients of multiple regression ( $b_0, b_1, b_2$  etc.) relate only to the sample results and represent evaluation of regression parameters ( $B_0, B_1, B_2$ ) which are the basic group (population). They enable prognosis of dependent variable according to empirical data on independent variables. Therefore it is important to

determine whether the parameters are statistically significant or not. In statistics it is important to have so called coefficient slope ( $b_1, b_2, \dots$ ) whereas the determining coefficient – intercept ( $b_0$ ) has secondary significance. Using the previously mentioned procedures for testing the significance of regression coefficients (coefficient of multiple determination and variance analysis) it was possible to reach conclusion about joint influence of independent variables, whereas the information on their individual influence on dependent variable missed. Such possibility of separate testing of statistical significance of regression coefficients is provided by separate procedure based on application of T-test. Its logic is analogous to T-test used for testing calculated values  $b_1$  and  $b_2$  and it is based on using assessment and standard error (Perić, 2001).”

## RESULTS

Table 1. Descriptive analysis of rally Olimp Banja Luka 2018. Time trials by sections

<i>Table 1. Time trials rally BL 18</i>					<i>Table 2. Time trials by sections BL 18</i>					
Valid N	12	Mean	Min.	Max.	Std.Dev.	Valid N	Mean	Minimum	Maximum	Std.Dev.
12	12	28.71	27.71	30.21	0.78	12	28.71	27.71	30.21	0.78
12	12	60.42	57.35	63.76	1.81	12	31.69	29.96	33.55	1.01
12	12	92.66	87.46	96.82	2.86	12	32.18	30.11	34.13	1.08
12	12	125.27	117.83	130.80	4.12	12	32.53	30.37	34.43	1.26
12	12	157.79	147.05	164.93	5.81	12	32.44	29.22	34.35	1.67
12	12	190.55	176.48	199.61	7.57	12	32.79	29.43	34.71	1.76
12	12	224.06	205.27	239.15	10.37	12	32.63	28.79	34.99	1.90
12	12	253.00	235.27	266.48	10.99	12	31.38	28.00	33.98	1.67

Table 2, Descriptive statistics of rally Olimp Banja Luka 2018 time trials by sections

In Tables 1 and 2 are minimum and maximum values of time trials as well as mean value with standard deviation of Open Championship Bosnia and Herzegovina during the rally Olimp Banja Luka 2018.

Table 3, Regression analysis of criterion variable swimming 50 m (rally Olimp Banja Luka 2018) and its effect to criterion variables swimming 400 m freestyle

<i>Table 3, Swimming 50 m</i>						<i>Table 4, Swimming 100 m</i>					
b*	Std.Err.	b	Std.Err.	t(10)	p-value	b*	Std.Err.	b	Std.Err.	t(10)	p-value
	of b*		of b				of b*		of b		
		18.62	3.37	5.51	0.00			17.43	3.93	4.42	0.00
<b>0.68</b>	0.22	0.32	0.10	2.99	0.01	<b>0.75</b>	0.20	0.45	0.12	3.62	0.00

Table 3. Regression Summary for Dependent Variable: 50 M BL 18  $R = .84$   $R^2 = .71$  Adjusted  $R^2 = .68$

$F(1,10) = 25.28$   $p < .00$  Std.Error of estimate: .43

Table 4. Regression Summary for Dependent Variable: 100M BL 18 ( $R = .82$   $R^2 = .68$  Adjusted  $R^2 = .65$

$F(1,10) = 21.54$   $p < .00$  Std.Error of estimate: 1.07

In Table 3 are presented results of regression line of results in swimming 50 m crawl with swimming 400 m freestyle. It is evident from the Table that the coefficient of multiple correlation is ( $R = .68$ ), and coefficient of determination ( $R^2 = .42$ ), which indicates 42% of common variance. Value of regression coefficients is je: beta values ( $Beta = .22$ ) in swimming 400 m, and significance level of F value is  $F(1,10) = 8.96$ , with t-test (10) value it is 5.51 at significance level .00 ( $p < 0.01$ ).

In Table 4 are presented results of regression line of results in swimming 100 m crawl with swimming 400 m freestyle. It is evident from the table that coefficient of multiple correlation is ( $R = .75$ ), and coefficient of determination is ( $R^2 = .52$ ), which indicates 52% of common variance. Value of regression coefficients is: beta values ( $Beta = .17$ ) in swimming 400 m, and significance level of F value is  $F(1,10) = 13.15$ , with t-test (10) value is 4.42 at significance level .00 ( $p < 0.00$ ).

Table 5, Regression analysis of criterion variable of swimming 150 m (rally Olimp Banja Luka 2018) and its effect to criterion variables of swimming 400 m freestyle

<i>Table 5, Swimming 150 m</i>						<i>Table 6, Swimming 200 m</i>					
<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>	<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b				of b*		of b		
		38.21	11.76	3.24	0.00			47.46	17.17	2.76	0.01
<b>0.82</b>	0.17	0.21	0.04	4.63	0.00	<b>0.82</b>	0.18	0.30	0.06	4.53	0.00

*Table 5. Regression Summary for Dependent Variable: 150 M BL 18 R= .82 R<sup>2</sup>= .68 Adjusted R2= .65 F(1.10)=21.45 p<.00 Std.Error of estimate: 1.69*

*Table 6. Regression Summary for Dependent Variable: 200 M BL 18 R= .82 R<sup>2</sup>= .67 Adjusted R2= .64 F(1.10)=20.57 p<.00 Std.Error of estimate: 2.47*

In Table 5 are presented results of regression line of results in swimming 150 m crawl with swimming 400 m freestyle. It is evident from the Table that the coefficient of multiple correlation is (R=.82), and coefficient of determination is (R<sup>2</sup>=.65), which indicates 65% of common variance. Value of regression coefficients is: beta value (Beta=.21) in swimming 400 m, and significance level of F value F(1.10)= 21.45, with t-test (10) value is 4.63 at significance level .00 (p<0.00).

Table 6, regression analysis of criterion variable of swimming 200 m (rally Olimp Banja Luka 2018) and its effect to criterion variables of swimming 400 m freestyle. In Table 6 are presented results of regression line of results in swimming 200 m crawl with swimming 400m freestyle. It is evident from the Table that the coefficient of multiple correlation is (R=.82), and coefficient of determination is (R<sup>2</sup>=.67), which indicates 67% of common variance. Value of regression coefficients is: beta value (Beta=.30) in swimming 400 m, and significance level F(1.10)= 20.57, with t-test (10) value is 4.53 at significance level .00 (p<0.00).

Table 7, regression analysis of criterion variable of swimming 250 m (rally Olimp Banja Luka 2018) and its effect to criterion variables of swimming 400 m freestyle

<i>Table 7, Swimming 250 m</i>						<i>Table 8, Swimming 300 m</i>					
<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>	<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b				of b*		of b		
		48.12	24.25	1.98	0.07			45.90	30.81	1.48	0.16
<b>0.81</b>	0.18	0.43	0.09	4.52	0.00	<b>0.82</b>	0.17	0.57	0.12	4.69	0.00

*Table 7. Regression Summary for Dependent Variable: 250 M BL 18 R= .81 R<sup>2</sup>= .67 Adjusted R2= .63 F(1.10)=20.48 p<.00 Std.Error of estimate: 3.49*

*Table 8. Regression Summary for Dependent Variable: 300 M BL 18 R= .82 R<sup>2</sup>= .68 Adjusted R2= .65 F(1.10)=22.06 p<.00 Std.Error of estimate: 4.43*

In Table 7 are presented results of regression line of results in swimming 250 m crawl with swimming 400 m freestyle. It is evident from the Table that the coefficient of multiple correlation is (R=.81), and coefficient of determination is (R<sup>2</sup>=.67), which indicates 67% of common variance. Value of regression coefficients is: beta value (Beta=.43) of swimming 400 m, and significance level of F value F(1.10)= 20.48, with t-test (10) value is 4.52 at significance level of .00 (p<0.00).

Table 8, regression analysis of criterion variable of 300 m (Rally Olimp Banja Luka 2018) and its effect to criterion variable of 400 m freestyle

In Table 8 are presented results of regression line of results in swimming 300 m crawl with swimming na 400 m freestyle. It is evident from the Table that koeficijent of multiple correlation is (R=.82), and coefficient of determination is (R<sup>2</sup>=.68), which indicates 68% of common variance. Value of regression coefficients is: beta value (Beta=.57) in swimming 400 m, and significance level of F value F(1.10)= 38.11, with t-test (10) value is 4.69 at significance level of .00 (p<0.00).

Table 9, regression analysis of criterion variable of 350 m (Rally Olimp Banja Luka 2018.) and its effect to criterion variable of 400 m freestyle

<b>b*</b>	<b>Std.Err.</b>	<b>B</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		66.08	56.68	1.16	0.27
<b>0.66</b>	0.23	0.62	0.22	2.78	0.01

Table 9, Regression Summary for Dependent Variable: 350 M BL 18 R= .66 R<sup>2</sup>= .43 Adjusted R2= .38 F(1.10)=7.78 p<.00 Std.Error of estimate: 8.16

In Table 9 are presented results of regression line of results in swimming 350 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.66), and coefficient of determination (R<sup>2</sup>=.43), which indicates 43% of common variance. Value of regression coefficients is: beta value (Beta=.62) in swimming 400 m, and significance level of F value F(1.10)= 41.84, with t-test (10) value is 2.78 at significance level of .00 (p<0.00).

Table 10, descriptive statistics of Rally Olimp Banja Luka 2017, time trials by sections

Table 10, Time trials rally BL 17

<b>Valid N</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>Std.Dev.</b>
12	28.79	27.73	30.10	0.83
12	60.43	57.34	62.62	1.70
12	92.84	88.34	96.10	2.88
12	125.48	119.10	129.95	4.16
12	157.88	148.74	164.97	5.88
12	190.56	178.72	200.18	7.63
12	224.56	208.02	239.15	9.50
12	252.25	236.23	268.92	11.95

Table 11, swimming time by sections BL 17

<b>Valid N</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>Std.Dev.</b>
12	28.82	27.76	30.10	0.79
12	31.74	30.08	32.67	0.81
12	32.48	30.30	34.27	1.20
12	32.69	30.76	34.18	1.25
12	32.47	29.64	35.02	1.67
12	32.72	29.98	35.21	1.71
12	32.42	29.30	34.81	1.79
12	31.13	28.08	34.16	2.20

Table 11, Descriptive statistics Rally Olimp Banja Luka 2017, times by sections

In Tables 10 and 11 are presented minimum and maximum values of time trials as well as mean value with standard deviation for Open Championship of BiH at Rally Olimp Banja Luka 2017.

Table 12, regression analysis of criterion variable of 50 m (Rally Olimp Banja Luka 2017) and its effect to criterion variable of swimming 400 m freestyle

Table 12, swimming 50 m BL 17

<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		15.32	3.56	4.30	0.00
<b>0.76</b>	0.20	0.05	0.01	3.78	0.00

Table 13, swimming 100 m BL 17

<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		31.90	6.93	4.59	0.00
<b>0.79</b>	0.19	0.11	0.02	4.11	0.00

Table 12, Regression Summary for Dependent Variable: 50 M BL 17 R= .76 R<sup>2</sup>= .58 Adjusted R2= .54 F(1.10)=14.31 p<.00 Std.Error of estimate: .55

Table 13, Regression Summary for Dependent Variable: 100 M BL 17 R= .79 R<sup>2</sup>= .62 Adjusted R2= .59 F(1.10)=16.94 p<.00 Std.Error of estimate: 1.08

In Table 12 are presented results of regression line of results of swimming 50 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.76), and coefficient of determination is (R<sup>2</sup>=.58), which indicates 58% of common variance. Value of regression coefficients is: beta value (Beta=.05) of swimming 400 m, and significance level of F value F(1.10)= 14.31, with t-test (10) value is 3.78 at significance level of .00 (p<0.00).

Table 13, regression analysis of criterion variable of swimming 100 m (Rally Olimp Banja Luka 2017) and its effect to criterion variable of swimming 400 m freestyle

In Table 13 are presented results of regression line of results of swimming to coefficient of multiple correlation which is (R=.76), and coefficient of determination (R<sup>2</sup>=.58), which indicates 58% of

common variance. Value of regression coefficients is: beta value (Beta=.05) in swimming 400 m, and significance level of F value  $F(1.10)= 14.31$ , with t-test (10) value is 3.78 at significance level of .00 ( $p<0.00$ ).

Table 14, regression analysis of criterion variable of swimming 150 m (Rally Olimp Banja Luka 2017) and its effect to criterion variable of swimming 400 m freestyle

<i>Table 14, swimming 150 m BL 17</i>						<i>Table 15, swimming 200 m BL 17</i>					
<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>	<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b				of b*		of b		
		41.53	10.31	4.02	0.00			51.50	15.01	3.43	0.00
<b>0.84</b>	0.16	0.20	0.04	4.98	0.00	<b>0.84</b>	0.17	0.29	0.05	4.93	0.00

*Table 14, Regression Summary for Dependent Variable: 150 M BL 17 R= .84 R<sup>2</sup>= .71 Adjusted R<sup>2</sup>= .68 F(1.10)=24.82 p<.00 Std.Error of estimate: 1.61*

*Table 15, Regression Summary for Dependent Variable: 200 M BL 17 R= .84 R<sup>2</sup>= .70 Adjusted R<sup>2</sup>= .67 F(1.10)=24.32 p<.00 Std.Error of estimate: 2.35*

In Table 14 are presented results of regression line of results of swimming 150 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.84), and coefficient of determination (R<sup>2</sup>=.71), which indicates 71% of common variance. Value of regression coefficients is: beta value (Beta=.20) of swimming 400 m, and significance level of F value  $F(1.10)= 24.82$ , with t-test (10) value is 4.98 at significance level of .00 ( $p<0.00$ ).

Table 15, regression analysis of criterion variable of swimming 200 m (Rally Olimp Banja Luka 2018.) and its effect to criterion variable of swimming 400 m freestyle

In Table 15 are presented results of regression line of results of swimming 200 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.84), and coefficient of determination (R<sup>2</sup>=.70), which indicates 70% of common variance. Value of regression coefficients is: beta value (Beta=.29) of swimming 400 m, and significance level of F value  $F(1.10)= 24.32$ , with t-test (10) value is 4.93 at significance level of .00 ( $p<0.00$ ).

Table 16, regression analysis of criterion variable of swimming 250 m (Rally Olimp Banja Luka 2017) and its effect to criterion variable of swimming 400 m freestyle

<i>Table 16, swimming 250 m Bl 17</i>						<i>Table 17, swimming 300 m BL 17</i>					
<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>	<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b				of b*		of b		
		53.15	21.18	2.50	0.03			53.02	26.52	1.99	0.07
<b>0.84</b>	0.17	0.41	0.08	4.94	0.00	<b>0.85</b>	0.16	0.54	0.10	5.19	0.00

*Table 16, Regression Summary for Dependent Variable: 250 M BL 17 R= .84 R<sup>2</sup>= .71 Adjusted R<sup>2</sup>= .68 F(1.10)=24.50 p<.00 Std.Error of estimate: 3.32*

*Table 17, Regression Summary for Dependent Variable: 300 M BL 17 R= .85 R<sup>2</sup>= .72 Adjusted R<sup>2</sup>= .70 F(1.10)=26.94 p<.00 Std.Error of estimate: 4.16*

In Table 16 are presented results of regression line of results of swimming 250 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.84), and coefficient of determination (R<sup>2</sup>=.71), which indicates 71% of common variance. Value of regression coefficients is: beta value (Beta=.41) of swimming 400 m, and significance level of F value  $F(1.10)= 24.50$ , with t-test (10) value is 4.94 at significance level of .00 ( $p<0.00$ ).

Table 17, regression analysis of criterion variable of swimming 300 m (Rally Olimp Banja Luka 2017) and its effect to criterion variable of swimming 400 m freestyle

In Table 17 are presented results of regression line of results of swimming 300 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.85), and coefficient of determination (R<sup>2</sup>=.70), which indicates 70% of common variance. Value of regression coefficients is: beta value (Beta=.54) of swimming 400 m, and significance level of F value  $F(1.10)= 26.94$ , with t-test (10) value is 5.19 at significance level of .00 ( $p<0.00$ ).

Table 18, regression analysis of criterion variable of swimming 350 m (Rally Olimp Banja Luka 2017) and its effect to criterion variable of swimming 400 m freestyle

<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		94.80	48.46	1.95	0.07
<b>0.64</b>	0.24	0.51	0.19	2.68	0.02

Table 18, Regression Summary for Dependent Variable: 350 M BL 17 R= .64 R<sup>2</sup>= .41 Adjusted R2= .35 F(1.10)=7.60 p<.02 Std.Error of estimate: 7.6

In Table 18 are presented results of regression line of results of swimming 350 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.64), and coefficient of determination (R<sup>2</sup>=.41), which indicates 41% of common variance. Value of regression coefficients is: beta value (Beta=.51) of swimming 400 m, and significance level of F value F(1.10)= 7.60, with t-test (10) value is 2.68 at significance level of .00 (p<0.02).

Table 19, Descriptive statistics (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017). Time trials by sections Table 20, Descriptive statistics (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017). Time trials by sections

Table 19, Time trials by sections Bg

<b>Valid N</b>	<b>Mean</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Std.Dev.</b>
12	28.82	27.76	30.10	0.79
12	31.74	30.08	32.67	0.81
12	32.48	30.30	34.27	1.20
12	32.70	30.76	34.18	1.26
12	32.47	29.64	35.02	1.68
12	32.72	29.98	35.21	1.72
12	32.42	29.30	34.81	1.79
12	31.13	28.08	34.16	2.21

Table 20, Time trials by sections Bg

<b>Valid N</b>	<b>Mean</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Std.Dev.</b>
12	30.14	27.68	31.90	1.46
12	38.01	29.86	61.88	10.31
12	43.96	30.00	94.85	22.20
12	49.61	30.11	128.43	34.43
12	55.21	30.11	161.50	46.58
12	60.75	30.35	195.52	59.03
12	66.31	30.51	228.60	71.30
12	70.57	29.64	261.17	83.84

In Table 19 are presented results of time trials of 50 m freestyle by sections to final result of 400 m through: mean value, minimum, maximum and standard deviation. Minimum times show better results, whereas the largest numeric number is at the same time the poorest overall score in swimming at international Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 in Belgrade.

In Table 20 are presented results of time trials freestyle by sections to final result of 400 m through: mean value, minimum, maximum and standard deviation. Minimum times show better results, whereas the largest numeric number is at the same time the poorest overall score in swimming at international Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 in Belgrade.

Table 21, regression analysis of criterion variable of swimming 50 m (Rally „Memorijal ANTE LAMBAŠA“ 2017) and its effect to criterion variable of swimming 400 m freestyle

Table 21, swimming 50 m Bg 17

<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		9.94	3.30	3.00	0.01
<b>0.89</b>	0.14	0.07	0.01	6.34	0.00

Table 22, swimming 100 m Bg 17

<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		4.17	5.52	0.75	0.46
<b>0.86</b>	0.15	0.85	0.15	5.48	0.00

Table 21, Regression Summary for Dependent Variable: 50 M Bg 17 R= .76 R<sup>2</sup>= .58 Adjusted R2= .54 F(1.10)=14.31 p<.00 Std.Error of estimate: .78

Table 22, Regression Summary for Dependent Variable: 100 M Bg 17 R= .80 R<sup>2</sup>= .65 Adjusted R2= .61 F(1.10)=18.91 p<.00 Std.Error of estimate: 3.02

In Table 21 are presented results of regression line of results of swimming 50 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.76), and coefficient of determination (R<sup>2</sup>=.58), which indicates 58% of common variance. Value of regression coefficients is: beta value (Beta=.07) of swimming 400 m, and significance level of F value F(1.10)= 14.31, with t-test (10) value is 6.34 at significance level of .00 (p<0.00).



Table 22, regression analysis of criterion variable of swimming 100 m (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 and its effect to criterion variable of swimming 400 m freestyle

In Table 22 are presented results of regression line of results of swimming 100 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.80), and coefficient of determination ( $R^2=.65$ ), which indicates 65% of common variance. Value of regression coefficients is: beta value (Beta=.19) of swimming 400 m, and significance level of F value  $F(1.10)= 30.12$ , with t-test (10) value is 4.34 at significance level of .00 ( $p<0.00$ ).

Table 23, regression analysis of criterion variable of swimming 150 m (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 and its effect to criterion variable of swimming 400 m freestyle

<i>Table 23, swimming 150 m Bg 17</i>						<i>Table 24, swimming 200 m Bg 17</i>					
<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>	<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b				of b*		of b		
		35.41	15.65	2.26	0.04			4.15	17.55	0.23	0.81
<b>0.79</b>	0.19	0.22	0.05	4.08	0.00	<b>0.92</b>	0.12	0.46	0.06	7.49	0.00

*Table23, Regression Summary for Dependent Variable: 150 M Bg 17 R= .79 R<sup>2</sup>= .62 Adjusted R2= .58 F(1.10)=16.67 p<.00 Std.Error of estimate: 3.71*

*Table24, Regression Summary for Dependent Variable: 200 M Bg 17 R= .92 R<sup>2</sup>= .84 Adjusted R2= .83 F(1.10)=56.17 p<.00 Std.Error of estimate: 4.16*

In Table 23 are presented results of regression line of results of swimming 150 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.91), and coefficient of determination ( $R^2=.62$ ), which indicates 62% of common variance. Value of regression coefficients is: beta value (Beta=.13) of swimming 400 m, and significance level of F value  $F(1.10)= 16.67$ , with t-test (10) value is 4.08 at significance level of .00 ( $p<0.00$ ).

Table 24, regression analysis of criterion variable of swimming 200 m (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 and its effect to criterion variable of swimming 400 m freestyle

In Table 24 are presented results of regression line of results of swimming 200 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.92), and coefficient of determination ( $R^2=.84$ ), which indicates 84% of common variance. Value of regression coefficients is: beta value (Beta=.46) of swimming 400 m, and significance level of F value  $F(1.10)= 64.67$ , with t-test (10) value is 7.94 at significance level of .00 ( $p<0.00$ ).

Table 25, regression analysis of criterion variable of swimming 250 m (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 and its effect to criterion variable of swimming 400 m freestyle

<i>Table 25, swimming 250 m Bg 17</i>						<i>Table 26, swimming 300 m Bg 17</i>					
<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>	<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b				of b*		of b		
		43.13	27.79	1.55	0.15			-8.13	23.34	-0.34	0.73
<b>0.82</b>	0.17	0.45	0.09	4.59	0.00	<b>0.94</b>	0.10	0.76	0.08	9.26	0.00

*Table25, Regression Summary for Dependent Variable: 250 M Bg 17 R= .82 R<sup>2</sup>= .67 Adjusted R2= .64 F(1.10)=21.07 p<.00 Std.Error of estimate: 6.60*

*Table26, Regression Summary for Dependent Variable: 300 M Bg 17 R= .94 R<sup>2</sup>= .89 Adjusted R2= .88 F(1.10)=85.81 p<.00 Std.Error of estimate: 5.54*

In Table 25 are presented results of regression line of results of swimming 250 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.82), and coefficient of determination ( $R^2=.67$ ), which indicates 67% of common variance. Value of regression coefficients is: beta value (Beta=.45) of swimming 400 m, and significance level of F value  $F(1.10)= 189.04$ , with t-test (10) value is 4.59 at significance level of .00 ( $p<0.00$ ).

Table 26, regression analysis of criterion variable of swimming 300 m (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 and its effect to criterion variable of swimming 400 m freestyle. In Table 27 are presented results of regression line of results of swimming 300 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.94), and coefficient of determination ( $R^2=.89$ ), which indicates 89% of common variance. Value of regression coefficients is: beta value (Beta=.76) of swimming 400 m, and significance level of F value  $F(1.10)= 143.12$ , with t-test (10) value is 9.26 at significance level of .00 ( $p<0.00$ ).

Table 27, regression analysis of criterion variable of swimming 350 m (Rally 25<sup>th</sup> International memorial race “Ante Lambaša“ 2017 and its effect to criterion variable of swimming 400 m freestyle

*Table 27swimming 350 m Bg 17*

<b>b*</b>	<b>Std.Err.</b>	<b>b</b>	<b>Std.Err.</b>	<b>t(10)</b>	<b>p-value</b>
	of b*		of b		
		-16.36	45.87	-0.35	0.72
<b>0.87</b>	0.15	0.92	0.16	5.65	0.00

*Table27, Regression Summary for Dependent Variable: 300 M Bg 17 R= .87 R<sup>2</sup>= .76 Adjusted R2= .73 F(1.10)=32.00 p<.00 Std.Error of estimate: 10.89*

In Table 27 are presented results of regression line of results of swimming 350 m crawl with swimming 400 m freestyle. It is evident from the Table that coefficient of multiple correlation is (R=.87), and coefficient of determination ( $R^2=.76$ ), which indicates 76% of common variance. Value of regression coefficients is: beta value (Beta=.92) of swimming 400 m, and significance level of F value  $F(1.10)= 32.00$ . with t-test (10) value is 5.65 at significance level of .00 ( $p<0.00$ ).

## DISCUSSION

Subject of discussion were results achieved in the following competitions: rally in Banja Luka in 2018 and 2017. Competition took place at the community Olympic pool “GOB“ in Banja Luka with dimensions 50 m with 10 lanes. and the third sub-sample was from result success rate at 25<sup>th</sup> International Swimming rally 25<sup>th</sup> International memorial race “Ante Lambaša“ organised by swimming club “Barakuda”, held in Novi Beograd, Belgrade on 4<sup>th</sup> and 5<sup>th</sup> March 2017.

Results of regression line of swimming 2018 in Banja Luka are as follows: 50 m crawl with swimming 400 m freestyle, coefficient of multiple correlation is (R=.68), and coefficient of determination ( $R^2=.58$ ), which indicates 58% of common variance, regression line of the results of swimming 50 m crawl with swimming 400 m freestyle.

Results of swimming 100 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation (R=.75), and coefficient of determination ( $R^2=.52$ ), which indicates 52% of common variance. Value of regression coefficients is: beta value (Beta=.17) of swimming 400 m, and significance level of F value  $F(1.10)= 13.15$ , with t-test (10) value is 4.42 at significance level of .00 ( $p<0.00$ ).

Results of swimming 150 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation (R=.82), and coefficient of determination ( $R^2=.65$ ), which indicates 65% of common variance. Value of regression coefficients is: beta value (Beta=.21) of swimming 400 m, and significance level of F value  $F(1.10)= 21.45$ , with t-test (10) value is 4.63 at significance level of .00 ( $p<0.00$ ).

Results of swimming 200 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation is (R=.82), a coefficient of determination ( $R^2=.67$ ), which indicates 67% of common variance. Value of regression coefficients is: beta value (Beta=.30) of swimming 400 m, and significance level of F value  $F(1.10)= 20.57$ , with t-test (10) value is 4.53 at significance level of .00 ( $p<0.00$ ).

Results of swimming 250 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation (R=.81), and coefficient of determination ( $R^2=.67$ ), which indicates 67% of common variance. Value of regression coefficients is: beta value (Beta=.43) of swimming 400 m, and significance level of F value  $F(1.10)= 20.48$ , with t-test (10) value is 4.52 at significance level of .00 ( $p<0.00$ ).

Results of swimming 250 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation is ( $R=.84$ ), and coefficient of determination ( $R^2=.71$ ), which indicates 71% of common variance. Value of regression coefficients is: beta value ( $Beta=.41$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 24.50$ , with t-test (10) value is 4.94 at significance level of .00 ( $p<0.00$ ).

Results of swimming 300 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.82$ ), and coefficient of determination ( $R^2=.68$ ), which indicates 68% of common variance. Value of regression coefficients is: beta value ( $Beta=.57$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 38.11$ , with t-test (10) value is 4.69 at significance level of .00 ( $p<0.00$ ).

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Results of swimming 50 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.76$ ), and coefficient of determination ( $R^2=.58$ ), which indicates 58% of common variance. Value of regression coefficients is: beta value ( $Beta=.05$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 14.31$ , with t-test (10) value is 3.78 at significance level of .00 ( $p<0.00$ ).

Results of swimming 100 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.79$ ), and coefficient of determination ( $R^2=.59$ ), which indicates 59% of common variance. Value of regression coefficients is: beta value ( $Beta=.11$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 16.94$ , with t-test (10) value is 4.11 at significance level of .00 ( $p<0.00$ ).

Results of swimming 150 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.84$ ), and coefficient of determination ( $R^2=.71$ ), which indicates 71% of common variance. Value of regression coefficients is: beta value ( $Beta=.20$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 24.82$ , with t-test (10) value is 4.98 at significance level of .00 ( $p<0.00$ ).

Results of swimming 200 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.84$ ), a coefficient of determination ( $R^2=.70$ ), which indicates 70% of common variance. Value of regression coefficients is: beta value ( $Beta=.29$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 24.32$ , with t-test (10) value is 4.93 at significance level of .00 ( $p<0.00$ ).

Results of swimming 250 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.84$ ), and coefficient of determination ( $R^2=.71$ ), which indicates 71% of common variance. Value of regression coefficients is: beta value ( $Beta=.41$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 24.50$ , with t-test (10) value is 4.94 at significance level of .00 ( $p<0.00$ ).

Results of swimming 300 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.85$ ), and coefficient of determination ( $R^2=.70$ ), which indicates 70% of common variance. Value of regression coefficients is: beta value ( $Beta=.54$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 26.94$ , with t-test (10) value is 5.19 at significance level of .00 ( $p<0.00$ ).

Results of swimming 350 m crawl with swimming 400 m freestyle have: coefficient of multiple correlation ( $R=.64$ ), a coefficient of determination ( $R^2=.41$ ), which indicates 41% of common variance. Value of regression coefficients is: beta value ( $Beta=.51$ ) of swimming 400 m, and significance level of F value  $F(1,10)= 7.60$ , with t-test (10) value is 2.68 at significance level of .00 ( $p<0.02$ ).

## CONCLUSION

Sample of 36 participants is divided to three sub-samples by 12 swimmers, participants of Open Championship of Bosnia and Herzegovina in 2017 and 2018, as well as rally at 25<sup>th</sup> International Competition Memorijal „Ante Lambaša“ in Belgrade, Serbia. For the purpose of research were used records from swimming competitions, i.e. time trials and final results of swimming freestyle 400 m.

Research was conducted with the aim of establishing the influence of swimming sections (50m, 100m, 150m, 200m, 250m, 300m and 350m) as predictor set of variables to criterion variable of result success rate of swimming 400 m freestyle. Obtained results of the regression analysis indicate statistically significant connection of the set of variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) to criterion variable of swimming 400 m freestyle. Value of coefficients of multiple correlation which determine the influence of the set of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) to criterion variable of swimming 400 m freestyle is: for 50 m 42%, 100 m 52%, 150 m 60%, 200 m 61%, 250 m 71%, 300 m 77%, 350 m 78% of common variance of swimmers at Rally Olimp Banja Luka in 2018.

Value of coefficients of multiple korelacije which determine the influence of set of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) to criterion variable of swimming 400 m freestyle is: for 50 m 58%, 100 m 59%, 150 m 66%, 200 m 61%, 250 m 71%, 300 m 70%, 350 m 35% of common variance of swimmers at the Rally Olimp Banja Luka in 2017.

Value of coefficients of multiple correlation which determine the influence of set of predictor variables to criterion variable of swimming 400 m freestyle is: for 50 m 61%, 100 m 75%, 150 m 83%, 200 m 67%, 250 m 68%, 300 m 93%, 350 m 96% of common variance of swimmers at Rally 25<sup>th</sup> International memorial race "Ante Lambaša" in 2017 in Belgrade.

Set of predictor variables (50m, 100m, 150m, 200m, 250m, 300m and 350m) of swimming freestyle has significant percentage of influence to criterion variable of 400 m freestyle of swimmers at Rally 25<sup>th</sup> International memorial race "Ante Lambaša" in Serbia (Novi Beograd 2017) in comparison to the one of swimmers at Open Championship of Bosnia and Herzegovina (Rally Olimp Banja Luka 2018 and 2017).

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Correspondence for author

PhD. Milomir Trivun, associate professor  
Faculty of Physical Education and Sport,  
University of East Sarajevo, Bosnia and Herzegovina  
E-mail: milomirtrivun@gmail.com