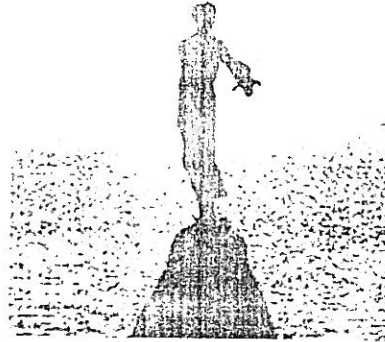


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CORRELATION OF CERTAIN MOTOR TESTS WITH PERFORMANCE OF BOYS AGED 12-13 IN WRESTLING

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Introduction

Wrestling is a sport of extremely long tradition and appertains to the group of sports defined by polystructural acyclic motions and high complexity (even in the Graeco-Roman style over 400 technical elements, standing and par terre, are registered; the free style not to be mentioned) Therefore, a high level of physical attributes and abilities is required of competitors, which are, more or less, trainable by the kinesiological operators' application during a treatment in transformational process. Successfulness is assessed usually by the two criteria – rate of the acquisition of wrestling techniques and performance in competitive combats. A vast number of anthropological variables influence results in the both criteria, but here the focus will be only on several of them. The aim of the study is to determine correlation between certain motor abilities, assessed by the standardized battery of tests applied yearly in all Croatian schools, and performance of boys in the Graeco-Roman wrestling. The obtained results should enable a more realistic approach to introducing the modified technique of wrestling in PE teaching in elementary and secondary schools. Simultaneously, coaches may use tests in selection, monitoring and testing younger age groups of wrestlers.

Methods

Sample of examinees consisted of 50 boys, aged 12-13, from the Zagreb wrestling sport clubs "Zagreb", "Petar Zrinski" and "Metalac". The age of the subjects indicate relatively unstable developmental phase of their motor, morphological and other psychosocial dimensions. Since the participants are selected wrestlers who have been chosen for the study, the sample is considered stratified.

Sample of variables consists of 6 predictor variables, which assess motor abilities and are regularly used in the Croatian schools (Findak et al., 1996): *polygon backwards* (MPN), *standing long jump* (MSD), *pull-up hang* (MIV), *sit-and-reach* (MPR), *sit-ups in 1 min* (MPT) and *hand tapping* (MTR), and 2 criterion variables: *sum of victories* (ZPP - a winner was awarded one point for the victory of his own and all the points of the defeated rival were added to his sum) and *competitiveness* (BORB). The participants had two-minute bouts which were continued even if one of the rivals had scored a fall and been awarded five points. Referees awarded points, while 3 coaches, who trained the fighters, rated competitiveness on the 1-7 scale.

Data processing methods. The data were processed by the standard descriptive methods. Further, matrices of intercorrelations among predictor variables were computed. Relations between particular measures of general motor abilities and performance in a classical wrestling bout were determined by means of multiple regression analyses.

Results and discussion

Descriptive parameters of predictor and criterion variable are displayed in table 1. The motor variable *polygon backwards* (MPN) has conspicuously negatively (inverse scaling – the shorter the time, the better the results) asymmetric and leptokurtic distribution, meaning the results of most of the examinees are very high on that variable, eventually suggesting high homogeneity of the sample. It is similar to results obtained in previous studies which confirms the well-documented inference that wrestlers are highly coordinated athletes. In the variable assessing explosive power of legs, *standing long jump* (MSD), a part of the sample achieved a

somewhat lower results. It indicates that some of the participants have not yet developed explosive power of legs, what has been expected for their chronological age.

Tablica 1. Descriptive parameters of results on the predictor and criterion variables

	VARIABLE	Mean	Minimum	Maximum	Std. Dev	Skewness	Kurtosis
1.	MPN	11.1265	7.8	21.1	2.52354	2.122703	5.94553
2.	MSD	194.5306	154	240	15.60334	0.177938	0.44726
3.	MIV	51.16	3	107	24.6298	0.052112	-0.72297
4.	MPR	57.96	32	86	9.96107	-0.07706	0.87007
5.	MPT	45.96	31	62	8.32003	0.025138	-0.81491
6.	MTR	27.1429	20	34	3.38502	-0.02736	-0.77034
7.	ZPP	4	0	10	3.67007	0.567655	-1.09488
8.	BORB	4.64	2	7	1.45350	0.333231	-0.82585

Intercorrelations among the predictor variables are presented in Table 2. Out of the total of 30 coefficients of correlation in the obtained matrix, only the two of them are not statistically significant, whereas 28 of them are statistically significant at the significance level of $p < .05$.

Table 2. Intercorrelations of the predictor variables

VARIJABLE	MPN	MSD	MIV	MPR	MPT	MTR
MPN	1.00	-.58	-.40	-.35	-.55	-.47
MSD	-.58	1.00	.38	.28	.33	.35
MIV	-.40	.38	1.00	.27	.42	.37
MPR	-.35	.28	.27	1.00	.40	.43
MPT	-.55	.33	.42	.40	1.00	.39
MTR	-.47	.35	.37	.43	.39	1.00

The greatest correlation (.55; statistically significant) is registered between variables assessing coordination (MPN - *polygon backwards*) and explosive power (SDM - *standing long jump*). The authors interpret the result by the measuring characteristic of *polygon backwards* - it measures speed, too, besides coordination, and by the fact that the explosive power measures are highly correlated with speed.

Regression analyses results.

Table 3. Regression analysis on the variable sum of victories (ZPP)

Dependent variable: SUM OF VICTORIES (ZPP)

Multiple R: .656736916

Determination coefficient: .431303377

Number of cases: 49

F (6, 42) = 5.308847 p < 0.001

Standard error of estimate: 2.952218409

VARIABLE	Beta	Partial correlation	Determination coeff.	t- test	p
MPN	-.095385	-.088155	.510445	-.573542	.569337
MSD	.075124	.078984	.367421	.513479	.610307
MIV	.283066	.305571	.269026	2.079806	.043684
MPR	.061087	.069799	.253897	.453456	.652554
MPT	.171755	.175671	.386136	1.156459	.254029
MTR	.219666	.232368	.327310	1.548298	.129054

In Table 3 correlation is obvious between the predictor variables and the criterion variable *sum of victories (ZZP)* at the level of significance of $p < .01$. The obtained coefficient of multiple correlation quotes .656. In accordance with it is the coefficient of determination of .43, meaning that the obtained multiple correlation explains 43% of the criterion variable variance.

The survey of the established relations of the manifested variables and partialization of the criterion variable makes it obvious that significant contribution to explanation of the criterion variable variance has been registered for the variable *pull-up hang (MIV)*, with the β coefficient of .28 at the significance level of $p < .05$. That means that arm and shoulder strength influences significantly the criterion variable *sum of victories (ZZP)* because boys of that age, being unexperienced in wrestling, perform predominantly techniques while in *par terre* position (arm hold, forward neck-tie, throw from a trunk hold). Arm and shoulder strength is very important for providing a fighter with a favourable position for the standing technique performance (side throw from the arm and head hold, shoulder throw, overarm takedown, as well as for the bridge breaking in the *par terre* position, which situation occurs frequently with the wrestlers of that age. Besides strength, the speed of the simple movements performance (MTR – hand tapping) also contributes (β coefficient of .21) to the criterion variance explanation. Interesting is also the work by Marić (1990) in which the author determined the greatest contribution to the criterion variable for the variables *20m running* and *50 m running* (both executed from the crouch start) and *body weight*. By these results he confirmed that longer engagement in wrestling positively influences development of motor abilities and active muscular mass.

Table 4. Regression analysis on the variable competitiveness (BORB)

Dependent Variable: COMPETITIVENESS (BORB)

Multiple R: .666041937

Number of cases: 49

Multiple R-Square: .443611862

$F(6, 42) = 5.581145$ $p < .000251$

Adjusted R-Square: .364127843

Standard Error of Estimate: 1.155425076

VARIABLE	Beta	Partial correlation	Determination coeff.	t- test	p
MPN	-.401676	-.352584	.510445	-2.44181	.018906
MSD	.060921	.064822	.367421	.42098	.675916
MIV	.252635	.278145	.269026	1.87664	.067527
MPR	-.078147	-.090126	.253897	-.58647	.560699
MPT	-.022732	-.023871	.386136	-.15475	.877763
MTR	.192248	.206818	.327310	1.36995	.177982

In the Table 4 correlation is obvious between the predictor variables and the criterion variable *competitiveness (BORB)* at the level of significance of $p < .01$. The obtained coefficient of multiple correlation quotes .66. In accordance with it is the coefficient of determination of .44, meaning that the obtained multiple correlation explains 44% of the criterion variable variance.

The survey of the established relations of the manifested variables and partialization of the criterion variable makes it obvious that the only significant contribution to explanation of the criterion variable variance has been registered for the variable *polygon backwards* (MPN), with the β coefficient of $-.40$. (inversed scaling) at the significance level of $p < .05$. Additionally, high positive influence on the criterion variable was registered for the variable *pull-up hang* (β coefficient of $.25$, which is very close to become statistically significant). The obtained results can be interpreted like this: boys with a higher level of coordination are quicker and better learners when the fundamental skills of wrestling are concerned. In addition, higher levels of arm and shoulder strength also contribute to their stronger self-assurance, which eventually allows them to lead, to be predominant (more aggressive) in a bout.

Wrestling is therefore a useful kinesiological operator when regarding children - it undoubtedly helps their natural aggressiveness to be instrumentalized through training and regulated fights. Children with anxiety become more self-confident, which may help them in solving problems later in adulthood. Therefore, wrestling should be regarded not only as physically complex operator, but the psychological one, as well. These characteristics make that ancient sport a comprehensive and beneficial kinesiological operator (sporting activity).

Conclusion

The obtained results indicate that the applied motor tests explained over 43% of the criterion variables' variance. The greatest influence was registered for the variables that measure coordination and arm strength. These anthropological dimensions are the leading factors /abilities in the wrestling specification equation. It quotes for children: coordination + strength + speed, whereas for the adult wrestlers it goes like: strength + speed + coordination (Marić, 1982). Hence, the applied battery of motor tests can be recommended for the processes of selection, monitoring and conditioning diagnostics that are implemented in the training of young wrestlers.

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