

ORIGINAL SCIENTIFIC PAPER**Borislav Cicović¹, Dalibor Stević¹, Marko Spasojević²**¹Faculty of Physical Education and Sport East Sarajevo²Postgraduate student, the Faculty of Physical Education and Sport, Pale

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**DIFFERENCES IN REPETITIVE STRENGTH AND COORDINATION
BETWEEN JUDO ATHLETES AND NON-ATHLETES****Abstract**

This study was conducted in order to determine the differences in some motor variables between male judo athletes and non-athletes, between 14 and 15 years old. A sample of 40 boys was divided into two subsamples: the sample (A) consisted of 20 judo athletes and sample (B) consisted of 20 students-athletes who attended only the regular Physical Education. Investigation with the aid of T-test, discriminant functions of motor abilities and canonical coefficient correlation showed that the respondents who were engaged in judo sport were statistically significantly different in all 3 repetitive power variables and four variables for checking of the coordination. A statistically significant difference is not found in the test MS3M (slalom with three medicine ball), which justifies the complexity of the embodiments of this test. Such a difference in benefit of judo athletes was probably a result of training impact and training work.

Key words: judo, non-athletes, repetitive strength, coordination, test

1. INTRODUCTION

Judo as a sport is among those sports of semi structural and acyclic movements with very complex elements that are performed at different stages of the fight. Both the performing success of the given technique and the fight is dependent of many factors and dimensions. Coordination, strength and speed occupies the specification of the motor space in judo sport for younger categories. (Sertic, 1997). Motor skills discriminate successful judoists from less successful ones in a great extent (Franchini, E. et al., 2001.; Krstulovic, S. et al. 2005), so it is therefore necessary to take such an important criterion for selection. Motor possibilities among pupils are primarily the result of the interaction of biological heritage, the legality of growth and development, as well as their adaptation to other types and frequency of physical activity (Svoboda et al., 2005). Each additional forms of involvement in physical activity, despite their regular Physical Education is of great benefit and importance for every young man (Findak, 2002).

The variety and multitude of technical elements, tactics, movements of the whole body and limbs in different directions with variable intensity and varying pace are typical for judo sport. During the judo fights dynamic situation with various changes in the position of both opponents are constantly changing which requires good dynamic stereotypes of movements, combination and throws, but also a good ability for efficiently and quickly performing of reorganization of these dynamic stereotypes. Constantly creation of new programs, offensive, defensive and against offensive actions during combat are necessary. Judo is characterized by a large number of techniques and their complexity, which requires the adoption of enormous amount of information by judo athlete, enabling him to perceive the essential elements of the techniques to be able to predict the intentions of opponents and to react adequately. Functional capabilities in judo athletes, must be extremely emphasized due to the high energy consumption during a fight and relatively long-term activity. Without a well-developed functional activity it is impossible to achieve good results in tournaments and individual championships, where in one day competition in judo athletes fight several times. Modern judo requires that judo fight is performed in a relatively short period, by a very rapid tempo and that it has many tactical and technical elements. Top judo athletes must be versatile, and in their repertoire requires several interventions „specialty” of different groups of techniques, different tactics for each procedure, as well as they need to cope with different opponents. This complex activity of judo athlete during the fight requires also adequate capabilities and characteristics, and the corresponding dimension of psychosomatic status (Stefan Cuk, 2011).

2. METHODS

The sample consists of two samples of respondents, namely: subsample consists(A) of the 20 boys who are actively engaged in the sport of judo (Judo club „Rajko Kusic” Pale), and the subsample (B) consists of 20 pupils 14 to 15 years old who are athletes of Elementary school („Pale”), attending a regular Physical Education.

It's been applied three tests in order to estimate the repetitive force: pushups (FSK), lifting the torso on the Swedish bench (MDTK), squats (CUC). Evaluation of coordination was performed by using five tests: slalom with three medicine balls (MS3M), agility in the air (MOZ), coordination with the bat (MKO), agility on the ground (MAGONT), slalom with legs with two balls (MSN2L).

Measurements among judo athletes and non-athletes were performed at the same time of the day between 2 pm and 6 pm. The room in which the measure was done was big and light enough and comfortable in the sense of warmth. All measurements were conducted by the same person, with the aid of the same tests, with the same measuring instruments (meter, stopwatch). The sequence of measurement for the implementation of motor tests was the same for all respondents. All individual tests were demonstrated before the test itself was performed (if the test is not otherwise specified), without the trial attempt (if the test is not otherwise specified).

The data obtained in this study were processed by T-test for independent samples, using the statistical software package SPSS 20.0.

3. RESULTS AND DISCUSSION RESEARCH

Table 1. The significance of the differences in tests of repetitive strength between judo athletes and non-athletes by the using of T-test.

	Judo athletes (A) N=20 (Mean)	Non-athletes (B) N=20 (Mean)	T-value	df	Sig.
MSK	19.45	7.85	5.79	38	.000*
MDKT	29.40	22.05	2.48	38	.018*
CUC	36.15	23.00	2.38	38	.022*

Legend: The number of respondents (N), mean (Mean), a T-test (T-value), degrees of freedom (df), the overall statistical significance (Sig.)

Table 1 shows the results of T-test administered tests for the evaluation of repetitive strength between judo athletes and non-athletes. The analysis of the obtained results can be concluded that there are statistically significant differences between groups for all tests in favor of judo athletes at the level of 95%.

Table 2. The significance of differences in tests of coordination between judo athletes and non-athletes, tested using the T-test.

	Judo athletes (A) N=20 (Mean)	Non-athletes (B) N=20 (Mean)	T-value	df	Sig.
MS3M	36.39	35.78	0.274	38	.786
MOZ	4.57	6.49	-3.42	38	.001*
MKO	4.74	6.36	-3.50	38	.001*
MAGONT	25.72	32.20	-3.39	38	.002*
MSN2L	35.64	31.11	2.52	38	.016*

Legend: The number of respondents (N), mean (Mean), a T-test (T-value), degrees of freedom (df), the overall statistical significance (Sig.)

Table 2 shows the results of T-test applied for the assessment of coordination between judo athletes and non-athletes. With the analysis of the obtained results it can be concluded that there are statistically significant differences between groups for all tests in favor of judo athletes at the level of 95%, except in the test MS3M (slalom with 3 medicine balls) with the value of Sig. .786, which is not statistically significant.

Table 3. Significance of the isolated discriminant function motor skills

Function	Eigenvalue	Wilks's Lambda	Chi- square	Cannon. R	df	Sig.
1	1.655	.377	33.19	.789	8	.000*

Legend: square coefficient of discrimination (Eigenvalue), canonical correlation coefficient (Cannon, R), the value of Bartlett's test (Wilks' Lambda), degrees of freedom (df), the overall statistical significance (Sig.)

In th Table 3 is showed the obtained substantial high discriminant function (Cannon. R = 78%), It indicates the level of the correlation data set where the discriminant analysis was conducted of the results. The aforementioned discriminative power variables was expressed over the Wilks' Lambda test, which is a medium-high (.377), confirming that the

differences between the groups in the area of used motor tests are statistically significant (Sig. = .000). The results indicate the existence of differences in applied tests between judo athletes and non-athletes

Table 4. Factor structure of the isolated discriminant function motor skills.

Motorical tests	Root 1
MSK	.731
MDKT	.313
CUC	.301
MS3M	.135
MOZ	-.432
MKO	-.442
MAGONT	-.429
MSN2L	.319

Table 4 shows the structure of discriminative function variables of motor abilities in the formation of important functions. The greatest impact has a test for evaluating repetitive strength: push-ups (MSK .731) and test for the evaluation of coordination: slalom legs with two balls (MSN2L .319). Other tests are shown in the table. The results showed significantly difference between athletes and non-athletes.

Table 5. Focus groups

Students	Root 1
Judo athletes (A)	1.252
Non-athletes (B)	-1.252

Table 5 centroids, which represent the arithmetic mean of the group and indicate that their discrimination is significant. Based on the values of the chapters (Root 1) it is clear that the judo athletes are better in almost all applied tests.

Table 6. Matrix classification

		1. judo athletes (A); 2.Non-athletes (B)	Predicted Group Membership		Total
			JUDO ATHLETES (A)	NON-ATHLETES. (B)	
Original	Count	JUDO ATHLETES (A)	18	2	20
		NON-ATHLETES (B)	2	18	20
	%	JUDO ATHLETES (A)	90,0	10,0	100,0
		NON-ATHLETES. (B)	10,0	90,0	100,0
Cross-validated ^a	Count	JUDO ATHLETES(A)	16	4	20
		NON-ATHLETES. (B)	4	16	20
	%	JUDO ATHLETES (A)	80,0	20,0	100,0
		NON-ATHLETES. (B)	20,0	80,0	100,0

From Table 6, it is concluded that training in judo clubs among judo athletes is leading to more improved results of motor tests, compared to non-athletes who are performing Physical Education in schools.

4. CONCLUSION

According to the results obtained from tests for assessment of motor abilities among the boys from 14 to 16 years old, it can be concluded that a judo sport has a considerable effect on the changes in some motor skills among the students athletes who are engaged in judo compared to those non-athletes. (Cicović, 2009; Lulzim, 2011). Based on the applied T-test and analysis that contributed to differentiate respondents of judo athletes from non-athletes, the differences are significant.

The changes were not recorded in the test slalom with three medicine ball that we can justify because of the complexity of performing this test, especially in the stated age. Research (and Drida Bala, 2010) showed that the young judo athletes (11-16 god.) compared to their peers who are not involved in sports are better at the repetitive exercises and with the static strength exercises, running speed and coordination of the whole body. Bearing in mind the fact that a large number of Physical Education teachers attaches very great importance to monitoring the development of motor skills of students (Milanovic, Radisavljevic Pasic, 2010), the results of this research can serve as a kind of a model for improving of Physical Education in school. The idea of improving the teaching of Physical Education with the judo elements and elements from the other fighting sports is not new (Kasum and Cirkovic, 2009), and the results of this study proves this idea.

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