THE EFFECTS OF TEACHING MARTIAL ARTS TECHNIQUES IN A SELECTED SAMPLE

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ABSTRACT

The aim of this research is to determine to what extent the implementation of the training of martial arts techniques will cause changes in the morphological characteristics and motor skills in the selected sample. The sample of respondents were cadets at the basic police training at the Police Training Unit – Police Academy for the Special Police Unit. The initial measurement of morphological characteristics and motor abilities was carried out at the beginning of the training, and the final measurement after completion of the first phase of training lasting fifteen weeks. All respondents went through the selection process, which differs from the selection for the police officer of general jurisdiction in that the cadets for the Special Police Unit pass through a psychophysical endurance test in extreme situations that lasts for seven days. The sample of variables is classified into five groups, one group being related to the morphological characteristics, and the remaining four groups of variables on motor abilities. It can be concluded that the teaching program of martial arts techniques in the selected sample caused statistically significant influence in most of the tested variables in favor of final measurement.

Key words: Special Police Unit, effects, martial arts, cadets, selected sample, police.

INTRODUCTION

The primary goal of this research was to determine the effects of training martial arts techniques on motor skills and morphological characteristics of the selected sample. The sample of respondents were cadets at the basic police training at the Police Training Unit – Police Academy for the Special Police Unit. All respondents went through four stages of testing, such as: medical examination of category A, testing of motor abilities, general information test and interview. After the successful completion of the previous four phases of the testing, cadets approach the final check that is reflected in the check of psychophysical endurance in extreme situations: it consists in bringing candidates into situations of psychophysical tension in which they are expected a certain form of behavior. During the examination, candidates solve specific tasks, and they are exposed to constant psychological and physical efforts. The training program in this research involved the training of martial arts techniques of cadets of basic police training for members of the Special Police Unit through the subject Special Physical Education. The SPE program lasts all three phases of the basic police training, and the aim is to train cadets that they can independently use physical strength with elements of martial arts and at the same time one of the most commonly used means

of force during the execution of official tasks and the tasks of the police officer and only when legal conditions have been created. The research was conducted during the first phase of the training lasting 15 weeks and with the realized fund of 49 classes. To evaluate the effects of training martial arts techniques in the selected sample, a group of variables was used to evaluate certain morphological characteristics, the maximum isometric force, explosive strength, repetitive strength and locomotion.

METHODS

During the training process the transfer of skills and knowledge from the SPE program, and depending on the complexity and connection of the elements that should form a logical sequence, different methods of learning apply. Learning of simple technical elements and motor programs was carried out using the synthetic method (methods of the whole), while in the training of complex elements of martial arts an analytical method (method of learning the whole by parts) was applied, but immediately after learning by parts, the learning of the technique as a whole. Starting from the specificity of the need for a police officer to effectively undertake security tasks and tasks in critical moment and the necessity for every use of force to be in accor-

dance with the law, the SPE is divided into thematic areas and harmonized with legislation in five teaching areas. Areas are defined by a logical line from simple to complex, and during the first phase of the training in which the research was carried out three areas were carried out, which are: basic elements of the SPE program such as basic elements of the SPE program, defense against unarmed attackers and overcoming passive and active resistance.

Measurement of morphological characteristics and motor abilities was carried out during the first phase of basic police training, initial measurement at the beginning of training and finite measurements at the end of the first phase of training lasting fifteen weeks. The morphological characteristics were measured by the Tanita BC 418-MA III body composition analyzer and included measuring body weight, body mass index and measurement of fat percentage. The variables of the motor skills included in this study were those for which previous studies have been found to cover the area that dominates in professional work performed by the police (Milošević, 1988; Milošević & Zulić, 1986, 89-92; Copay & Charles, 2001, 32-39). The group of variables referring to the maximum isometric force was measured by a tensiometric probe with

a maximum force of measurement of 7500 nm (N) at a sensitivity range of 1.25 N, and all raw data are archived on a computer, the data are automatically processed for each respondent after archiving individually, calculating the maximum achieved F max. It consists of: a platform with a hook, a tensiometric probe, an electronic force display, a bar with a hook and a chain (Dopsaj et al. 2010). Explosion measurement was performed using the Physical Ability Test 02 - PAT 02 (UNO-LEX, Novi Sad, Serbia, according to Jankovic, 2015). The Ergo Timer Globus system was used to measure the movement speed of the respondent. Measurement of repetitive power is done using standardized capability tests such as: push up, abdominal muscle strength, chin up test. The locomotion was measured by the use of tests agility T- test, Cooper 12 minut test, ground agility test.

Basic statistical methods, descriptive statistics were applied such as mean, standard deviation, minimal and maximum values, range, skewness and kurtosis. For the determination of statistically significant differences in morphological characteristics and motor abilities between the subjects on the initial and final measurement, the T test of paired samples was applied.

Table 1. Results of descriptive statistics of the selected sample

Variable	Phase	Mean	SD	Min	Max	Range	Skew	Kurt
fat%	initially	11,03	2,81	7	17,5	10,5	0,34	-0,79
	final	12,46	3,12	7,1	18,9	11,8	0,4	-0,43
tm (kg)	initially	81,91	7,18	71,9	98,3	26,4	0,41	-0,67
	final	83,73	7,38	72,2	99,6	27,4	0,26	-1,06
BMI(kg/m ²)	initially	25,23	1,53	22,3	28,6	6,3	0,01	-0,49
	final	25,67	1,66	22,5	30,9	8,4	0,69	1,24
MrVu Fmax (N)	initially	144,59	23,4	94,2	204,2	110	0,05	0,14
	final	151,31	20,45	96	201,3	105,3	-0,1	0,49
Noge Fmax(N)	initially	129,15	25,3	68,8	186	117,2	-0,22	0,51
	final	136,53	19,49	98	173,1	75,1	-0,14	-0,76
t100 (s)	initially	13,13	0,6	12,06	14,33	2,27	-0,12	-0,64
	final	13,39	0,56	12,3	14,47	2,17	0,14	-0,53
vis (cm)	initially	42,77	5,2	34,3	61,6	27,3	1,1	3
	final	43,61	5,43	34	58	24	0,45	0,24
dalj (cm)	initially	235,5	12,6	209	272	63	0,87	1,6
	final	244	12,1	228	280	52	1	0,93
zgib (rep)	initially	14,55	4,73	5	25	20	0,11	-0,06
	final	16,15	4,68	5	25	20	-0,05	-0,21
sklek (rep)	initially	46,25	9,28	24	63	39	-0,48	-0,16
	final	57,6	9,87	27	75	48	-0,72	1,41

ptsp (rep)	initially	49,43	6,06	40	64	24	0,65	0
	final	59,88	5,14	45	72	27	-0,38	1,1
ttest (s)	initially	10,65	0,49	9,9	11,69	1,79	0,56	-0,37
	final	10,09	0,49	9,16	11,25	2,09	0,55	0,23
pn (s)	initially	8,37	0,85	5,85	10,03	4,18	-0,39	0,53
	final	8,31	0,75	6,62	10,32	3,7	0,46	0,88
oss (s)	initially	17,62	0,9	16,09	19,54	3,45	0,26	-0,73
	final	17,22	0,94	15	20,15	5,15	0,48	1,38
kuper (m)	initially	2962,6	226,2	2720	3520	800	1,33	0,79
	final	2997,5	204,3	2670	3480	810	0,91	0,41

Legend: Mean – aritmetical mean; SD – standard deviation; Min. – minimum value; Max. – maximum value; Range – range of results; Skew. – coefficient of curvature; Kutr. – coefficient of roundness.

Observing the results of descriptive statistics, it is noticeable that the difference between the results obtained on the final measurement in almost all variables. it is evident improvement of the mean value towards better results in variables that have been testing certain types of strenght. On the other hand, it is also evident that there has been an increase in the results of the morphological characteristics (fat%, tm and BMI) of the sampled sample which probably led to a slight deterioration of the

results in the variables that were examining the locomotion, such as variable t100 (100 meter run).

DIFFERENCESS BETWEEN INITIAL AND FINAL MEASUREMENTS

For the determination of statistically significant differences in morphological characteristics and motor abilities between the respondents at the initial and final measurements, the T test of paired samples was applied.

Table 2. *Significance of differences in morphological characteristics, initial - final measurement (T-test of paired samples)*

Variable	Mean Differences	SD	t	df	Sig. (2-tailed)
TM-I vs. TM-F	-1,83	±2,40	-4,811	39	,000**
BMI-I vs. BMI-F	-0,43	±0,82	-3,324	39	,002**
FAT-I vs. FAT-F	-1,43	±1,73	-5,230	39	,000**

Legend: I –initial measurement; F – final measurement; Mean Differences – difference between aritmetica mean initial – final measurement; SD – standard deviation; t – value; df – number of degree of freedom; Sig. (2-tailed) – level of significance; * - Sig. < 0.05; ** - Sig. < 0.01

Statistically significant differences in the morphological characteristics of the subjects between the initial and final measurements were examined by the T-test of the paired samples (Table 2). By ana-

lyzing the results obtained by the statistical procedure, statistically significant differences were found for all variables in favor of the final measurement, at the significance level of 0.01.

Table 3. *Significance of differences in in maximum isometric force, initial - final measurement (T-test of paired samples)*

Variable	Mean Differences	SD	t	df	Sig. (2-tailed)
F _{max} LEDA-I vs. F _{max} LEDA -F	-6,72	±15,45	-2,749	39	,009**
F _{max} NOGE-I vs. F _{max} NOGE-F	-7,38	±17,01	-2,743	39	,009**

Legend: I –initial measurement; F – final measurement; Mean Differences – difference between aritmetica mean initial – final measurement; SD – standard deviation; t – value; df – number of degree of freedom; Sig. (2-tailed) – level of significance; * - Sig. < 0.05; ** - Sig. < 0.01

Statistically significant differences in the variables for estimating the maximum isometric force of the subjects between the initial and final measurements were examined with the T-test of the paired samples (Table 3). Analyzing the obtained

results with the above statistical procedure, statistically significant differences were found for all variables of the maximum isometric force in favor of the final measurement, at the significance level of 0.01.

Table 4. Significance of differences in explosivity, initial - final measurement
(T-test of paired samples)

Variable	Mean Differences	SD	t	df	Sig. (2-tailed)
VIS-I vs. VIS-F	-0,84	±4,10	-1,297	39	,202
DALJ-I vs. DALJ-F	-8,52	±7,73	-6,976	39	,000**
TR100-I vs. TR100-F	-0,25	±0,41	-3,938	39	,000**

Legend: I – initial measurement; F – final measurement; Mean Differences – difference between arithmetic mean initial – final measurement; SD – standard deviation; t – value; df – number of degree of freedom; Sig. (2-tailed) – level of significance; * - Sig. < 0.05; ** - Sig. < 0.01

Statistically significant differences in the variables for assessing the explosiveness of the subjects between the initial and final measurements were examined with the T-test of the paired samples (Table 4). By analyzing the results obtained by the statistical procedure, statistically significant dif-

ferences were found in the two variables in favor of the final measurement (DALJ, TR100) at a significance level of 0.01, while in one variable for the assessment of explosiveness (VIS) no statistically significant differences were detected between the measurements.

Table 5. Significance of differences in repetitive strength, initial - final measurement
(T-test of paired samples)

Variable	Mean Differences	SD	t	df	Sig. (2-tailed)
ZGIB-I vs. ZGIB-F	-1,60	±2,87	-3,524	39	,001**
SKLEK-I vs. SKLEK-F	-11,35	±7,72	-9,301	39	,000**
PTSP-I vs. PTSP-F	-10,45	±4,67	-14,158	39	,000**

Legend: I – initial measurement; F – final measurement; Mean Differences – difference between arithmetic mean initial – final measurement; SD – standard deviation; t – value; df – number of degree of freedom; Sig. (2-tailed) – level of significance; * - Sig. < 0.05; ** - Sig. < 0.01

Statistically significant differences in the variables for estimating the repetitive strength of the respondents between the initial and final measurements were examined with the T-test for paired samples (Table 5). By analyzing the results obtained

by the statistical procedure, statistically significant differences were found in all the variables of the repetitive force in favor of the final measurement, at the significance level of 0.01.

Table 6. Significance of differences in locomotion, initial - final measurement
(T-test of paired samples)

Variable	Mean Differences	SD	t	df	Sig. (2-tailed)
TTEST-I vs. Ttest-F	-0,25	±0,41	-3,938	39	,000**
PN-I vs. PN-F	0,06	±0,69	,593	39	,557
KUPER-I vs. Kuper-F	-44,87	±181,97	-1,560	39	,127

Legend: I – initial measurement; F – final measurement; Mean Differences – difference between arithmetic mean initial – final measurement; SD – standard deviation; t – value; df – number of degree of freedom; Sig. (2-tailed) – level of significance; * - Sig. < 0.05; ** - Sig. < 0.01

Statistically significant differences in the variables for assessing the locomotion of the respondents between the initial and final measurements were examined with the T-test of the paired samples (Table 6). Analyzing the results obtained by the above statistical procedure, statistically significant differences were found in one variable in favor of the final measurement (TTEST) at a significance level of 0.01, while in the two variables for the evaluation of the locomotion (PN, KUPER) no statistically significant differences were detected between the measurements.

CONCLUSION

By analyzing the obtained data for the group of variables of morphological characteristics after the training program of martial arts techniques in the selected sample and statistical processing, it is evident that there was an increase in value and statistical significance in comparison between the initial and final measurements. According to (Dopsay et al. 2005) who performed the diagnosis of body mass index (BMI) on a sample of students of the Police Academy, aged up to 18.4 to 24.1 years, the results showed that, as a point of inflection between adequate and inadequate BMI values for police officers, critical BMI value over 27.04 kg / m² (medical criterion), respecting BMI value over 27.80 kg / m² (sports-metrology criterion). (Petrice and Jebb 2001) analyzed the assumption on the topic "after the body mass index" and explained that the surrogate anthropometric measure (especially BMI) can provide unreliable data on the fat content in the body. They include: youth and childhood, aging, racial differences, athletes, soldiers and civilian forces, physical training and special clinical circumstances. The quoted authors believe that the body mass index continues to serve well for many purposes, but that it is time to start a gradual evolution beyond that index according to standards separate from the start-up masses of body fat. For a more detailed explanation of the results obtained, it is necessary to indicate the arguments that have come up with Woods et al. (2000) that energy homeostasis, long-term alignment of food intake with energy consumption, is achieved through the control of the size of the meal. Individuals who did not eat enough food to maintain their normal weight have a lower level of signals on adiposity (leptin and insulin) in the blood and brain, and one consequence is that the signal generated by a meal (such as CCK) is

less effective in reducing the size of the meal. The assumption is that the reason why there was an increase in the value of morphological characteristics in the sample of the selected sample, which is covered by this research, is actually the concept of basic police training that is carried out in the Republic of Srpska, Ministry of Interior, which implies in-house accommodation with a precisely defined dining time and the quality of the of the meal itself. By reviewing the data obtained for the variables of maximum isometric force after the training program of martial arts techniques in the selected sample, statistical significance in favor of the final measurement is evident. It is assumed that the expected change in the maximum isometric force occurred under the influence of a martial arts training program as a result conducting physical fitness which makes an inevitable segment in the structure of the class. The results obtained by this study certainly lead to the conclusion that the applied training model has had positive effects on the maximum isometric force in the sample of the selected sample, and that the applied training method could be recommended in the professional development of police officers. By looking at the results obtained using the statistical analysis of the T-test for paired samples (Table 4), it is visible that statistical significance was obtained in two variables, while the VIS variable is not the case. Statistically significant differences in the variables for estimating the repetitive power of the respondents between the initial and final measurements after the T-test for the dependent samples (Table 5) were found to exist in all the variables of the repetitive power in favor of the final measurement, at the significance level of 0.01. Statistical significance between the initial and final measurements of the respondents was determined using the T-test for the paired samples (Table 6) and the obtained result indicates statistically significant differences only in one variable in favor of the final measurement (TTEST) at a significance level of 0.01, two variables for estimating locomotion (PN, KUPER) did not show statistically significant differences between measurements. By the overall observation of the obtained results, it can be concluded that the training program of martial arts techniques has led to a significant improvement in morphological characteristics, motor and functional abilities in the selected sample.

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