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## **THE CHANGE OF MORPHOLOGICAL DIMENSIONS OF KARATE PLAYERS UNDER THE INFLUENCE OF THE MODEL OF MOTOR EXERCISES**

### **Abstract**

The experiment involved 38 karate players from East Sarajevo, aged 18 and 19. All the examines performed their activities in karate clubs and fitness centres where they were involved in the training process consisting of three hours a week, during the time period of two months with the aim of developing the strength of arms and pectoral muscles. The measurement for the assessment of the morphological characteristics were the following: average bust measurement (AABM), upper arm measurement (AUAM), lower arm measurement (ALAM), upper arm skin folds (AUASF) and lower arm skin folds (ALASF). The aim of the research was to investigate the influence of the model of motor strength exercises of arms and bust on the development of morphological characteristics of karate players (defined on the basis of circular dimensionality of the body and underskin fat) involved in the training process in the fitness center and in this way to create the possibility of the creation of more rational procedures for optimal planning, programming and controlling of the training process at the fitness centre. In this way the compatibility of their development would be investigated and, in relation to it, useful directions of their further morphological development would be set. The results of the discriminatory analysis research by use of Barthlett's Lambda Test and its testing by the corresponding Chi-Sqr test showed that the difference between the initial and final measuring under the influence of the motor exercises for the development of the strength of arms and bust resulted in statistically significant enlargement of the dimension of circular dimensionality of the body as well as in the lowering of the underskin fat level (P- Level= .000) of the karate players.

**Key words:** *Morphological dimension, karate players, model of motor exercises, canonical discriminatory analysis.*

### **1. Introduction**

Karate is a sport in which the technical elements in the fight are realized with acyclical movements and the complex structure, timely performance of the technique and its respective

phases, as well as through the use of psychological and motor energetic potential of a person. During the fight, dynamic situations continuously follow one another, fighters are expected to possess good knowledge of technical and tactical skills, as well as to be able to use them timely and to constantly create new defence, attack and counter-attack programmes of acting. (Bratić i Nurkić, 1996; Al-Kubati, Fišer i Nováková, 2007; Cicović i Pržulj, 2011).

Some authors proved in their researches that for the success in a karate fight the strength of muscles is of crucial importance. In order for it to be developed it is necessary to ensure the optimal relationship between the intensity and the size of the muscle activity which will, in turn, activate corresponding physiological and biochemical mechanisms during a sufficiently long time interval. (Katić, Blazević, Krstulović i Mulić, 2005).

In a large number of researches the strength is defined a precondition for the significant enlargement of the level of certain motor dimensions and motor tasks, which contributed to the more efficient realization of the training process and to the achievement of better sports results. Such researches were done by numerous (Jorga, 1983; Weineck, 2000; Željaskov, 2003), but on the sample of very good karate players. A few such researches were done on the sample of selected karate players aged 18-19 years.

In relation to that, certain topological priorities of motor strength which are known to be contributing to the optimal body development could be gradually favoured in fitness centres. From the perspective of the muscle strength the topological regions on the body of a karate player that are of the highest priority are legs, stomach, as well as the muscles of arms and pectoral muscles that are of main subject of this research.

The aim of this research was to investigate the influence that the model of motor exercises for the strength of arms and bust has got on the development of the morphological characteristics of karate players (defined on the basis of circular dimensionality of the body and underskin fat) involved in the training process in the fitness centre

## **2. Method**

### **2.1 Research sample**

The experiment involved 38 karate players from East Sarajevo, aged 18 and 19. All the examines performed their activities in karate clubs and fitness centres where they were involved in the training process consisting of three hours a week, during the time period of two months with the aim of developing the strength of arms and pectoral muscles.

The examines involved in the research were healthy and with no chronic diseases, heart problems, as well as without any of the locomotion apparatus that could influence the results of the research.

### **2.2 The sample of variables**

The measurement for the assessment of the circular dimensionality of the body and underskin fat were the following: average bust measurement (AABM), upper arm measurement (AUAM), lower arm measurement (ALAM), upper arm skin folds (AUASF)

and lower arm skin folds (ALASF). Anthropometric measures were taken from the research by Lohman i Martorell (1988). Student's T-test and parameter dicriminatory analysis were tekaen from the filed of comparative statistics.

### 2.3. The exercising programme

The programme for the development of the motor strength of arms and bust was implemented in the fitness centre of East Sarajevo and it lasted for eight weeks consisting of three training sessions per a week. Each exercise was repeated 12-14 times, the number of series per a training session was 5/6 and breaks between series lasted for 2-3 minutes. Different types weighs and training machines were used for the following exercises:

**Table 1:** Exercises for the development of arms and bust

<b><i>Arm strength</i></b>	<b><i>Bust strenght</i></b>
1. Lower arm bends on the training machine - m. biceps brachii (caput longum et breve) - m. brachialis	1. Sideways presses - m. pectoralis maior - m. deltoideus (pars anterior) - m. triceps brachii (caput longum et mediale) - m. anconeus - m. seratus anterior
2. Reverse lower arm bend - m. biceps brachii (caput longum et breve) - m. brachialis - m. brachioradialis - m. extensor carpi radialis longus - m. extensor carpi radialis brevis - m. extensor digitorum - m. extensor digiti minimi - m. extensor carpi ulnaris	2. Presses from the bench - m. pectoralis maior - m. deltoideus (pars anterior) - m. triceps brachii (caput longum et mediale)
3. Arm bends - m. flexor carpi radialis - m. palmaris longus - m. flexor digitorum superficialis et profundus - m. flexor pollicus longus - m. flexor carpi ulnaris	3. Narrow presses from the bench - m. pectoralis maior - m. anconeus - m. triceps brachii (caput laterale, longum et mediale)
4. Reverse arm bend - m. extensor carpi radialis longus - m. extensor carpi radialis brevis - m. extensor digitorum - m. extensor digiti minimi - m. extensor carpi ulnaris - m. extensor indicis	4. Counter-sideways presses - m. pectoralis maior - m. triceps (caput longum et breve)
5. Stretched lower arm - m. triceps brachii (caput laterale, longum et mediale) - m. anconeus	5. Stretching with small weighs - m. pectoralis maior (pars sternocostalis et clavicularis)
	6. Stretching with crossed cables - m. pectoralis maior - m. pectoralis minor

- 6. Reverse lower arm stretching
- m. triceps brachii (caput laterale, longum et mediale)
- m. anconeus
- m. extensor carpi radialis longus
- m. extensor carpi radialis brevis
- m. extensor digitorum
- m. extensor carpi ulnaris

### 3. Results of the research

#### 3.1 Student's T-test

**Tabela 2.** Significance of differences between the arithmetic middles of the experimental group:

Measurements	Mean(i)	Mean(f)	T-value	p
<b>AABM</b>	104.36	109.32	2.55	<b>.004</b>
<b>AUAM</b>	34.69	38.60	8.67	<b>.000</b>
<b>ALAM</b>	28.52	33.83	2.27	<b>.008</b>
<b>AUASF</b>	6.46	3.59	5.78	<b>.000</b>
<b>ALASF</b>	4.65	2.11	7.41	<b>.000</b>

Table 2 shows the results of the morphological characteristic between the initial and final measuring. After the analysis of the obtained results it was concluded that there is a statistically significant difference in all the anthropometric measurements: middle bust size (AABM .004), upper arm size (AUAM .000), lower arm size (ALAM .008), upper arm skin folds (AUASF .000) lower arm skin folds (ALASF .000).

#### 3.2 Discriminatory analysis

**Table 3.** Significance of the isolated discriminatory

Disc. Func.	Eigenvalue	Canonical R	Wilks' Lambda	Chi-Sqr.	df	P-Level
1	2.367	0.83	.144	128.47	5	<b>.000</b>

Legend: Chi-Sqr values of the coefficients of discrimination kvadrati (Eigenvalue), coefficient of canonical relation (Canonical R), values of Berthlet's testa (Wilks' Lambda), value of Chi-Sqr test (Chi-Sqr), degree of freedom(df) and level of significance of the coefficient of determination (P-Level)

One discriminatory function of high intensity was obtained (CR=83%) which shows what the correlation between is between the data on the basis of which the discriminatory analysis of the obtained results was performed (table 3). The results of the discriminatory strength of the anthropometric measures are obtained through Wilks'-Lambda (.144) test and they show that the results between the initial and final measuring in the space of morphological characteristics is significant (P-Level=.000), since the result of Chi-Sqr test has got high value (Chi-Sqr = 128.47).

**Table 4.** Factorial structure of the isolated discriminatory function

<b>Anthropomotoric measure</b>	<b>Root 1</b>
<b>AUASF</b>	-0.685
<b>ALASF</b>	-0.621
<b>AUAM</b>	0.588
<b>AABM</b>	0.551
<b>ALAM</b>	0.422

Table 4 gives the structure of the discriminatory function of the involvement of the anthropomotoric dimensions in process of the creation of important discriminatory functions. The presented centroids represent the arithmetic middles of the results of the initial and final measuring. In order to check the significance of the differences between the initial and final measuring and the efficiency of the exercising programme of the karate players, five anthropomotoric measurement, that are taken as good predictors of the investigated space, were measured. The obtained results show that the anthropomotoric measures of the upper arm skin folds (AUASF 0.685) and of the lower arm skin folds (ALASF 0.621) have got the biggest contribution to the discriminatory function.

**Tabela 5.** Centroids of measuring

<b>Measurement</b>	<b>Root 1</b>
<b>Initial</b>	2.145
<b>Final</b>	-2.145

Results in table 5 represent the discriminatory function of the centroid based on all the anthropomotoric measures whose value 2.145 i -2.145. The significance of the presented centroid of the measuring which has been tested through the significance of the discriminatory function shows that their distance (discrimination) is statistically significant.

**Tabela 6.** Classification matrix

<b>Measuring</b>	<b>Initial</b>	<b>Final</b>	<b>Sum</b>
<b>Initial</b>	40	10	50
<b>Final</b>	5	45	50
<b>Initial</b>	<b>80%</b>	20%	100%
<b>Final</b>	10%	<b>90%</b>	100%

The separation of the groups as given in table 6 as percentiles shows that the performed separation (discrimination) of the results explains with precision of 85% (middle value of the percentages of the respective groups) of the coefficient of the canonical correlation whose value is CR = 83%.

The obtained results of the discriminatory analysis of morphological characteristic in the final, in comparison to the initial measuring, shows that under the influence of the exercise programme for the strength development of arms and bust, statistically significant changes of the dimension of morphological characteristics took place.

#### **4. Discussion**

The results of the canonical discriminatory analysis (tables 3-6) show that at the end of the experimental period under the influence of the application of the exercising programme for the development of the strength of arms and bust of the examinees, statistically significant changes of the dimension of circular dimensionality of the body took place, together with the lowering of the level of the underskin fat (P-Level =.000).

It can be suggested that the changes of the investigated dimensions of the examinees appeared as the result of proper methodical organization of training activities through the process of planning, programming, dosing, distribution and control of the applied training loads, together with the intensification of training activities in correspondence with the authentic needs of the examinees.

The results of the research showed that the lowering of the level of underskin fat at the end of the experimental period did not have the negative influence of the lowering of the circular dimensionality of the skeleton of the examinees. Some authors (Jorga, 1983; Željaskov, 2004; Duraković, 2006; Pržulj, 2007; Milanović, 2007) explain such transformational processes in the experimental period with adaptive processes that, through the process of internal redistribution, enabled the enlargement of the muscular system.

The investigation of the change of morphological dimension of under the influence of the model of motor exercises for the development of the strength of arms and bust represents an actual practical and theoretical problem which is of big importance since it invests us with the possibility of creating the rational procedures in fitness clubs for optimal planning, programming and control of training process, as well as for the efficient following of the development of the anthropological dimension in the course of the training process with karate players.

## **5. Conclusion**

After the implementation of a twelve-week model of exercising in a fitness centre aimed at the development of the strength of arms and bust karate players aged 18-22 years it was noticed that in the final, in comparison to the initial measuring, the statistically significant enlargement of the dimension of circular dimensionality of the body took place, together with the lowering of the level of the underskin fat.

The results of this research offer the possibility to increase the level of other relevant morphological dimensions of both, lower and upper region of a karate player body through the use of specific exercises which would contribute to the development of better and more explosive overall motor structures in a karate fight.

Apart from that, the results of a diagnosis of morphological dimensions encourage the process of individualization of training activities in the fitness club through planning, programming and controlling of the work in such a way so that it corresponds to the individual abilities and characteristics of a karate player.

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