

Danko Pržulj¹ Mitar Vukotić² Miloslav Marković³

¹Faculty of Physical Education and Sport, University of East Sarajevo

²Student of master studies, Faculty of Physical Education and Sport, University of East Sarajevo

³Pedagogic academy, Krusevac

UDK:796.012.11:572.087

Doi: 10.7251/SHT1301080P

THE INFLUENCE OF THE PROGRAMME OF MOTOR EXERCISES FOR THE STRENGTH OF LEGS AND STOMACH ON THE DEVELOPMENT OF MORPHOLOGICAL DIMENSIONS

Abstract

The research sample comprises 45 examines involved in the training sessions of fitness clubs in East Sarajevo. The examines aged 18 – 22 years are submitted to the eight-week long training sessions aimed to develop the strength of legs and stomach. The examines are not sanctioned by any criterion and do not actively pursue sport activities. The aim of this research is the investigate the influence of a two-month recreational treatment aimed at improving the strength of legs and stomach on the quantitative changes of the circular dimesionality of the body and underskin fat in order to obtain information relevant to the significance that researched dimensions have in relation to the process of managing, planning, programming and controlling of the functioning of fitness clubs in East Sarajevo. The results of the research showed statistically significant difference between the applied measures of morhological dimensions (P -Level =.000) under the influence of the exercises for the improvement of the strength of legs and stomach at the multivariant level.

Key words: *morphological characteristics, strength of legs and stomach, canonic discriminatory analysis*

1. INTRODUCTION

In order to maintain health and physical abilities different tools and methods of training are applied. It has been showed that the programme for the dvelopment of the strength of legs and stomach has got direct influence on the scope and the way in which the working ability is exerted during the realization of sports and recreational exercising and it is

directly related to morphological characteristics and functional abilities (Malacko, 2002; Pržulj, 2006; Milanović, 2007).

Some authors point out (Čabrić, 1976; Željaskov, 2004; Radovanović i sar., 2009) that the losing of muscle mass, due to the lack of motor activity lowers the exchange of materies, and therefore the overall level of blood is lowered together with the number of red blood cells and other important parametars in our body.

The main problem of this research is to investigate whether the exercise programme for the developoment of the strength of legs and abdomen of the examines who are aged 18-22 years and are not sportsmen but are involved the training sessions of fitness clubs in East Sareajevo has got statistically significant influence on the deveopment of the circular dimenisonality of the body and on the losing of underskin fat.

The aim of this research is to investigate the results of the influence of a two-month recreationalk treatment for the develop ment of the stength of legs and stomach on the quantitative changes of the circular dimesionality of the body and underskin fat in order to obtain information relevant to the significance that researched dimensions have in relation to the process of managing, planning, programming and controlling of the functioning of fitness clubs in East Sarajevo.

2. METHOD

2.1 The research sample

The research sample comprises 45 examines involved in the training sessions of fitness clubs in East Sarajevo. The examines aged 18 – 22 years are submitted to the eight-week long training sessions aimed to develop the strength of legs and stomach. The examines are not sanctioned by any criterion and do not actively pursue sports activities. Apart from this each examine had to fullfil the following conditions:

- to attend the training process continuously redovno
- to be devoid of any physical and somatic handicaps

2.2 The sample of variables

In order to assess the morphological characteristis six anthropomotoric measures od the lower body region were used: the size of stomach (ASTS), upper leg size (AULS), lower leg size (ALLS), stomach skin folds size (ASSFS), upper leg skin folds size (AULSF) and lower leg skin fold size (ALLSF). Anthropomotoric measures are taken form the research by Lohman, Roche i Martorell (1988). Student's T-test and parameter dicriminatory analysis were tekaen from the filed of comparative statistics. The obtained data were processed bs use of the statistical programmes SPSS 12.0 and Statistics 5.0.

2.3. The exercising programme

The examines were involved in the training process for the development of the strength of legs and abdomen four times a week during the period of eight weeks. Each exercise was repeated 10-12 times in 4-5 series per a training session and breaks between sessions lasted for 2-3 minutes. Different weighs and different training machines were used for the performance of the following exceries:

- A. The strength of legs:

1. Squats
m. quadriceps femoris (m. rectus femoris, m. vastus lateralis, m. vastus medialis, m. vastus intermedius, m. gluteus medius, m. gluteus maximus),
 2. Sideways leg presses
m. quadriceps femoris (m. rectus femoris, m. vastus lateralis, m. vastus medialis, m. vastus intermedius, m. gluteus maximus),
 3. Streaching out the lower leg (m. quadriceps femoris (m. rectus femoris, m. vastus lateralis, m. vastus medialis et m. vastus intermedius),
 4. Flexing the lower leg – while lying (m. biceps femoris -caput longum et breve, m. Semimembranosus, m. Semitendinosus, m. Gastrocnemius),
 5. on the training machine (m. pectineus, m. adductor -longus, brevis et magnus),
Lifting up on toes – while standing (m. triceps surae - gastrocnemius caput laterale et mediale, m. Soleus, m. plantaris
- B. The strength od abdomen:
1. Torso bends (m. obliquus abdominus externus, m. tensor fasciae latae, m. rectus femoris, m. rectus abdominis),
 2. Torso bends with raised legs (m. obliquus abdominus externus, m. tensor fasciae latae, m. rectus femoris, m. rectus abdominis),
 3. Torso bends on the decline or incline bench (m. obliquus abdominus externus, m. tensor fasciae latae, m. rectus femoris, m. rectus abdominis),
 4. Leg lifting (m. obliquus abdominus externus, m. tensor fasciae latae, m. rectus femoris, m. rectus abdominis, m. iliopsoas (m. maior, minor et iliacus, m. Pyramidalis),
 5. Torso lifts on the Roman chair (m. obliquus abdominus externus, m. obliquus abdominus internus, m. rectus abdominis, m. Pyramidalis);

3. THE RESULTS OF THE RESEARCH

3.1 Student's T- test

Table 1. The significance of the differences between the arithmetic middles of the initial and final measuring at the end of the experimental period

Measures	Mean(i)	Mean(f)	T-value	p
ASTS	100.74	92.73	8.14	.000
AULS	60.60	64.67	3.67	.001
ALLS	38.14	41.23	3.27	.002
ASSFS	16.46	11.54	5.78	.000
AULSF	13.65	9.02	6.21	.000
ALLSF	6.28	4.31	5.45	.000

Table 1 comprises the results of T-test of the morphological characteristics of the examines between the initial and final measuring. On the basis of the results obtained through the analysis it can be concluded that statistically significant difference in relation to all the measures was found: the size of stomach (ASTS .000), upper- leg size (AULS .001), lower

leg size (ALLS .002), stomach skin folds size (ASSFS .000), upper leg skin folds size (AULSF .000) and lower leg skin fold size (ALLSF .000).

3.2 Discriminatory analysis

Table 2. The significance of the isolated discriminatory function of the morphological characteristics

Disk. Func.	Eigenvalue	Cannonicl R	Wilks' Lambda	Chi-Sqr.	df	P-Level
1	3.775	0.88	.127	138.22	6	.000

Legend: Chi-Sqr values of the coefficients of discrimination kvadrati (Eugenvalue), coefficient of canonical relation (Cannonical R), values of Berthlett'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)

In table 2. one discriminatory function of high intensity was obtained (CR=88%) which shows what the correlation between is between the data on the basis of which the discriminatory analysis of the obtained results was performed. The results of the discriminatory strength of the anthropomotoric measures are obtained through Wilks'-Lambda (.127) 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 = 138.22).

Table 3. Factorial structure of the isolated discriminatory function

Anthropomotoric measures	Root 1
ASTSF	-0.712
AULSF	-0.605
ALLSF	-0.489
ASTS	0.425
AULS	0.402
ALLS	0.324

The represented centroids of the groups (Table 3) represent the the arithmetic middles of the results of the initial and final measuring of the examines. In order to check the significance of the differences between the initial and final measuring and the efficiency of the exercising programme for the development of the strenght of the muscles of legs and stomach, six anthropomotoric measurement, that are taken as good predicators of the investigated space, were measured. The obtained results show that the anthropomotoric measures of the stomach skin folds (ASTSF -0.712) and of the upper leg skin folds (AULSF -0.605). have got the biggest contribution to the discriminatory function.

Tabela 4. Centroids of measuring

Measuring	Root 1
Initial	-3.589
Final	3.589

Results in table 4 represent the discriminatory function of the centroid based on all the anthropomotoric measures whose value 3.589 i 3.589. The significance of the presented centroid of the measuring which has been tested throught the significance of the discriminatory function shows that their distance (discrimination) is statistically significant.

Tabela 5. Classification matrix

Measuring	Initial	Final	Sum
Initial	42	8	50
Final	6	44	50
Initial	84%	16%	100%
Final	12%	88%	100%

The separation of the groups as given in table 5 as percentiles shows that the preformed separation (discrimination) of the results explains with precision of 86% (middle value of the percenteges of the respective groups) of the coefficient of the canonical correlation whose value is CR = 88%.

4. DISCUSSION

The results of the canonical discriminatory analysis show (tabeles 1-5) that at the end of the experiment, in comparison to the initial state, under the influence of the application of the exercising programme for the development of the strength of legs and stomach within the exercising programme of the Fitness centre, statistically significant changes of of the morphological dimensions of the examines took place.

At the beginning of the realization of the programme for the development of the strength of legs and stomach on the development of the morphological dimension we started with general strength exercises in order to reach the qualitative and quantitative muscle potential, with the intention to subsequently introduce the excercises for specific preparation.

The size and intensity of the training load in the process of exercising was adopted to the age of the examines. The dosing of the training load had a gradual and progressive character with the aim to enlarge the activity of the central and peripheral nervous system in order to improve the speed of the transmission of the nervous impulses for the activation of the biggest number of the muscle units of legs and stomach. In this way more intensive function of heart and breathing system was obtained in order to provide the transport of oxygen and enlarge the level of aerobic processes of the examines.

The first steps in the process of the strength development were directed at the enlargement of the level of muscle mass, which was obtained through the slow tempo of exercising (which initiated the growth of muscle size and strength), so that subsequently the deveolpemnt of the relative and absolute strength of the muscles of legs and stomach could be positively influenced. The exercises of general strength consisted mainly of well-known motoric structures for the development of big muscle groups (shoulders, arms, pectoral and and dorsal muscles, abdominal muscles and legs).

Some authors suggests (Pržulj, 2006; Malacko, 2004; Isurin, 2008) that in order to realize the motoric strenght of each muscle group of agonist and antagonist, two to three exercies should be chosen to be done in three to five series, with four to eight repetitions in each series and that the train load ranges withing the range of 60-90% of the maximum. The

suggestions of these authors were accepted and applied in this research for the development of the strength of the muscles of legs and stomach of the examines.

The results obtained through this research correspond to the results of certain authors (Watson, 1984; Weineck, 1988; Duraković, 2008; Čustonja i sar., 2008) who, in their researches performed on the samples of sportists, obtained nearly the same parameters of statistically significant enlargement of the morphological dimensions under the influence of the exercises for the development of the muscles of legs and stomach.

5. CONCLUSION

In the course of a two-month long period of the realization of the programme for the motor strength of legs and stomach in fitness clubs of East Sarajevo, the development of morphological characteristics of 45 examines aged 18-22 years was followed. The examines are not sanctioned by any criterion and do not actively pursue sports activities

By use of canonical discriminatory analysis it was shown that in the final, in comparison to the initial measuring, the statistically significant improvement of the level of all the applied measures of circular dimensionality of the skeleton took place, as well as the lowering of the level of underskin fat of the examines. Therefore, it can be suggested that all the changes took place under the influence of the appropriate and methodical organization of the training process in relation to planning, programming and implementation of the applied train loads as adopted to the individual abilities and characteristics.

6. REFERENCES

1. Brown, L., Ferrigno, V. i Santana, C. (2000). Training for speed, agility and quickness. (Trening brzine, agilnosti i eksplozivnosti). *Champaign IL: Human Kinetics*.
2. Čabrić, M. (1976). *Dizanje tegova kao sredstvo rekreacije*. Partizan: Republička zajednica za fizičku kulturu Srbije.
3. Čustonja, Z., Škegro, D., Popovčić, A. (2008). *Razvoj metoda treninga jakosti*. Kondicijski trening 6 (2), str. 70 – 76.
4. Drabik, J. (1996). *Children and sports training: How your future champions should exercise to be healthy, fit and happy*. (Deca i sportski trening: Kako vaši budući šampioni treba da vežbaju da bi bili zdravi, sposobni i srećni). Island Pond, Vermont: Stadion Publ.
5. Duraković, M. (2008): *Kinatropologija, Biološki aspekti tjelesnog vježbanja*. Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu.
6. Isurin, V. (2009). *Blok periodizacija (prekretnica u sportskom treningu)*. Prevod sa engleskog. Beograd: Data status.
7. Kurelić N., Momirović, K., Stojanović, M., Radojević, Ž. i Viskiće-Štalec, N. (1975). *Struktura i razvoj morfoloških i motoričkih dimenzija omladine*. Beograd: Institut za naučna istraživanja. Fakultet za fizičku kulturu.
8. Lohman, T.G., Roche, A.F., & Martorell, R. (1988). *Antropometric standardization reference manual*. (Priručnik za antropometrijsku standardizaciju). *Chicago: Human Kinetics Books*.
9. Malacko, J. (2002). *Osnove sportskog treninga – kibernetički pristup*. Beograd: IGRO „Sportska knjiga“.

10. Milanović, L. (2007): *Metodika treninga brzinsko-eksplozivnih svojstava kod djece i mladih*, Kondiciona priprema sportaša. Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu.
11. Pržulj, D. (2006). *Antropomotorika, Udžbenik*. Pale: Fakultet fizičke kulture.
12. Pržulj, D. (2007). *Kondiciona priprema sportista, Udžbenik*. Pale: Fakultet fizičke kulture.
13. Pržulj, D. (2012). *Dijagnoza antropoloških obeležja i treniranosti sportista*, Udžbenik. Istočno Sarajevo: Fakultet fizičkog vaspitanja i sporta.
14. Radovanović i Ignjatović, A (2009). *Fiziološke osnove treninga sile i snage*. Niš: Fakultet fizičke kulture.
15. Watson, A. W. S. (1984). Metode treninga. *Savremeni trening*, 1(15), str. 1 – 24.
16. Weineck, J. (1988). *Optimales Training*. Perimed Fachbuch, Verlag, Geselsehalf mnH, Erlangen
17. Željaskov, C. (2004). Teorija i metodika treninga izdržljivosti. *Međunarodni znanstveno-stručni skup „Kondicijska priprema sportaša“* (str. 239-245). Zagreb: Zagrebački Športski Savez.

Correspondence:

*Dr Danko Pržulj, full professor
Faculty of Physical Education and Sport
University of East Sarajevo
E-mail: dankoprzulj@hotmail.com*