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CHANGES IN FUNCTIONAL ABILITIES OF STUDENTS AGED 11 AND 12 AFTER APPLICATION OF EDUCATIONAL CONTENT OF ACROBATICS

 **Dušan Mićović[1] ,**  **Dalibor Fulurij[2]**  **Tatjana Ćeremidžić [2]**

 **Bojan Bjelica[2] ,**  **Saša Jovanović[3] ,**  **Rosario D'Onofrio[4]**

[1] *Šošo "Kosovski Božur" – Special School, Kosovska Mitrovica*

[2]*Faculty of Phusical Education and Sport, University of East Sarajevo*

[3]*Faculty of Phusical Education and Sport, University of Banjaluka*

[4]*Faculty of Medicine and Surgery, Sapienza University of Rome*

ABSTRACT

Main aim of the research was testing the changes o functional abilities of students aged 11 and 12 after the application of educational content of acrobatics. Said research was conducted on the sample of 104 male students of elementary schools in Kosovska Mitrovica, divided in two sub-samples. Experimental group had 52 participants who had PE classes twice a week and training three times a week intended for realisation of educational content of acrobatics in supplemental classes. Control group was comprised of 52 students who attended only PE classes twice a week. For the purpose of assessment of functional abilities of the students following tests were applied: Margaria Anaerobic Power Test, vital lung capacity test and pulse frequency at load. Functional abilities of students in control group were increased by application of acrobatics educational content in duration of 36 classes. Research results have suggested that the participants of the experimental group showed improvements in all the applied tests for assessment of functional ability in experimental period. Small changes were observed in control group in all the applied tests but they were insignificant from the statistical standpoint **Citation.** Dušan Mićović, Dalibor Fulurija,Tatjana Ćeremidžić,Bojan Bjelica, Saša Jovanović, Rosario D'Onofrio Changes in Functional Abilities of students age 11 and 12 after application of educational content of acrobatics *Ita. J. Sports Reh. Po.; 2020; 15,(7); 3; 1638 -1650 ; ; DOI : 10.17385/itaJSRP.20.15.070304 ; ISSN 2385-1988 [online] IBSN 007-111-19 - 55; CGI J OAJI 0,101)]*

Key words: acrobatics, experimental program, functional abilities, students.

INTRODUCTION

Human organism is unified organised unit comprised of multiple dimensions of psycho-somatic status. Many authors have pointed out that positive and negative changes of those dimensions are influenced by numerous factors [21, 27.] Multiple performed analyses and research show that people have become highly dependent of modern way of living with very little physical activity, even less than natural requirement which consequently leads to reduction of level of functional abilities [24.] Activities which are hard, tiring, not adapted to the individual and personal needs or lacking the quality of making one feel good are being avoided [20.] Results presented in many papers and based on research suggest that people who regularly exercise with adequately organised and individually dosed physical activity are less likely to suffer from cardio-vascular and psycho-somatic conditions [33.] Above mentioned activities should be everyday requirement due to adaptation of organism to new living conditions and influence on health status [4,22], increase of working abilities to higher level or for the purpose of active vacation and entertainment of younger generations. If children develop a habit of regular physical activity on daily basis and if it becomes mandatory element in their regime and lifestyle, they will be able to maintain it for the rest of their life to very old age. Positive effects of such exercises are always present, under condition that they are in line with one's physical potential [22.] Physical abilities of children are

falling behind their physical development [10, 17, 31.] That peace of information should be accepted far more seriously when complemented with the fact that children are born with relatively high motor potential of genetic origin which is being reduced over time under the influence of exogenous factors [9,10,17,] primarily due to hypokinesia, a synonym of contemporary way of living [8,9,32.] Research results are in favour of such standpoint, where there is apparent generational trend in increase of body mass and real decrease of muscle mass, in reduction of functional abilities and increase in various psychological conditions, which all are indicators of compromised health in early childhood which occurs, among other things, due to lack of movement [10,12, 19, 32.] In the course of training, educational process and supplemental classes aimed at development of anthropological characteristics of elementary school students [6, 18,] efficient procedures in the selection of methodology, organisation of activities, load intensity and recovery should be applied. In line with that, positive effects of transformation processes can be expected only under condition that methodology of training is adapted to individual abilities and characteristics of the student or participant [15.] Functional abilities indicate efficiency of energy processes in the organism and they are related to the development of aerobic and anaerobic functional mechanisms. In contemporary research they have been evaluated through various procedures and on various population samples, aimed at assessing functions of individual organs and systems (locomotor, transport and nervous) which established numerous definitions on structure and functioning of organism [3.] However, in the
area of functional abilities there are still valid theoretical models on latent structure of the abilities because they are highly complex [5.] Main ain of this research is testing the changes in functional abilities of students aged 11 and 12 after application of educational content of acrobatics. In line with the established aim the assumption is that experimental group shall gain statistically significant increase of functional abilities in relation to the control group.

RESEARH METHODOLOGY

Sample

Participants in the research were selected from the population of elementary school students in Kosovska Mitrovica, aged 11 and 12, male. Total sample of 104 participants was divided into two sub-samples. The first sub-sample consisted of 52 participants, all taking regular PE classes twice a week and training acrobatics three times a week in additional PE classes (experimental group). The second sub-sample consisted of 52 participants who were taking only regular PE classes twice a week (control group). Participants had never been involved in training process as part of additional PE classes for realization of elements in gymnastics – acrobatics.

Measuring instruments

1. Margaria anaerobic power test – **FMARG**
2. Vital lung capacity – **FVKPL**
3. Pulse frequency at load – **FPPOP**

Functional tests used for the purpose of this research were adopted from the model of functional tests (Heimar & Medved, 1997).

Experimental protocol

Table 1. Program of realisation of educational content of acrobatic exercises for the experimental group

PROGRAM UNITS	HOURS NO.
Initial diagnosis of functional abilities	Prior to program realisation
1. SHAPING EXERCISES	Every class

Arms and shoulders: frontal and sideways arm circles with higher amplitude, arm-bend backwards, stretch rope pulled backwards with simultaneous circling of one arm at the front and one arm at the back. Upper body: backbend with higher amplitude in standing, kneeling and lying position, forward bend in standing and sitting position, side bend to the right and to the left with and without pull-up and body turn to the left and to the right. Pelvic area and legs: turn and deep forward bend, upper body circles in various positions front kicks, back kicks and side kicks with high amplitude, body circles in ankles and hips, squats with full flexion.

2. ACROBATICS AND STRECHING	26

Acrobatic exercises: Bridge, half-split and split; Rocking on the back, Rocking on the chest, candlestick, headstand, hanstand, Forward roll, backward roll, flying roll**,** neckspring, headspring, cartwheel, roundoff (Arabian handspring), front flip, back flip, forward tucked, backward tucked. Streching exercises: dragging both feet with hands; standing hamspring strech; L-sit with bent legs; front hands push; pulling knees towards the chest; pulling feet towards the chest; pulling the foot of the stretched leg; forward bend (legs together) forward bend to side (legs spread), forward bend (legs folded), forward bend towards one streched leg; Streching of short muscles, especially large chest muscles, two-headed shoulder muscles and muscles flexors of hand and fingers.

3. ACROBATIC EXERCISES THROUGH STRUCTURES	6
4. PLYOMETRIC EXERCISES AND STRECHING	4

Basic jumping exercises: front jumps, lateral jumps, jumps with change in rhythm, jumps with pauses, back jumps jogging. Basic vertical jumps: Hurdles (height 20 - 30 cm, height 30- 40 cm). basic horizontal jumps: Triple, quintuple jump, decouple jump. Streching: pulling both feet with hands, deep front bend in position with bent knees, cat stretch with bent knees, push ups with pulling the legs towards the

chest, pulling the feet towards the chest, pulling the foot of the bent leg, standing forward bend – feet together, sideway bend – feet apart, forward bend – bent knees, forward bend towards the stepping leg – other leg bent; stretching of short muscles, especially large chest muscles, shoulder biceps and hand and finger flexors.

Data proceding

Data was processed using *Statistica for Windows* (data analysis software system), version 7.0. For the purpose of determination of differences between the groups (experimental and control) at final measurement MANOVA multivariate analysis of variance was performed. Differences between the groups for each variable individually were established using ANOVA univariate analysis of variance, and the differences between initial and final measuring in both groups for each variable individually were established using the T-test for small independent samples.

RESULTS AND DISCUSSION

Table 2. Significance of differences between arithmetic means of participants in the experimental group in functional abilities.

Tests	Mean(i)	Mean(f)	T-value	p
FMARG	4.34	4.10	2.54	**.004**
FVKPL	2310.00	2460.00	2.26	**.003**
FPPOP	161.54	153.27	2.76	**.002**

Legend: arithmetic mean initially – Mean (i), arithmetic mean finally – Mean (f), T-test value – T-value and significance level –p.

In Table 2 are presented results of T-test of functional abilities between initial and final measurement of the experimental group. Upon the performed analysis of the obtained results we may draw a conclusion that there is statistically significant difference in all three applied tests for assessment of functional abilities: Margaria anaerobic power test (FMARG .006), vital lung capacity (FVKPL .007) and pulse frequency at load (FPPOP .008).

Table 3. Significance of differences between arithmetic means of participants in the control group in functional abilities

Testovi	Mean(i)	Mean(f)	T-value	p
FMARG	4.42	4.38	1.48	.157
FVKPL	2290.00	2320.00	-1.54	.210
FPPOP	162.14	160.45	1.41	.126

Legend: arithmetic mean initially – Mean (i), arithmetic mean finally – Mean (f), T-test value – T-value and significance level –p.

In Table 3 are presented results of T-test of functional abilities between initial and final measurement of the control group. Upon the performed analysis of the obtained

results we may draw a conclusion that there is no statistically significant difference in the tests for assessment of functional abilities.

Table 4. Multivariate analysis of variance of functional abilities between the experimental and control group at final measuring

Wilks' Lambda	Rao's R	Q
.108	10.20	**.000**

Legend: Bartlet's test values – Wilks' Lambda, Rao's F-approximation – Rao's R and significance level – Q.

Upon the performed analysis of Table 4 where the results of multivariate analysis of variance between the participants of experimental group at the final measuring are presented it was established that there is statistically significant difference between the groups in functional abilities since Wilk's lambda was .108 which, using Rao's F-approximation of 10.20 provides significance of differences at the level of Q = .000. In line with the aforesaid, in the applied system of functional abilities of the participants statistically significant differences have been established.

Table 5. Univariate analysis of variance of functional abilities between the experimental and control group at final measuring

Tests	Means	Means (K)	F-ratio	Q
FMAR	4.10	4.38	4.48	**.004**
FVKPL	2460.00	2320.00	4.65	**.004**
FPPOP	153.27	160.45	2.08	**.010**

Legend: arithmetic mean experimental group – Mean (e), arithmetic mean control group Mean (k), F-test value – F-ratio and significance level – Q.

In Table 5 is presented univariate analysis of variance of functional abilities' tests by comparing the results of arithmetic means between the experimental and control group at final measuring. According to F-ratio coefficient and their significance (P-Level) we can conclude that there is statistically significant difference between the levels of functional abilities of experimental and control group in the following tests: Margaria anaerobic power test (FMARG .004), vital lung capacity (FVKPL .004) and pulse frequency at load (FPPOP .010).

Research results have provided evidence that the participants from the experimental group had accomplished significantly better results in comparison to control group in all tests used for assessment of functional abilities in duration of experimental period.

For the experimental group, which attended two regular PE classes plus three supplemental classes of acrobatic elements a week, it was to be assumed that statistically better results were due to adequate application of acrobatic elements for the purpose of development of functional abilities.

Applied acrobatic educational content increased the participants' ability of faster and more complete activation of motor units by high load level which enabled increased activity of agonist muscles, increased strength level of entire organism and consequently

functional abilities at final measuring [3]. In other words, these are the solutions which can be used for modelling adequate control of one's body's functional ability, determination of direction and manner for increasing the mobilisation abilities of athletes, determination of means, methods and manner of influencing the training and educational processes respectively or combined [30].

According to some authors [2, 14, 16, 26,] in training and educational processes is evident domination of certain energy mechanisms. Therefore, in the process of physical education, in line with the intensity and overview of various types of movements students perform, aerobic, anaerobic or mixed energy mechanism can dominate, whereas the demand for aerobic energy is significantly reduced [25, 29, 34.]

Similar research of functional abilities was performed by many authors [5, 7, 23, 28] but on sample of high quality athletes from various sport branches. Obtained results were similar on the level of statistical significance of functional abilities in the end of experimental treatment.

These results provide additional information and on development of functional abilities of children and possibility of gaining new information about modelling in supplemental PE classes using educational content of acrobatics which is also confirmed by research of other authors who dealt with the same or similar topic [1,13,34.]

CONCLUSION

On the basis of analysis of the results obtained, we may conclude that experimental program with educational content of aerobics resulted in significant improvements of anaerobic abilities, vital lung capacity and reduced pulse frequency at load. Research results lead to general conclusion that the applied experimental program of acrobatics had positive effect to improvement of functional abilities of male participants in the experimental group. Applying the adequate intensity, duration and frequency of educational contents of acrobatics may provide pre-requisites for efficient manner of improvement, significance and preservation of health and function of respiratory and cardio-vascular system. This research may have diverse scientific and practical significance regarding the application of research results which can be easily applied in practice because they enable the teachers and trainers to develop their own model of exercising acrobatics in line with individual abilities and characteristics through teaching and training process. Research results may also have positive influence on motivation of the participants to systematically get involved in sport activities. Children must intensively take up sports at this age especially because small number of PE classes a week is insufficient load for development of anthropological dimensions; everyday sport activities definitely suffice. PE teachers and trainers in sport clubs should be adequately informed on anthropological dimensions as well as technical and tactical knowledge of children they work with in order to establish adequate modality, volume, intensity and frequency of stimuli in line with their abilities and characteristics.

Upon completion of every research task many issues certainly remain open. One of the key issues is definitely establishing which acrobatic exercises in particular contributed to changes between experimental and control group. Task before us or other researchers dealing with the same or similar research is to follow larger number of measuring instruments and to keep under control as many factors influencing the

changes as possible. In the end, we may not dismiss the fact that this and similar conducted research shall open other relevant issues which may not be answered at this particular moment which would, in any case, be additional motivation for further expert and scientific verification of the research.

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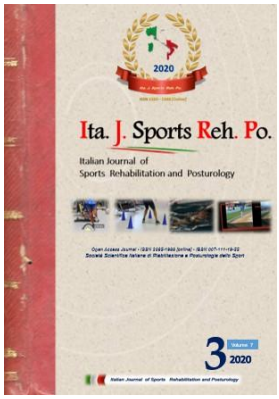

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Corresponding Author

Dr. Dušan Mićović

Correspondence
Dr Dušan Mićović
ŠOSO „Kosovski Božur – Special school" Kosovska Mitrovica
38220 Kosovska Mitrovica , Republic of Serbia
E-mail: d.micovic@hotmail.com

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All authors played a significant role in this project; All authors were involved in drafting the manuscript critically for important content, and all authors approved the final version.

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