COMPLEX GROUP ORGANIZATIONAL FORMS – AN OPTIMIZING FACTOR IN PHYSICAL EDUCATION INSTRUCTION

Tonči Bavčević[1], Josip Babin[1] and Ivan Prskalo[2]

[1]Department of Kinesiology, Faculty of Natural Sciences, Mathematics and Kinesiology University of Split, Croatia
[2]Teachers Faculty, University of Zagreb, Croatia

Original scientific paper
UDC 371.31:796.06:796.021(-053:6:-055.1)

Abstract:

A sample of 114 male pupils from elementary schools in Split aged 11 to 12 years was divided into experimental (N=58) and a control group (N=56) with the aim of determining the differences between differently treated groups considering patterns of instruction used in physical education lessons. The conducted experimental model included participation of students from the Department of Kinesiology, the Faculty of Natural Sciences, Mathematics and Kinesiology, the University of Split, in PE classes of both groups, with 35 lessons given throughout the school year 2003/2004. The students taught complex patterns of instruction (work in stations, the circuit type of work, an obstacle course, work in a station – consecutive repetition of the same movement under various conditions) only in classes of the experimental group. The other 35 lessons were taught by the PE teachers and complex instruction forms were not used. Both groups did their PE lessons according to the same programme, based on 70 lessons per year, 2 hours per week, using the same curriculum content. The researchers did not have an insight into the possible participation of the subjects in any of the extracurricular sporting activities. The sample of variables consisted of the 11-item battery of standard tests assessing anthropological status of pupils. The testing was conducted at the beginning and at the end of the school year. The analysis of variance showed a statistically significant improvement of both groups between the initial and the final testing (p=0.00), so that the hypothesis about the positive influence of group instruction forms on the observed anthropological characteristics can be considered correct. The advantages of complex instruction forms which contributed to the intensification of the teaching process in the experimental group are especially emphasized. They enabled the significantly better achievements than those of the control group (p=0.00). The mentioned findings were recorded in the measures of body mass (p=0.04), forearm circumference (p=0.00), and upper arm skin fold (p=0.00), in the field of power, dynamic muscular endurance and static muscular endurance (p=0.00), and also in the physiological abilities (p=0.00). It can be concluded that the quality of PE lessons, as well as the effects of the process of exercising, considerably depends on the choice and the correct usage of the instruction forms.

Key words: *elementary school pupils, class organizational, physical education, intensification of teaching*

KOMPLEXE GRUPPENARBEIT – EIN OPTIMISIERUNGSFAKTOR IM SPORTUNTERRICHT

Zusammenfassung:

114 11- und 12jährigen Schülern aus Grundschulen in Split wurden in zwei Gruppen aufgeteilt – eine Experimetalgruppe (N = 58) und eine Kontrollgruppe (N = 56), um die Unterschiede zwischen den Gruppen mit denen mittels verschiedener methodischen Gruppenarbeitsweisen während Sportunterrichts gearbeitet wurde. Ein experimentales Modell wurde konstruiert, an dem während des Unterrichts bei beiden Gruppen die Studenten der Abteilung für Kinesiologie der Fakultät für Naturwissenschaften, Mathematik und Kinesiologie der Universität Split teilnahmen. Die Forschung wurde während 35 Unterrichtsstunden im Schuljahr 2003/2004 durchgeführt. Die komplexe Gruppenarbeit (Stationsarbeit, Circuit-Arbeit, Hindernisstrecke) wurden von den Studenten nur bei der Experimentalgruppe verwendet. Die anderen 35 Stunden hat der Sportlehrer/die Sportlehrerin durchgeführt, ohne die komplexe Gruppenarbeit verwendet zu haben. Mit den beiden Gruppen wurde laut desselben die gleichen Themen benutzenden Kurrikulums während 70 Unterrichtsstunden (2 Unterrichtsstunden pro Woche) gearbeitet. Es war nicht bekannt, ob die Schüler Sport außerhalb der Schule

trieben. Es wurden 11 Standardtests verwendet und die Messungen fanden am Anfang und am Ende des Schuljahres statt. Die Varianzanalyse wies auf den signifikanten Fortschritt von beiden Gruppen von Schülern zwischen der Anfangs- und Endmessung (p = 0,00) auf, so dass die Hypothese über den positiven Einfluss von Gruppenarbeit auf die anthropologische Charakteristiken als richtig betrachtet werden kann. Die Vorteile der komplexen Gruppenarbeit, die bei der Experimentalgruppe der Intensivierung des Unterrichtsprozesses beitrug und die die Realisation von bedeutend besseren Ergebnissen als in der Kontrollgruppe (p = 0,00) ermöglichte, wurden besonders betont. Dies hat sich aufgewiesen bei Körpergewicht (p = 0,04), Unterarmumfang (p = 0,00) und Oberarmhautfalte (p = 0,00), sowohl bei Explosiv- und Schnellkraft als auch bei der statischen Kraft, und bei den physiologischen Fähigkeiten (p = 0,00). Sowohl die Sportunterrichtsqualität als auch die Effekte von Körperübungen hängen von der richtigen Auswahl und vom Verwenden methodischer Organisationsarbeit ab.

Schlüsselwörter: *Grundschüler, Gruppenarbeit, Sportunterricht, Intensivierung des Unterrichts*

Introduction

Childhood is a very important ontogenetic period in any person's life. It is the period of intense growth and development of all the anthropological characteristics, psychological, as well as anthropometric, motor and cardio-respiratory and energy capabilities. Just as quality psychological development requires a sufficient amount of psychological stimuli in the form of intellectual and emotional stimuli, the development of anthropometric characteristics and motor and physiological abilities require physical activity, i.e. a sufficient amount of quality kinesiological stimuli.

However, childhood has globally changed during the last few decades – environmental changes, such as an increase in urbanization, traffic, media offers, staying indoors, an awareness of education and the dissolution of traditional social structures have been described as influencing negatively the motor development of children (Dollman, Olds, Norton, & Stuart, 1999). The changes in children's capabilities are described as involving a decrease in sensory, motor, playing and social experience, and the capacity of concentration and endurance (Kretschmer, 2001). So, at a time in which children suffer from insufficient physical work, movement, spontaneous play and exercise, in short, from an insufficient physiological workload, an inappropriate diet and increased intellectual and emotional workload (Nagyová & Ramacsay, 1999), every second of effective physical workout is important.

The above mentioned civilization changes, as well as the changes in the way of life of each individual and the contemporary limited teaching standards determined by spatial and temporal resources and material work preconditions require the discovery of optimal methods and teaching modalities in general, and also in Physical and Health Education (PE). The right choice and application of a certain instruction form is a precondition for the optimization and intensification of the process of teaching and, consequently, for the improvement of physical exercise effects (Findak, 1992).

There is a large body of research studies focusing on effective teaching and learning motor skills, including teaching techniques that may facilitate the process of learning and thus improve the effectiveness of work. They focus on a variety of topics such as different aspects of teaching styles (Byra & Jenkins, 1998), organization of work (Ernst & Byra, 1998), effects of two instructional models (Harrison, Preece, Blakemore, Richards, Wilkinson, & Fellingham, 1999), difficulties in frontal teaching methods with large classes (Hastie, Sanders, & Rowland, 1999), and the interrelationships with task structures and student skill levels (Silverman, Woods, & Subramaniam, 1999). Findak (1999) mentions that the effect of physical exercise, realization of the desired changes and their duration depend on dosage, distribution and control of the workload. Prskalo (2002) researched the effective exercise time in PE lessons and confirmed the hypothesis about the positive correlation between effective exercise time and pupils' preparedness to apply the tested instruction pattern. Prskalo and Findak (2003) observed the effective exercise time with a parallel–alternate pattern of class organization with and without additional exercise on a sample of elementary school pupils. Heart-rate data were used as a physiological workload parameter. Research has shown that a good choice of a teaching form contributes significantly to intensifying, rationalization and optimization of work in PE lessons and controlled exercise. Findak, Prskalo and Pejčić (2003) have conducted research to establish the effect of group work forms with additional exercise on the efficiency of a PE lesson. The research showed that the efficiency of a lesson may be significantly increased in the scope of an increase of effective exercise time when the mentioned organizational forms of work are applied. Babin, Bavčević and Vlahović (2004) have confirmed the hypothesis that group work with additional exercise significantly contributed to the optimization of the effects of physical exercise. The common accent in all of the mentioned articles

is: the effective work time in PE lessons should be enhanced in order to provide proper stimuli for physical fitness and the healthy development of children. Also teachers' expertise and proficiency in content delivery, as well as in the classroom and in time management play a crucial role in it (Coker, 1999). Bavčević, Babin and Vlahović (2004) assessed the effects of group work on a sample of 114 first-form elementary school female pupils. The research showed the efficiency of group work with the aim of intensifying physical exercise and optimizing transformational process.

This shows the need for implementing complex instruction forms into PE lessons and the verification of their effect on an increase of the developmental effects of programmed physical exercise. When introducing teaching forms into PE lessons it is necessary to follow the principle of gradualism, i.e. the simple class organizational patterns have to precede the complex ones (Findak, 1992, 1996; Sinibaldi, 2002). Therefore, pupils should first be introduced to the frontal type of instruction, pair work, work in threes and fours, so they can, gradually through simple group work (parallel class work, parallel–alternate group work, alternate class work pattern and their variations with additional exercise), move on to the complex group work (work in stations, circuit work, an obstacle course, work in a station line – consecutive repetition of the same movement under various conditions), which should prevale in higher forms of primary and secondary schooling, because their application ensures the highest achievements in PE lessons (Findak, 1999). The positive developmental effects of the use of complex group work are due to the increased load of motor and cognitive pupils' characteristics, thus ensuring a higher engagement of the previously mentioned factors and consequently higher achievements.

This methodology, based on the principle of gradualism should be introduced already in the primary school first form since it represents an organizational and teaching precondition for quality teaching of PE over the entire education period. Applying the previously mentioned work modalities enables teachers to plan and programme the contents and to properly structure classes which will be a qualitative and quantitative precondition for quality work, regardless of whether new motor skills are acquired or motor achievements are perfected. To conclude, the efficiency of a class or any other work modality depends, to a great extent, on the properly chosen and applied instruction pattern and class organization (Findak, 1989).

The aim of this research is to establish the possible differences between differently treated groups of subjects with regard to class organizational patterns used in PE lessons. In concordance with the aim, the quantitative differences between a group of pupils whose classes were saturated with predominantly complex group forms of work, and a group in whose classes the previously mentioned forms of instruction were not used, will be tested.

The research aims to test the following hypotheses:

1. The use of group work (both simple and complex) will, over the period of one school year, lead to statistically significant quantitative changes of all the tested anthropological characteristics.
2. The complex group work will lead to statistically more significant quantitative changes of the tested anthropological characteristics than the simple group work.

Research methods

Sample

The sample for this research consisted of male sixth-form pupils, aged between 11 and 12 years, from three elementary schools in Split, Croatia. The research was conducted in the school year 2003/2004, and the total number of the sample was 114. In order to test the hypotheses, two subgroups were formed.

The experimental group consisted of 58 subjects who attended PE lessons taught by the students of the Department of Kinesiology, Faculty of Natural Sciences, Mathematics and Kinesiology, University of Split, as part of their preservice teaching practice which amounted to 35 lessons per year. During the lessons taught by the students, complex group work patterns were used (Table 1).

The control group consisted of 56 subjects whose 35 PE lessons were also taught by the students, teachers, but with this group none of the complex group work patterns were used (Table 1).

The lessons taught by the students were divided into regular intervals over the school year 2003/2004. The remaining 35 PE lessons were in both groups taught by their PE teachers, and none of the complex group teaching forms were used.

Table 1. Instructional forms used by a particular group during a school year

Group	Instructional forms	
	simple	***complex***
Control	70 classes	0 classes
Experimental	35 classes	35 classes

Both groups did their PE lessons according to the same official global curriculum, based on 70 lessons per year, 2 hours per week, and using the same content themes.

The researchers did not have an insight into the possible participation of the subjects in any of the extracurricular sporting activities.

The classes of the experimental and of the control group were organized using the different instruction patterns, simple or complex, depending on the group, according to valid didactic principles. The global curriculum is given in Table 2.

stacle course backwards (MPN), static strength endurance – bent-arm hang (MIV) and dynamic muscular endurance – sit-ups (MPT). The physiological abilities were tested by 6-minute run (F6) (Findak et al., 1996).

The previously mentioned testing was conducted at the beginning and at the end of the school year, as a part of the initial and final testing.

Table 2. Curriculum PE content for the sixth elementary school form programme

Units	Themes	
Running	1.	Cyclic movement at varying paces for < 4 min
	2.	Fast running < 50 m
	3.	Obstacle course
Jumping	4.	Long jump
	5.	High “scissors” jump
Throwing	6.	Tossing a medicine ball of <2 kg
	7.	Throwing a 200g ball from running
Hang, support, climbing	8.	Swing from the standing position (horizontal bar – shoulder height)
	9.	Reverse hang (rings)
	10.	Climbing a rope, with arms and legs < 4 m
Balance position	11.	Cartwheels
	12.	Walking along a balance beam with turns
Vaulting	13.	Jump over a low vaulting horse in the crouch position
Combat exercise	14.	Basic combat position on the ground (wrestling)
	15.	Arms hold and reversal (wrestling)
	16.	Ground fighting (wrestling)
Dancing structures	17.	Rope skipping
Games	18.	Elementary and relay games
	19.	Catching and throwing a ball (handball)
	20.	Goal throws (shots) (handball)
	21.	Kicking a rolling ball (football)
	22.	Receiving a ball (football)
	23.	Tackling a ball (football)
Preparatory exercise	24.	Developing kinaestetic sensibility using strengthening, stretching, relaxation and loosening preparatory exercises

Variables

The sample of variables consisted of the 11-test battery, regularly used in the schooling system of Croatia to assess anthropological status of pupils. The anthropometric characteristics were measured with the following tests: body height (ATV), body mass (ATT), forearm circumference (AOP), and upper arm skinfold (ANN). The motor abilities were tested with the following tests: speed of alternate hand movement – hand tapping (MTR), power of a jumping type – standing broad jump (MSD), flexibility – sit-and-reach (MPR), coordination – ob-

Methods of data processing

The following parameters of descriptive statistics were calculated for the control and experimental group at the initial and final testing: arithmetic mean ($\bar{x}$), standard deviation (SD), minimum result (min), maximum result (max). The differences between the groups of subjects, and different measure points were tested with a multivariate and univariate analysis of variance. In data processing the statistical package Statistica for Windows, version 6.0 was used.

Results

The parameters of descriptive statistics, calculated for the initial and final results both for the experimental and control group, further the hypothesis concerning the positive effect of group work on the development of certain anthropological characteristics in the tested sample, are shown in Tables 3 and 4. It is obvious that both the experimental and control group achieved a certain positive quantitative shift from the initial to the final testing.

If we compare the results of the initial and the final test of the experimental group (Table 3) we can observe that the results for body mass ($\bar{x}_{ATT}$=53,60), forearm circumference ($\bar{x}_{AOP}$=24,02), upper arm skinfold ($\bar{x}_{ANN}$=8,59), standing broad jump ($\bar{x}_{MSD}$=205,90), obstacle course backwards ($\bar{x}_{MPN}$=15,86), bent-arm hang ($\bar{x}_{MIV}$=51,55), sit-ups ($\bar{x}_{MPT}$=44,36) and the 6-minute run ($\bar{x}_{F6}$=1282,84), show a quantitative positive shift. It can be concluded, therefore, that the experimental group, between the initial and final testing, in general, achieved a significant shift of results. As regards the anthropometric characteristics, the improvement was achieved by the reduction of subcutaneous fatty tissue and an increase in the circular measures at the expense of an increase in the muscular mass. Excellent results in all the manifest forms of strength can be observed (dynamic muscular endurance, power of a jumping type and static muscular endurance), as well as in the scope of physiological abilities. Furthermore, there was a positive shift in the scope of body movement coordination ($\bar{x}_{MPN}$).

Table 3. Parameters of descriptive statistics - experimental group

Experimental group								
Var	Initial state				Final state			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
ATV	152.98	3.96	145.50	169.00	155.26	4.48	147.50	171.00
ATT	53.07	5.42	40.00	67.00	53.60	5.31	43.00	67.00
AOP	20.72	3.12	15.20	28.00	24.02	3.87	17.30	35.90
ANN	12.17	2.94	7.00	18.00	8.59	3.07	4.00	15.00
MTR	26.90	3.58	19.00	35.00	27.09	3.69	19.00	35.00
MSD	183.43	12.81	156.00	206.00	205.90	10.25	181.00	223.00
MPR	43.45	3.69	37.00	51.00	46.03	3.84	39.00	57.00
MPN	17.01	2.18	12.00	21.60	15.86	3.13	11.10	26.70
MIV	32.05	7.28	16.00	45.00	51.55	8.97	34.00	68.00
MPT	33.60	5.33	20.00	44.00	44.36	6.50	29.00	57.00
F6	1090.71	68.26	905.00	1190.00	1282.84	21.77	1236.00	1378.00

Table 4. Parameters of descriptive statistics – control group

Experimental group								
Var	Initial state				Final state			
	$\bar{x}$	SD	min	max	$\bar{x}$	SD	min	max
ATV	154.54	4.46	143.50	163.50	156.29	4.06	148.00	164.00
ATT	55.43	5.07	43.00	67.00	55.71	5.25	43.00	67.00
AOP	21.15	3.41	15.70	28.90	21.59	3.33	16.00	27.90
ANN	12.91	3.05	6.00	18.00	10.63	2.82	6.00	17.00
MTR	28.54	4.09	17.00	36.00	28.59	3.44	18.00	36.00
MSD	180.61	18.69	143.00	235.00	193.84	10.28	174.00	211.00
MPR	42.64	4.52	34.00	53.00	46.55	4.54	37.00	55.00
MPN	17.40	3.45	11.10	28.30	15.14	2.71	9.80	21.70
MIV	34.59	8.01	22.00	52.00	44.32	7.31	32.00	58.00
MPT	34.45	7.08	23.00	51.00	34.61	7.08	23.00	51.00
F6	1110.64	46.32	1022.00	1198.00	1208.41	31.35	1149.00	1263.00

Legend: ATV–body height, ATT–body mass, AOP–forearm circumference, ANN–upper arm skinfold, MTR–speed of alternate hand movement - hand tapping, MSD–power of jumping type standing broad jump, MPR–flexibility-sit-and-reach, MPN–coordination-obstacle course backwards, MIV–static muscular endurance bent-arm hang, MPT–dynamic muscular strength-sit-ups, F6–physiological abilities 6-minute run, $\bar{x}$–arithmetic mean, SD–standard deviation, min–minimum result, max–maximum result

The final state of the control group (Table 4) also shows a positive change in the results. So, in comparison with the initial testing, the final results of this group in the test of forearm circumference ($\bar{x}_{AOP}$=21,59), hand tapping ($\bar{x}_{MTR}$ =28,59), standing broad jump ($\bar{x}_{MSD}$=193,84) and obstacle course backwards ($\bar{x}_{MPN}$=15,14) show positive changes. It is obvious that group work contributed to the development of the circular anthropometric measures, power and movement coordination.

The results of the multivariate analysis of variance (MANOVA) (Table 5) confirmed the accuracy of the initial hypotheses. It is evident that both groups, from the initial to final testing, achieved a statistically significant positive shift (E1:E2, p=0.00 and K1:K2, p=0.00). It can, therefore, be concluded that group work, generally speaking, generate significant developmental effects. If we should, on the other hand, look at the results of the multivariate analysis of variance between the experimental and control group in the initial testing (E1: K1), we can observe that there have been no statistically significant differences between the two groups (p=0.07). Since the analysis did not show any statistically significant difference between the groups in the initial testing, the differences between the groups obtained in the final testing (E2:K2, p=0,00) can be interpreted as the result of the application of complex group work patterns. It is important to emphasize that the results should be interpreted by respecting the fact that the control of the possible pupils' participation in extracurricular sporting activity was not conducted in the experimental model. This could also have contributed to a positive quantitative shift of the results. Considering the significance of the obtained differences between the groups, it is possible to assume that teaching organized in complex group patterns, applied in structuring the experimental group's lessons, have given the better developmental results and have obviously, generally, led to the more significant positive quantitative changes.

In order to evaluate the partial influence of each variable in the differentiation of each group and individual points of measurement, it was necessary to apply a univariate analysis of variance (Table 6).

Table 6. Analysis of variance between the groups, and between the initial and final measurements

Var	Groups							
	E1:E2		K1:K2		E1:K1		E2:K2	
	F	p	F	p	F	p	F	p
ATV	8.39	0.00	4.67	0.03	3.91	0.05	1.64	0.20
ATT	0.29	0.59	0.09	0.77	5.75	0.02	4.55	0.04
AOP	25.48	0.00	0.48	0.49	0.49	0.48	12.80	0.00
ANN	41.35	0.00	16.98	0.00	1.73	0.19	13.63	0.00
MTR	0.08	0.78	0.01	0.94	5.19	0.02	5.05	0.03
MSD	108.74	0.00	21.55	0.00	0.89	0.35	39.30	0.00
MPR	13.68	0.00	20.89	0.00	1.09	0.30	0.44	0.51
MPN	5.29	0.02	14.91	0.00	0.54	0.46	1.72	0.19
MIV	165.12	0.00	45.09	0.00	3.13	0.08	22.16	0.00
MPT	94.92	0.00	0.01	0.90	0.52	0.47	58.75	0.00
F6	417.11	0.00	171.10	0.00	3.31	0.07	218.06	0.00

Legend: ATV–body height, ATT–body mass, AOP–forearm circumference, ANN–upper arm skinfold, MTR–speed of alternate hand movement - hand tapping, MSD–power of jumping type standing broad jump, MPR–flexibility-sit-and-reach, MPN–coordination-obstacle course backwards, MIV–static muscular endurance bent-arm hang, MPT–dynamic muscular strength-sit-ups, F6–physiological abilities 6-minute run, $\bar{x}$–arithmetic mean, SD–standard deviation, min–minimum result, max–maximum result

Table 5. Multivariate analysis of variance between the groups, and between the initial and final state of each group

Groups	Wilks λ	F	df1	df2	p
E1:E2	0.10	86.55	11	104	0.00
K1:K2	0.25	27.97	11	100	0.00
E1:K1	0.84	1.76	11	102	0.07
E2:K2	0.20	37.21	11	102	0.00

Legend: E1–initial state of the experimental group, E2–final state of the experimental group, K1–initial state of the control group, K2–final state of the control group, F–Rao's F approximation, df1–degrees of freedom (for variables), df2– degrees of freedom (for the pupils), p–level of significance

Discussion and conclusion

Since the multivariate analysis did not show the statistically significant difference between the initial states of the experimental and control group (E1:K1, p=0.07), the significant difference obtained with F-test (p=0.02) for *body mass* variable (ATT) and hand tapping (MTR) had no statistical significance.

On the other hand, the multivariate analysis of the difference in the initial and final state of the experimental and control group, as well as the differences between the groups in the final test, showed that the centroids of the two groups are differently positioned in the scope of the variables' vector (Bala, 1986), and, therefore it is possible to apply the interpretation of univariant analyses. It is obvi-

ous that both groups, achieved a significant positive shift in the results between the two measurement. This is confirmed with the high level of significance for the majority of the tested characteristics and capabilities. The same findings are obtained in the scope of anthropometric variables. Both groups achieved a significant reduction of subcutaneous fatty tissue (ANN), while in the experimental group there was also a significant increase in the forearm circumference (AOP), obviously a consequence of the increase of muscular mass.

A positive effect of group work is even more evident in the scope of motor abilities. Both groups, thus, achieved a significant shift in the results for strength. While in the control group this shift is noticeable in the scope of power (MSD) and static muscular endurance (MIV), in the experimental group the shift was achieved in all three manifest forms of strength (power and static and dynamic muscular endurance). Statistically significant shifts were made in the scope of flexibility (MPR) and coordination (MPN) in both groups. There was no significant growth tendency for speed, which is not surprising, as it is a predominantly inborn ability.

In the scope of physiological abilities (F6), both groups achieved a statistically significant shift, which confirms the positive effect of group work on the intensifying of teaching and optimization of conditions for the development of the cardio-vascular and respiratory system.

It can, therefore be concluded that group instruction forms are a significant factor in the proper structuring of the teaching process and *conditio sine qua non* of the successful work and development in the scope of all the targeted anthropological characteristics.

Since the multivariate analysis of variance (Table 5) showed that both the experimental and the control group are significantly different in the final test (p=0.00), and the parameters of descriptive statistics (Table 4) showed the advantage in the results for the mode of work used with the experimental group, the hypothesis about the significant effect of teaching organized in complex group pattern on the tested anthropological dimensions may be considered correct.

However, in order to establish the contribution of individual variables in differentiating the two groups it is necessary to apply the univariate analysis of variance between the final state of the experimental and control group (Table 6, group: E2:K2).

The results of ANOVA indicated a significant contribution of body mass (ATT, p=0.04) to differentiating between the two groups (Figure 1). If we add the significant effect of the forearm circumference measures (AOP, p=0.00) (Figure 2) and upper arm skinfold (ANN, p=0.00) (Figure 3), it is evident that the complex group work created the preconditions for an intensification of the teaching and optimization of the effects of exercise (Findak, 1992), which significantly influenced the reduction of subcutaneous fatty tissue and the increase of circular measures at the expense of muscular hypertrophy in the experimental group.

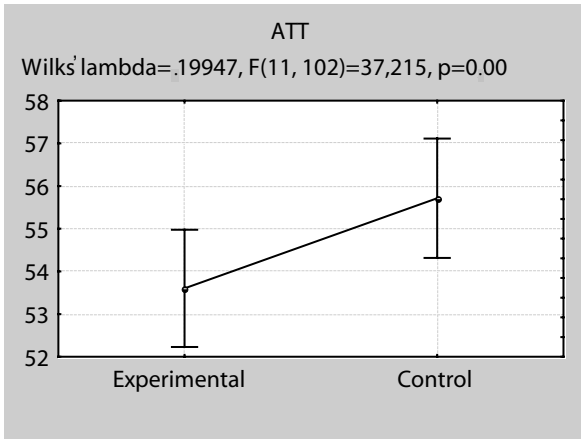

Figure 1. Differences between $\bar{x}$ and SD in the final test of ATT variables

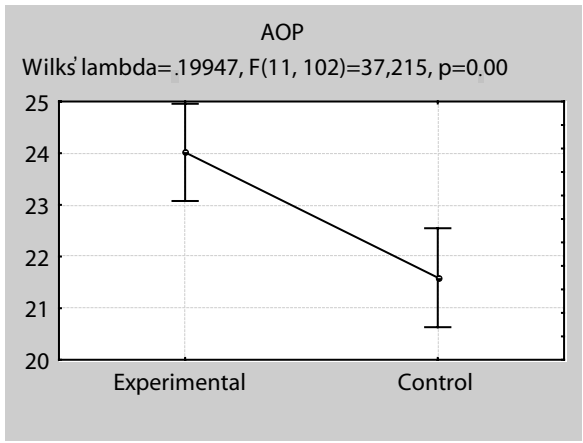

Figure 2. Differences between $\bar{x}$ and SD in the final test of OAP variables

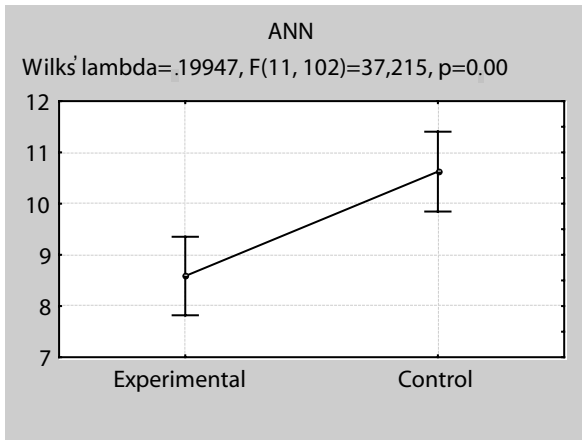

Figure 3. Differences between $\bar{x}$ and SD in the final test of ANN variables

The positive effect of the complex group organization of teaching can be seen in the scope of motor skills (Table 6).

The significant results of the F-test were obtained for speed (MTR, p=0.03). However, the effect of this variable (Figure 4) has to be taken cautiously, especially if we take into consideration the high coefficient of the hereditary nature of this motor skill. The definition of the solution to this problem would require a more complex study with a greater number of speed tests, with the of to establishing the correlation of the quantity and modality of work with the increase of the stated skill.

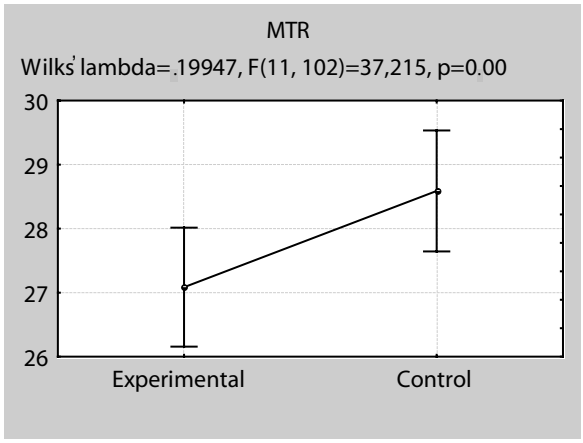

Figure 4. Differences between $\bar{x}$ and SD in the final test of MTR

The difference between the two tested groups is most obvious in the scope of strength (Table 6), to the benefit of the experimental group. The effect of all the manifest forms of strength on differentiating the two groups is visible. The significant results of the univariate analysis of variance in the measures of power of a jumping type (MSD, p=0.00) (Figure 5), static muscular endurance (MIV, p=0.00) (Figure 6) and dynamic muscular endurance (MPT, p=0.00) (Figure 7), corroborate the hypothesis concerning the efficiency of complex group work on the development of strength since they enable an increase in the effective exercise time, and with their purpose of improving motor achievements correspond to the development of the previously mentioned motor skills (Findak, 1992).

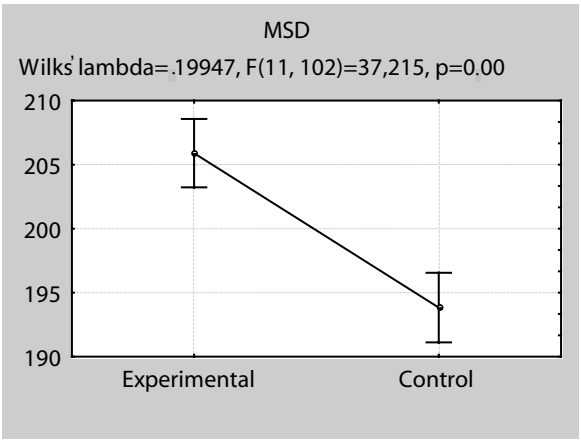

Figure 5. Differences between $\bar{x}$ and SD in the final test of MSD variables

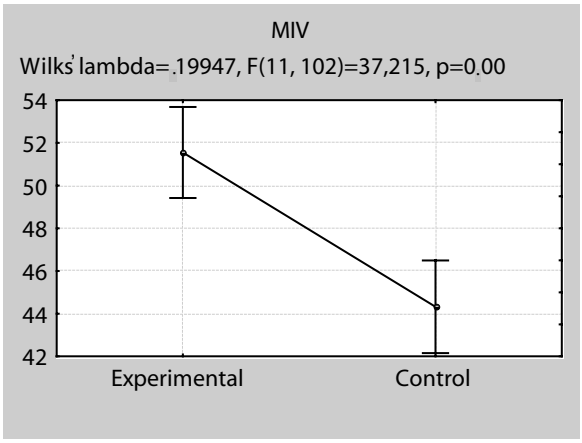

Figure 6. Differences between $\bar{x}$ and SD in the final test of MIV variables

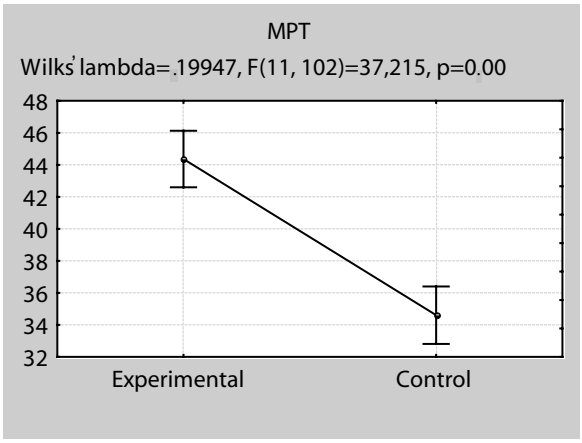

Figure 7. Differences between $\bar{x}$ and SD in the final test of MPT variables

A statistically significant contribution to the differentiation of the two groups is obvious in the scope of physiological abilities to (Table 6; F6, p=0.00). The increase of the intensity and volume of work by applying complex group instruction forms produced significant developmental ef-

fects in the previously mentioned anthropological domain (Figure 8). It can be concluded that complex group work, among other factors, is also appropriate in the development of aerobic capacity, i.e. physiological abilities (Findak, 1992), which points to the need for their use as the dominant modalities in the structuring of a PE lesson.

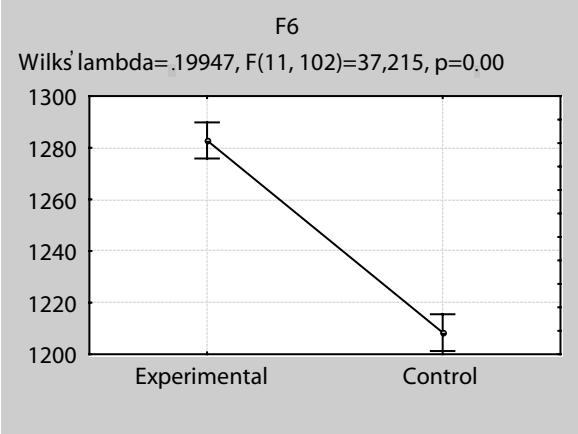

Figure 8. Differences between $\bar{x}$ and SD in the final test of F6 variables

The conducted research has confirmed the hypothesis concerning the positive effect of group work on the optimization of the work effects in teaching PE lessons. Special reference has been made to the significant advantage of complex group organizational pattern which in the experimental group helped to intensify and optimize teaching, thus enabling the achievement of significantly better results than in the control group. This confirms the second hypothesis set by the experimental model.

The conducted analyses of variance between the two groups showed the superiority of complex group work in the domain of all three anthropological areas. With the anthropometric characteristics this was reflected on body mass (ATT), forearm circumference (AOP), and upper arm skinfold (ANN). In the scope of motor skills the advantage of the previously mentioned instructional forms was observed in power of a jumping type (MSD), dynamic muscular endurance (MPT), and static muscular endurance (MIV). Furthermore, the advantage of complex group work is evident in the scope of physiological abilities (F6).

In conclusion, it can be said that the quality of PE lesson greatly depends on the choice and proper use of instructional forms and teaching metods. Therefore, with the aim of intensifying and optimizing the effects of work, but also individualizing the process of physical exercise, special attention needs to be given to the organization and teaching units through the system of class organizational patterns.

References

Babin, J., Bavčević, T., Vlahović, L. (2004). Rad s dopunskim vježbama u cilju poticanja nastave tjelesne i zdravstvene kulture kod učenika prvih razreda osnovne škole. In V. Findak (Ed.), *Proceedings of the 13nt Summer School of Croatian PE Educators Rovinj* (pp. 218-221). Zagreb: Hrvatski kineziološki savez.

Bala, G. (1986). *Logičke osnove metoda za analizu podataka iz istraživanja u fizičkoj kulturi.* Novi Sad: Private edition.

Bavčević, T., Babin, J., Vlahović, L. (2004). Skupni metodički organizacijski oblici rada kao značajan čimbenik razvoja nekih antropoloških obilježja kod učenica najmlađe školske dobi. In V. Findak (Ed.), *Proceedings of the 13nt Summer School of Croatian PE Educators Rovinj* (pp. 222-225). Zagreb: Hrvatski kineziološki savez.

Byra, M., & Jenkins, J. (1998). The thoughts and behaviors of learners in the inclusion style of teaching. *Journal of Teaching in Physical Education,* ***18,*** 26-42.

Coker, C.A. (1999). Time management: Strategies for increasing student engagement. *Journal of Physical Education, Recreation & Dance,* ***70*** (5), 15.

Dollman, J., Olds, T., Norton, K., & Stuart, D. (1999). The evolution of fitness and fatness in 10-11-year-old Australian schoolchildren: Changes in distributional characteristics between 1985 and 1997. *Pediatric Exercise Science,* ***11,*** 108-121.

Ernst, M., & Byra, M. (1998). Pairing learners in the reciprocal style of teaching: Influence on student skills, knowledge, and socialization. *The Physical Educator,* ***55,*** 22-37.

Findak, V. (1989). *Metodika tjelesne i zdravstvene kulture – priručnik za nastavnike razredne nastave.* [Didacties and teaching methodology of Physical and Health Education: A handbook for the class teachers.] Zagreb: Školska knjiga.

Findak, V. (1992). *Metodički organizacijski oblici rada u edukaciji, športu i športskoj rekreaciji.* [Instruction organizational patterns in education, sport and physical recreation.] Zagreb: Hrvatski savez za športsku rekreaciju, MENTOREX.

Findak, V. (1996). *Tjelesna i zdravstvene kultura u osnovnoj školi.* [Physical and Health Education in elementary school.] 2nd ed. Zagreb: Školska knjiga.

Findak, V., Metikoš, D., Mraković, M. & Neljak, B. (1996). *Primjenjena kineziologija u školstvu.* [Applied kinesiology in education system.] Zagreb: Hrvatski književno-pedagoški zbor, Fakultet za fizičku kulturu Sveučilišta u Zagrebu.

Findak, V. (1999). Planiranje, programiranje, provođenje i kontrola procesa vježbanja. [Planning, programming, implementation and control of the process of exercise.] In D. Milanović (Ed.), *Proceedings of the 2nd International Scientific Conference "Kinesiology for the 21st century"* (pp. 109-113). Zagreb: Faculty of Kinesiology, Univerity of Zagreb.

Findak, V. (1999). *Metodika tjelesne i zdravstvene kulture.* [Teaching methods in Physical and Health Education.] Zagreb: Školska knjiga.

Findak, V., Prskalo, I. & Pejčić, A. (2003). Additional exsercise as an efficiency factor in physical education lessons. *Kinesiology, **35*** (2), 143-154.

Harrison, J.M., Preece, L.A., Blakemore, C.L., Richards, R.P., Wilkinson, C., & Fellingham, G.W. (1999). Efects of two instructional models – skill teaching and mastery learning – on skill development, knowledge, self-eficacy, and game play in volleyball. *Journal of Teaching in Physical Education, **19,*** 34-57.

Hastie, P.A., Sanders, S.W., & Rowland, R.S. (1999). Where good intentions meet harsh realities: Teaching large classes in physicl education. *Journal of Teaching in Physical Education, **18,*** 277-289.

Kretschmer, J. (2001). Changes in childhood and children's motor development. *International Journal of Physical Education, **38,*** 114-126.

Nagiová, L., Ramacsay, L. (1999). The occurence of the risk factors and health problems of people. In D. Milanović (Ed.) *Proceedings Book of the 2nd International Scientific Conference "Kineziology for the 21st Century", Dubrovnik, 1999* (pp. 349-351). Zagreb: Faculty of Physical Educatin University of Zagreb.

Prskalo, I. (2002). Metodički organizacijski oblik rada – čimbenik programiranja opterećenja u edukaciji. [Instruction forms and organizational patterns as an intensifying factor in Physical Education.] In V. Findak (Ed.), *Proceedings of the 11nt Summer School of Croatian PE Educators* (pp. 78-80). Rovinj: Hrvatski kineziološki savez.

Prskalo, I., Findak, V. (2003). Metodički organizacijski oblici rada u funkciji optimalizacije nastavnog procesa. [Work forms aimed at optimising the teaching process.] *Napredak, **144,*** (1), 53-65.

Silverman, S., Woods, A.M., & Subramaniam, P.R. (1999). Feedback and practice in physical education: Interrelationships with task structures and student skill level. *Journal of Human Movement Studies, **36,*** 203-224.

Sinibaldi, R. (2002). The alternating station line: Reducing transition time during station work. *Teaching Elementary Physical Education, **13*** (4), 30.

Submitted: June 28, 2005
Accepted: May 1, 2006

Correspondence to:
Assist. Tonči Bavčević
Department of Kinesiology, Faculty of Natural Sciences, Mathematics and Kinesiology
University of Split
Jurja Križanića 15
21 000 Split, Croatia
Phone: + 385 98 895 958
E-mail: tonci.bavcevic@st.htnet.hr

SLOŽENI GRUPNI METODIČKI ORGANIZACIJSKI OBLICI RADA – ČIMBENIK OPTIMALIZACIJE RADA U TJELESNOJ I ZDRAVSTVENOJ KULTURI

Sažetak

Uvod

Ograničeni prostorno-vremenski resursi, uvjetovani aktualnim pedagoškim standardima i materijalnim uvjetima rada, iziskuju od nastavnika pronalaženje optimalnih metoda i modaliteta rada u nastavi općenito, pa tako i u nastavi tjelesne i zdravstvene kulture. Pravilan odabir i primjena metodičkih organizacijskih oblika rada preduvjet je za intenzifikaciju nastavnog procesa te poboljšanje učinaka procesa tjelesnog vježbanja.

Cilj je ovog istraživanja utvrditi moguće razlike između različito tretiranih skupina ispitanika s obzirom na metodičke organizacijske oblike rada korištene u nastavi tjelesne i zdravstvene kulture. Sukladno cilju, testirale su se kvantitativne razlike između skupine učenika koja je pohađala nastavu saturiranu pretežno složenim grupnim oblicima rada te skupine učenika u čijoj nastavi navedeni oblici rada nisu korišteni.

Metode rada

Uzorak ispitanika od 114 dječaka, izvučen iz populacije učenika šestih razreda osnovnih škola (dob 11-12 godina) školske godine 2003./04., podijeljen je u dva poduzorka. ***Eksperimentalna skupina (N=58)*** pohađala je nastavu tjelesne i zdravstvene kulture u kojoj su studenti Zavoda za kineziologiju Fakulteta prirodoslovno-matematičkih znanosti i kineziologije Sveučilišta u Splitu, u sklopu vježbi iz kolegija Kineziološka metodika, participirali u fondu od 35 sati godišnje. Na satima koje su izvodili studenti koristili su se složeni grupni metodički organizacijski oblici rada (rad u stanicama, kružni oblik rada, poligon prepreka, rad na stazi – uzastopno ponavljanje istog motoričkog gibanja u različitim uvjetima). U nastavi ***kontrolne skupine (N=56)***, u kojoj su također participirali studenti u fondu od 35 sati godišnje, složeni grupni metodički organizacijski oblici rada nisu se koristili. Nastavni sati koje su izvodili studenti raspoređeni su u pravilnim razmacima tijekom školske godine. Preostalih 35 sati nastave u obje skupine izvodili su predmetni nastavnici, a složeni grupni metodički organizacijski oblici rada nisu se koristili. Obje skupine izvodile su nastavu po istom programu od 70 sati godišnje, po dva sata tjedno, a obrađivale su se iste nastavne teme. Istraživači nisu imali uvida u to sudjeluju li učenici možda u nekoj izvanškolskoj sportskoj aktivnosti.

Uzorak varijabli činilo je 11 standardnih školskih antropoloških testova: tjelesna visina (ATV), tjelesna težina (ATT), opseg podlaktice (AOP), kožni nabor nadlaktice (ANN), taping rukom (MTR), skok udalj s mjesta (MSD), pretklon raznožno (MPR), poligon natraške (MPN), izdržaj u visu zgibom (MIV), podizanje trupa (MPT), trčanje 6 minuta (F6). Mjerenja su provedena na početku i na kraju školske godine u sklopu inicijalnih i finalnih provjeravanja.

Na temelju prikupljenih podataka izračunati su parametri deskriptivne statistike, a razlike između skupina ispitanika te različitih točaka mjerenja testirane su multivarijatnom i univarijatnom analizom varijance. Korišten je statistički paket Statistica 6.0.

Rezultati

Parametri deskriptivne statistike idu u prilog hipotezi o pozitivnim utjecaju grupnih metodičkih oblika rada na razvoj promatranih antropoloških obilježja, premda su obje skupine postigle, od inicijalnog do finalnog provjeravanja, određeni pozitivni kvantitativni pomak.

Usporedimo li rezultate finalnog i inicijalnog provjeravanja eksperimentalne skupine, možemo zaključiti kako je navedena skupina postigla značajan rezultatski pomak. U području antropometrijskih obilježja ostvareno je to redukcijom potkožnog masnog tkiva i povećanjem cirkularnih mjera zbog povećanja mišićne mase, a evidentirano je i poboljšanje rezultata u svim manifestnim oblicima snage te u području funkcionalnih sposobnosti. Također je došlo i do pozitivnog pomaka u području koordinacije. Finalno stanje kontrolne skupine također pokazuje pozitivan rezultatski pomak u odnosu na inicijalno stanje, i to na području cirkularnih antropometrijskih mjera, eksplozivne snage i koordinacije pokreta.

Multivarijatna analiza varijance pokazala je statistički značajan rezultatski pomak između dva mjerenja u obje skupine (p=0,00). Da bi se valorizirali parcijalni utjecaji varijabli na napredak skupina između dva mjerenja, primijenjena je univarijatna analiza varijance. Na području antropometrijskih karakteristika obje su skupine ostvarile značajnu redukciju potkožnog masnog tkiva, dok je u eksperimentalnoj skupini došlo i do značajnog povećanja opsega podlaktice, očito kao posljedica povećanja mišićne mase. Pozitivan utjecaj grupnih metodičkih oblika rada još je očitiji u sferi motoričkih sposobnosti. U kontrolnoj skupini značajan napredak zabilježen je na području eksplozivne i statičke snage, dok je u eksperimentalnoj skupini pomak ostvaren još i na području repetitivne snage. Značajni pomaci u obje skupine ostvareni su i u fleksibilnosti i koordinaciji, kao i u funkcionalnim sposobnostima.

Diskusija i zaključak

Budući da je multivarijatna analiza pokazala značajnu diferencijaciju skupina u finalnom provjeravanju (p=0,00), što nije bio slučaj u inicijalnom provjeravanju (p=0,07), a parametri deskriptivne

statistike ukazali su na rezultatsku prednost modaliteta rada eksperimentalne skupine, hipoteza o značajnijem učinku složenih grupnih oblika rada na testirane antropološke dimenzije može se smatrati ispravnom. Stoga je bilo moguće pristupiti ispitivanju parcijalnih utjecaja pojedinih varijabli.

Rezultati univarijatne analize varijance ukazuju na značajan doprinos tjelesne težine (p=0,04), opsega podlaktice (p=0,00) i kožnog nabora nadlaktice (p=0,00) razlikovanju skupina. Očito su složeni grupni metodički oblici rada stvorili preduvjete za intenzifikaciju nastavnog procesa, što je dovelo do značajne redukcije potkožnog masnog tkiva te povećanja cirkularnih mjera na račun mišićne hipertrofije u eksperimentalnoj skupini. Razlika između dviju skupina najočitija je na području triju manifestnih oblika snage (eksplozivne, statičke i repetitivne; p=0,00), a u korist eksperimentalne skupine. Navedeno potvrđuje hipotezu o učinkovitosti složenih grupnih metodičkih organizacijskih oblika rada upravo u razvoju snage povećanjem efektivnog vremena vježbanja. Statistički značajan doprinos diferencijaciji skupina evidentan je i na području funkcionalnih sposobnosti (p=0,00), gdje je povećanje intenziteta i ekstenziteta rada primjenom složenih grupnih metodičkih oblika rada proizvelo značajne razvojne efekte.

Istraživanje je potvrdilo hipoteze o pozitivnom utjecaju grupnih metodičkih organizacijskih oblika rada na povećanje efekata rada u nastavi tjelesne i zdravstvene kulture. Ukazalo je na značajnu prednost složenih organizacijskih oblika rada koji su u eksperimentalnoj skupini doprinijeli intenzifikaciji nastavnog procesa te omogućili ostvarenje znatno boljih rezultata u sva tri ciljana antropološka područja od kontrolne skupine, što potvrđuje i drugu hipotezu istraživanja. U antropometrijskim obilježjima očitovalo se to kod mjera tjelesne težine, opsega podlaktice te kožnog nabora nadlaktice. Na području motoričkih sposobnosti prednosti navedenih oblika rada uočene su kod eksplozivne, repetitivne i statičke snage, a isto je dobiveno i u funkcionalnim sposobnostima. Zaključno je moguće reći da o izboru i pravilnoj primjeni metodičkih organizacijskih oblika rada uvelike ovisi kvaliteta nastave tjelesne i zdravstvene kulture. Stoga je, u cilju intenzifikacije i optimalizacije efekata rada, ali i individualizacije procesa tjelesnog vježbanja, osobitu pozornost potrebno posvetiti upravo organizaciji rada u nastavnim jedinicama.