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# **DIFFERENCES IN THE LEVEL OF PHYSIOLOGICAL EFFECTS DURING PHYSICAL AND HEALTH EDUCATION CLASS USING COMPLEX METHODOLOGICAL ORGANIZATIONAL FORMS OF WORK**

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*Original research:*

## **Abstract**

Optimization of P.E. lesson for each student is a challenge for a teacher and demands knowledge and competences, necessary for realization of the aim of the class. The thing that is now certain and evident is that future P.E. programs will be based on real needs of students, their abilities and interests. One of the ways is to increase engagement of students and improve their abilities by including adequate methodic and organizational forms of work.

The aim of this paper is to determine differences on the level of physical loading between individual simple and complex methodic and organizational forms of work in P.E. lesson and to qualify them according to achieved level of loading and influence on functional abilities of random male sample subjects of the third grade of high school, respectively, and to show their individual influence on functional abilities by applying objective measure instrument.

**Keywords:** physical education, intensification, organization forms of work, workload

## **Introduction**

Contemporary concept of physical education is based on optimization of lesson for every student (Drljačić, D., Arsić, K., & Arsić, D., 2012.). It is very difficult for teachers today, to optimize lesson, due to inclusive, material conditions of work, as a challenge for every teacher or educator of P.E. One of the basic conditions of optimization of educational process in individual approach to each student, is determination of initial condition, which is followed by homogenizing of groups, which results with every student completing his task according to his abilities (Drljačić, D. et al., 2012.). In developed countries of Europe it is very common for schools to own sophisticated equipment for monitoring physical changes, caused by physical activity, which, to the great amount, eases optimizing educational process, where educators and teachers gain relevant data. In our country, unfortunately, this is still a taboo topic (Leko, G., 2019.).

Programs of Physical Education in schools will be based on students' real needs, skills, capabilities and interests. Humanized physical education is a chance to make a real progress in training an individual for life, in most of its dimensions. The aim of physical education is to create necessary habits for everyday exercise, which will be in function of maintenance of health and reaching levels of motor skills, which also includes higher level of skills in individual's everyday life Najšteter, Đ., 1997.).

For over 20 years, children have been playing in parks, streets and playgrounds, using different forms of movements and parents called them to go inside only for lunch or dinner, which children accepted unwillingly because they felt sad for leaving their friends and the play. Do children and young people live in that way today? Do they play? If yes, where and when? Do they move? Numerous studies, discussion and statistics indicate the sad fact that today's children move less and

they use information technologies more (Stanojević, D., 2016.). Technology reduces physical activity, which affects quality of life of children and young people, which results more work for medical workers. Physical activity prevents many illnesses, but modern lifestyle leads to great number of diseases such as: adiposity, cardiovascular diseases, diabetes, cancer, osteoporosis etc. (A., Petrovac Šikić, B., Alborghetti, H., Petrović Mayer, J., Vrkić, M., Tičinović, M., & Pieters, V., 2019.). Therefore P.E. has a key role in maintenance of health, which is human's most important asset.

The aim of physical education area is bio-psychological-sociological motifs for movement, as an expression for satisfaction of human needs, which increase adjustable and creativity skills in modern lifestyle (Findak, V., 1996.). This defined aim of this educational area includes a goal of physical education, which is manifested on: improvement of health of students, development of their abilities and skills, forming motor skills and improvement of motor accomplishments, improvement of educational values and acquiring certain theoretical knowledge and kinesiology information (Findak, V., 1996.).

Final results depend on organization and performance of the process of exercising in physical education lessons, especially because the teacher has autonomy in selecting methods of organizational forms of work (MOFW) methods of work and application of method proceedings. Dosage, distribution and control of loading during the physical exercising influence on, whether wanted changes will occur, what that changes will be and how long they will last. (Hadžikadunić, A., 2010.). Loadings can be defined as overall influence on body of the student, which is achieved through overall educational work at lessons (Hadžikadunić, M., Mađarević, M., 2004.). In order to influence (through physical exercise), properly and efficiently, on complete anthropological status of students, their physical development, development of their abilities and skills, fond of motor skills, different motor accomplishments and other results of educational work, it is necessary to determine not only current state of anthropological status of students and directions of their transformation, but to ensure the feedback on results of work and students' progress (Hadžikadunić, A., 2010.).

The aim of this paper is to determine differences on the level of physiological loading between individual simple MOFW (parallel division form of work, parallel division form of work with additional exercises), complex MOFW (cellular form of work, circular form of work, range and work on track), and to classify as simple and complex

MOFW in the level of loadings at the physical education lesson and their individual influence on functional abilities of random subject (third grade of high school; male subjects) applying objective measure instrument (Polar RS800CX).

## Methods

### *Method organizational forms of work (MOFW)*

Today's practice showed great number of MOFW, which are defined differently, by different authors. Some of the authors divide them on: classical and contemporary or simple and complex ones. This division is bad if method organizational form of work, which are considered as contemporary or complex, are not applied in a proper way, and teacher doesn't do all necessary preparations. On the other hand, there are examples that some teachers, using classical or simple MOFW achieved great educational results (Hadžikadunić, A. 2010). Basic division of MOFW is: frontal, group and individual form of work (Hadžikadunić, M. Mađarević, M. 2004).

Some goals, tasks and results of physical education lessons are gained better by frontal, some of them by group work, while the best results have the individual forms of work Hadžikadunić, M. Mađarević, M. 2004). There is a certain number of transit method organizational forms of work. The first ones create condition for transition to the second ones (simple precedes the complex). Application of MOFW in practice starts in the first grade of elementary school from frontal form of work with the tendency to move to group form of work, as soon as possible. That transition is conditioned by age of students and series of another factor (Hadžikadunić, M. Mađarević, M. 2004). The more complex MOFW need to dominate in higher grades.

Well selected and properly applied is any form of work, which contributes bigger intensification, optimization and individuality of work and therefore humanization of the process of physical exercises (Ujević, T. Sporis, G.Milanović, Z.Pantelic, S.& Neljak B. 2013).

Two simple MOFW were used in this paper (parallel division form and parallel division form with additional exercises) and four complex MOFW (cellular form of work, work on track, circular form of work and range)

Parallel section form of work presents good preparation for introducing students into group forms of work, which are based on sections as basic organizational unit (Hadžikadunić, M., Mađarević, M., 2004.). In parallel section form class is divided in two or more groups, which do the tasks simultaneously. Students perform

tasks one by one without much waiting, which increases intensity of exercising, rational use of space, means and equipment. This provides independence for students and more common use of individual form of work for teachers. It is useful for learning new units, revision, assessment and can be applied in all parts of the lesson (Hadžikadunić, M., Mađarević, M., 2004.).

Parallel division form of work with additional exercises, is a form where main exercise is complemented by additional exercise, where a student, before his return to the group and after performing the main exercise, performs additional exercise, which contributes intensity of physical exercise (Hadžikadunić, M., Mađarević, M., 2004.).

### Sample subjects

Method of random sample subject is used in this study, which isolated male student at the age of 17 (3<sup>rd</sup> grade of Fourth Gymnasium Ilidza, Sarajevo). Feature of this age is the end of puberty, stabilization and reduction of tempo of growth and gaining weight, the end of process of ossification with the exception of long bones of extremities and collarbone (Maksimović B., 1974.). Body has bigger increase in width than in height. According to Medved R. et al (1987) this period is called the second phase of slow growth, which lasts from 16 to 18 or 19 years of age in boys. Some authors call this phase post-puberty or adolescence. As the growth comes to its end, after the post-puberty, the bigger chances appeared deviations in growth leave permanent consequences without possibility of corrections. (Medved, R., 1987.). Therefore, it is necessary that young people at this age, subject themselves to physical exams, more frequently, especially if they are included in system of training process, where special attention is directed to proper posture (Medved, R., 1987.).

Anatomic growth of certain organs and central nervous system is mainly finished, while functional development of certain organs and organ systems still flows and finishes at the age of 24 (Maksimović B., 1974.). Heart grows intensively, pulse is stabilized and blood pressure is increased, which is explained by lower volume of blood vessels in relation to the heart mass (Najšteter, Đ., 1997.). Beat and minute volumes of heart increase and get closer to means of an adult. Respirator system balances its functions, while change of matter of the level of cells is more

and more reduced, although it is still bigger than in an adult (Maksimović B., 1974.).

Muscles mass is almost completely the same as in an adult, therefore as dividend we have increased strength and endurance. Coordination skills are improved and coming close to skills of an adult, which has a direct influence on successful performance of sport activities (Maksimović B., 1974.). Although means of motor skills such as: endurance, strength and speed approach to border means, they are still in growth. One of the important assumptions was that subject can be subjected to maximal test regardless of age, and that he is clinically healthy, which is confirmed by clean lab reports (done 2 days before conducted testing) and reports of spirometry, which are done right before initial testing. Subject was prepared according to the following standards: (Medved R. et al 1987.):

- Consumption of light breakfast 1.5-2 hours before testing
- Subject comes to testing well- rested
- Subject hasn't taken simulative supplements and drinks just before testing (coffee, tea, nicotine, alcohol)
- Subject was dressed in training trunks, sport cotton T-shirt, cotton socks and sport sneakers.
- Clinical exam (Lab reports) preceded testing.

### Sample variables

Initial testing random sample is subjected to measurement in following anthropometric features:

- Volume and body mass
- longitude
- dimensionality
- level of cardio-respiratory functions modified by Taylor progressive test on moving carpet, which obtained for maximal means and means on anaerobic level of the following measures:
- VO<sub>2</sub>/Kg (ml/Kg/min) – relative consumption of oxygen
- VE (l/min) – one-minute ventilation

Table 1. Results of initial testing of subjects (modified Taylor test on treadmill)

PARAMETERS	VO <sub>2</sub> /Kg ml/Kg/min	VE l/min	RF b/min	HR bpm	VO <sub>2</sub> ml/min	EE kcal/hour	Velocity km/h	Elevation %
Test duration 00:14:45	52.7	120.9	37	190	4166	1250	14.0	2.0
Anaerobic threshold 00:11:30	42.0	79.9	26	168	3316	995	11.0	2.0

- RF (b/min) – respiration frequency,
- HR (bpm) – heart frequency
- VO<sub>2</sub> (ml/min) – maximal consumption of oxygen
- EE (kcal/hour) – consumption of kilo-calories,
- Speed (km/h) – speed of running,
- Inclination (%) – an angle of inclination of the running surface.

Analysis of the results of initial testing (Table 1) determine zones of intensity (Table 2) and in each lesson of physical education application of different complex MOFW, will show, precisely, how much time subject spent in each zone.

Table 2. Intensity Zones

INTENSITY ZONE (% HRmax)	HR (bpm/min)
50 – 60	95 – 119
60 – 70	120 – 134
70 – 80	135 – 154
80 – 90	155 – 169
90 – 100	170 – 190

Maximal, minimal and average heart frequency and time spent in each zone in the main A part of the lesson, represent sample variables (Table 3) in this study, which will be monitored on each and separate P.E. lesson.

(Table 3) Sample variables

SAMPLE VARIABLES OF FUNCTIONAL STATE OF SUBJECTS IN THE MAIN „A”PART OF THE LESSON
HRmax – maximal heart frequency
HRmin – minimal heart frequency
HRavg – average heart frequency
Time spent in certain metabolic zones

### Applied Work Program

Construction of performance program for each lesson unit is conducted according to month-operative plan and program of High school of Fourth Gymnasium Iłidza. According to regular plan and program of the school, lesson module was gymnastics, lesson unit was front roll and back roll and the type of the lesson was *Education of sport technique – revision*. Therefore, elements of front roll and back roll were the basic means of physical education in this study. Each of the six conducted lesson units had identical introductory, preparation and main “B” part of the lesson. In the main “A” part of the lesson, activities were the same. He only difference was application of method organizational forms of work, both simple and complex.

Exercises, which were performed during MOFW (Table 4) were exercises, which are normally used in training of gymnastic-acrobatic elements, front roll and back roll, and this study, showed exercises, which are intended for training of a certain element, can be used in revising of given structure.

Table 4. Exercises which were conducted in main „A” part of the class

EXERCISE NO.	FRONT ROLL EXERCISES	BACK ROLL EXERCISES
1	Start position (S.P) – heel to heel position, arms in the air. From S.P. getting to the sturdiness by squatting in knees, going back to sturdiness by squatting and again back to S.P. Note: from the moment of coming to sturdiness by squatting, chin is constantly by the chest bone.	Start position- sitting position with bend legs in knees, arms around shins, chin by the chest. From S.P. perform rollover on the back, and in the moment of contact of shoulders with the ground, set hands on the ground with fingers turned to shoulders and come back to S.P.
2	Start position- sitting position with bended legs in joints of knees, arms around shins, chin by the chest. From S.P. perform rollover on the back and turn to S.P. again.	Start position- sturdiness by squatting From S.P. performing rollover, legs bended in knees, arms around shins. After rollover in moment of contact with the ground, put the hands on the ground with chests turned to shoulders, and turn back to S.P.
3	Start position- sitting with bended legs in joints of knees, arms around shins, chin by the chest. From S.P. perform a rollover the back and from S.P. stand into in heel-to-heel position with arms in the air.	The same exercise as the previous one, where S.P. position with arms in the air.
4	Performing complete front roll.	Performance of complete back roll.

### Methods of Data Processing

Since this study is conducted in the area of one entity of the country, by method of random choice and the fact that this is transversal study, results analyzed method of comparative analysis. Method which obtained data of physiological loading by application of MOFW methods of pulsometry, conducted by application of objective measure instrument.

## Results and Discussion

Achieving optimal loading for each student/an athlete is the aim of sport coaches and teachers/educators of physical education, because only with optimal training stimuli we ensure practical performance of aims and tasks of physical education. In order to optimize optimal loading, the objective measure instruments are necessary, which lead to objective measure indicators, where the most important parameters of means are heart frequencies (Table 5).

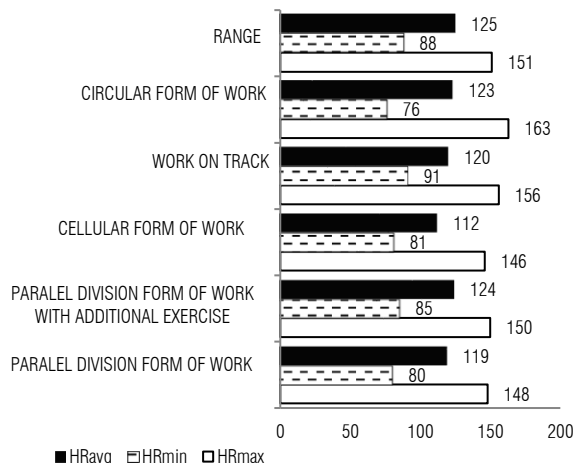
Since many schools in our country have poor material-space conditions, it is hard to think about usage of objective measure instruments. However, that doesn't mean that a teacher shouldn't and cannot optimize work for every student. Application of adequate MOFW and homogenizing groups enable each student to exercises according to his/hers abilities and needs. Review will be parameter HRmax.

In this study, means of HRmax of random sample is obtained by application of objective measure instrument (modified Taylor progressive test on moving carpet) and was 190 bpm. Based on these means for separate, zones of intensity adjusted to abilities of subjects, were determined. If the means of HRmax of subjects of this study were calculated by Karvonen's method, it would be 203 bpm, since subject is 17-years-old. If these means were used for determination of the zones of intensity, then we would get zones of intensity unadjusted to subjects. This indicates that means of maximal heart frequency of genetically predisposed and only objective instruments and methods can give relevant means of HRmax.

Results show that average heart frequency (HRavg) the biggest influence on sample subject has range as

applied form of work with average heart frequency with 125 bpm (Graph 1).

Graph 1. Means of heart frequency in the main A part of the lesson through application of different MOFW



That means that subject, during the main A part of the of the lesson, was moving with intensity of 66% HRmax, which is on the level of increased base endurance and aerobic capacity and reduction of subcutaneous fat. Range includes successive performance of certain number of physical exercises, where student needs to overcome natural and artificial obstacles, which are outdoors or indoors, in the shortest time (Findak, V., 1999.). The smallest influence on sample subject had performance of cellular form of work with average heart frequency of 112 bpm, which means that subject was moving at intensity of 59% of HRmax, which is on the level of reduction of subcutaneous tissue. Circular form of work brought biggest means of heart frequency and it is the only form of work, which leads to fourth zone of intensity of sample subject, aerobic-anaerobic zone, which influences on increase of muscle mass, increase of capacity of buffering system, as well as depot of muscle glycogen. It is interesting that application of parallel division form of work with additional exercises achieved second best result, looking at variable HRavg. Parallel division form of work with additional exercises",

Table 5. Parameters of heart frequency and time spent in separate zones of intensity for every MOFW in „A“ part of the lesson

METHOD-ORGANIZATIONAL FORMS OF WORK	HRmax	HRmin	HRavg	50 – 60 % HRmax (time/%)	60 – 70% HRmax (time/%)	70 – 80% HRmax (time/%)	80 – 90% HRmax (time/%)	90 – 100% HRmax (time/%)
PARALEL DIVISION FORM OF WORK (17' 44")	148	80	119	07' 31" 42.4%	07' 58" 45%	01' 23" 7.8%	00' 00" 0%	00' 00" 0%
PARALEL DIVISION FORM OF WORK WITH ADDITIONAL EXERCISE (20' 04")	150	85	124	05' 21" 26.7%	10' 19" 51.6%	03' 39" 18.3%	00' 00" 0%	00' 00" 0%
CELLULAR FORM OF WORK (20' 18")	146	81	112	12' 46" 63%	05' 21" 26.4%	00' 05" 0.4%	00' 00" 0%	00' 00" 0%
WORK ON TRACK (17' 00")	156	91	120	07' 50" 46.1%	05' 10" 30.4%	03' 20" 19.6%	00' 10" 1.0%	00' 00" 0%
CIRCULAR FORM OF WORK (17' 15")	163	76	123	01' 05" 6.3%	03' 30" 20.3%	07' 30" 43.5%	00' 30" 2.9%	00' 00" 0%
RANGE (17' 40")	151	88	125	05' 05" 28.8%	04' 20" 24.5%	07' 00" 39.6%	00' 00" 0%	00' 00" 0%

which are in the second place in size of influence on cardio-respiratory system of a subject

Surprising results obtained by application of simple form of work "parallel division form of work with additional exercises", which is in the second place in size of the influence on cardio-respiratory system of a sample subject, regarding HRavg, and third place regarding time spent in individual zones of intensity.

It is obvious that applied additional exercises in this form of work, which were performed after "the main exercise" and which were compensatory (additional exercise engaged muscle groups, which were not activated by the main exercise) contributed in intensification of the lesson of physical education. The reason for this result can be searched in motivation of students for realization of the lesson and in well interpretation of form of work by teacher. As mentioned, reasons for poor results can be searched in lack of motivation of subjects, poor interpretation of this complex form of work by teacher or application of form of work is not applicable as repetition and improvement of gymnastic-acrobatic elements: front roll and back roll.

## Conclusion

Since the study was conducted on only one sample, and that there were no conditions for conducting statistical and mathematical analysis, obtained results are analyzed by comparative analysis. Application of additional exercise, as it was assumed, lead to significant positive differences by looking at parameters of HRavg and the time spent in individual zones of intensity, on behalf of work in which additional exercise was applied.

Application of cellular form of work showed relatively poor effect on functional abilities of the subject, where the last place, in terms of efficiency, confirms obtained results. According to results, application of circular form of work in terms of parameters HRavg is behind parallel division form of work with additional exercise, while referring to the variable "time spent in individual zones of intensity" had the best effect on functional abilities of the subject. Results obtained by application of range as complex of MOFW, in relation to other variables, are expected. In the end, the way of interpretation of the lesson by the teacher and the level of motivation of students are maybe the most important parameters of higher degree of realized content on functional abilities of subject at the P.E. lesson.

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