

Original research article

**THE EFFICIENCY OF PHYSICAL EDUCATION DEPENDING
ON THE PROFESSIONAL COMPETENCE OF TEACHERS***

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Abstract. *The study examined the efficiency of physical education depending on the professional competence of teachers. On a sample of 70 boys, 4th-graders from primary schools "Djura Jakšić" and "Sveti Sava" from Kikinda, an experimental treatment was carried out represented by the physical education program as prescribed by the compulsory syllabus designed by the Ministry of Education of the Republic of Serbia. The duration of the treatment was six months. The experimental group consisted of boys from the primary school "Djura Jakšić", and the control group consisted of boys from the primary school "Sveti Sava". Teaching in the experimental group was led by the teacher of physical education while in the control group was led by the home room teacher. Based on the obtained results it can be concluded that, at the end of the treatment, the experimental group led by the physical education teacher achieved statistically significant better results.*

Key words: *junior school age, programmed teaching, motor skills, physical education.*

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INTRODUCTION

Any research of kinesiological determinants, which leads to insights into more efficient programming of transformation processes, inevitably leads to the determination of basic laws framed into the enduring knowledge that change is a feature of an entity in some process. This is especially the case in children going through phases of intensive changes. In this sense, it is obvious that it is a case of determining the laws of the dynamics of complex phenomena, which occur as the quality of movement, and the realization of their most various types. This is also the case due to intertwined different mechanisms of governance.

In this sense it is possible to find numerous publications that attempt to answer these complex questions, whose answers are always in the field of developmental characteristics. In a global sense, surely, of great importance are the considerations of some authors (Malina & Bouchard, 1991; Jansma & Decker, 1992; Blair, 1993; Bunc & Heller, 1993; Gallagher, Thomas, & Michael, 1994; Burton & Miller, 1988). What characterizes the results and recommendations of these studies are primarily developmental principles and determining the rules of developmental characteristics of different ages, no matter whether one may find some disagreement regarding the individual results. Of course, research and studies would be considerably less objective without the offered models or more global solutions, often based on modern and adequate technical and conceptual solutions (Momirović, 1987; Johnson & Wichern, 1992).

Maximally highly objective solutions are possible only if the researchers, primarily teachers, encompass the individualization of the children's potential to a greater extent. This concept certainly provides a high dose of objectivity and opens a whole new door for the approach towards transformational programming procedures, while trying to identify the processes among children.

In recent years, in Serbia there has been a trend of poor child care, both in a broad sense and in terms of the dealing with kinesiological activities. It is obvious that the transition process has left little opportunity for the normal growth and development of children in all segments of their being. Complete anthropological status that includes conative, health, morphological and social features, and also motoric, functional and cognitive abilities in the past has been compromised. This has therefore caused a phenomenon of inadequate growth and development, social closure, and the occurrence of aberrant behavior, which is defined as behavior that deviates from the standard sociological norms. When we add to all of this also the elements of the modernization of society, and the general global trend in which sedentarism is increasingly gaining momentum, it is not difficult to conclude that children in Serbia today are passing through a far worse period than only ten, fifteen or twenty years ago.

In a more specific sense, from the kinesiological-pedagogical point of view, motor development can be characterized by qualitatively different periods in the lifespan. Clark (1994) described six major periods in the development of motor skill behavior. These included: 1) the reflexive; 2) preadapted; 3) fundamental patterns; 4) context-specific; 5) skillful and 6) compensation periods.

These are not completely age-determined or empirically verifiable periods. Rather they, like the mountain metaphor, are meant to be a heuristic device to assist our conceptualization of the vast changes that occur in movement and mobility across one's lifespan. Only the last two or three of the above-mentioned periods occur during the devel-

opment of motor abilities of children who are the participants in this study, with the last period often occurring too late.

If we take all of this into consideration, it is difficult to understand the logic of legislators who insist that the relatively unskilled persons, mostly elementary school teachers, teach physical education classes. A refutation of this kind of logic is the purpose of this paper. Attempts were made, in an extremely precise way, to determine how much a competent and trained person, in a relatively short period, may contribute to the development of motoric skills in children, and if the state is poor and has no money to pay the teachers of physical education throughout all of the compulsory education, far less damage is made if the persons with a general education hold physical education classes in the upper grades than in the lower.

THE METHOD

The sample of participants

The experimental treatment was conducted in the period from January to June 2010 and consisted of two measurements: the initial (at the beginning of the research), and final measurement (at the end of the research). The sample consisted of 70 boys from two elementary schools in the town of Kikinda (northeastern Vojvodina, Serbia). The sample was divided into two sub-groups: an experimental group of children from the primary school "Đura Jakšić" (N=33) and a control group of children from the "Sveti Sava" primary school (N=37). For all of the students anthropometric measurements were performed according to the International Biological Program (IBP), along with the default calculation of the decimal age of children on the day of the measurement and testing. It should be noted that all the procedures were adhered to in accordance with the Declaration of Helsinki, and that before the conducted experimental program the consent of primary schools principals was acquired to carry out such a study in their facilities. In addition, the parents and children themselves were asked to participate in the study, which they agreed/did not agree to by signing the appropriate forms. Participation was voluntary. Each parent was fully introduced to the test procedures and experimental treatments.

The measuring instruments

The following measures and tests were performed:

- 1) Anthropometric measurements of the children, with anthropometric characteristics assessed according to the IBP method (Lohman, Roche, & Martorell, 1988). The following set of anthropometric measures were used:
 - a) Body height (in cm),
 - b) Body weight (in kg), and
 - c) Body mass index (BMI) (in kg/m²).
- 2) Motor testing of children was performed according to recommendations published by Bala (1999a; 1999b). Although the above references relate primarily to preschool children it is the opinion of the authors of this paper that recommendations given for preschool children are also valid for elementary school children. The following test battery was used in motor ability assessment:

a) for assessment of the movement structuring factors:

- obstacle course backwards (s) – restructuring of the movement stereotype,

b) for assessment of functional synergy and tonus regulation factors:

- arm plate tapping (freq.) – frequency speed, and
- seated straddle stretch (cm) – flexibility,

c) for assessment of motor unit excitation duration factors:

- crossed-arm sit-ups (freq.) – repetitive trunk strength, and
- bent-arm hang (s) – static strength of arms and shoulder girdle,

d) for assessment of motor unit excitation intensity regulation:

- the standing broad jump.

It is observed that the Kurelić et al. (1975) model was used. The use of this model has been demonstrated on older children and adults, so that the battery of tests applied here only "covered" the above-mentioned motoric model and is not expected to have confirmed it also. Namely, it is difficult to expect that elementary school age, having previous studies in mind (Bala, Popović, & Jakšić, 2009), especially in the first and second grade, outgrew the general motor model (Bala, 1981) or the model of two motor factors – general motor skills and flexibility (Popović, 2010).

The mentioned motor tests are briefly described below, while a complete standardization of the measuring conditions can be found in Bala, Stojanović & M. Stojanović (2007):

Obstacle course backwards

The child has to walk backwards on all fours and cover a distance of 10 m, climb the top of the Swedish bench and go through the frame of the bench. The task is measured in tenths of a second.

Arm plate tapping

For fifteen seconds the child has to alternately tap two plates on the tapping board with his dominant hand, while holding the other hand in between the two plates. The result is the number of alternate double hits.

The seated straddle stretch

The child sits on the floor, leaning against the wall in a straddle position and bends forward as far as possible. A straight-angle ruler lies down in front of the child and he/she reaches the scale with cm as far as he/she can. The result is the depth of the reach measured in cm.

Crossed-arm sit-ups

The child lies on his/her back with his/her knees bent and arms crossed on the opposite shoulders. He/she rises into a seated position and return into the starting position. The instructor's assistant holds the child's feet. The result is the number of correctly executed raises to the seated position (no longer than 60 seconds).

The bent arm hang

The child under-grips the bar and holds the pull-up as long as he/she can (chin above the bar). The result is the time of the hold measured in tenths of a second.

The standing broad jump

The child jumps with both feet from the reverse side of a Reuter bounce board onto a carpet, which is marked in cm. The result is the length of the jump in cm.

All measurements and tests were conducted in the morning (from 8:00 to 12:00 h) by trained measurers who used identical protocols.

The experimental treatment

The treatment is represented by teaching physical education which as designed in the compulsory syllabus prescribed by the Ministry of Education of the Republic of Serbia (Ordinance on the Syllabus for the Fourth Grade Elementary School Education, n.d.). In the current syllabus physical education is represented by two classes per week and one class of recreational activities.

Classes in the experimental group of boys from the primary school "Đura Jakšić" were held by a qualified teacher (a physical education teacher), while in the control group from the primary school "Sveti Sava" classes were held by the children's elementary school teacher (a teacher). During the physical education class, as a basic organizational form of work, the scheduled goals and objectives and also the teaching materials were realized through an adequate selection of physical exercise. The quality of teaching mostly depends on the teacher. The teacher chooses the tasks, resources and organizational forms of work and it is his responsibility to what extent the existing working conditions are being used, what will be the ratio of the load and rest periods and what will be the articulation of time in class. The trace left on the physical development of the pupils in the sense of the transformation of morphological characteristics, motor abilities and success in mastering assignments depends on everything above-mentioned and also on the activities of the pupils.

The question of what is the impact of teaching on the transformation of motor abilities in pupils who attended the classes held by elementary school teachers and the pupils who attended classes taught by physical education teachers, is the issue of this research.

Data analysis

Data analysis was performed by using the statistical package IBM SPSS Statistics Version 19.

For all the variables basic descriptive statistics were calculated (mean and standard deviation). The effects of the experimental treatment were determined using a multivariate analysis of covariance (MANCOVA) for the entire system of analyzed variables, while the individual effects by variables were determined by a univariate analysis of covariance (ANCOVA). In this way, statistical equalization of the experimental and control groups in the initial measuring was enabled, and also the neutralization of the differences between these two groups. This allowed the determination of the actual effects that the program has produced.

THE RESULTS

Table 1 shows the results of the participants in the pre-testing and post-testing in morphological and motor variables, as well as obtained differences between groups analyzed using the univariate and multivariate analysis of covariance.

Table 1. The significance of differences between the analyzed groups.

Variables	Elementary School	Pretest		Posttest		f	p
		M	SD	M	SD		
Body height (cm)	Đura Jakšić	126.56	4.81	128.55	4.97	3.66	0.06
	Sveti Sava	129.11	6.71	130.16	7.20		
Body weight (kg)	Đura Jakšić	26.09	4.76	27.09	4.79	2.86	0.10
	Sveti Sava	28.81	8.22	28.57	8.28		
BMI (kg/m ²)	Đura Jakšić	16.23	2.37	16.33	2.30	0.52	0.47
	Sveti Sava	17.09	3.67	16.72	3.90		
Arm plate tapping (freq.)	Đura Jakšić	20.15	4.07	22.39	3.86	0.00	0.99
	Sveti Sava	18.51	1.77	21.57	4.33		
Standing broad jump (cm)	Đura Jakšić	116.24	17.19	118.24	21.54	5.04	0.03
	Sveti Sava	120.03	19.97	110.30	20.54		
Obstacle course backwards (s) [#]	Đura Jakšić	20.73	6.78	19.48	5.41	0.16	0.69
	Sveti Sava	21.62	6.71	19.86	6.43		
Bent-arm hang (s)	Đura Jakšić	17.73	12.33	19.35	15.85	0.53	0.47
	Sveti Sava	12.65	8.60	14.38	9.10		
Crossed-arm sit-ups (freq.)	Đura Jakšić	18.61	5.10	24.85	5.74	3.10	0.08
	Sveti Sava	22.62	8.25	24.43	7.52		
Seated straddle stretch (cm)	Đura Jakšić	38.79	9.30	37.52	10.54	0.86	0.36
	Sveti Sava	41.97	10.52	42.57	11.40		

F=2.37 P=0.03

By reviewing the results of individual effects from Table 1 it can be noted that in 5 out of 6 applied motor variables (arm plate tapping, the standing broad jump, the obstacle course backwards, the bent-arm hang and the crossed-arm sit-ups) better results were obtained for the participants from the experimental group (Đura Jakšić), while in one motor variable (the seated straddle stretch) the control group (Sveti Sava) had better results. Statistically significant differences between the analyzed groups are found only in one motor variable (the standing broad jump) which is in favor of the experimental group. However, the results of the overall system of the applied variables revealed statistically significant differences between the analyzed groups in favor of the participants from the experimental group. These results indicate that in this sample of participants there has not yet been any differentiation of motor abilities, which should start to emerge at the end of junior school age, so they are still of a general type.

Based on further analysis of Table 1 it can be said that during the follow-up period there were no significant differences between the groups analyzed in the terms of the an-

thropometric dimensions of the participants. The development of anthropometric dimensions at this age is primarily affected by various endogenous and exogenous factors. These factors have different influences on the intensity and pace of growth of certain dimensions (Stamatović, 2001; Marković, 2002). Growth of the related dimensions in this study corresponds to the standard values of natural growth for this age group.

Based on the obtained results, it can be said that the applied treatment (transformation process) i.e. the teaching, which stems from the syllabus, has had a positive impact on the transformation of the motor abilities of the participants from the experimental group.

CONCLUSION

In the end it can be concluded that the introduction of the physical education teachers in the fourth, and even lower grades of elementary school is needed, because it produces significant effects on almost all motor skills in pupils. In this way physical education classes would have continuity, and therefore the effects of a unique concept of physical education development would be better. This would also have an impact on the harmonious growth and development of children and the remedying of the negative impact of the modern way of life.

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EFIKASNOST NASTAVE FIZIČKOG VASPITANJA U ZAVISNOSTI OD PROFESIONALNE SPOSOBNOSTI NASTAVNIKA

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Istraživanje je imalo za cilj da proceni efikasnost fizičkog vaspitanja u zavisnosti od profesionalne sposobnosti nastavnika. Na uzorku 70 dečaka, učenika četvrtog razreda osnovnih škola "Djura Jakšić" i "Sveti Sava" iz Kikinde, izvršen je eksperimentalni program časova fizičkog vaspitanja u formi propisanoj od strane Ministarstva za obrazovanje Republike Srbije. Eksperimentalni program trajao je šest meseci. Eksperimentalna grupa sastojala se od dečaka iz osnovne škole "Djura Jakšić", a kontrolna grupa dečaka iz osnovne škole "Sveti Sava". Nastavu eksperimentalnoj grupi vodio je nastavnik fizičkog obrazovanja dok je nastavu kontrolnoj grupi vodio njihov učitelj. Na osnovu dobijenih rezultata može se zaključiti da je na kraju eksperimentalnog programa, eksperimentalna grupa koju je vodio nastavnik fizičkog vaspitanja postigla statistički bolje rezultate.

Ključne reči: *mlađi školski uzrast, programirana nastava, motoričke sposobnosti, fizičko obrazovanje.*