

PHYSICAL EDUCATION IN FUNCTION OF TRANSFORMATION OF MORPHOLOGICAL CHARACTERISTICS IN ELEMENTARY SCHOOL STUDENTS

Preliminary communication

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Abstract.

*The purpose of this study was to determine the effects of the current physical education curriculum on morphological characteristics of first grade primary school male students. In all 79 male students from the primary school were tested for the purpose of this research. 13 metrical instruments were used for the assessment of morphological characteristics of male students (body height, total arm length, leg length, biacromial diameter, biiliocrystal diameter, chest circumference, circumference of the stretched upper arm, triceps skin fold, subscapular skin fold, abdomen skin fold and body mass). The final measuring was carried out after one year of physical exercise, and the obtained results were compared with the results of the initial measuring. The significance of differences was obtained using student's *t*-test at the significance level of 0.05% and boundary value of $t = 1.96$. On the basis of the results and discussion, it can be concluded that the program of physical education had no significant effects on the changes of morphological characteristics.*

Keywords: *primary school male students, morphological characteristics, initial measuring, final measuring, longitudinal dimensionality of the skeleton, physical activity, health, Physical Education Program, class of physical education, Student's *t*-test*

INTRODUCTION

Regular physical education classes should contribute to particular segments of transformation of morphological characteristics of students insofar as we know the specifics of children's body and if we optimally dose exercise intended for certain children age group. The consequences of physical inactivity are numerous, but the most common is obesity, which in the later period can cause serious health problems. Only regular physical activity can prepare them to withstand the efforts that await them in everyday life and build a healthy, creative and happy personality.

Appropriate physical growth and development is the priority task of the modern education, but what is of particular concern recently are the results of systematic control which are not encouraging and indicate an increase in the number of students with poor health condition, bad posture and postural disorders. Nowadays physical activity of children is reduced to a minimum, which certainly reflects negatively on their health, since it is in human nature to move, run, jump; or in other words, to be physically active. In urban areas, children of younger school age hardly can satisfy their most basic need - the need for movement.

That's the reason why physical activity intended for children should be given more attention, especially children of preschool and younger school age. In order to be implemented in practice at appropriate level, a lot of knowledge and experience is required, and above all, a good knowledge of the age characteristics of children.

Achievement of the objectives and tasks of physical education, as well as monitoring of the effects of working in this educational area is not possible without monitoring and verification of anthropological characteristics of students. The first condition is the initial assessment and diagnosis of the current state of anthropological characteristics

of the subjects; further on the transit assessment, which should show whether the necessary amendment is needed to the program, and then the final evaluation, that should give insight into the objective state of students' abilities, its improvement over the initial assessment, but also approximate values for the next school year (Findak, 2003).

Physical activity positively affects the development of the locomotive apparatus, proper growth and the development of motor and functional abilities, after all, the entire development of children's body. The results of the convenient work in physical education with children of younger school age is not visible only in the sphere of physical development, but also in the overall development of the child; therefore, the objectives of physical education should be placed as widely to influence the all-round children's development.

This study was aimed to determine to what extent the physical education curriculum implemented in the period of one academic (school) year affects the morphological characteristics of male and female students.

Morphological characteristics (anthropometric characteristics) are part of the anthropological characteristics, and they describe body composition (bone growth in length and width, muscle, subcutaneous adipose tissue) and are subjected to the change during growth and development due to numerous internal (endogenous factors - genetic factors, sex and endocrine system) and external (exogenous) factors - socio-economic and psychological factors, physical activity, diet, climate, etc.) (Zrnzević, 2016).

Research done on morphological characteristics of younger school age children is very limited, especially among first graders. Previous studies have shown that changes in the morphological characteristics largely depend on the innate (genetic) factors. Any activity, irrespective of the ex-

tent, affect the adaptive changes in the organism, and to what extent will these changes manifest depends on the methods and means that are used in working with children.

Period of early school age (7 to 10/11 years), is the first phase of slower growth. The increase in body height is relatively slow, and the annual growth level is relatively even until the end of this period. Grows in height is accompanied by the corresponding increment in body mass. During this period, children are growing annually about five centimeters, and the body weight receives an average of two to three kilograms (Medved, 1981; Kragujević, 1985).

Krsmanovic (1985) examined the effectiveness of teaching physical education depending on two models of the curriculum, of which one is control model, and other is specially designed methodical approach - an experimental model. Based on these results, the author concludes that the smallest difference was found in morphological characteristics, as expected, because systematic exercise can't effect on them in greater extent.

Zrnzević (2003, 2007) examined the influence of physical education on the morphological characteristics of the students, and those results showed that among male and female students of the first, and male and female students of second grade, there are no statistically significant differences in morphological characteristics.

METHODS

The aim of this study was to determine the effects of the current physical education curriculum on the morphological characteristics of first grade elementary school students. The study was conducted on a sample of 79 students.

To assess the morphological characteristics of students, in all 13 measuring instruments were applied (body height, arm length, leg length, shoulder width, pelvic width, wrist width, circumference of chest, upper arm circumference, volume, upper leg, upper arm skin fold, back skin fold, abdominal skin fold and body weight).

“Educational content that teachers were required to implement for those students of first grade were: natural body movements, elementary games, free exercise, exercises on the ground, various polygons, rhythmic exercises and dances, exercises with props, balance exercises...” (Regulations of the school curriculum for the first and second grade of primary education, 2004).

At the beginning of the school year the initial measurement was conducted; after a year of work the final measuring was conducted to evaluate morphological characteristics of male and female students. To assess the growth and development the International Biological Program was used (IBP - a) (Weiner & Lourie, 1969).

All the data collected from this study were statistically analyzed and basic statistical parameters were calculated, as well as the analysis of normal distribution of results. To determine how students progressed in morphological characteristics during the school year the student's t-test was applied, which examine the difference between the initial and final states for each variable separately. In order to be considered as statistically significant difference, the coefficient t had to be greater than or equal to 1.96 at a significance level of $p = .05$.

RESULTS

Differences between the initial and final measuring in groups

Table 1. Differences between the initial and final measurements of the morphological characteristics of male students

Test	Mean Initial	Mean Final	t (37)	p
AVIS	1245.00	1281.63	30.82	.000
ADUR	541.45	561.34	7.34	.000
ADUN	668.08	696.05	17.89	.000
ASIR	280.87	290.18	24.21	.000
ASIK	202.11	209.55	24.18	.000
ADZS	40.79	42.21	13.64	.000
AOGR	585.92	608.58	7.00	.000
AONL	166.58	176.05	8.14	.000
AONK	335.68	360.74	11.39	.000
AKNN	5.99	6.47	3.59	.001
AKNL	4.78	4.83	.68	.499
AKNT	4.44	5.18	4.60	.000
ATEZ	23.58	25.95	12.33	.000

Table 2. Differences between the initial and final measurements of morphological characteristics of female students

Test	Mean Initial	Mean Final	t (40)	p
AVIS	1233.85	1270.54	30.19	.000
ADUR	533.10	550.37	20.80	.000
ADUN	662.93	691.02	40.70	.000
ASIR	273.49	283.05	26.59	.000
ASIK	198.95	205.80	28.76	.000
ADZS	40.05	41.24	9.41	.000
AOGR	578.05	596.63	5.49	.000
AONL	173.95	183.85	11.16	.000
AONK	356.68	379.27	13.19	.000
AKNN	7.47	7.77	1.78	.083
AKNL	5.69	5.88	1.63	.111
AKNT	5.38	6.30	3.28	.002
ATEZ	23.56	25.74	11.15	.000

Table 1, shows the results of t-test of morphological characteristics of male students, which examined the difference between the initial and final measurement. Based on these results it can be concluded that after one year of implementation of the physical education program a statistically significant change exists in all measures, in a positive direction. All the dimensions of morphological characteristics have increased during the implementation of the program, except subcutaneous fat AKNL (back skin fold), where the values were increased compared to the initial measurement, but not statically significant. Values of abdomen skin folds (AKNT) increased compared to the initial measurement significantly, which is considered as negative phenomenon.

Table 2, shows the results of t-test of morphological characteristics of female students, which examined the difference between the initial and final measurement. Based on these results it can be concluded that after one year of implementation of the physical education program, a statistically significant change exists in all measures, in a positive direction, as it is the case in male students. All measu-

res of morphological characteristics increased during the implementation of the program, except subcutaneous adipose tissue (AKNN – arm skin fold and AKNL – back skin fold) where the values increased compared to the initial measurement, but not statically significant, and abdominal skin folds (AKNT), whose value has increased significantly compared to the initial measurement, which is considered as negative phenomena.

The changes made in other dimensions of the morphological status of female students were similar to changes occurred in male students.

DISCUSSION

Analyzing the Mean results of the morphological characteristics of male and female students at the final measure it can be concluded that there has been a positive change in all variables for the evaluation of longitudinal dimensionality of the skeleton.

The greatest changes in one-year period for both, male and female students, were found in skeleton longitudinal dimensionality measures: body height (AVIS), whose t-test value is 30.82 in male and 30.19 in female students, and leg length (ADUN) whose $t = 17.89$ in male and $t = 40.70$ in female students.

The coefficient inherent in longitudinal dimensionality of the skeleton is the largest, and it is approximately 98%, while body volume is genetically conditioned with 90%, and body fat with 50% (Malacko, 1985).

Measures of transversal dimensionality of the skeleton were increased as well in both, male and female students, within the limits expected for this age.

Keeping in mind that there has been a statistically significant increase in subcutaneous fat on the abdomen (AKNT), and an increase on the back (AKNL) and upper arm (AKNN), which represents a ballast weight, it can be concluded that physical education program is not in operational needs of children or is not in all segments realized sufficiently. The increase was most likely a result of the reduced volume of physical activity of children.

Skin wrinkles are less influenced by growth hormone ($Q = .50$), and in a large rate may depend on diet and physical activity (Đurašković, 2001), so it is possible to affect them.

In its development process, a human goes through developmental stages that are caused by certain laws of inner growth and development, but also by the external factors, as well as the activity of individual. In addition to alternating phases of rapid and slow growth, developmental changes are heterophony as the development of all systems and organs, as well as the abilities, at the same time are not at the same level of development.

Period of early school age is an important period, period of distribution phase, when developmental changes can effectively be stimulated, and if get missed, as many believe, this chance can never be compensated (Šepa, 1959).

No matter that physical education classes can't greatly affect the morphological characteristics, primarily the longitudinal and transversal dimensionality, it is important to monitor the growth and development of children. During operationalization certain steps should be taken: to satisfy the needs of each student individually and that each teacher decides independently which contents will use in order to

become more successful in objectives and tasks of specific program.

Physical Education Program is an operating school document, mandatory for every teacher of physical education. It consists the objectives and tasks of physical education, according to thematic content areas and school grades, then didactic and methodological guidelines for the realization of physical education (Matić & Bokan, 1990).

Teacher is obligated to have written preparation for every single class of physical education.

Reality of the obtained data of the morphological characteristics on the initial measurement is based on the previous research and the experience of the national researchers (Stojanović, 1977; Krsmanović, 1985; Kragujević, 1985; Đurasković 2002; Kragujević & Rakić, 2004; Zrnzević, 2003; Zrnzević, 2007). Considering these data it can be said that the obtained values are real and expected ones.

If one aspires to act more significantly on the anthropological status of children it is necessary to apply high intensity exercising which is hard to find in the real pedagogical work. Inadequate volume of load will not contribute to the systematic changes of motor and functional abilities, especially the morphological characteristics which are the research topic of this paper. There is a need for more contemporary and more efficient physical education with contents that will enhance more opportunities for the holistic development of children. To successfully manage the process of physical exercising in the physical education teachers should excel in their expertise knowledge directed at the application of adequate teaching methods, exercising, dosing of exercises, choice of exercises and methods to assess the obtained results. All this will inevitably put more demands on the teachers and pupils as well and will call for more qualitative realization of the abovementioned contents.

CONCLUSION

It is obvious that in practice nothing has changed a lot, that teachers are still not up to the task, do not respond to requests to perform quality teaching physical education. The cause is the insufficient preparedness of teachers to fully implement the program of physical education, but also the insufficient equipping of facilities necessary for the realization of the content of physical education. Adequate material means are important but not the only one. Whether the students will complete the tasks at required level depends primarily on the knowledge and skills of teachers and how they use the offered time, space, resources and which content they apply.

Based on the results of this study, together with the results of earlier research done with students of younger elementary school age, it can be concluded that the impact of physical exercise has a slight impact on the longitudinal and transversal dimensionality of the skeleton that are largely influenced by genetic factors. On the transformation of circular dimensions and skin folds, the program of physical exercise can have huge influence depending on the content and intensity of exercise, as well as the methods used in working with children. Research done has shown that the current program of physical education does not sufficiently influence the reduction of subcutaneous adipose tissue, but the lack of physical activity contributes to increase it.

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