

TRANSFORMATIONAL EFFECTS OF PARTIAL CHANGES OF COMPOSITE STRUCTURES OF THE BODY AND MORPHOLOGICAL CHARACTERISTICS OF PUPILS WITH SPECIAL NEEDS

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Abstract

Basic goal of this research is to establish partial quantitative changes (differences) of morphological characteristics and body composite structure of pupils with special needs under the influence of the changed training operators of kinesiology. To what extent the teaching of physical education contributes to the transformation of morphological characteristics of children with special needs is a problem that is so far very little studied in this population. The survey was conducted on a sample of 92 subjects in the Centre 'los Rosales' for children and youth with special needs in Mostar. The level of partial quantitative changes in the morphological characteristics was assessed with eight tests, while the body composite analysis of body composition is performed by Body Composition Analyzer "Tanita" - 300 A. Data obtained in this study were processed using the program system for univariate and multivariate data analysis. Manifested variables were processed using standard descriptive methods in order to determine their distribution function and the basic function parameters: mean (mean), standard error of the mean (error), standard deviation (st. dev.), variance (variance). Multivariate (Manova) and univariate analysis (Anova) of variance was performed to test differences between groups of pupils with special needs in the area of morphological characteristics and parameters for estimating body composite structures of the body. From the above it is clear that the applied program in physical education and sport produced significant partial quantitative effects in most of the studied variables in both study areas, provided that these effects are much better with the male pupils compared to female students.

Key words: *physical education, pupils with special needs, morphological characteristics, Tanita*

Introduction

Human need for physical activity is one of the conditions for its survival as a species and individuals. During the ontogenetic development, man improved his physical activity from rough, imprecise, scattered, to very complex movements and trends. This refers to the biological growth and development, and the development of individual body organs and especially the central nervous system, which is a very important factor in the overall development of motor skills of children. Many studies have established the positive effect of kinetic activity on the anthropological dimension, as well as the research of (Pottman, 2000) showed that children who participated in a ten-minute daily program of physical education and sport, significantly enhance the skills of reading, writing and drawing.

It also showed great progress considering morphological characteristics. 20 to 25% of children is with special health and educational needs from the population of children in primary schools. Their special health - educational needs are distributed from mild to very pronounced and from short-term to perpetual. Most of motor skills and habits are acquired and developed exclusively during childhood. They can be particularly affected and effectively develop in preschool and young school age. During this period, the structure of motor space is built on the basis of endogenous and exogenous factors that affect the future growth and development of children.

Physical education and sport as an integral part of the educational - learning process in schools has the basic task of applying appropriate kinesiology operators to affect the positive transformation processes in all dimensions that make up the structure of pupils' personality. Primary school population of children with special needs is a very sensitive and highly specific population in a complex chain of educational and systematic social impact on the physical and health education, that new generations are subjected to (Mikić, 2000). To what extent the teaching of physical education and sports training contribute to the transformation of morphological characteristics of children with special needs is a problem that is so far very little studied in this population, and we have therefore decided to first mention studies of this character with children who attend regular plan and program of the primary school. (Tanović, Bratovčić & Hodžić, 2009) conducted a research with a primary goal to define level of qualitative and quantitative effects of applied kinesiological activities on positive transformations of motor abilities of the pupils with special needs, within regular teaching of physical and health development during the period of one school year. The primary mission of teaching physical and health education to children with special needs, is to meet the bio-psycho-social needs for movement as an expression of satisfying certain needs that affect the adaptive and creative abilities in modern life circumstances and in developing health culture

of students in order to preserve health, corrections and repairs of native and acquired deviations in growth and development during early childhood years (Tanovic et.al., 2013). Also, special care is needed for the early inclusion of children with special needs in regular physical exercise with other children because that child will better accept his own handicap while the other children from an early age learn to accept, understand and respect diversity. Physical activity is an important measure in preventing the occurrence of obesity, but also a range of other health disorders in children with special needs (Bouchard & Despres, 1995). Significant number of research is conducted in the recent years regarding morphological dimensions. Most significant of those research are dating back to beginning of the last century.

Methods

The research was conducted on a sample of 92 respondents, 46 girls and 46 boys, who were involved in regular physical education for a period of one school year, in the Center "Los Rosales" for children and young people with special needs in Mostar. The level of partial quantitative changes in the morphological characteristics was assessed with eight tests, while the body composite analysis of body composition is performed by Body Composition Analyzer "TANITA" TBF- 300 A. The sample of variables for assessing morphological characteristics: 1. Thorax circuit, 2. the upper arm circuit, 3. thigh circuit, 4. calf circuit, 5. shoulder blade skinfold, 6. upper arm skinfold, 7. abdominal skinfold, 8. calf skinfold. Body composite analysis of the body structure is performed by composition analyzer "TANITA" TBF - 300 A, and following parameters are evaluated: HEIGHT - body height, WEIGHT - body weight, FFM - fat free mass.

Mass without fat is comprised from muscles, bones, tissue, water, and rest of the fat free mass of the body, TBW. Total body water. Total mass of the water in the body is amount of the water expressed in lb or kg, found in body. TBW makes 50% to 70% of the total body mass. Men usually have higher level of water in the body then women because of the bigger amount of the muscles in the body. BMI, Body mass index - (estimation of body weight) is a ration of height and weight, and it is calculated by formula: weight (kg)/height (m²). Desired range is from 18.5 to 24.9. BMRC, Basal metabolic rate - basic metabolic rate represents total energy released from the body to maintain normal body function in the static state, for example, breathing and circulation (1kcal=4.184kj). FAT MASS, total amount of fat mass (kg, lb) in the body, FAT MASS %, total amount of fat mass in the body expressed in percentage, IMPEDANCE- represents present body resistance to electricity. Muscle is acting like conductor of electricity and adiposity tissue is acting like resistance. Data derived by this research are processed by program systems for univariate and multivariate data analysis.

Manifest variables were processed using standard descriptive methods in order to determine their distribution function and the basic function parameters: mean (mean), standard error of mean (error), standard deviation (st. dev), variance (variance). Multivariate (manova) and univariate analysis (anova) of variance was performed to test differences between groups of students with special needs in the area of morphological characteristics and parameters for estimating body composite structures of the body.

Results

In order to determine the partial quantitative differences (partial quantitative effects of changes) in relation to the results of the initial and final measurements of subjects - pupils with special needs, especially for changes in the tests for the assessment of body compositional structure of the body and morphological characteristics, univariate level testing was applied (T-test for dependent samples). Analysis of quantitative parameters change (T-Test) of structural analysis of the body (tanita) students with special needs is performed. Based on the results of the arithmetic mean of the parameters for the assessment of body compositional structure of the body, the initial and final measurements, the sample of respondents students with special needs (Table 1), and based on the significance of the change (difference) tested by t-test for paired samples (Table 2), it is clear that applied teaching program of physical education and sport gave significant partial quantitative effects in the researched space.

Table 1. Composite body structure, initial and final measuring, for the sample of respondents - pupils with the special needs.

		Mean	Std. Dev	Std. Error
1	Height	152,00	8,12	1,19
	Height F	158,06	9,19	1,35
2	Weight	49,59	13,68	2,01
	WeightF	55,10	13,91	2,05
3	FFM	37,39	7,91	1,16
	FFMF	43,71	9,72	1,43
4	TBW	27,36	5,80	,855
	TBWF	32,45	7,05	1,04
5	BMI	21,32	5,10	1,75
	BMIF	22,09	5,63	,830
6	BMRC	1467,79	242,30	35,72
	BMRCF	1606,60	237,49	35,01
7	FATM	11,98	10,37	1,53
	FATMF	11,41	11,38	1,67
8	FATPR	21,78	12,36	1,82
	FATPRF	18,72	13,70	2,02
9	IMPADQ	578,54	103,93	15,32
	IMPADQF	531,08	125,06	18,44

Table 2. Significance of the changes (differences) tested with T-test for dependent samples.

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Dev	Std. Error	95% Confidence Interval of the Difference				
					Lower				Upper
1	Height - Height F	-6,06	12,33	1,81	-9,72	-2,40	-3,334	45	,002
2	Weight - WeightF	-5,51	12,87	1,07	-10,71	-2,68	-2,590	45	,008
3	FFM - FFMF	-6,31	13,89	2,04	-10,44	-2,19	-3,083	45	,003
4	TBW - TBWF	-5,08	10,09	1,48	-8,08	-2,09	-3,419	45	,001
5	BMI - BMIF	-4,76	10,45	1,99	-6,98	-1,44	-,700	45	,048
6	BMRC - BMRCF	-138,84	342,16	50,44	-240,45	-37,23	-2,752	45	,009
7	FATM - FATMF	-4,56	14,40	2,02	-7,70	-1,84	,267	45	,037
8	FATPR - FATPRF	-3,05	16,99	2,50	-1,98	8,10	-1,220	45	,022
9	IMPADQ - MPADQF	-7,45	115,36	20,85	-4,62	-19,53	-2,835	45	,007

Table 4. Significance of the changes (differences) tested by T-test for dependent samples.

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Dev	Std. Error	95% Confidence Interval of the Difference				
					Lower				Upper
1	Height - Height F	-11,71	9,52	1,40	-14,54	-8,88	-8,34	45	,000
2	Weight - Weight F	-8,81	16,21	2,39	-13,63	-4,00	-3,68	45	,001
3	FFM - FFM F	-8,37	12,27	1,80	-12,02	-4,73	-4,63	45	,000
4	TBW - TBW F	-7,09	9,08	1,33	-9,79	-4,39	-5,29	45	,000
5	BMI - BMI F	-,734	6,35	,936	-2,62	1,15	-,784	45	,437
6	BMRC - BMRC F	-127,15	257,59	37,98	-203,64	-50,65	-3,34	45	,002
7	FATM - FATM F	-2,00	14,62	2,15	-6,34	2,34	-,929	45	,358
8	FATPR - FATPR F	,532	18,11	2,67	-4,84	5,91	,199	45	,843
9	IMPADQ - IMPADQ F	63,21	169,24	24,95	12,95	113,47	2,53	45	,015

Table 6. Significance of the changes (differences) tested by T-test for dependent samples.

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Dev	Std. Error	95% Confidence Interval of the Difference				
					Lower				Upper
1	AOBGRU - AOBGRU	-3,81	10,67	1,57	-6,98	-,644	-2,42	45	,019
2	AOBNAD - AOBNAD	-1,71	6,69	,987	-3,70	,271	-1,73	45	,089
3	AOBNAK - AOBNAK	-6,33	8,04	1,18	-8,72	-3,94	-5,33	45	,000
4	AOBPOD - AOBPOD	-2,39	3,71	,547	-3,49	-1,28	-4,36	45	,000
5	ANABLO - ANABLO	1,99	2,70	,398	1,19	2,80	5,01	45	,000
6	ANABNA - ANABNA	1,08	2,05	,303	,472	1,69	3,57	45	,001
7	ANABTR - ANABTR	2,06	2,97	,438	1,18	2,95	4,71	45	,000
8	ANABKL - ANABKL	1,03	1,65	,244	,546	1,53	4,25	45	,000

Table 8. Significance of the changes (differences) tested by T-test for dependent samples.

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Dev	Std. Error	95% Confidence Interval of the Difference				
					Lower				Upper
1	AOBGRU - AOBGRU	-4,22	10,31	1,52	-7,29	-1,16	-2,77	45	,008
2	AOBNAD - AOBNAD	-2,81	4,40	,649	-4,12	-1,50	-4,33	45	,000
3	AOBNAK - AOBNAK	-3,68	3,26	,481	-4,65	-2,71	-7,65	45	,000
4	AOBPOD - AOBPOD	-,926	2,10	,309	-1,54	-,302	-2,99	45	,005
5	ANABLO - ANABLO	2,42	2,62	,386	1,64	3,20	6,27	45	,000
6	ANABNA - ANABNA	2,39	2,48	,366	1,66	3,13	6,55	45	,000
7	ANABTR - ANABTR	2,60	2,08	,307	1,98	3,22	8,47	45	,000
8	ANABKL - ANABKL	,443	1,39	,206	,027	,859	2,14	45	,037

Based on the significance of the change (difference) tested by t-test for paired samples (Table 2), it is clear that the applied program of physical education and sport has produced a statistically significant partial quantitative effects in all measurement parameters for the assessment of body compositional structure of the pupils with special needs.

Quantitative change parameter analysis (T-Test) of body structural analysis (tanita) for female pupils with special needs. Based on the results of the arithmetic mean of the parameters for the assessment of body compositional structure of the body, at the initial and final measurements, the sample of respondents female pupils with special needs (Table 3).

And based on the significance of the change (difference) tested by t-test for paired samples (Table 4), it is clear that the applied program of physical education and sport has produced a significant partial quantitative effects in the research area.

Table 3. Results of parameters for estimation of the parameters of the composite structures of the body, the initial and final measurements, for the sample of female pupil respondents with special needs.

		Mean	Std. Dev	Std. Error
Pair 1	Height	149,28	5,91	,871
	Height F	161,00	7,57	1,11
Pair 2	Weight	48,21	12,73	1,87
	WeightF	57,03	10,16	1,49
Pair 3	FFM	38,02	9,87	1,45
	FFMF	46,40	9,51	1,40
Pair 4	TBW	27,83	7,24	1,06
	TBWF	34,93	6,54	,964
Pair 5	BMI	21,47	4,97	,733
	BMIF	22,20	4,20	,620
Pair 6	BMRC	1450,84	217,24	32,03
	BMRCF	1578,00	133,22	19,64
Pair 7	FATM	9,99	9,35	1,37
	FATMF	11,99	11,80	1,74
Pair 8	FATPR	19,15	12,39	1,82
	FATPRF	18,61	14,35	2,11
Pair 9	IMPADQ	548,34	153,13	22,57
	IMPADQF	485,13	96,19	14,18

Table 5. Results of parameters for estimation of morphological characteristics at initial and final measuring of respondents pupils sample.

		Mean	Std. Dev	Std. Error
Pair 1	AOBGRU	73,21	7,22	1,06
	AOBGRU	77,03	7,25	1,06
Pair 2	AOBNAD	24,97	5,40	,797
	AOBNAD	26,69	3,72	,549
Pair 3	AOBNAK	45,55	3,20	,471
	AOBNAK	51,89	6,60	,974
Pair 4	AOBPOD	31,96	2,22	,328
	AOBPOD	34,35	2,43	,358
Pair 5	ANABLO	9,35	2,39	,352
	ANABLO	7,35	1,77	,261
Pair 6	ANABNA	6,85	2,16	,319
	ANABNA	5,77	1,33	,196
Pair 7	ANABTR	9,63	3,65	,539
	ANABTR	7,56	1,91	,283
Pair 8	ANABKL	5,68	1,75	,258
	ANABKL	4,64	,910	,134

Looking at Table 4, and based on the significance of the change (difference) tested by t-test for paired samples (Table 4), it is clear that the applied program of physical education and sport has produced a statistically significant partial quantitative effects in all measurement parameters for the assessment of body compositional structure of the pupil with special needs, except following variables: BMI Body mass index – (estimated body weight), FAT MASS – total weight of body fat (kg, lb) in the body and FATPR – total weight of body fat in the body expressed in percentages.

After examining the results of significance changes (difference) tested by t-test for dependent samples, it can be concluded that the applied program of work in physical education and sport, caused partial quantitative effects in the body structure of the composite body of pupils with special needs, and that it had significantly better effect in application for male pupils then for female pupils. Quantitative change analysis (T-Test) of morphological characteristics of pupils with special needs. Based on the results of the arithmetic mean of the parameters for the assessment of morphological characteristics at the initial and final measurements, the sample of respondents pupils with special needs (Table 5), and based on the significance of the change (difference) tested by t-test for dependent samples (Table 6), it is clear that the applied program of physical education and sport has produced a significant partial quantitative effects in the variables of morphological space.

By looking at Table 6, and based on the significance of the change (difference) tested by t-test for paired samples (Table 4), it is evident that the applied program of physical education and sport has produced a statistically significant partial quantitative effects in all the studied variables for assessment of morphological characteristics of the pupils with special needs, except variable forearm circuit – AOBNAD.

Table 7. Results of parameters for estimation of morphological characteristics at initial and final measuring of respondents pupils sample.

		Mean	Std. Dev	Std. Error
Pair 1	AOBGRU	77,09	7,38	1,08
	AOBGRU	81,32	5,75	,847
Pair 2	AOBNAD	23,78	3,32	,490
	AOBNAD	26,59	2,72	,401
Pair 3	AOBNAK	45,69	3,03	,447
	AOBNAK	49,38	2,14	,315
Pair 4	AOBPOD	28,68	3,63	,535
	AOBPOD	29,60	3,01	,445
Pair 5	ANABLO	10,15	2,64	,389
	ANABLO	7,73	1,74	,257
Pair 6	ANABNA	8,35	2,75	,406
	ANABNA	5,95	,992	,146
Pair 7	ANABTR	11,20	3,82	,564
	ANABTR	8,59	2,70	,398
Pair 8	ANABKL	5,76	1,20	,177
	ANABKL	5,32	,934	,137

Quantitative change analysis (T-Test) of morphological characteristics of female pupils with special needs. Based on the results of the arithmetic mean of the parameters for the assessment of morphological characteristics at the initial and final measurements, the sample of respondents female pupils with special needs (Table 7), and based on the significance of the change (difference) tested by t-test for dependent samples (Table 8), it is clear that the applied program of physical education and sport has produced a significant partial quantitative effects in the variables of morphological space.

Table 9. Results of multivariate analysis of variance between subject male and female pupils with special needs in the final measurement.

MAIN EFFECT: GROUP (final stat.)		
1-GROUP	Value	p-level
Wilks' Lambda	0.41	
Rao R Form 2 (12, 77)	10.14	0.00
Pillai-Bartlett Trace	0.62	
V (12,77)	10.14	0.00

The results in Table 7, as well as the significance of the change (difference) tested by t-test for paired samples (Table 8) show that the applied program of physical education and sport has produced a statistically significant partial quantitative effects in all the studied variables for assessing morphological characteristics of female pupils with special needs. Based on the results of the quantitative significance of partial change (difference) tested by t-test for dependent samples, it can be concluded that the applied program of work in physical education and sport, caused partial quantitative effects in the structure of the investigated morphological space at female pupils with special needs. After examining the results of T-test, it is evident that the partial quantitative differences (partial quantitative effects of changes) in relation to the results of the initial and final measurements of respondents male and female pupils with special needs as it is obvious that the applied program of physical education and sport caused partial quantitative effects of changes. Multivariate and univariate statistical significance of differences between groups of students with special needs in morphological variables and parameters for the assessment of body compositional structure. Within discussion of basic statistics it was noted that there are quantitative differences in the initial and final measurement of both groups of respondents (male and female pupils with special needs), but within that, it was not established whether these differences are statistically significant and if they are in which segment of the studied area are significant. That is why multivariate and univariate analysis of variance are performed, to determine the differences within the investigated area between respondent groups of male and female pupils with special needs arising under the influence of applied programs of physical education in elementary school. Multivariate analysis of variance in morphological variables and parameters for the assessment of body compositional structure of the investigated sample of male and female pupils with special needs. Multivariate (manova) and univariate analysis (anova) of variance was performed to test the difference between male and female pupils with special needs in the area of morphological characteristics and parameters for estimating body composite structures of the body. Table 9 shows the results of multivariate analysis of variance between subject male and female pupils with special needs in the final measurement with partiality and neutralization of differences in mean values of the initial measurement.

First part of the table shows the results of multivariate analysis of variance, from which it is evident that within the studied variables morphological space and variables to estimate the parameters of the composite structure of the body, there is no statistical significance between groups at the level of $p < 0.01$. Value of Wilks Lambda is 0.41. Table 10 shows the results of univariate analysis of variance where you can see exactly which variables in the study of morphological space between groups exist, that there is no statistically significant difference, and that we can see that the variable morphological characteristics and composite structures of the body contribute most to distinguishing groups.

Table 10. Results of univariate variance analysis.

MAIN EFFECT: GROUP (final.)				
1-GROUP				
	Mean sq	Mean sq	F(df1,2)	
	Effect	Error	1,64	p-level
AOBNAK	1.87	0.64	2.94	0.09
AOBPOD	93.12	29.20	34.22	0.00
ANABLO	2.57	6.36	0.40	0.53
ANABNA	5.69	6.72	0.85	0.36
ANABTR	170.15	13.96	12.19	0.00
ANABKL	17.97	0.44	40.40	0.00
AOBGRU	0.20	0.01	16.93	0.00
AOBNAD	0.13	0.01	18.15	0.00
Height	0.21	0.14	1.50	0.23
Weight	1.58	0.31	5.18	0.03
FFM	26.16	1.73	15.08	0.00
TBW	47.14	1.79	26.31	0.00
BMI	5.44	16.24	0.34	0.57
BMRC	0.16	0.01	16.84	0.00
FATM	7.14	2.59	2.75	0.10
FATPR	0.71	1.80	0.39	0.53
IMPADQ	14.99	5.64	2.66	0.11

Looking at Table 10, we can see that for the univariate analysis of variance, it is evident that there is a statistically significant difference at the level mentioned in the following variables: abdominal skinfold (ANABTR), calf skinfold (ANABKL), forearm circuit (AOBPOD), chest circuit (AOBGRU), upper arm circuit (AOBNAD), body weight (WEIGHT), fat free mass (FFM), total body water (TBW) and basal metabolic (BMRC), so those variables contribute the most to the established difference. In the remaining variables of the studied morphological space there is no statistically significant difference between groups.

Discussion and conclusion

As already mentioned, the primary mission of teaching physical education and sport is to meet the bio-psycho-social needs for movement as an expression of satisfying certain needs that affect the adaptive and creative abilities in modern life circumstances and in developing health culture of pupils in order to preserve health, corrections and repair of congenital and acquired deviation in growth and development during early childhood.

It can be justified to ask the question what is the use of this or similar studies in the field of physical education and sport, when it comes to male and female pupils with special needs. This research was aimed to present and demonstrate how different kinesiology operators may affect the transformation of anthropological status of the population of pupils with special needs.

Here, first of all we should emphasize the role of the professional interests of teachers of physical education and sport, and that first of all he must have information about the mental and the physical state of pupils with special needs and to use information and expertise towards a more successful realization of classes with children with special needs. This is especially important in working with this population of students at primary school age, because as is well known that individualization of teaching in addition to being based on differences in biological properties and physiological function, is largely based on differences in personality traits and degree of mental ability.

The population of children with special needs is a very sensitive and specific population in a complex chain of educational and systematic social impact of physical culture. If we compare the results with a study which performed by (Tanovic and Mikic 2008), which was aimed at monitoring the transformation of morphological characteristics and motor abilities of children with special needs and children who attend regular classes of the same age, they tell us that the values in terms of variables for estimating mass and body weight significantly higher for children with special needs, which is due to very low degree of motor intelligence and motor abilities (Fragala et.al., 2005) studied the influence of kinesiology program on the anthropological status of children with special needs at the age of 5 to 9 years and they concluded the progress of the engaged children. Much progress has been observed after the program for group exercise than after the training program at home and the authors emphasize the importance of organized and regular group exercise for children with special needs.

Since some studies suggest that physical exercise can mostly improve cardiovascular endurance for children with low motor skills, in whose category are included children with special needs (Hands, 2008.), those children should be enabled and created the habit of regular exercise even when they are not involved in some of the group programs of physical exercise. The results that are presented in this paper indicate that the applied program of work in teaching physical education and sport, caused partial quantitative effects in the structure of the investigated morphological

space of tested population with special needs. (Tanovic, Bratovčić and Hodžić, 2009) conducted a study analyzing the composite body structure with the help of scales "Tanita" TBF -300 A, for children with special needs. Research is performed on a sample of 56 children with special needs, of chronological age from 12 to 15 years. BMI - classification was made according to the recommendations and standards of World Health Organization (WHO) (however, we must note that these recommendations and categorization may differ from country to country - depending on the type of material bodies) that are established for psychosomatic healthy people.

Results were as follows: Anorexia <18.5 - 11 children, malnutrition 0 = 18.5 - 12; ideal weight = 20 - 25 - 9 children; overweight = 25 - 30 - 16 children; obesity > 30 - 4; bulimia > 40 - 2 children. Obtained results are confirmation or better to say product of sensory-motor disorders in this population, which is also manifested by reducing kinesiology activities due to the limited performance of different motor tasks. Such situation inevitably leads to disturbances in the structural analysis of the composition of the body, and thus the disturbance of nutritional status. In the study performed by (Tanovic et.al., 2013), and based on the results of T-test, it is confirmed that the program applied during three month period gave statistically significant partial quantitative differences (partial quantitative effect) of changes in relation to results of initial and final measuring and testing of respondents, pupils with special needs. Children with special needs, in general, require pedagogical and kinesiology interventions that allow the best possible quality of work and the development so the adaptation to their capabilities as much as it is possible.

Accordingly it is necessary for classes to be individualized in favor of such children and provide them the optimal program that is obtained from the knowledge of their anthropometric characteristics, motor and functional abilities. Such individually tailored programs will allow the child continued progress and positive socialization and integration, and on the other hand the reduction and total elimination of isolation. In such way, we will secure possibility of discovering potential of the children that they were not aware until they were, conditionally, challenged.

The significance of this study lies in the possibility of obtaining important information that can greatly enhance the curriculum in general for children with special needs in primary schools, and in particular to improve the teaching of physical education and sport and thus have a positive impact on improving the children's psychomotor status for children pupils with special needs.

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TRANSFORMACIONI EFEKTI PARCIJALNIH KVANTITATIVNIH PROMJENA KOMPOZITNE STRUKTURE TIJELA I MORFOLOŠKIH KARAKTERISTIKA DJECE S POSEBNIM POTREBAMA

Sažetak

Osnovni cilj ovog istraživanja je utvrđivanje parcijalnih kvantitativnih promjena (razlika) morfoloških karakteristika i kompozitne strukture tjelesne građe učenika i učenica sa posebnim potrebama pod utjecajem primjenjenih kinezioloških trenažnih operatora. U kojoj mjeri nastava tjelesnog odgoja doprinosi transformaciji morfoloških karakteristika djece s posebnim potrebama je problem koji je do sada vrlo malo istraživao na ovoj populaciji. Istraživanje je sprovedeno na uzorku od 92 ispitanika u Centru „los Rosales“ za djecu i omladinu sa posebnim potrebama u Mostaru. Razina parcijalnih kvantitativnih promjena morfoloških karakteristika procijenjena je sa 8 testova, dok je kompozitna analiza tjelesne građe, urađena pomoću Bodi Composition Analizera "Tanita"- 300 A. Podaci dobiveni ovim istraživanjem obrađeni su pomoću programskih sustava za univarijantnu i multivarijantnu analizu podataka. Manifestne varijable obrađene su standardnim deskriptivnim postupcima kako bi se utvrdila funkcija njihovih distribucija i osnovni parametri funkcija: aritmetička sredina (mean), standardna greška aritm.sredine (error), standardna devijacija (st.dev), varijanca (variance). Multivarijantnom (manova) i univarijantnom analizom (anova), varijance izvršeno je testiranje razlika između grupa učenika i učenica s posebnim potrebama, u prostoru morfoloških karakteristika i parametara za procjenu kompozitne strukture tijela. Iz svega navedenog jasno je vidljivo da je primjenjeni program u nastavi tjelesnog odgoja i sporta proizveo značajne parcijalne kvantitativne efekte u većem dijelu istraživanih varijabli u oba istraživana prostora, s tim što su ti efekti znatno bolji kod učenika u odnosu na učenice.

Ključne riječi: tjelesni odgoj, učenici sa posebnim potrebama, morfološke karakteristike, Tanita

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