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Original research article

THE LEVEL OF MORPHO-MOTOR SKILLS OF SEVEN-YEAR-OLD BOYS OF VARIOUS NUTRITIONAL STATUS

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Stevan Stamenković, Milovan Bratić, Dragana Berić, Saša Pantelić

Faculty of Sport and Physical Education, University of Niš, Serbia

Abstract. *The aim of this research was to determine the level of morphological characteristics and motor skills of seven-year-old boys of various nutritional status. The sample of participants consisted of 254 boys aged 7 divided into 3 groups in terms of their weight category (participants with normal body weight n=168, overweight participants n=47 and obese participants n=39). In order to measure their morphological characteristics we used the following measures: body height, leg length, arm width, shoulder width, pelvic width, body mass, average thorax volume, extended upper arm volume, thigh volume, lower leg volume, upper arm skinfold, back skinfold, abdominal skinfold, thigh skinfold and upper leg skinfold. In order to evaluate their motor skills, 9 variables were used: the plyometric jump, the standing depth jump, the forward bend - bend back - push press, 20 forward steps with a baton, horizontal skip rope, running and rolling, hand tapping, leg tapping against a wall and the 5x10 meter sprint. For all of the data obtained by testing we calculated the Mean and standard deviation (SD). In order to determine the differences between the groups we used a one factor univariate analysis of variance, the ANOVA and LSD Post Hoc test. After summarizing the results of the morphological characteristics of the participants aged 7, the lowest values were noted for the participants with normal weight, higher for those participants who were overweight, and the highest for obese participants. In the area of motor skills, the group of participants with normal weight achieved the best results for the variables used to evaluate the explosive strength of the lower extremities, coordination in space, arm coordination, running speed with a change in direction and the speed and frequency of leg movement. Overweight participants scored better values on the tests for the evaluation of speed and frequency of arm movement and coordination of the lower extremities, while obese participants were scored highest in the explosive strength of the upper extremities. The greatest statistically significant differences were noted between the group of participants with normal body weight and obese participants. From all the above, we can conclude that obesity is negatively correlated to the development of most of the motor skills of seven-year-old boys.*

Key words: *obesity, children, younger school age, physical activity.*

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Corresponding author: Stevan Stamenković
Faculty of Sport and Physical Education, University of Niš, Serbia, Čarnojeviča 10a St., 18000 Niš, Republic of Serbia
Phone: +381 18 510 900 • E-mail: stevajudo@yahoo.com

INTRODUCTION

Based on morphological characteristics, we can determine the nutritional status of the children and adolescents. Body mass represents one of the most important indicators of health, psycho-physical abilities and potential for normal growth and development (Madić, Popović, & Kaličanin, 2009; Marković, Igrutinović, Kostić, & Vuletić, 2008). If there are any deviations in body mass which are greater than the optimum, they can, not infrequently, indicate the existence of symptoms of health disorders of illnesses which have already developed (Vlaški & Katanić, 2010). Alterations in terms of mass can be divided into mass problems which represent a personal and general social problem of economically underdeveloped countries of the world, and obesity which is becoming an increasing social-health problem of modern life (Kostić, Gligorijević, & Marković, 2001).

Morphological characteristics and motor skills are mutually related and significantly influence the realization of motor tasks. Morphological structures manifest motor skills, and so these two areas are studied simultaneously and treated integrally, which has been proven in numerous studies (Zaciorski & Todorović, 1975; Malackov & Željaskov 2004; Milanović, 2007; taken from Živković, Goranović, Marković, & Branković, 2010; Ciliga, Petrinović-Zekan & Trošta, 2006). Many authors have studied the problems related to obesity and the development of the motor skills of children (Mota, Santos, Guerra, Ribeiro, & Duaret, 2002; Thompson, Baxter-Jones, Mirwald, & Bailey, 2003; Deforche et al., 2003; Ara, Moreno, Leiva, Gutin, & Casajús, 2007).

In the study of De Onis, Blossner, & Borghi (2010) it has been proven that approximately 43 million children aged under 5 years are obese and insufficiently physically active. Very often the cause of excessive mass is hypokinesis, that is, a lack of movement (Hills, King, & Armstrong, 2007; Lavizzo-Mourey, 2007). There are numerous researchers who have proven that an excessive number of overweight and obese children are more prone to not taking part in physical activities (Planinsec & Matejek, 2004; Korsten-Reck et al., 2007; Macfarlane & Tomkinson, 2007). A reduction in sedentary lifestyle and a more frequent implementation of various activities leads to an improvement in general health, but also has a preventive effect on the onset of obesity (Pate et al., 2002; Cvetković et al., 2014). The inclusion of children in sport, in addition to the aforementioned benefits, aids in the process of socialization (Gustafson & Rhodes, 2006; Baranowski, 1997).

The aim of this research was to determine the level of morphological characteristics and motor skills of seven-year-old boys of various nutritional status.

METHODS

The sample of participants

The sample of participants consisted of 254 boys aged 7 divided into 3 groups in relation to their nutritional status (participants with normal body mass n=168, overweight participants n=47 and obese participants n=39), which was calculated based on the values of their body mass index, and according to the table designed by Cole, Belizzi, Flegal, & Dietz, 2000. They were all first graders. The principals of the school, the teachers and parents were instructed on the rules and means of measuring, and their approval was obtained prior to the testing. The schoolchildren who were not granted permission to participate were not tested.

The sample of measuring instruments

Four morphological factors were measured: the longitudinal dimensionality of the skeleton (body height, leg length, arm length), transversal dimensionality of the skeleton (shoulder width, pelvic width, hip width), circular dimensionality of the skeleton (upper arm skinfold, back skinfold, abdominal skinfold, thigh skinfold, upper leg skinfold) and body mass. The measuring was carried out according to the standard procedures in accordance with the guidelines of the International Biological Program, IBP (Weiner & Lourie, 1969).

In order to measure and determine the level of motor skills, we used the appropriate motor tests. The following motor skills were measured, including: explosive strength – the plyometric jump (Nazarenko, 2000), the standing depth jump (Kurelić et al., 1975) and the forward bend - back bend - push press (Kostić et al., 2009); coordination - 20 forward steps with a baton (Kurelić et al., 1975), horizontal jump rope (Kurelić et al., 1975) and running and rolling (Kostić et al., 2009); and speed – hand tapping (Kurelić et al., 1975), foot tapping against a wall (Kurelić et al., 1975), the 5x10 meter sprint (Kurelić et al., 1975).

The metric characteristics of the measuring instruments for the evaluation of motor status were published by Kostić et al. (2010).

Methods of data processing

The data were processed using the statistical program SPSS 20.0. For all the data which were obtained by testing, the arithmetic means were calculated (Mean), as well as the standard deviation (SD)

In order to determine the differences between the groups, we used a one factor univariate analysis of variance, the ANOVA method and LSD Post Hoc test. Testing the differences was carried out using an F-test, and the level of significance was set at .05.

RESULTS

Table 1 The descriptive parameters of the morphological characteristics of the participants, seven-year-old boys of various nutritional status (n=254)

Variables	Normal mass (n=168) Mean (SD)	Overweight (n=47) Mean (SD)	Obese (n=39) Mean (SD)
Age (yrs)	7.25±0.48	7.34±0.45	7.19±0.39
BMI (kg/m^2)	15.59±1.15	19.19±0.85	23.16±2.49
Body height (cm)	127.54±5.50	130.92±6.13	132.71±5.29
Leg length (cm)	69.48±4.10	71.97±3.54	72.22±3.75
Arm length (cm)	54.10±2.53	55.17±2.16	55.75±2.74
Shoulder width (cm)	28.58±1.33	29.99±1.35	30.58±2.23
Pelvic width (cm)	20.23±1.23	21.77±1.59	22.77±1.74
Hip width (cm)	21.36±1.18	23.33±1.27	24.62±1.58
Body mass (kg)	25.42±2.99	32.99±3.64	40.99±6.53
Thorax volume (cm)	58.89±2.97	64.83±3.44	71.23±5.98
Upper arm volume (cm)	17.09±1.39	20.36±1.56	23,00±2.22
Thigh volume (cm)	33.97±2.73	39.43±2.93	44.75±3.42
Upper arm skinfold (mm)	9.32±2.47	14.95±2.97	20.31±7.19
Back skinfold (mm)	5.93±1.95	10.60±3.86	18.67±7.91
Abdominal skinfold (mm)	6.23±2.86	14.32±5.76	21.89±6.49

Legend: Mean – means value; SD – standard deviation; Об – volume; КН – skinfold; n – number

Table 1 shows the descriptive statistics of the seven-year-old boys of various nutritional levels. They were all divided according to the table designed by Cole et al. (2000). The participants whose BMI did not exceed 17.92 kg/m^2 were classified as having normal body mass, those within in the range from 17.92 kg/m^2 to 20.63 kg/m^2 we found to be overweight and those exceeding 20.63 kg/m^2 we found to be obese. Based on the table, we can conclude that the average value of the body mass index of participants with normal body mass was 15.59 kg/m^2, of overweight participants was 19.19 kg/m^2 and of obese participants was 23.16 kg/m^2.

The relationship between means and standard deviations indicates that there are no statistically significant deviations from the normal distribution of the results among most of the variables, except in the field of subcutaneous fatty tissue (upper arm skinfold, back and abdomen skinfold). Among the group of participants with normal body mass we can note a significant deviation in terms of abdominal skinfolds, among the overweight participants in back and abdominal skinfolds, and among obese participants, the skinfolds of the upper arms and back.

Table 2 The descriptive parameters of the motor skills of participants, seven-year-old boys of various nutritional status (n=254)

Variables	Normal mass (n=168) Mean (SD)	Overweight (n=47) Mean (SD)	Obese (n=39) Mean (SD)
Plyometric jump (cm)	18.44±4.72	16.50±5.76	14.04±6.25
Forward bend – back bend – push press (dm)	36.68±15.36	42.90±19.83	44.13±16.76
Standing depth jump (cm)	117.20±16.64	113.88±16.71	103.95±20.00
20 forward steps with a baton (s)	30.47±8.46	31.42±9.36	34.81±10.64
Horizontal jump rope (reps in 20s)	3.00±3.04	4.12±5.34	2.11±2.62
Running and rolling (s)	19.88±2.74	20.31±3.59	21.69±3.90
Hand tapping (reps in 20s)	23.01±4.80	24.34±4.44	24.08±5.94
Foot tapping against a wall (reps in 15s)	14.07±2.90	13.79±3.50	12.95±2.87
5x10 meter sprint (s)	17.6±1.37	17.69±1.66	19.30±2.05

Legend: Mean – mean value; SD – standard deviation; n – number

Table 2 shows the results for the descriptive statistics of motor skills of the participants, seven-year-old boys of various nutritional status. The relationship between the means and standard deviation determined that there were significant deviations from the normal distribution of the results for some of the variables used to evaluate the explosive strength and coordination for all the groups (normal weight, overweight and obese participants). Differences can be noted for the plyometric jump, forward bend - back bend - push press, 20 steps with a baton and horizontal jump rope. In the remaining tests for the evaluation of motor skills there are no significant deviations from the normal distribution of the results.

Table 3 represents the results of a one factor analysis of variance. By analyzing these results we can conclude that there are statistically significant differences at the .01 level, for the following measures: body height, body mass, arm length, shoulder width, pelvic width, hip width, body mass, average thorax volume, upper arm volume, thigh volume, upper arm skinfold, back skinfold, abdominal skinfold and the plyometric jump , while a somewhat smaller statistically significant difference was determined for the following tests: forward

bend – back bend – push press (sig=.008), the standing depth jump (sig=.015), 20 forward steps with a baton (sig=.027) and the 5x10 meter sprint (sig=.001). Statistically significant differences were not determined only for the horizontal jump rope (sig=.213), running and rolling (sig=.105), hand tapping (sig=.177), and foot tapping against a wall (sig=.116).

Table 3 One factor univariate analysis of variance (ANOVA) of the participants, seven-year-old boys of various nutritional status

	F	Sig.
Body height	17.107	.000**
Leg length	12.409	.000**
Arm length	8.593	.000**
Shoulder width	37.129	.000**
Pelvic width	64.703	.000**
Hip width	127.351	.000**
Body mass	286.528	.000**
Thorax volume	197.927	.000**
Upper arm volume	259.688	.000**
Thigh volume	249.092	.000**
Upper arm skinfold	159.259	.000**
Back skinfold	181.196	.000**
Abdominal skinfold	245.191	.000**
Plyometric jump	12.336	.000**
Forward bend-back bend-push press	4.871	.008**
Standing depth jump	4.382	.015*
20 forward steps with a baton	3.683	.027*
Horizontal jump rope	1.567	.213
Running and rolling	2.314	.105
Hand tapping	1.742	.177
Foot tapping against a wall	2.177	.116
5x10 meter sprint	8.232	.001**

Legend: F – Rao's F approximation; Sig – level of significance

Based on the results of the LSD Post Hoc test, a statistically significant difference was determined between the groups.

By analyzing the results in Table 4 we can conclude that for the variables of body height, body mass, arm length and shoulder width there is a statistically significant difference between the groups of participants with normal body weight and the overweight participants, but also between the participants with normal body weight and the obese participants at the .01 level of significance. Between the overweight and obese participants, no statistically significant differences were noted. In the cited morphological parameters the greatest values were determined for obese participants, somewhat lower values for overweight participants, and least of all for the group of participants with normal weight. For the variables of pelvic width, hip width, body mass, thorax volume, upper arm volume, thigh volume, upper arm skinfold, back skinfold and abdominal skinfold statistically significant intergroup differences were determined between all the groups at the .01 level of significance.

Table 4 LSD Post Hoc test results for the participants, seven-year-old boys of various nutritional status

	(I) Group	(J) Group	Mean Difference (I-J)	Sig.
Body height	normal	overweight	-3.39*	**.000****
	normal	obese	-5.17*	**.000****
	overweight	obese	-1.78	.142
Leg length	normal	overweight	-2.49*	**.000****
	normal	obese	-2.74*	**.000****
	overweight	obese	-.25	.774
Arm length	normal	overweight	-1.06*	**.010***
	normal	obese	-1.64*	**.000****
	overweight	obese	-.58	.286
Shoulder width	normal	overweight	-1.41*	**.000****
	normal	obese	-2.00*	**.000****
	overweight	obese	-.59	.072
Pelvic width	normal	overweight	-1.54*	**.000****
	normal	obese	-2.55*	**.000****
	overweight	obese	-1.01*	**.001****
Hip width	normal	overweight	-1.97*	**.000****
	normal	obese	-3.26*	**.000****
	overweight	obese	-1.29*	**.000****
Body mass	normal	overweight	-7.57*	**.000****
	normal	obese	-15.56*	**.000****
	overweight	obese	-7.99*	**.000****
Thorax volume	normal	overweight	-5.94*	**.000****
	normal	obese	-12.34*	**.000****
	overweight	obese	-6.40*	**.000****
Upper arm volume	normal	overweight	-3.27*	.000**
	normal	obese	-5.91*	.000**
	overweight	obese	-2.64*	.000**
Thigh volume	normal	overweight	-5.47*	.000**
	normal	obese	-10.79*	.000**
	overweight	obese	-5.32*	.000**
Upper arm skinfold	normal	overweight	-5.63*	.000**
	normal	obese	-10.99*	.000**
	overweight	obese	-5.36*	.000**
Back skinfold	normal	overweight	-4.67*	.000**
	normal	obese	-12.74*	.000**
	overweight	obese	-8.08*	.000**
Abdominal skinfold	normal	overweight	-8.09*	.000**
	normal	obese	-15.66*	.000**
	overweight	obese	-7.57*	.000**
The plyometric jump	normal	overweight	1.94*	.024*
	normal	obese	4.40*	.000**
	overweight	obese	2.46*	.029*
Forward bend-back bend-push press SUM	normal	overweight	-6.22*	.023*
	normal	obese	-7.45*	.012*
	overweight	obese	-1.23	.731

Standing depth jump	normal	overweight	3.32	.480
	normal	obese	13.26*	.004**
	overweight	obese	9.93	.088
20 forward steps with a baton	normal	overweight	-.95	.522
	normal	obese	-4.34*	.007**
	overweight	obese	-3.39	.083
Horizontal jump rope	normal	overweight	-1.12	.223
	normal	obese	.89	.307
	overweight	obese	2.01	.080
Running and rolling	normal	overweight	-.44	.622
	normal	obese	-1.82	.034*
	overweight	obese	-1.38	.196
Hand tapping	normal	overweight	-1.33	.104
	normal	obese	-1.07	.225
	overweight	obese	.26	.805
Foot tapping against a wall	normal	overweight	.28	.577
	normal	obese	1.12	.038*
	overweight	obese	.84	.201
5×10 meter sprint	normal	overweight	-.03	.954
	normal	obese	-1.64*	.000**
	overweight	obese	-1.61	.003**

Legend: Mean Difference – difference in the average values; Sig. – level of significance, statistical significance set at **sig<.01, *sig<.05; Об – volume; КН – skinfold;

In the area of motor skills, a statistically significant difference between all these groups can be noted for the plyometric jump, with the best values scored by the participants with normal body mass, somewhat lower results for the group of overweight participants and the lowest results for obese participants. Between the participants with normal body mass and the overweight participants, but also the overweight and obese participants, the significance of the difference was at the level of .05, while for the intergroup relations between the participants with normal weight and obese participants the significance of the difference was at the .01 level.

For the tests used to evaluate the explosive strength of the torso, shoulders and arms (the forward bend – back bend – push press) and the speed of running with changes in direction (the 5x10 meter sprint) statistically significant differences were noted between certain groups. In the case of the forward bend – back bend – push press the highest results were noted for participants with normal body mass. A statistically significant difference can be noted between the group of obese participants and participants with normal body mass (sig=.012), as well as the overweight participants and group of participants with normal body mass (sig=.023). For the 5x10 meter sprint, a statistically significant difference was noted between the participants with normal body mass and overweight participants, in favor of the former (sig=.000), as well as the overweight and obese participants with a statistically significant difference and better values in favor of the overweight participants (sig=.003).

For the standing depth jump, a statistically significant difference was noted between the participants with normal body mass and obese participants, in favor of the former (sig=.004).

For the 20 forward steps with a baton, there is a significant intergroup difference between the participants with normal body mass and obese participants, where the former group achieved better results (.007).

For running and rolling a statistically significant difference was noted between participants with normal body mass and obese participants, with better results achieved by the participants with normal body mass (sig=.034).

For foot tapping against a wall there is a statistically significant difference between the group of participants with normal weight and obese participants, where the participants with normal weight scored better results (sig=.038).

Statistically significant intergroup differences were not noted for horizontal jump rope and hand tapping.

DISCUSSION

Based on the mean values of the morphological characteristics which are found in table 1 we can note an increase in the growth of morphological parameters with the increase in the body mass index. In particular, the highest values were noted for the group of obese participants, followed by the overweight participants and finally the participants with normal body mass. A greater difference can be noted for volume and subcutaneous fatty tissue, which was expected. An increase in the values of morphological variables along with an increase in the body mass index are also visible for the longitudinal and transversal dimensionality of the skeleton.

By gaining insight into the mean values of motor skills and comparing the three groups (participants with normal body mass, overweight participants and obese participants) we can conclude that the best results were noted for the participants with normal weight, then for the overweight participants and finally the obese participants, for the following variables: the plyometric jump, the standing depth jump, 20 forward steps with a baton, running and rolling, foot tapping against a wall and the 5x10 meter sprint. For the horizontal jump rope and hand tapping the best average result was noted for the overweight participants, while the obese participants were dominant in the explosive strength of the abdomen, shoulder belt and arms (forward bend – back bend – push press) which to a great extent is in accordance with the results of other studies (D'Hondt et al., 2013; Esmaeilzadeh & Ebadollahzadeh, 2012; Pantelić et al., 2012).

Based on the results of table 3 (ANOVA method) we can conclude that there is a statistically significant intergroup difference for all the parameters used to evaluate the morphological characteristics at the .01 level of significance.

Table 4 (LSD Post Hoc test), for the measures of body height, arm length and leg length no statistically significant difference was noted between the group of overweight and obese participants, while for the other two remaining intergroup relations (participants with normal weight-obese and normal weight-overweight) there is a statistically significant difference in the aforementioned measures of longitudinal dimensionality of the skeleton. The tendency of growth and child development is not the same. Thus, individual deviations are not infrequent, which are subject to the influence of various internal and external factors (Smiljanić, 1999; Đurašković, 2002).

For pelvic width and hip width we noted statistically significant differences between all the groups (participants of normal body mass, overweight and obese participants), while for shoulder width between the overweight participants and obese participants there is no statistically significant difference (a result of .072 indicates a small deviation from the borderline value of significance of .05), but for the remaining two inter-group relations (participants with normal weight-obese and normal weight-overweight) differences were noted at the .01 level of significance. For body mass, average thorax volume, upper arm volume and thigh volume there is a statistically significant difference between all of the groups at the .01 level of significance. These values support the results of the study carried out by Đorđević (2015).

In the area of subcutaneous fatty tissue (upper arm skinfolds, abdominal skinfolds and back skinfolds) we noted a statistically significant difference between the groups at the .01 level of significance.

These results and the differences between the groups were confirmed in previous studies (Tomkinson, 2007; Shephard, 1991; Tomkinson et al. 2003; taken from Parízková, 2010) in which it was proven that a change in lifestyle (diet and reduced movement) also brings a change, that is increase, in morphological characteristics, but there is also a decrease in the functional and motor skills.

By analyzing the results in table 3 we can conclude that there is a statistically significant intergroup difference in the area of explosive strength of the upper and lower extremities (the forward bend – back bend – push press and the plyometric jump at the .01 level of significance, and the depth jump at the .05 level of significance). For the 20 forward steps with a baton, running and rolling and horizontal jump rope, hand tapping and foot tapping against a wall no statistically significant intergroup differences were noted, while for the 5×10 meter sprint variable there is a statistically significant intergroup difference at the .01 level of significance.

By analyzing the values of the LSD Post Hoc test from Table 4. the best results for the explosive strength of the lower extremities (the plyometric jump, the standing depth jump) were achieved by the participants with normal weight. A statistically significant difference for the standing depth jump was noted only between the groups of participants with normal weight and obese participants, for the plyometric jump a difference was noted only between the group of participants with normal weight and obese participants, while for the plyometric jump there are significant differences between all the groups. The overweight participants scored higher results than the group of obese participants. However, for the explosive strength of the upper extremities (the forward bend – back bend - push press) the best results were noted for the obese participants, somewhat lower results were noted for the overweight participants and the lowest for the participants with normal weight. A statistically significant difference, on the aforementioned test, was not determined between the overweight and obese participants.

These results indicate that obesity has a negative impact on the explosive strength of the lower extremities (Riddiford-Harland, Steele, & Baur, 2006), but highly correlates with the explosive strength of the upper extremities of children aged 7. The results of this research are compatible with the results obtained by Rodić (2012) who concluded that body mass has a positive effect on the explosive strength of the upper extremities.

Based on the results of the LSD Post Hoc test in the area of coordination (20 forward steps with a baton, horizontal jump rope and running and rolling) the values indicate that

there is a statistically significant difference only between the group of participants with normal weight and obese participants for the variable of running and rolling as well as the 20 forward steps with a baton, at the .05 level of significance. For the horizontal jump rope there is no statistically significant intergroup difference. For most of the tests for the evaluation of coordination, the best results, but not significant, were obtained by the participants with normal body weight, unlike the group of obese participants who scored the lowest values. For the horizontal jump rope, the overweight participants had only slightly better results than the participants with normal body mass.

The results indicate that obesity has a negative impact on the development of coordination, which supports the study of Lopez, Stodden, Bianchi, Maia, & Rodriguez, (2012), who proved that participants with normal weight had significantly better coordination than overweight and obese participants, but also supports the study of Pereira et al. (2011).

For the 5×10 meter sprint, the obtained results indicate a statistically significant difference between the group of participants with normal weight and obese participants, but also the overweight participants and obese participants at the .01 level of significance. It has been proven that running speed is negatively correlated with subcutaneous fatty tissue (Milanese, Bortolami, Bertucco, Verlato, & Zancanaro, 2010), which is confirmed by the results of this research. On the test for the evaluation of the frequency and speed of movements of the lower extremities (foot tapping against the wall) there is a statistically significant difference at the intergroup level between the participants with normal weight and obese participants at the .05 level of significance. Based on the results for the movement frequency of the upper extremities (hand tapping) there is no statistically significant intergroup difference.

For the measures used to evaluate the frequency and speed of upper and lower extremities (hand tapping and foot tapping against a wall), the smallest intergroup difference was noted in comparison to the results noted for the other motor variables. Considering the fact that this segment of motor skills is mostly genetically conditioned (Željaskov, 2004), and body composition and body weight do not have a significant influence on the improvement of the results, these values are expected. Đorđević (2015) confirmed all of the above and based on the obtained results which indicate that there are no statistically significant intergroup differences for the variable of hand tapping and for foot tapping against the wall, a significant difference was noted between the participants with normal weight and obese participants. The obtained values can be identified with the results obtained by other researchers (Đorđević, 2015; Pantelić, Kostić, Đurašković, Uzunović, & Ranđelović, 2012; Milanese et al., 2010; Siahkouhian, Mahmoodi, & Salehi, 2011; Kostić et al., 2010).

CONCLUSION

Following a summary of the results of the morphological characteristics of participants aged 7, the lowest values were noted for the participants with normal body mass, higher values were noted for overweight, and the highest for obese participants.

In the area of motor skills, the group of participants with normal body mass achieved the highest results for the variables used to evaluate the explosive strength of the lower extremities, arm coordination, running speed with a change in direction and frequency and speed of leg movement. Overweight participants scored higher values on the tests

used to evaluate the frequency and speed of arm movement and coordination of the lower extremities, while obese participants scored highest results for explosive strength of the upper extremities. The highest statistically significant differences were noted between the group of participants with normal weight and the obese participants.

Based on the aforementioned, we can conclude that obesity is negatively correlated with the development of most of the motor skills of seven-year-old boys.

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NIVO MORFO-MOTORIKE SEDMOGODIŠNJIH DEČAKA RAZLIČITOG STEPENA UHRANJENOSTI

Cilj ovog istraživanja je bio da se utvrdi nivo morfoloških karakteristika i motoričkih sposobnosti dečaka uzrasta 7 godina različitog stepena uhranjenosti. Uzorak ispitanika činilo je 254 dečaka starosti 7 godina podeljenih u 3 grupe u odnosu na stepen uhranjenosti (ispitanici sa normalnom telesnom masom n=168, ispitanici sa prekomernom telesnom masom n=47 i gojazni ispitanici n=39). Za merenje morfoloških karakteristika koristile su se sledeće mere: telesna visina, dužina noge, dužina ruke, širina ramena, širina karlice, širina kukova, telesna masa, srednji obim grudi, obim nadlaktice opružene ruke, obim butine, obim potkolenice, kožni nabor nadlakta, kožni nabor leđa, kožni nabor trbuha, kožni nabor butine i kožni nabor potkolenice. Za procenu motoričkih sposobnosti korišćene su 9 varijable: pliometrijski skok, skok u dalj iz mesta, pretklon-zaklon-izbačaj, 20 iskoraka sa provlačenjem palice. preskakanje horizontalne vijače, trčanje i valjanje, taping rukom, taping nogom o zid i trčanje 5x10 metara. Za sve podatke koji su dobijeni testiranjem izračunata je aritmetička sredina (Mean) i standardna devijaciaja (SD). Za utvrđivanje razlike između grupa korišćena je jednofaktorska univarijantna analiza varijanse ANOVA i LSD Post Hoc test. Sumiranjem rezultata morfoloških karakteristika ispitanika uzrasta sedam godina najmanje vrednosti su zabeležili normalno uhranjeni, veće od njih prekomerno uhranjeni i najveće gojazni ispitanici. U oblasti motorike grupa normalno uhranjenih je postigla najbolje rezultate u varijablama za procenu eksplozivne snage donjih ekstremiteta, koordinacije u prostoru, koordinacije ruku, brzine trčanja sa promenom smera i brzine frekvencije pokreta nogu. Prekomerno uhranjeni ispitanici su imali najbolje vrednosti u testovima za procenu brzine frekvencije pokreta ruku i koordinacije donjih ekstremiteta, dok su gojazni prednjačili u eksplozivnoj snazi gornjih ekstremiteta. Najveće statistički značajne razlike su zabeležene između grupe ispitanika sa normalnom telesnom masom i gojaznih. Iz svega navedenog može se zaključiti da je gojaznost u negativnoj korelaciji sa razvojem većine motoričkih sposobnosti dečaka uzrasta 7 godina.

Ključne reči: *gojaznost, mlađi školski uzrast, fizička aktivnost*.