FACTA UNIVERSITATIS
Series: **Teaching, Learning and Teacher Education** Vol. 3, N° 1, 2019, pp. 11 - 18
https://doi.org/10.22190/FUTLTE1901011M

Original research paper

MOTOR SKILLS IN FOURTH GRADE PRIMARY SCHOOL STUDENTS

UDC 796.012.11-053.5 +572.512-053.5 (497.11 Vranje)

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Abstract. *The authors of this paper, which is a part of a more extensive research, provide an overview of anthropometric characteristics and motor skills in fourth-grade primary school students in Vranje and differences in these between boys and girls. The anthropometric characteristics included in the measurements were body height (Tv) and body weight (Tt), while the motor skills measured were the explosive leg power, explosive torso and shoulder power, speed, static (isometric) arm and shoulder strength, and flexibility (mobility).Body height was measured by a height meter, body weight by a weight scale, explosive leg power by a standing long jump (Sudm), explosive torso and shoulder power was measured by throwing a 2 kg medicine ball (Bm), speed was measured by a 30 m run from a high start (Tvs), static (isometric) arm and shoulder strength with pull-up endurance up to 120 seconds (Iuz) and flexibility (mobility) with standing hamstring stretch (Dpk). This research included 500 participants, fourth-grade primary school students in Vranje, both boys and girls. Statistical analysis provided us with descriptive data as well as with the differences between boys and girls in anthropometric and motor skill variables which were calculated using the t-test. The research results tell us that all the statistically significant differences are in favour of the boys. The same results that this research has provided can serve as a basis for further diagnostics efforts and planning of physical education lessons. These findings have also shown us that it is necessary to identify reliable measuring instruments for monitoring and tracking the state and changes in the anthropometric characteristics of younger school age children.*

Key words: *motor skills, students, primary school*

Received March 18, 2019/Accepted June 26, 2019
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1. INTRODUCTION

Physical education is an integral part of the education system, and it is not simply a subject that only helps to strengthen the muscles and improve flexibility, but it also has an impact on the development of personality. Physical education coupled with mental, moral and aesthetic education is the foundation for further development of children, and it is seen as a particularly important pedagogical process with regard to education of children of the younger school age.

One of the physical education focus areas is the optimum development of physical abilities – speed, mobility, endurance and strength. Only the appropriate level of motor skills allows for a successful learning of more complex motor tasks, the adoption of motor skills and habit formation (Višnjić, et al., 2004). Therefore, the development of the anthropometric characteristics, the acquisition of motor knowledge and skills, and the formation of useful habits should be seen as a dialectic unity between regular physical education classes and extracurricular activities, since these are inseparable factors affecting the development of school children and young people (Momčilović, V. 2015).

Many researchers (such as Momčilović, 2015) (according to: Malacko, 2002, 2009; Pržulj, 2007, et al.) have provided a scientific overview of the anthropometric characteristics which indicates that, if followed, the so-called *sensible periods* in school children's development are the most effective ones. These periods are included in the ontogenesis period, when, based on laws of nature, certain abilities and qualities develop the most, when adaptive skills start to prevail over exogenous factors, and when certain motor skills begin to be formed.

Between the ages of 10 and 15, child's body is more susceptible to the influence of external factors.

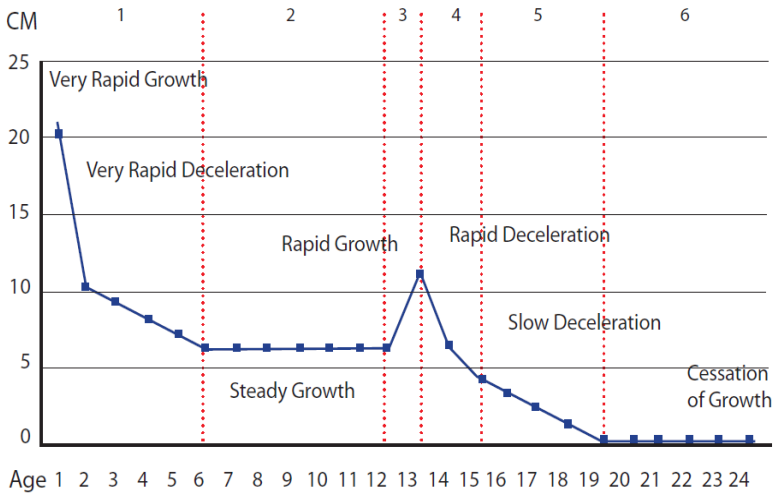

Fig. 1 Growth chart throughout childhood
(Balyi & Way, 2011., from: Momčilović, V. 2015).

Changes in the anthropometric characteristics of school children depend on longer training hours, teacher requests and knowledge – whose activities should rely on their knowledge of

global indicators and rules based on which the appropriate transformation processes can be successfully designed. Moreover, after certain curriculum has been covered, the effects of the exercise conducted can be expressed in the form of transformation processes.

We were particularly interested in the effects that exercise would have in physical education classes, that is, whether the teacher would be able to meet the goals and objectives set and whether the planned curriculum would be followed all the time or only occasionally (Ad hoc). Of course, this depends on many factors, one of the most important ones being the methodological approach to meeting the objectives of physical education curriculum. (Kukolj, Jovanović, and Ropret, 1992).

The success of the transformation process in physical education classes enables the effective measurement of the corresponding anthropometric characteristics. This research is based on the past measurements done by (Kurelić, Momirović, Stojanović, Šturm, Radojević, Viskić-Štalec, 1975; Ahmetović, et al. 1990, etc.). Of course, such studies are always welcome and they certainly provide an explanation not only for the numerous anthropometric characteristics, but also for the latent personality traits, which are of particular importance for further research.

Physical education classes enable the desirable changes in the anthropometric characteristics of younger school age children, through a specific transformation process where the effects are achieved by physical exercise taking place during physical education lessons. A good choice of physical education teaching methods also influences these transformation processes.

Let us remind ourselves that physical education teaching methods are not only the ways to teach the curriculum, but they also help to:

1. Develop motor skills in school children,
2. Teach school children how to live and work and how to have a good-quality and harmonious relationship with oneself and the society,
3. Satisfy the need for physical exercise and activity.

When choosing the correct physical education teaching methods, teachers should especially focus on meeting certain didactic principles.

Regarding the students of the particular age that this paper is focusing on, we believe that Diesterweg's PROGRESSIVE method is the best choice, of course, without diminishing the significance of other methods used to teach physical education. Diesterweg's teaching guidelines were to teach:

a) from the known to the unknown,
b) from the simple to the complex,
c) from the easy to the difficult, and
d) from the familiar to the unusual. (See for more: Momčilović, 2011, 145-184).

The goal of this research was to identify anthropometric characteristics and motor skills in fourth grade primary school students in Vranje, and to present the research findings to all the relevant primary school personnel and to the parents of the children who participated in this study.

2. METHODS

The sample included primary school students from Vranje. Purposive sampling was conducted, while the sample was mixed (male and female students). This research included 500 participants, fourth grade primary school students in Vranje, both boys and girls.

Table 1 Sample of survey participants by gender

Gender	Number of students	Percentage
Male	257	51.4
Female	243	48.6
Total	500	100.0

Table 1 show that this research included 257 male students, or 51.4% of the total sample, and 243 female students or 48.6% of the total sample.

The anthropometric characteristics included in the measurements were body height (Tv) measured by a height meter, and body weight (Tt) measured by an electronic weight scale.

A test battery specifically designed to test the effect of physical education lessons on the development of motor skills, which was published in the Official Gazette, was used in our study to measure the motor skills (Official Gazette of RS, No. 15. August 15th 1995). (See also: Momčilović and Momčilović, 2010; Bala, 2007, 2010).

Research methods used in this research were:

1. Descriptive method,
2. Inductive approach, and
3. Statistical method.

Data analysis methods used in this research were descriptive statistics and deductive statistics - statistical methods for comparative studies. Data analysis was conducted using the SPSS 17.0 statistics software.

The statistical indicators used were:

1. frequency,
2. percentage,
3. minimum value,
4. maximum value,
5. average value (mean value),
6. standard deviation,
7. T – test result.

All measurements for the purposes of this research were taken at regular physical education classes. The measurements were taken in the mornings in the physical education classroom, except for the 30-meter run which took place in the school yard. All participants had regular sports equipment they always wear in regular physical education classes.

Two days were spent in each school, while two additional days were planned in case certain problems arose during the research.

The research variables: body height, body weight, pull-up endurance up to 120 seconds, throwing a medicine ball and a 30 m run from a high start were measured once each, while the research variables standing long jump and standing hamstring stretch were measured twice (two turns taken). Prior to each measurement, the measurement instruments were checked, and after every ten measurements the weight scale was calibrated.

Six (6) primary schools participated in the research:

1. "Branko Radičević" primary school in Vranje,
2. "Dositej Obradović" primary school in Vranje,
3. "Svetozar Marković" primary school in Vranje,
4. "1. Maj" primary school in Gornji Vrtogoš,
5. "Branislav Nušić" primary school in Rataje,
6. "20. Oktobar" primary school in Vlase.

Table 2 Number of participants per school

School	Number of participants	Percentage
Branko Radičević Primary School	85	17.0
Dositej Obradović Primary School	81	16.2
Svetozar Marković Primary School	84	16.8
1. Maj Primary School	80	16.0
Branislav Nušić Primary School	86	17.2
20. Oktobar Primary School	84	16.8
Total	500	100.0

Table 2 shows the number of research participants per school:

- 85 students from *Branko Radičević* primary school in Vranje participated in the research, which is 17 % of the total sample.
- 81 students from *Dositej Obradović* primary school in Vranje participated as well, which is 16.2 % of the total sample
- 84 students from *Svetozar Marković* primary school participated in the research, which is 16.8 % of the total sample.
- When it comes to the *1. Maj* primary school in Gornji Vrtogoš, 80 students participated in the research, which is 16 % of the total sample.
- 84 students from *Branislav Nušić* primary school in Rataje participated in the research, which is 17.2 % of the total sample.
- 84 students from *20. Oktobar* primary school in Vlase participated in the research, which is 16.8 % of the total sample.

3. Discussion and Research Results

Starting from the subjects and goals of this research and on the basis of the research papers published so far, one can conclude that a similar problem has been studied and that there are many differences not only in program contents and applied research methods, but also in the processing of data.

In most of the research, some latent dimensions have been determined which, regardless of the need to critically analyze the stability of each of them, were the framework of the following researches, which aimed to determine the complete structure of the motor space. Research on the structure of the motor space by this model has led to the definition of numerous latent dimensions, some of which represent identical abilities, but differently defined and named by the authors (Kurelić, Momirović, Stojanović, Šturm, Radojević, & Viskić-Štalec, 1975).

Research carried out to determine the structure of the motoric area was mainly comprised of young people, while research involving the motoric latent structure of pre-school children and children of younger grades in primary school did not pay enough attention. There are several reasons for such a situation, but two are basic.

First, children at that age are characterized by "whole-body reaction", which leads to the instability of a general motoric structure that has a rapid development, primarily determined by individual genetic dispositions. Children of this age do not have stable motorics and therefore it is very difficult to reliably measure and objectively evaluate any parameters of the motoric structure.

The other reason is the lack of sufficient valid measurement procedures to reliably measure the motoric status of children. Research of this type was carried out by the following researchers: (Dukovski, 1984) on a sample of 500 boys and girls, aged five and six. On a sample of 765 children aged four and a half to fourteen and a half (Cruz, Bruininks, and Robertson, 1981). On the sample of 138 boys and 125 girls (Planinšec and Čagran, 2001), they identified motoric types of children on the territory of Maribor. The sample of the indicators consisted of 28 motoric tests standardized for the Slovenian population.

This part also includes research results shown in tables so that we get a clear picture of the work done here.

Descriptive statistics findings are shown in table 3 below and they describe the results of the variables measured during this research.

Table 3 Descriptive statistics results

Variables	N	Minimum value	Maximum value	Mean value	Standard deviation
Tv	500	115.00	169.00	145.69	7.192
Tt	500	21.00	90.00	39.68	8.879
Sudm	500	45.00	190.00	120.34	21.757
Bm	500	1.50	7.50	3.6534	.96730
Tvs	500	3.77	9.90	6.4645	.76253
Iuz	500	.00	101.97	15.8630	15.18866
Dpk	500	0.00	36.00	19.28	8.649

For body height variable (Tv), the minimum value was 115 cm, while the maximum value was 169 cm. The mean value was 145.69, while standard deviation was 7.192.

For body weight variable (Tt), the minimum value was 21 kilograms, while the maximum value was 90 kilograms. The mean value was 39.68 kilograms, while standard deviation was 8.879.

For standing long jump variable (Sudm), the minimum value was 45 cm, while the maximum value was 190 cm. The mean value was 120.34 cm, while standard deviation was 21.575.

For throwing a medicine ball variable (Bm), the minimum value was 1.50 meter, while the maximum value was 7.50 meter. The mean value was 3.6534 meter, while standard deviation was 0.96730.

For the run from a high start variable, the minimum value was 3.77 seconds, while the maximum value was 9.90 seconds. The mean value was 6.4645 seconds, while standard deviation was 0.76253.

For the pull-up endurance up to 120 seconds variable (Iuz), the minimum value was 0.0 seconds, while the maximum value was 101.97 seconds. The mean value was 15.8630 seconds, while standard deviation was 15.18866.

For the standing hamstring stretch variable (Dpk), the minimum value was 0 cm, while the maximum value was 36 cm. The mean value was 19.28 cm, while standard deviation was 8.649.

Table 4 shows the research results differentiated based on gender, and based on the above results and on the T-test confidence intervals we can conclude the following: there are statistically significant differences between boys and girls regarding their motor skills - explosive leg power (Sudm), explosive torso and shoulder power (Bm), speed (Tvs), static

Table 4 Research results differentiated based on gender

Var.	Gender	N	Mean value	Std. Deviation	Std.error Of mean	T-test	Confidence Interval
Sudm	Male	257	124.51	22.243	1.431	4.274	.000
	Female	243	115.93	19.960	1.280		
Bm	Male	257	3.8528	1.06075	.06617	4.848	.000
	Female	243	3.4424	.80752	.05180		
Tvs	Male	257	6.3289	.73809	.19486	-.420	.000
	Female	243	6.6079	.76320	.04896		
Iuz	Male	257	19.4909	17.23118	1.07485	5.661	.000
	Female	243	12.0261	11.52561	.73937		
Dpk	Male	257	19.11	8.841	.551	-.444	.657
	Female	243	19.46	8.457	.542		
Tv	Male	257	145.69	7.119	.444	-.017	.987
	Female	243	145.70	7.283	.467		
Tt	Male	257	39.73	9.212	.575	.133	.894
	Female	243	39.63	8.532	.547		

(isometric) arm and shoulder strength (Iuz), and all the results are in favour of the boys. Regarding the flexibility (mobility) variable, no statistical differences were observed. With regard to anthropometric characteristics- body height (Tv) and body weight (Tt), there were also no statistical differences observed.

4. CONCLUSION

Based on the results obtained during this research, we can make the following conclusions:

1. With regard to anthropometric characteristics body height (Tv) and body weight (Tt), there were no statistical differences observed between boys and girls.
2. With regard to motor skills, there were statistical differences observed between boys and girls regarding their:
   a) explosive leg power, which was measured by a standing long jump (Sudm),
   b) explosive torso and shoulder power, which was measured by throwing a 2 kg medicine ball (Bm),
   c) speed, which was measured by a 30 m run from a high start (Tvs),
   d) static (isometric) arm and shoulder strength, which was measured with pull-up endurance up to 120 seconds (Iuz).

As for the variable flexibility (mobility), which is linked to motor skills as well, measured by a standing hamstring stretch (Dpk), no statistical differences were observed between boys and girls.

The research results and their differentiation based on gender tell us that all the statistically significant differences are in favour of the boys.

This research has provided one more finding which the necessity to track is and monitor motor skills in primary school students and that the same should be done with pre-school children as well.

This is a cross-sectional study, thus the claims stated should be taken with restriction. Future studies on this topic should be longitudinal with more variables, including not only motor skills, but also morphological and functional skills.

Moreover, the results that this research has provided can serve as a basis for further diagnostics efforts, planning and design of physical education lessons. These findings have also shown us that it is necessary to identify reliable measuring instruments for monitoring and tracking the state and changes in the anthropometric characteristics of younger school age children.

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MOTORIČKE SPOSOBNOSTI UČENIKA ČETVRTOG RAZREDA OSNOVNE ŠKOLE

Autori ovog rada, koji je deo opsežnijeg istraživanja, daju pregled antropometrijskih karakteristika i motoričkih sposobnosti učenika četvrtog razreda osnovnih škola u Vranju, kao i razlika u njima između dečaka i devojčica. Antropometrijske karakteristike obuhvaćene merenjem bile su telesna visina (Tv) i telesna težina (Tt), dok su motoričke sposobnosti bile eksplozivna snaga nogu, eksplozivna snaga torza i ramena, brzina, statička (izometrijska) snaga ruke i ramena i pokretljivost (fleksibilnost). Visina tela merena je visinomerom, telesna težina vagom za merenje težine, eksplozivna snaga nogu skokom u dalj (Sudm), eksplozivna snaga torza i ramena merena je bacanjem medicinske lopte od 2 kg (Bm), brzina je merena trčanjem iz visokog starta na 30 m (Tvs), statička (izometrijska) snaga ruke i ramena izdržajem do 120 sekundi (Iuz) i fleksibilnost (pokretljivost) stojećim istezanjem tetive (Dpk). Ovo istraživanje obuhvatilo je 500 ispitanika, učenika četvrtih razreda osnovnih škola u Vranju, i dečaka i devojčica. Statistička analiza nam je pružila deskriptivne podatke kao i razlike između dečaka i devojčica u antropometrijskim i motoričkim varijablama koje su izračunate korišćenjem t-testa. Rezultati istraživanja pokazuju da su sve statistički značajne razlike u korist dečaka. Isti rezultati koje je ovo istraživanje pružilo mogu poslužiti kao osnova za dalja dijagnostička nastojanja i planiranje nastave fizičkog vaspitanja. Ovi nalazi su nam takođe pokazali da je neophodno identifikovati pouzdane merne instrumente za praćenje stanja i promene u antropometrijskim karakteristikama dece mlađeg školskog uzrasta.

Ključne reči: *motoričke sposobnosti, učenici, osnovna škola.*