

Original research article

MOTOR ABILITIES OF CHILDREN IN URBAN AND RURAL AREAS

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Abstract. *Knowledge of motor skills in young schoolchildren is directly related to the effects of physical education and the development of certain motor skills. During the younger school age, the dynamics of the development change is slower when compared to the development of preschoolers. The general mobility factor which, according to most authors, exists during the pre-school age begins to vary during the first few years of elementary school, and this is precisely the period in which children quickly develop their motor skills. The aim of this study is to determine the differences in the motor abilities of students in urban and rural areas. The sample in this study consisted of fourth-grade elementary school students (N = 120) in the municipality of Vranje. The data processing was carried out with the help of the T-test and X2 test. What was tested was the explosive strength, speed of movement frequency, repetitive strength of the trunk and flexibility. Each test of motor ability is covered with at least three variables, and in any case, it did not happen that one group had better results in all three variables that are used for the estimation of some motor skills. Students from urban areas showed significantly better results in explosive strength of the upper limbs (MBCM) and the flexibility of the lower extremities (MDPR and MPRS). Students from rural areas showed significantly better results in speed-frequency movements of the arms and legs (MKRR and MKRN) and the repetitive strength of the trunk (MPNL and MZTL). The number of schoolchildren from urban areas who participate in sports is not significantly different from the number of schoolchildren from rural areas who are involved in sports. The difference that occurs in some variables of motor skills is most likely a consequence of specific training in the context of some field of sport, the quality of training in the field, genetics and physical activity during leisure time.*

Key words: *motor skills, children in urban and rural areas, younger school age, differences.*

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INTRODUCTION

Knowledge of the motor abilities of younger school age children is directly related to the effects of physical education and the development of certain motor skills. For teachers, knowledge of motor skills facilitates the process of planning physical education classes, the choice of methods and organizational forms of the work involved, and most importantly, the selection of physical exercise on the basis of which the aims and tasks of physical education are realized (Batez, Krsmanovic, Dmitrić & Pantović, 2011). Changes in motor skills occur in the current socio-economic conditions, which are typical for the environment of an individual or group of people, and they represent a set of cultural, material, urban and other factors (Matić, Kuljić & Maksimović 2010). It is expected that without adequate conditions for the growth and development of individuals in a favorable socio-economic environment, physical activity cannot reach its goal, i.e. the optimal development of motor skills (Matić & Jaksic, 2007). Previous research on the relation between sociological characteristics and motor abilities has shown that the development of motor skills in addition to their great inherited conditionality depends on the dimensions of stratification, and most of these on socialization subsystems (primary and educational residential status) (Matić et al., 2010). Children from lower socio-economic settings are less involved in sports activities (Cvetkovic et al., 2014) and thus have lower levels of physical fitness (Lämmle, Worth & Bos, 2012), and weaker motor skills than children with higher social and economic standards (Ketelhut, Bittmann & Ketelhut, 2003). Hošek (1979) concludes that favorable environment mostly influences the results of complex motor tasks or the results of tests of movement coordination. A large number of studies which have investigated the comparison between the motor abilities of students in urban and rural areas have found that students from rural areas tend to have better results than students from urban areas (Özdirenç, Özcan, Akin & Gelecek, 2005; Tinazci & Emiroglu, 2010; Badrić & Petračić, 2007; Cetinić, Petric & Vidakovic-Samarđija, 2011; Karkera, Swaminathan, Pais, Vishal & Rai, 2014; Adamo et al., 2011; Tanovic, Kurtalić, Bojic, Mijatović & Azapagić, 2013; Albarwani et al., 2009). In some studies, the authors came to the conclusion that for some variables that were used for the assessment of motor abilities, significantly higher values were achieved by students from urban areas, and for some variables the students from rural environments (Gadžić & Vuckovic, 2012; Chillón, Ortega, Ferrando & Casajús, 2011). In contrast, there are studies that have shown that one's residence does not have too big an impact on motor skills, i.e. that there are no significant differences in motor skills between students living in urban and rural areas (Tsimeas, Tsiokanos, Koutedakis, Tsigilis & Kellis, 2005), as well as studies in which students from urban areas showed significantly better results in motor abilities than students from rural areas (Andrade et al., 2014; Ujevic, Sporis, Milanovic, Pantelic & Neljak, 2013). In the period from 1995 to 2009, in the population of primary school students, there has been a decrease in the average values of motor skills, 6% among male students and 12% among female students (Gajević, 2009). The motor skills of students determine their development in every respect. Therefore, it is important to plan and organize daily physical activities in accordance with the students' age, mental and physical characteristics and individual capabilities (Markovic & Kopas-Vukašinović, 2013). The development of motor skills can have an extremely beneficial effect from a period of four to 12 years of age (Bala, 1991). This period is not characterized by abrupt growth and development: annual growth in height and weight is not so pronounced, which has a positive influence on the formation and development of motor

skills (Prodanović, Sljivić, Kurtović, Kurtović & Devedžić, 2013). However, during this period, students are rarely involved in sport, and frequency and intensity, and often the content of the exercise in preschools and elementary schools represent an insufficient stimulus for the further development of motor skills (Bala, 1991). Younger school age children start school at the age of seven and complete it at the age of 11. The dynamics of developmental changes in children of this age is slower (as opposed to pre-school age) until they reach the age of eleven, actually until they cease to be younger school-age children (Buišić, Cvejić & Zivković-Vuković, 2013). The general mobility factor which, according to most authors, determined during the pre-school period, begins to differ from individual to individual during their early years at school (Kalentić, Jovančević & Obradović, 2009). It is well known that during the younger school-age period, motor skills develop very quickly and that properly applied physical activity contributes to the development of more complex motor skills (Marković & Kopas-Vukašinović, 2013). The aim of this study is to determine the differences in the motor abilities of children in urban and rural areas.

THE METHOD

The participants

The sample in this study consisted of fourth-grade elementary school students from the municipality of Vranje, namely: elementary schools "Radoje Domanović" from Vranje, "May 1" from Vrtogoš with satellite classes in Katun and Dubnici, "Bora Stanković" from Tibužde, "Vuk Karadžić" from Levosoj and the elementary school "Branisav Nušić" from Rataj. The total sample of students who participated in this study was 120 (58 boys and 62 girls). The sample was divided into two subgroups. The first sub-sample consisted of children from urban areas (N = 60, 34 boys and 26 girls). The second sub-sample consisted of children from rural areas (N = 60, 24 boys and 36 girls). Students, their parents and teachers were notified about the research, and the parents signed consent forms for their children to be included in the survey. A sample of 13 measuring instruments was used for the purpose of evaluation: explosive strength (throwing a medicine ball (MBCM), the long jump (MSKD) and vertical jump (MSKV)), the speed of movement frequency (Circulation with foot (MKRN), hand rotations (MKRR), hand tapping (MTPR) and foot tapping on the wall (MTPN), repetitive strength (torso lifts for 60sec (MPDT), sit-ups (MZTL), the lying leg lift (MPNL) and flexibility (foot deep forward bend (MDPR), the bat bend (MISP) and bend-and-sit (MPRS). In addition to the assessment of motor skills, it was also noted whether and in which sport the students were engaged, to which the students gave their verbal responses. Data processing was performed by the SPSS 20 statistics program: the t-test for independent samples was used to determine the difference, the X² test of independence was used to establish the connection between the variables, the descriptive statistics - frequency was used to obtain the crucial percentages important for this research, and the Kolmogorov-Smirnov test was used to determine the normality of the distribution.

RESULTS

Table 1 Kolmogorov-Smirnov test

Variables	Statistic	df	Sig.	Variables	Statistic	df	Sig.
MSKD	,071	120	,200*	MPNL	,117	120	,000
MBCM	,070	120	,200*	MZTL	,098	120	,007
MTPR	,098	120	,007	MPRS	,082	120	,048
MKRN	,197	120	,000	MISP	,077	120	,075
MKRR	,104	120	,003	MDPR	,064	120	,200*
MTPN	,152	120	,000	MCKB	,134	120	,000
MPDT	,084	120	,035				

Based on the results shown in Table 1, nine of the 13 variables violate the assumption of normality of distribution (Sig. <0.05). It is quite usual for large samples (Pallant, 2011).

Table 2 Relation between environment and sport engagement

Environment	Sport engagement at children		Continuity Correction		
	Engaged in sport	Not engaged in sport	X ²	p	fi
Urban environment	61,7%	38,3%	,848	,357	,101
Rural environment	51,7%	48,3%			
Total	56,7%	43,3%			

The result of the X² test of independence shown in Table 2 (with continuity correction according to Yeats (Pallant, 2011)) showed no significant relationship between the environment in which the children live and their involvement in sport X² (n = 120) = 0.848, p = 0.357, f = 0,101. This means that the number of students from urban areas who are involved in sports is not significantly different from the number of students from rural areas who are involved in sports. It is interesting that from the total number of children, 68 (56.7%) are involved in sports, and 52 (43.3%) do not play sports.

In Table 3, the T-test for independent samples indicates that there is a statistically significant difference between students in urban and rural areas for the MBCM variable (t = 6.29; p = 0.000). On the basis of the mean value (Mean), we can see that the students from the urban environment (Mean = 381.63) achieved better results than students from rural areas (Mean = 305.50). Based on the Eta Squared = 0.252, the difference between the groups is significant. According to Kohen, 0.01 is a small effect (slight difference), 0,06 – a medium effect (difference), 0.14 and more – a great impact (difference) (Pallant, 2011). Also, a statistically significant difference between the students in urban and rural areas exists for the MKRR variable (t = -2.25; p = 0.026). On the basis of the mean value (Mean), the students from urban areas (Mean = 28.22) showed weaker results than students of rural areas (Mean = 31.05). Based on Eta Squared = 0.041, the difference between the groups is small. A statistically significant difference exists for the following variables: MKRN (t = -3.39; p = 0.001) where rural students showed better results (Mean = 16.08) compared to urban students (Mean = 14.67). Based on Eta Squared = 0.089, the difference between the groups is medium; MZTL (t = -3.58; p = 0.000) where students from rural areas showed better results (Mean = 28.70) compared to students from urban areas (Mean = 20.73). Based on Eta Squared = 0.098, the difference between the groups is medium; MPNL (t = -2.58; p = 0.011) where students from rural areas showed better results (Mean = 9.62) compared to students from urban areas

(Mean = 6.50). Based on Eta Squared = 0.054, the difference between the groups is small; MPRS ($t = 3.28$; $p = 0.001$), where better results were shown by students from urban areas (Mean = 19.05) compared to students from rural areas (Mean = 15.65). Based on Eta Squared = 0.084, the difference between the groups is medium, MDPR ($t = 3.21$; $p = 0.002$), where students from urban areas showed better results (Mean = 71.08) compared to students in rural areas (Mean = 65.72). Based on Eta Squared = 0.080, the difference between the groups is medium.

Table 3 T-test for independent samples

Variables	Environment	N	Mean	Std. Deviation	t	p	Eta Squared
MSKD	Urban	60	119,82	18,95	-,148	,883	,000
	Rural	60	120,40	24,06			
MSKV	Urban	60	21,17	5,19	,516	,607	,002
	Rural	60	20,53	7,96			
MBCM	Urban	60	381,63	61,30	6,29	,000	,252
	Rural	60	305,50	70,77			
MTPR	Urban	60	60,68	9,03	-,615	,540	,003
	Rural	60	61,58	6,85			
MTPN	Urban	60	16,00	3,08	-,815	,417	,006
	Rural	60	16,40	2,21			
MKRR	Urban	60	28,22	6,69	-2,25	,026	,041
	Rural	60	31,05	7,05			
MKRN	Urban	60	14,67	1,65	-3,39	,001	,089
	Rural	60	16,08	2,78			
MPDT	Urban	60	30,63	7,45	1,450	,150	,018
	Rural	60	28,12	11,18			
MZTL	Urban	60	20,73	10,20	-3,58	,000	,098
	Rural	60	28,70	13,84			
MPNL	Urban	60	6,50	5,89	-2,58	,011	,054
	Rural	60	9,62	7,25			
MPRC	Urban	60	19,05	6,15	3,28	,001	,084
	Rural	60	15,65	5,14			
MDPR	Urban	60	71,08	7,92	3,21	,002	,080
	Rural	60	65,72	10,29			
MISP	Urban	60	95,65	15,28	1,70	,092	,024
	Rural	60	91,60	10,33			

Legend: N – number of participants; Mean – Mean value; Std. Deviation – Standard deviation from arithmetic mean; p – the level of significance; Eta Squared – magnitude of impacts (differences among groups); *Note* – the level of significance is $p < 0,05$.

DISCUSSION

Based on the results obtained for seven out of 13 variables, there is a statistically significant difference between students from urban and rural areas. In four variables, significantly better results were achieved by students from rural areas (MKRR, MKRN, MZTL, MPNL), and for three variables significantly better results were achieved by students from urban areas (MBCM, MDPR, MPRS). Gadžić & Vucković (2012), on a sample of 188 female sixth and seventh graders, obtained similar results and found that

students from rural areas were better in ten variables, and students from an urban environment in eight variables. In our study and in the already mentioned research, each of the tested motor abilities was covered by three variables, and in no case did it happen that one group had better results in all three variables used for the estimation of some motor skills. Similar results (the case when for some variables used to evaluate motor skills better results were obtained by students from rural areas and for others by students from urban areas) were obtained by Chillón et al. (2011). They found, on a sample of 2569 schoolchildren from the region Aragon - Spain, that students from rural areas had significantly better cardio-respiratory endurance and better results for variables for the assessment of arm strength than students from urban areas. Students from urban areas had significantly better results in variables that estimated speed, agility, flexibility and repetitive force. In contrast to our studies and those by the already mentioned authors, Tsimeas et al. (2005), on a sample of 360 subjects, mean age 12.3 years, in Greece (Athens), determined that the place of residence does not have too an big impact on the physical abilities of students.

Related to explosive strength, statistically significant differences in our study were obtained for the variable MBCM while for the variables MSKD and MSKV there was no significant difference. Students from urban areas statistically achieved significantly better results for the variable MBCM than students from rural areas. There was no difference in the explosive power of the lower limbs between these two groups, but that there was some difference in the explosive force of the upper extremities. A large number of urban students play basketball (23.3%) and volleyball (8.3%). In the rural areas, 5% of the students are involved in basketball, and 6.7% in volleyball. Basketball and volleyball have characteristic practices that develop explosiveness of the upper extremities in order to give players the ability to develop high precision at greater distances in basketball, and an improved the spike in volleyball. This may be one reason why students from urban areas showed better results in the variables used for the assessment of explosive strength of the upper limbs (MBCM) than students from rural areas. However, basketball and volleyball also develop explosive power of the lower limbs, but there were no differences in the variables that are used to estimate the explosive power of the lower extremities. Probably the students from rural areas through sports and daily activities developed explosive power of the lower extremities, so for the variables MSKD and MSKV there was no difference. In contrast to our study, Ujevic, Sporis, Milanovic, Pantelic & Neljak (2013), on a sample of 2431 students, fifth-graders from Croatia, found that students from urban areas achieved significantly better results in variables for assessing the explosive strength of the lower extremities (the 20m sprint and standing long jump). On the other hand, Tanović, Kurtalić, Bojić, Mijatović & Azapagić (2013), on a sample of 180 students, sixth to eighth graders from the Brčko District, determined that there was no significant difference in explosive strength between the students from urban and rural areas.

Of a total of four variables that were used to estimate the speed-frequency movements, for the variables MKRR and MKRN significantly better results were achieved by students from rural areas, compared to students from urban areas. For the variables MTPR and MTPN, there was no significant difference. 25% of the total number of students in rural areas who participated in the survey were involved in folk dancing. In contrast, 5% of the total number of students from the urban areas were involved in folk dancing. Considering the typical folk dancing rapid movement of the legs, the difference that occurs in the variable MKRN, where students from rural areas showed significantly better results, may

be due to the specific physical activity during folk dance training. Similar results were obtained by Adamo et al., (2011) who on a sample of 179 students aged 9 to 13 in Kenya found that students from rural areas have better results in variables that are used to estimate speed than students from urban areas. Tanović et al. (2013) on a sample of 180 students, sixth to eighth graders from the Brčko District, determined that there was no significant difference in speed between students from urban and rural areas. Of a total of three variables that are used to estimate repetitive strength of the trunk, for variables MPNL and MZTL significantly better results were achieved by students from rural areas compared to students from urban areas. For the variable MPDT there was no significant difference. The fact that the students from rural areas showed significantly better results in variables that are used for the estimation of repetitive strength was also determined by Tanović et al. (2013) on a sample of 180 students, sixth to eighth graders from the Brčko District. On the other hand, Ujević, Sporis, Milanović, Pantelić & Neljak (2013) achieved different results and found that students from urban areas achieved significantly better results in the variable of the torso lift than students in rural areas.

The X2 independence test showed that the number of students from urban areas who participate in sports (61.7%) was not significantly different from the number of students in rural areas who are involved in sports (51.7%). This means that the statistically significant difference that occurs in some variables which assess motor skills between these two groups does not exist because the subjects of one of the groups are to a higher percentage engaged in sports, but may be due to the different branches of sport, the quality of training, genetics, or different leisure activities at home. There is a large number of studies that compared the level of physical activity of students from urban and rural areas, and it is interesting that many of them disproved the theory that students from rural areas are less active than students from urban areas, and confirmed the opposite (Planinšec, 1997; Petrovich, Ambrožič, Sila, Topič & Bednarik, 2000; Pogorelčnik, 2006; Planinšec, Pišot & Fošnarić, 2006; Matějček & Planinšec, 2008; Liu, Bennett, Harun & Probst, 2008; Özdirenç et al., 2005; Aspray et al., 2000; Joens-Matre et al., 2008; Abdullah, Ahmed & Rahman, 1995; Albarwani et al., 2004). Students from urban areas are more involved in sports during the week (Bathrellou, Lazarou, Panagiotakos & Sidossis, 2007) and have streamlined physical activities, but students from rural areas, spending free time outdoors and playing games, have better motor test scores than students from urban areas (Dollman, Norton & Tucker, 2002; Pišot, Turk & Trebi, 2002; Rupar, 2006). Students who live in rural areas spend more time out in the open, use sports fields much more (Petric & Novak, 2007; Neljak, Novak & Podnar, 2011) and are more involved in outdoor activities (Bathrellou et al., 2007) than students who live in urban areas. Students from urban areas spend significantly more time in front of TVs and playing computer games (Albarwani et al., 2009) or reading books (Neljak, et al., 2011). This may be one reason why the students from rural areas showed better results for variables used to evaluate repetitive force. However, we did not examine how the students spent their free time, so we cannot confirm this.

In variables for assessing flexibility, two of them (MDPR and MPRS) showed that statistically significant better results were achieved by students from urban areas, and for one variable (MISP) there was no significant difference. This shows that students from urban areas have better flexibility of the lower extremities than students from rural areas. When you look at many sports in which students are engaged in rural areas it can be seen that, of the total number of these students, 48.4% are involved in folk dancing. In the

urban environment, of the total number of students who participate in sports, 78.3% practise basketball, football and volleyball, but folk dancing only 8.1%. Each well organized training session in any sport involves exercises of flexibility in both the preparatory and the final stage of training. We assume that the football, basketball and volleyball coaches did flexibility exercises with their children. However, flexibility exercises are not so popular in folk dancing. The fact that more than half of the students from rural areas who are involved in organized physical activity are also engaged in folk dancing tells us that a much smaller number of students in rural areas have organized and systematically monitored stretching which leads to increased flexibility. This may be one of the reasons why in some variables which assess flexibility, urban students achieve better results. The temperature of the environment in which sport is practiced also significantly affects the level of flexibility. At higher temperatures, flexibility increases, and at a lower ones, is significantly reduced (Stojiljković, 2003). During the measurements, we noticed that students in the urban environment had warm gyms in which the measurements were carried out, while the gyms in the schools of rural areas were quite cold. And that may be one reason why the students from rural areas showed significantly lower results for some of the variables which assess flexibility. Although some authors have found that the students from rural areas are more physically active in their leisure time than students from urban areas, this activity does not have an excessive influence on the development of flexibility. The most common space where students from rural areas can be active during their leisure time is the yard and their neighborhood (Loucaides, Chedzoy & Bennett, 2004). It is certain that students before going or leaving the yard or neighborhood are not interested in flexibility exercises. In contrast to our study, authors Tanović et al. (2013), on a sample of 180 students, sixth to eighth graders from the Brcko District, Tinazci et al. (2010), on a sample (N = 7414) of primary school students between the ages of 9 and 11 from Turkey, Özdirenç et al. (2005) on a sample of 172 students aged 9 to 11 from Turkey, Badrić et al. (2007) on a sample of students from Croatian, and Karkera et al. (2014) on a sample of 650 children aged 9 to 13 found that students from rural areas achieved significantly better results in flexibility than students from the urban environment. In contrast to our and the already mentioned studies, Ujević et al. (2013) on a sample of 2431 students, fifth graders from Croatia, determined that there are no statistically significant differences in flexibility between students from urban and rural areas.

CONCLUSION

The results of this study showed that in seven of the 13 variables which evaluated motor skills, there is a statistically significant difference between students from urban and rural areas. Students from urban areas showed significantly better results in explosive strength of the upper limbs (MBCM) and the flexibility of the lower extremities (MDPR and the MPRS). Students from rural areas showed significantly better results in speed-frequency movements of the arms and legs (MKRR and MKRN) and the repetitive strength of the trunk (MPNL and MZTL). Each of the tested motor abilities was covered with three variables, and in none of the cases did it happen that one group had better results in all three variables for the assessment of a motor skill. Thus, we cannot conclude that there is a statistically significant difference in motor skills between students from urban and rural areas, but we can conclude that there is a statistically significant difference in some

variables which estimated motor skills. For some variables, better results were obtained by students from urban areas, and for some by students from rural areas. Also, the results of this study show that the number of students from urban areas, who participate in sports (61.7%) is not significantly different from the number of students from rural areas who are involved in sports (51.7%). As a result, we can conclude that the difference that occurs in some variables which assess the motor skills of students is not a consequence of the fact that the subjects of one of the groups are more involved in sports, but it is most likely a consequence of the specific training within various sports, the quality of training, genetics and the physical activity of children in their free time. We believe that the kind of sport that children are involved in had a significant impact on the difference that emerged in some of the variables between students from urban and rural areas. Further research should determine the differences in motor skills between students from urban and rural areas that are not involved in sports in order to exclude the influence of organized sports activities on the results, and gain insight into how the environment affects motor skills. The physical activity of students in their spare time also probably had an impact on the differences that occurred. We have not investigated how students spend their free time and based on that we cannot draw conclusions.

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MOTORIČKE SPOSOBNOSTI DECE IZ URBANIH I RURALNIH SREDINA

Znanje koje imamo o motoričkim sposobnostima mlađe školske dece direktno se tiče posledica fizičkog vaspitanja i razvoja određenih motoričkih veština. Kod mlađe školske dece, dinamika razvojnih promena nije toliko brza kao kod dece predškolskog uzrasta. Opšti faktor mobilnosti koji, kako ističu mnogi autori, se javlja tokom predškolskog perioda počinje da varira tokom prvih nekoliko godina osnovne škole, a to je upravo period tokom kog deca brzo razvijaju svoje motoričke sposobnosti. Cilj ovog istraživanja bio je da se odrede razlike između motoričkih sposobnosti učenika u urbanim i ruralnim sredinama. Uzorak ispitanika u ovom istraživanju sastojao se od učenika četvrtog razreda osnovnih škola ($N=120$) na teritoriji opštine Vranje. Podaci su analizirani uz pomoć T -testa i X^2 testa. Analizirane su sledeće vrednosti: eksplozivna snaga, učestalost pokreta, repetitivna snaga trupa i fleksibilnost. Svaki test motoričkih sposobnosti uključivao je minimum tri varijable. Nijedna grupa nije postigla bolje rezultate za sve tri varijable koje su se koristile za procenu nekih motoričkih sposobnosti. Učenici iz urbanih sredina imali su značajno bolje rezultate eksplozivne snage gornjih ekstremiteta (MBCM) i fleksibilnost donjih ekstremiteta (MDPR i MPRS). Učenici iz ruralnih sredina imali su značajno bolje rezultate za brzinu pokreta ruku i nogu (MKRR i MKRN) i za repetitivnu snagu trupa (MPNL i MZTL). Broj školske dece iz urbanih sredina koji učestvuju u sportskim aktivnostima nije se

značajno razlikovao od broja školske dece iz ruralnih oblasti koji se bave sportom. Razlike koje su se javile u nekim varijablama motoričkih sposobnosti su najčešće posledica specifičnog treninga u kontekstu neke sportske oblasti, kvaliteta treninga, genetike i fizičkih aktivnosti u slobodno vreme.

Ključne reči: motoričke sposobnosti, deca iz urbanih i ruralnih oblasti, mlađa školska deca, razlike