

## IMPACT OF RESIDENTIAL STATUS ON SPORTS ACTIVITY, ANTHROPOMETRY AND MOTORIC CAPABILITIES OF ADOLESCENTS

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**Abstract:** *The aim of this study is to examine potential differences in involvement in sports, anthropometry and motoric capabilities of adolescents of different residential status in Belgrade region. Sample included 83 adolescents (13.48±.53 yrs.), of which 45 (54.2%) from urban and 38 (45%) from rural areas. Surveying detected their involvement in sports, anthropometry was detected through BM (kg), BH (cm) and BMI (kg/m<sup>2</sup>), and motoric capabilities through explosive strength of lower and upper extremities and agility. Man-Whitney U test determined that place of residency impacts involvement in sports and motoric capabilities, while the impact on physical characteristics proved to be insignificant. Cohen's criteria detected level of impact. Adolescents from urban areas are better at sports and have better motoric capabilities. Difference in physical characteristics is insignificant, with residency impact being low.*

**Keywords:** *Physical fitness, city versus village, adolescent, difference*

### INTRODUCTION

The global goals of the World Health Organization highlight normal growth as the best indicator of children's physical health. Proper growth and development of physical competencies are multidimensional determinants of physical, psychological, mental, cognitive, and social well-being. The adolescent period is characterized by important, inextricably linked, and coordinated physiological and morphological transformations conditioned by genetic (Gajdos, Henderson, Hirschhorn, & Palmert, 2010) and paragenetic factors (Brown, Patel, & Darmawan, 2017). Motor skills are mostly developed through physical activity and exercise.

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The habit of exercise and physical activity acquired during the school period is retained even in the later periods of life (Paavola, Vartiainen, Haukkala, 2004). During the period of adolescence, social elements of the environment can influence the biological potential of pubertal development (Euling, Selevan, Pescovitz, & Skakkebaek, 2008; Vasić, Vidović, Vulić, Šnjegota, Šušćević, Bojić, & Baroš, 2012). Environmental factors, personal preferences, and cultural environment play an important role in the involvement of young people in sports (Seabra, Mendonça, Thomis, Anjos, & Maia, 2008; Stalsberg, & Pedersen, 2010; Beets, Cardinal, & Alderman, 2010; Lämmle, Worth, & Bös, 2012; Fernandez-Alvira, Bammann, Pala, Krogh, Barba, Eiben, ... & Kovacs, 2014; Li, Kearney, Keane, Harrington, & Fitzgerald, 2017; Olson, March, Brownlow, Biddle, & Ireland, 2019).

A large number of studies have examined sports activity in urban and rural areas, with the youth population being the focus. The largest number of studies has focused on researching the connection and influence of place of residence on participation in sports, physical characteristics, and motor skills of young people (Chillón, Ortega, Ferrando, & Casajus, 2011; Ujevic, Sporis, Milanovic, Pantelic, & Neljak, 2013; Nikolic, Kocic, Beric, Cvetkovic, & Krzalic, 2015; Fernandez-Alvira, et. al., 2014; Li, et. al., 2017; Olson, et. al, 2019). A number of authors suggest that there are differences in motor skills between urban and rural children (Joens-Matre, Welk, Calabro, Russell, Nicklay, & Hensley, 2008; Gadžić<sup>1</sup>, & Vučković, 2012), pointing to better results of urban youth (Ujevic, et. al., 2013; Andrade, Ochoa-Avilés, Lachat, Escobar, Verstraeten, Van Camp, ... & Kolsteren, 2014), while others point out that rural students are more competitive (Wang, Wu, & Chang, 2013; Rodrigues, Coelho-E-Silva, Mota, Padez, Martins, Cumming, ... & Malina, 2014; Li, et. al., 2017). Some studies indicate that there is no significant difference in BMI between urban and rural populations, while there is a moderate difference in motor skills (Tishukaj, Shalaj, Gjaka, Ademi, Ahmetxhekaj, Bachl,... & Wessner, 2017). Lämmle and colleagues (2012) state that there is no significant difference in the level of physical activity and physical condition between respondents from urban and rural areas (Lämmle, et. al., 2012).

The problem and goal of this research is to examine whether there are differences in participation in sports, physical characteristics, and motor skills of adolescents from urban and rural areas of the territory of the city of Belgrade.

## RESEARCH METHOD

**The sample** consisted of 83 ( $n=83$ ) clinically healthy adolescents of both sexes, with a chronological age of  $13.48 \pm .52$  years, who voluntarily participated in the testing and who were divided into two subsamples according to the location of their registered residence. The first subsample consisted of 45 (54.2%) adolescents residing in the city municipality of Voždovac (ADG) and attending the “Bora Stanković” Elementary School, while the second subsample consisted of 38 (45%) adolescents residing in the village of Vranić attending the “Pavle Popović” Elementary School. The schools gave their consent for the implementation of the research. The different status of the settlement and the degree of urbanization were determinants for the selection of adolescents and schools.

**The sample of measuring instruments** consisted of a survey, physical characteristics, and motor skills. Under the same conditions, testing was carried out from March 13 – 20, 2019. Data on involvement in sports (UKS) were obtained through a survey. Body characteristics were assessed using: Body mass-TM (kg), which was measured with a scale with an accuracy of 0.5 kg. Body height-TV (cm) was measured with an anthropometer according to Martin in a standing position, without shoes, with the heels together and the head placed in the Frankfurt plane with an accuracy of 0.1 cm. Body mass index (BMI) was calculated. Motor ability was assessed by the explosive power of the lower extremities using the long jump test (SKD) measured with an accuracy of 1 cm, the explosive power of the upper extremities using the test of throwing a 2 kg medical bag from a chair (BMS) measured with an accuracy of 1 cm, and used to assess agility is a test sprint 5x10m measured with an accuracy of 0.10 (SPR). During the testing, the subjects wore sneakers and light clothes. The measurement were carried out in accordance with the protocol of the International Biological Program (IBP), and the testing was carried out in accordance with the Declaration of Helsinki.

**Data processing** was done with the statistical program “SPSS 19.” Descriptive statistics and frequency were used to obtain data for this research. The distribution of normality of the results was examined with the Kolmogorov-Smirnov test, while the Mann-Whitney U test was used to determine differences. Cohen’s criterion was used to determine the effect size (Pallant, 2009).

## RESULTS WITH DISCUSSION

Table 1 shows the same percentage distribution by gender within the subsample, while there are more male respondents in the total sample. The mean value of years by subsamples differs slightly. Within the subsample, ADGs are percentageally more involved in sports than ADS, and in the total sample, the percentage of those involved in sports is lower than those who are not involved ( $48.2\% < 51.8\%$ ).

*Table 1. Statistical indicators of gender, age and involvement in sports*

Respo- ndents	Gender		Age			Involvement in sports (UKS)	
	M	Ž	Mean±SD	Min	Max	YES	NO
ADG	26 (57.8%)	19 (42.2%)	13.51± .549	12	14	66.7%	<b>33.3%</b>
ADS	22 (57.9%)	16 (42.1%)	13.45± .504	13	14	26.3%	<b>73.7%</b>
CUA	48 (57.8%)	35 (42.2%)	13.48± .526	12	14	48.2%	<b>51.8%</b>

The obtained values (Table 2) indicate that TM and TV are slightly higher in ADG, while BMI is lower in ADG. ADG jumped further from the spot, threw the medicine ball further from the saddle, and were faster in the 5x10m test.

*Table 2. Descripta's statistics of body characteristics and motor abilities.*

Var.	ADG			ADS			CUA		
	Mean±SD	Min.	Max.	Mean±SD	Min.	Max.	Mean±SD	Min.	Max.
TM	60.44±10.39	41.0	92.5	57.85±12.44	39.5	100.0	59.25±11.37	39.5	100.0
TV	170.66±9.25	153.2	190.8	168.13±6.87	154.0	188.5	169.50±8.29	153.2	190.8
BMI	20.74±3.06	15.4	28.8	20.40±3.87	14.4	33.0	20.59±3.45	14.4	33.0
SKD	172.32±27.79	115.0	237.0	156.18±32.59	83.0	215.0	164.93±30.97	83.0	237.0
BMS	370.07±103.37	200.0	679.2	347.01±92.03	145.5	574.8	359.51±98.43	145.5	679.2
SPR	14.11±1.31	11.30	17.80	15.24±1.71	12.11	19.38	14.63±1.60	11.30	19.38

The Mann-Whitney U test (Table 3.) reveals a significant difference between the results of ADG and ADS in the variables UKS ( $Z = -3.64$ ;  $p=0.00$ ), SKD ( $Z = -2.25$ ;  $p=0.02$ ) and SPR ( $Z = -3.10$ ;  $p=0.00$ ), and Cohen's criterion (Pallant, 2009) shows that the size of the influence of place of residence for UKS ( $r=0.4$ ) and SPR ( $r=0.34$ ) is medium, and small for SKD ( $r=0.25$ ). For the variables TM ( $p=0.15$ ;  $r=0.1$ ), TV ( $p=0.21$ ;  $r=0.1$ ), BMI ( $p=0.37$ ;  $r=0.1$ ) and BMS ( $p=0.38$ ;  $r=0.1$ ) no statistically

significant difference exists between the groups of adolescents, while the size of the influence of the place of residence for the mentioned variables is small.

*Table 3. Kolmogorov-Smirnov test, Mann-Whitney U test*

Test		UKS	TM	TV	BMI	SKD	BMS	SPR
Kolmogorov-Smirnov <sup>a</sup>	Stat	.349	.109	.086	.115	.061	.118	.074
	Df	83	83	83	83	83	83	83
	Sig	<b>.000</b>	<b>.016</b>	.198	<b>.008</b>	.200 <sup>a</sup>	<b>.006</b>	.200 <sup>a</sup>
Mann-Whitney U test		510.00	697.50	718.00	757.00	608.50	760.00	515.50
Z		-3.643	-1.440	-1.252	-.896	-2.253	-.868	-3.104
Asymp. Sig. (2-tailed)		<b>.000</b>	.150	.210	.370	<b>.024</b>	.385	<b>.002</b>
Koenovom criteria-r		0.4	0.1	0.1	0.1	0.25	0.1	0.34

a.Lilliefors Significance Correction.

In this study, adolescents from the city achieved better results in all examined variables compared to their peers from the countryside, with the size of the influence of the environment ranging from small to medium ( $r=0.1$  to  $0.4$ ).

Adolescents from the city are more significantly involved in sports than adolescents from the countryside ( $66.7\% > 26.3\%$ ), whereby the influence of the environment is of medium size ( $Z = -3.64$ ;  $p = .00$ ;  $r = 0.4$ ). Davy et al. (2004) stated that the environment affects participation in sports in a study that included 205 children, where the participation of rural youth was lower (Davy, Harrell, Stewart, & King, 2004). Other studies also detect a differential impact of urbanization on sports involvement (Chillón, et. al., 2016). Lämmle et al. (2012) in their study that included 2574 respondents from Germany, indicate that there is no significant difference between urban and rural environments when it comes to the level of physical activity (Lämmle, et. al., 2012). Different levels of urbanization and population density contribute to differential access to sports facilities (Reimers, et. al., 2014) and the possibility of practicing sports (Parks, et. al., 2003). Twenty-four sports branches and 54 clubs in the city municipality of Voždovac provide a better sports offer for young people compared to three sports clubs in two sports in the village of Vranić (<https://www.ssgovozdovac.rs>, <http://www.barajevo.org.rs>, viewed 02/23/2020). Adolescents from Voždovac are involved in 12 sports, most of which are in basketball (15.6%), while adolescents from Vranić are involved in five sports, most of which are in football (13.2%). All sports, except football, are played outside the territory of the village, and the mass involvement of rural youth in sports implies

traveling outside the village. These facts in this research can detect the reasons for the existence of a significant difference in the involvement of young people in sports. A number of authors state that the difference in the social structure of the city and the countryside exposed through socio-economic, infrastructural, cultural and educational factors, life habits and ways of spending school and free time have different effects on the involvement of adolescents in physical activities (Booth, et. al., 2001 ; Seabra, et. al., 2008; Stalsberg, et. al., 2010; Beets, et. al., 2010; Badrić, et. al., 2011; Lämmle, et. al., 2012; Fernandez-Alvira, et al., 2014; Li, et al., 2017; Olson, et al., 2019). Our study did not investigate how adolescents spend their free time, the material and educational status of their parents, and these reasons cannot be cited as influencing factors on the degree of involvement in sports.

In our research, the values of TM, TV, and BMI are slightly better in adolescents from the city without a significant difference compared to adolescents from the countryside. Similar findings are highlighted by Gadžić et al. (2012) who found that respondents from rural areas had lower values of TM and TV (Gadžić, & Vučković, 2012). Authors Chillón et al. (2011) found that respondents from rural areas had lower values of TM and BMI (Chillón, et. al., 2011). Vasić et al. (2012) point out that children from rural areas had statistically lower values in anthropometric measures (Vasić, et. al., 2012). Andrade et al. (2014) state that no difference in BMI was found between the groups of respondents. Zegnal Koretić (2017) did not establish statistical significance in the difference in anthropometric parameters between urban and rural respondents. The somewhat greater adulthood of urban adolescents in our study can be observed from the aspect of the effects of greater involvement in sports and the influence of city life standards, which synergistically positively influence faster growth and maturation. The absence of a significant difference in physical characteristics, despite the significantly greater involvement of urban adolescents in sports, may suggest that rural youth spend more time daily in movement during socializing through peer groups, as well as that the nutritional parameters are appropriate (Badrić, et. al., 2011). The results in our study indicate that the size of the influence of the environment on TM, TV and BMI is small without statistical significance and it can be said that the residential status in this research has no influence on body characteristics.

The results of motor skills indicate that adolescents from the city are better in all examined variables, with the size of the influence of the environment ranging from small to medium. The results in our study show

that adolescents from the urban environment achieved a significantly better result in the explosive power of the lower extremities than their peers from the countryside ( $Z = -2.25$ ;  $p = .02$ ;  $r = 0.25$ ), while the size of the influence of the environment is small. On a sample of 2431 subjects, the authors Ujevic et al. (2013) point out a significant difference in the long jump in favor of urban respondents. (Ujevic, et al., 2013). The similarity of the results is emphasized by Gadžić et al. (2012), in which female respondents from urban areas achieved better results in the explosive strength of the lower extremities (Gadžić, & Vučković, 2012). Authors Wang et al. (2013) state that in 546 subjects, in the explosive strength of the lower extremities, the subjects from the city achieved better results compared to the subjects from the countryside (Wang, et. al., 2013). In contrast, Tishukaj et al. (2017) in his study conducted on 354 adolescents from Kosovo, found no significant difference in the long jump between urban and rural adolescents (Tishukaj, et. al., 2017). Nikolic et al. (2015) in 120 subjects in the explosive strength of the lower extremities did not establish a significant difference between the subsamples (Nikolic, et. al., 2015). In the current study, adolescents from an urban environment achieved slightly better results in the explosive power of the upper extremities compared to young people from the countryside ( $Z = -.868$ ;  $p = .38$ ;  $r = 0.1$ ), and the size of the influence of the environment is small. Nikolic et al. (2015) in their research found significantly better results in the explosive strength of the upper extremities in urban subjects (Nikolic, et. al., 2015). When it comes to motor ability and agility, adolescents from the urban environment showed significantly better results than respondents from the countryside ( $Z = -3.10$ ;  $p = .00$ ;  $r = 0.34$ ), with the size of the influence of the environment being medium. The obtained results show that adolescents from the city are more significantly involved in sports and at the same time achieved significantly better results in the explosive power of the lower extremities and agility, while in the explosive power of the upper extremities they were marginally better than the adolescents from the countryside. Agility contextually unites explosive strength and speed, and is developed with specific training content (Malacko, 2009). Within the subsample, 66.7% of them from the urban population are involved in sports, while 26.3% from the rural population are involved. Among respondents from the city, 15.6% practice basketball, 8.9% volleyball, while among adolescents from the countryside, 5.3% practice basketball. For basketball and volleyball, the manifestation of explosive strength of the lower and upper extremities and agility is dominant. Training contents in basketball and volleyball



are focused on the development of explosive strength of the lower and upper extremities and agility (Trunić, & Mladenović, 2011; Lazić, 2016) in order to achieve more advanced sports results. Primarily the type of sports activity and then the involvement in sports suggest that these are the factors that, acting together, influenced the differences in motor skills as well as their more advanced development in adolescents from urban areas. Not finding a significant difference in the explosive strength of the upper extremities between the groups of respondents could be interpreted by the fact that adolescents from the countryside, compared to their peers from the city, spend most of their time actively outside the home in free activities characteristic of the rural environment (Badrić, et. al., 2011).

## **CONCLUSION**

The study determined that greater involvement in sports and better results in motor skills in urban compared to rural youth can be attributed to the level of urbanization, which provides an environment with a wider range of sports and easier access to sports infrastructure with its socio-economic potential.

A significant difference in involvement in sports was found in two of the three examined motor abilities, whereby the results obtained in this research correspond to a number of works indicating that the place of residence is a significant predictor of the level of sports activity and motor competence. Rural adolescents were characterized by a low percentage of participation in sports (26.3%) and weaker motor skills, which indicates the presence of hypokinesia in the rural environment. Based on the findings of the inactivity of rural youth, the necessity of a comprehensive social intervention to improve the conditions in the village for greater access to sports should be emphasized.

The findings indicate that the place of residence does not affect the measured anthropometric dimensions. From this, it can be concluded that they are not determined by the place of residence and playing sports. However, it is suggested that they are influenced by hereditary factors and dietary habits. Factors behind growth and physical activity that are potentially suggested by socio-economic conditions of urban and rural environments should be examined in more detail for a more comprehensive understanding of the details of the daily life of adolescents in cities and villages. Considering the relatively small sample size and number of variables, the obtained results cannot be generalized. It is suggested that a larger number of respondents and variables be included



in future research. To obtain more complete findings, variables from the socio-economic sphere of life should be included in the research.

## UTICAJ REZIDENCIJALNOG STATUSA NA SPORTSKU AKTIVNOST, ANTROPOMETRIJU I MOTORIČKE SPOSOBNOSTI ADOLESCENATA

**Rada Rakočević**

**Abstract:** Cilj studije je ispitati da li postoje razlike u uključenosti u sport, antropometriji i motoričkim sposobnostima adolescenata različitog rezidencijalnog statusa u regionu Beograda. Uzorak od 83 adolescenta ( $13.48 \pm .53$  god.) činilo je 45 (54.2%) adolescenata iz grada i 38 (45%) sa sela. Anketiranjem je detektovana uključenost u sport, antropometrija je procenjenjena kroz TM(kg), TV(cm) i BMI ( $\text{kg}/\text{m}^2$ ), a motorička sposobnost eksplozivnom snagom donjih i gornjih ekstremiteta i agilnošću. Man-Witnjev U test utvrdio je da mesto prebivališta utiče na uključenost u sport i motoričke sposobnosti, dok je uticaj na telesne karakteristike neznatan. Koenov kriterijum je utvrdio veličinu uticaja. Adolescenti iz grada su značajnije u sportu i imaju bolje motoričke sposobnosti. Razlika telesnih karakteristika je neznatna, uticaj sredine je mali.

**Ključne riječi:** Fizička spremnost, grad u odnosu na selo, adolescent, razlika.

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