

ORIGINAL SCIENTIFIC PAPER

Impact of residential status on sports activity, anthropometric characteristics and motor abilities of adolescents

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Abstract

The world's leading health institutions warn that adolescents do not meet the minimum level of physical activity necessary for the proper physical development of young people, which is considered one of the main problems of public health. In addition to personal preference, environmental and cultural factors play an important role in the involvement of young people in sports. This study aimed to examine potential differences in involvement in sports, anthropometric characteristics and motor abilities, in adolescents of different residential statuses. The sample included 83 adolescents, of whom 45 (54.2%, 13.51±0.55 yrs) were from urban areas and 38 (45%, 13.45±0.50 yrs) were from rural areas in the Belgrade region. Surveying detected their involvement in sports, and anthropometric characteristics were assessed through body height (BH) body mass (BM), body mass index (BMI), and motor abilities through explosive strength of lower and upper extremities and agility. A Mann-Whitney U test has shown that place of residency impacts involvement in sports and motor abilities, while there was no impact on anthropometric characteristics. Cohen's criteria (r) detected the level of impact. Adolescents from urban areas are more involved at sports and have better motor abilities. There is no difference in anthropometric characteristics. Considering the relatively small sample of respondents and variables assessed, the obtained results can hardly be generalized. However, this does not diminish the importance of the present study which examined the urban-rural state of sports activity, anthropometric characteristics and motor abilities of adolescents in Serbia, thus making an important contribution to this field.

Keywords: *urban-rural differences, adolescent, physical fitness, motor abilities, anthropometric characteristics*

Introduction

The global goals of the world health organizations highlight normal growth as the best indicator of children's physical health, with proper growth and development of physical competencies being a multidimensional determinant of physical, psychological, mental, cognitive, and social well-being. Adolescence is characterized by important inextricably linked, and coordinated physiological and morphological transformations conditioned by genetic (Gajdos, Henderson, Hirschhorn, & Palmert, 2010) and paragenetic factors, whereby motor abilities and skills are mostly developed through physical activity and exercise (Brown, Patel, & Darmawan, 2017).

Adolescence is considered the healthiest period of life, in which motor abilities, primarily strength, speed, and endurance, as well as many cognitive abilities, reach their peaks (Kuzman, 2009). However, the world's leading health institutions believe that adolescents do not meet the minimum level of physical activity (CDC, 2003), which is necessary for the proper physical development of young people, and this is considered one of the main public health problems (Rosamond, et al., 2007).

The habit of exercise and physical activities acquired during the school period is retained in the later periods of life (Paavola, Vartiainen, & Haukkala, 2004), whereby during the period of adoles-

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cence social elements of the environment can influence the biological potential of pubertal development (Euling, Selevan, Pescovitz, & Skakkebaek, 2008; Vasic et al., 2012). Environmental factors, personal preferences, and the cultural environment play an important role in youth involvement in sports (Seabra, Mendonça, Thomis, Anjos, & Maia, 2008; Stalsberg, & Pedersen, 2010; Lämmle, Worth, & Bos, 2012; Li, Kearney, Keane, Harrington, & Fitzgerald, 2017; Olson, March, Brownlow, Biddle, & Ireland, 2019).

A large number of studies examining sports activity in urban and rural environments included the youth population. The largest number of studies is focused on researching the relationship and influence of place of residence on involvement in sports (Li et al., 2017; Olson et al., 2019), physical characteristics, and motor skills of young people (Ujevic, Sporis, Milanovic, Pantelic, & Neljak, 2013; Chillón, Ortega, Ferrando, & Casajus, 2011; Nikolic, Kocic, Beric, Cvetkovic, & Krzalic, 2015). Some authors suggest that there are differences in motor skills between children from urban and rural areas (Joens-Matre et al., 2008; Gadzic & Vuckovic, 2012) pointing to the better results of urban youth (Ujevic et al., 2013; Andrade et al., 2014) while others point out that rural students are more competitive (Wang, Wu, & Chang, 2013; Rodrigues et al., 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 hand-grip strength and running speed favoring rural populations (Tishukaj et al., 2017). Lammle et al. (2012) state that there is no significant difference in the level of physical activity and physical condition between respondents from urban and rural areas (Lammle et al., 2012).

Since the results are not consistent, and only a small number of studies have examined the residential status of adolescents in our country, there is a need for such research. In this regard, this study aimed to examine potential differences in involvement in sports, anthropometry, and motor capabilities of adolescents of different residential statuses.

Methods

The Sample of Participants

A total of 83 healthy adolescents participated in this transversal study. The sample was divided by the location of the registered residence into two groups: urban and rural. The urban group consisted of 45 (54.2%, 13.51±0.55 yrs) adolescents residing in the city municipality of Vozdovac (Belgrade) and attending the “Bora Stankovic” elementary school, while the rural group consisted of 38 (45%,

13.45±0.50) adolescents residing in the village of Vranić attending the “Pavle Popovic” elementary school.

The schools gave their consent for the implementation of the research. Students participated in the research process voluntarily and with parental consent, and this research was conducted in accordance with the Helsinki Declaration.

The Sample of Measuring Instruments

The sample of measuring instruments consisted of a survey, anthropometric characteristics, and motor abilities tests. Data on participation in sports were obtained through a survey.

Body height (BH) was measured to the nearest 0.1 cm using a fixed stadiometer (Seca, Leicester, UK) and body mass (BM) was measured to the nearest 0.1 kg with an electronic weighing machine (HD-351, Tanita, Illinois, USA). The standard formula for calculating the body mass index (BMI) was used: BMI = body mass (kg) ÷ body height² (meters). The measurements were taken according to a predetermined International Biological Program (IBP; Marfell-Jones, Stewart, & de Ridder, 2012).

The following tests were used to assess motor abilities: a standing broad jump (SBJ, cm), which assesses the explosive power of the lower extremities; a medicine ball throwing (MBT, 2 kg) from a sitting position (cm), which assesses the explosive power of the upper extremities; and a 5 x 10 m shuttle run (s) which assess agility.

Statistics

The data obtained were tested using the Kolmogorov-Smirnov test to determine the normality of the data distribution. While the Mann-Whitney U test was used to determine differences between the groups of urban and rural adolescents. Cohen’s criterion (r) was used to determine the effect size (Pallant, 2009). The significance level for all statistical analyses was set at p<0.05. Data processing was performed using the statistical program SPSS v19.0 (SPSS Inc., Chicago, IL, USA).

Results

Table 1 shows that in both groups of urban and rural adolescents, there are more boys than girls, and this ratio is approximately 58% versus 42%. The average age is about the same. The urban group is more involved in sports than rural adolescents, and in the total sample, the percentage of those involved in sports is lower than the percentage of those who are not involved (48.2%<51.8%).

Table 1. Indicators of residential status, gender, age, and involvement in sports

	Gender		Age	Participation in Sports	
	Boys	Girls	Mean±SD	Yes	No
Urban	26 (57.8%)	19 (42.2%)	13.51±.549	66.7%	33.3%
Rural	22 (57.9%)	16 (42.1%)	13.45±.504	26.3%	73.7%
Total	48 (57.8%)	35 (42.2%)	13.48±.526	48.2%	51.8%

Table 2. Descriptive statistics of physical characteristics and motor abilities

Variables	Urban			Rural			Total		
	Mean±SD	Min.	Max	Mean±SD	Min.	Max	Mean±SD	Min.	Max
Body height	170.66±9.25	153.2	190.8	168.13±6.87	154.0	188.5	169.50±8.29	153.2	190.8
Body mass	60.44±10.39	41.0	92.5	57.85±12.44	39.5	100.0	59.25±11.37	39.5	100.0
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
Standing Broad Jump	172.32±27.79	115.0	237.0	156.18±32.59	83.0	215.0	164.93±30.97	83.0	237.0
Medicine ball throwing	370.07±103.37	200.0	679.2	347.01±92.03	145.5	574.8	359.51±98.43	145.5	679.2
Agility 5x10*	14.11±1.31	11.30	17.80	15.24±1.71	12.11	19.38	14.63±1.60	11.30	19.38

*Variable with an opposite metric orientation

Descriptive statistics in terms of anthropometric characteristics and motor abilities is presented in Table 2.

The results of the Kolmogorov-Smirnov test (Table 3) showed

that the assumption of normal distribution was violated for most variables, and for this reason, a non-parametric Mann-Whitney U test was performed.

Table 3. Kolmogorov-Smirnov test

	Kolmogorov-Smirnov		
	Statistic	df	Sig
Body height	0.86	83	0.016
Body mass	0.109	83	0.198
BMI	0.115	83	0.008
Standing Broad Jump	0.061	83	0.200
Medicine ball throwing	0.118	83	0.006
Agility 5x10*	0.074	83	0.200

*Variable with an opposite metric orientation

The Mann-Whitney U test (Table 4) has shown that there is no significant difference between urban and rural groups in anthropometric characteristics. On the other hand, a significant difference

in motor abilities was identified, namely in SBJ ($r=0.25$; $p=0.024$) and 5 x 10 m shuttle run ($r=0.34$; $p=0.002$). The size of the impact for SBJ is small, while for 5 x 10 m shuttle run is medium.

Table 4. Urban-rural differences in anthropometric and motor abilities

	Urban	Rural	Sig	Choen's r
	Mean±SD	Mean±SD		
Body height	170.66±9.25	168.13±6.87	0.210	0.1
Body mass	60.44±10.39	57.85±12.44	0.150	0.1
BMI	20.74±3.06	20.40±3.87	0.370	0.1
Standing Broad Jump	172.32±27.79	156.18±32.59	0.024	0.25
Medicine ball throwing	370.07±103.37	347.01±92.03	0.385	0.1
Agility 5x10*	14.11±1.31	15.24±1.71	0.002	0.34

*Variable with an opposite metric orientation.

Discussion

Main findings of this study indicate that adolescents from the urban areas are significantly more involved in sports than those from the rural areas. There are no significant differences between urban and rural groups in terms of anthropometric characteristics, while there is a significant difference in terms of motor abilities. More precisely, adolescents from urban areas have better explosive power of the lower extremities and better agility than the adolescents from rural areas.

In line with our results, a previous study that included 205 children has shown that the environment affects playing sports, where the participation of rural youth is lower (Davi, Harrell, Stewart, & King, 2004). Other studies also reveal a different impact of urbanization on sports participation (Chillon et al., 2011). Lammler et al. (2012) in their study that included 2574 respondents from Germany, indicate that there is no significant difference between urban and rural areas when it comes to the level of physical activity (Lammler et al., 2012). Different levels of urbanization and population density contribute to different access to sports facilities (Reimers et al., 2014) and opportunities to play sports (Parks et al., 2003).

We suggest that twenty-four sports branches and 54 clubs in the territory of the city municipality of Vozdovac provide a better sports offer for young people compared to three sports clubs in two sports in the village of Vranic (SS GO Vozdovac, 2020, GO Barajevo 2020). Adolescents from Vozdovac play 12 sports, with most of them playing basketball (15.6%), while adolescents from Vranic play five sports, with most of them playing football (13.2%). All sports except football are played outside the territory

of the village, and the mass participation of rural youth in sports involves traveling outside the village. These facts may indicate the reasons for the existence of a significant difference in the participation of young people in sports. In this line, some authors suggested that the difference in the social structure of the city and the village exposed through socio-economic, infrastructural, cultural, and educational factors, life habits, and the way of spending school and leisure time, has a different effect on the involvement of adolescents in physical activities (Seabra et al., 2008; Stalsberg et al., 2010; Badric, Prskalo, & Kvesic, 2011; Lammler et al., 2012; Li et al., 2017; Olson et al., 2019).

The present study also shows that there is no difference in anthropometric characteristics (BH, BM, and BMI) between urban and rural adolescents, which is in line with previous evidence (Andrade et al., 2014; Zegnal & Koretic, 2017). In contrast, some studies have shown that children from rural areas have lower values of BMI and BH (Gadzic and Vuckovic, 2012), BM and BMI (Chillon et al., 2011), and other anthropometric characteristics (Vasic et al., 2012). We suggest that the different outcome in these studies may be influenced by hereditary factors and eating habits. It is known that higher BMI values can be attributed to inadequate nutrition, biological age, and genetic conditioning (Banjevic et al., 2022).

The results of our research show that adolescents from the urban areas achieved a significantly better result in the explosive strength of the lower extremities than their peers from the rural areas, while the size of the effect is small. These results are consistent with previous research (Gadzic & Vučkovic, 2012; Ujevic et al., 2013; Vang et al., 2013) where respondents from the city also

achieved better results compared to respondents from the countryside on various explosive tests. It should be noted that in some studies, the authors did not find a significant difference between urban and rural adolescents in the explosive strength of the lower extremities (Nikolic et al., 2015; Tisukaj et al., 2017). Differences in the outcome of these studies may be due to different methodological design, different tests used to assess explosive strength of lower extremities as well as different age of the studied population.

In contrast to the lower extremities, there was no difference between the groups in the strength of the upper extremities at the present study. Nikolic et al. (2015) conducted one of the few studies that looked at urban-rural differences in upper limb strength. In this study, a significant difference was achieved in the case of urban children, which was not the case in our study. We suggest that the different outcome may be due to the different age of the studied population, and also the effect of puberty, which may directly impact the levels of strength. Unfortunately, we have no data regarding the pubertal stage in which the studied children are. Also, finding no significant difference in the explosive strength of the upper extremities between the groups of subjects could be interpreted by the fact that adolescents from the rural areas, compared to their peers from the urban areas spend most of their time actively outside the home in leisure activities.

When it comes to agility, adolescents from the urban area showed significantly better results than the respondents from the countryside, while the size of the effect was medium. Agility develops with specific training contents and contextually combines explosive strength and speed (Malacko, 2009). The obtained results show that adolescents from the city are more involved in sports and that, at the same time, they achieved significantly better results in the explosive power of the lower extremities and agility.

Additionally, within the sub-sample, 66.7% of the urban population does sports, compared to 26.3% of the rural population. Among respondents from the city, 15.6% play basketball and 8.9% play volleyball, while among adolescents from the countryside, 5.3% play basketball. For basketball and volleyball, the dominant manifestation is the explosive strength and agility. Basketball and volleyball training contents are designed to improve explosive strength and agility (Trunic & Mladenovic, 2015; Lazic, 2016) in order to achieve more advanced sports results. Therefore, we suggest that the type of sports activity and the percentage of adolescents that are practicing that activity, may be the factors that acting together, influenced the differences in motor abilities, as well as their more advanced development in adolescents from urban areas.

Limitations

Some of the limitations of this study are reflected in the relatively small sample and the fact that anthropometric characteristics and motor abilities were assessed with a small number of tests. Additionally, the lack of pubertal stage data may be another limitation. Therefore, the recommendation for further research is to include a larger number of variables and a larger number of respondents with a possibility for pubertal status assessment.

Conclusions

This research showed that urban adolescents were more likely to participate in sports than children from rural areas. The reason for this may be that cities have a greater socio-economic potential, which is why they have a wider range of sports and easier access to sports infrastructure. The findings of the present study indicate that the place of residence does not affect the anthropometric dimensions, while it seems to affect motor abilities. Adolescents from urban areas have better explosive power of the lower ex-

trimities and better agility than the adolescents from rural areas. Based on these findings, the necessity of a comprehensive social intervention to improve conditions in rural areas for greater access to sports should be emphasized.

Given the relatively small sample of respondents and variables, the obtained results can hardly be generalized. However, this does not diminish the importance of this study which determined the urban-rural state of sports activity, anthropometric characteristics and motor abilities of adolescents in Serbia, and thereby made an important contribution to this field.

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Conflicts of Interest

Authors declare that there is no conflict of interest.

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