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THE CORRELATIONS OF CERTAIN ENVIRONMENTAL FACTORS WITH MOTOR ABILITIES IN 6TH GRADE ELEMENTARY SCHOOL PUPILS

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Abstract: Physical culture (and its corresponding areas: physical education, sports and recreation), exists as a complex human activity in a variety of social circumstances, and there is no doubt that one of the vital circumstances is the conditions of the environment in which it transpires. More optimal socio-economic conditions should contribute to a better position of physical culture in a given environment, while the main aim of this research was to carry out an analysis of the correlations between the motor abilities and some environmental factors in 6th graders, as well as to determine the impact of these factors on the level of motor abilities. On a sample of 94 6th graders, by applying the canonical correlation analysis, no statistically significant link between the mentioned areas was established, while a series of regression analysis determined the existing of a significant impact of only one environmental factor (the number of children in a family) on the motor ability of foot precision. The obtained results point to the fact that motor abilities are more under the impact of some other factors, not environmental.

Key words: environmental factors, motor abilities, pupils

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INTRODUCTION

The times we are living in are characterized by many accomplishments which have eased daily life and liberated him from great physical effort. However, along with these conveniences, contemporary age is also characterized by a series of negative impacts, especially from the aspect of the hypokineses of modern man. Today, we have increasingly more commitments, and less time for ourselves, and we live under constant stress which is an additional danger for health. Along with the mentioned, for a long time we have been witnessing a deep recession, whose consequences on the psychosomatic status have yet to be scientifically researched. However, it is clear that the mentioned crisis has been reflected on all aspects of life, as well as work in schools, where physical education (hereinafter: P.E.) classes have often taken place in poor conditions and with an unmotivated staff. The motor abilities of primary school pupils can also be viewed in the context of the results of recent research carried out on primary and secondary school pupils in Serbia. The data in the pilot project 'Determining the physical abilities of children and youth' carried out by the Ministry of Youth and Sports and the Republic Institute for Sports in cooperation with the Ministry of Education of Serbia on the state of physical abilities of children and youth, and obtained on the basis of testing pupils from 1,553 schools in Serbia (74% elementary and 26% high schools), indicate weak results of elementary and high school pupils. Some of the variables which characterize the physical abilities applied in this research (the Eurofit test battery), showed lesser values than 6% in girls and 12% in boys in relation to earlier measurements, and by a comparative analysis with the results of children from certain EU countries, it has been concluded that the results of Serbian pupils were mostly under average. Such a state of physical abilities can be the consequence of the fact that only 15% of elementary and high schools in Serbia have a P.E. hall larger than 450 m², as well as the fact that in the tested schools the most represented team sport was volleyball, while the least represented were the basic sports of Track and Field and gymnastics (Republic Institute for Sports, 2010).

The tendency of reducing the physical activities of children has a direct impact on the level of motor abilities, which occurs not only in this country but also the neighboring countries (Šiljeg, Zečić, Morgan and Kević, 2008; Strel, Bizjak, Starc and Kovač, 2009), as well as developed countries (Janz, Dawson, & Mahoney, 2000; Tomkinson, Olds, & Gulbin, 2003; Wedderkopp, Froberg, Hansen, & Andersen, 2004).

If physical culture (and its corresponding areas: physical education, sport and recreation) is viewed as a complex human activity which exists in different

social circumstances, it is without doubt that the environmental circumstances is one of the vital features. Thus, more optimal socio-economic conditions should contribute to a better position of physical culture in an environment and the results of the newest research have shown that the socio-economic status of respondents impacts the level of their abilities (primarily coordination), which the authors link with better possibilities to carry out the sports activities of the respondents in larger environments (Mikalački, Hošek-Momirović and Bala, 2006; Matić and Jakšić, 2007). Changes in motor abilities occur in certain socio-economic conditions, which are characteristic for the environment of an individual or a group of people, and which consist of a group of cultural, material, urban and other factors. The social standard, the cultural level of the environment, the place and role of P.E. within it, the social status of the parents and the pupils, are just some of the factors of a social environment which can indirectly impact the development of motor abilities of the population and the level of engagement in sports activities (Gadžić and Vučković, 2009; Ivanović, 2010; Matić, Kuljić, and Maksimović, 2010).

The main aim of this research is to carry out an analysis of the correlation between motor abilities and some environmental factors as well as to determine the impact of these factors on the level of motor abilities of 6th grade pupils of the Elementary School Čibukovački partizani from Kraljevo.

METHOD

Sample

The sample of 94 respondents in this research can be defined as 6th grade elementary school pupils, of the male gender, average age of 12.89 (± 0.31).

Variables

For the sample of variables which assess the motor abilities applied was a set of 12 variables which measure the following motor abilities: precision, balance, coordination, speed, flexibility and strength.

The tests for assessing motor abilities were separated from a battery made up of 110 tests (Gredelj, Metikoš, Hošek and Momirović, 1975):

- a) for assessing precision (tossing horizontally with the hand – THWH and kicking vertically with the foot - KVWF);
- b) for assessing balance (standing on one leg longitudinally on a balance bench - SILB and standing on one leg with eyes closed - S1EC);
- c) for assessing coordination (figure eight with bending – 8WB and

- drumming with hands and feet - DWHF);
- d) for assessing speed (hand tapping - HTAP and foot tapping - FTAP);
- e) for assessing flexibility (deep bend on the bench – DBB and one arm skin the cat with stick - OASCT);
- f) for assessing strength (standing long jump – SLJ and pull-ups - PU).

The set of variables which represented environmental factors has been obtained from the reduced questionnaire SSMAXIP (Hošek, 2004) which served to gather data on the following residential, social and economic features:

- Residential type of family home (RTFH)
- Father's education (FE)
- Mother's education (ME)
- Father's work status (FWS)
- Mother's work status (MWS)
- Number of children in the household (NCH)
- Total monthly income of household (TMIH)

Method of data processing

The measuring results have been statistically processed and calculated based on basic central and dispersion parameters. The normality of distribution has been assessed by Skewness and Kurtosis. Along with descriptive statistics, also applied was canonical correlational analysis in order to test the link between environmental factors and the motor abilities of respondents.

In the further data processing procedure, applied was a series of multiple regression analyses in order to test the impact of the variable system which assesses the environmental factors on motor variables, that is, establishing the individual contribution of predictor variables according to each criteria variable individually.

RESULTS

Table 1. *Basic body features of respondents*

	AS	SD
Body height	157.91	7.24
Body weight	50.79	10.54

The average values of body weight and body height of the respondents (Table 1) are within the range of the expected limits and values for the tested age (Gajević, 2009).

Table 2. *Central and dispersional parameters of variables for assessing the motor abilities of pupils*

Variable	M (SD)	Min - Max	Skewness	Kurtosis
GHCR	16.74 (5.20)	5 - 36	0.59	1.09
GVCN	11.70 (3.48)	3 - 20	0.21	-0.34
SJUK	8.72 (4.90)	3.1 - 34.3	2.46	8.38
SZOJ	17.78 (12.12)	3.8 - 61.2	1.34	1.24
OSAS	58.28 (4.47)	49.5 - 71.2	0.43	0.13
BURN	6.51 (2.88)	0 - 15	0.53	0.01
TAPR	36.07 (4.11)	25 - 48	-0.21	0.49
TAPN	29.40 (3.05)	22 - 35	-0.16	-0.56
ISKP	84.84 (15.57)	47 - 125	0.23	-0.22
DPKL	33.70 (6.99)	12 - 45.5	-0.52	0.21
SUDM	164.73 (24.93)	94 - 218	-0.30	0.00
VISZ	26.01 (18.12)	1.1 - 85.9	0.53	-0.01

M – median value, SD – standard deviation, Min – minimum result, Max – maximum result, Skewness – parameter of result distribution symmetry, Kurtosis – parameter of result elongation in regards to normal distribution

Based on the results from Table 2, we can see that the distribution of results with the majority of assessed variables does not deviate significantly from normal distribution. The exception are the variables for assessing balance (S1LB and S1EC) where the distribution is of an exceptionally positive direction which points to the fact that the majority of respondents had weaker results. At the same time, the values of the coefficient of roundness of these two variables are somewhat larger and confirm the existing of several extreme results which deviate significantly from the average. A somewhat higher heterogeneity of results is evident in variables for assessing static and explosive strength (VISZ and SUDM) which is to be expected in the tested age group (high school age) as the biological development of pupils is intensified, uneven and heterochronous which is also reflected on motor abilities. There are periods when some abilities are developed more quickly (the sensitive development stages), in order to be followed by periods of the slower development of these abilities (Radovanović and associates, 2009).

Table 3. *The link between environmental factors and the motor abilities of pupils*

Roots	Canonical R	R ²	Wilk's	Chi-Sq	df	p
1	0.373	0.055	0.328	0.301	84.00	0.253

Roots – characteristic roots, Canonical R – coefficient of canonical correlations, R² – coefficient of determination, Wilk's – Wilk's lambda test, Chi-Sq – Bartlett's chi-square test, df – degrees of freedom, p – level of significance.

The results of the applied canonical correlation analysis (Table 3) have shown that there are no statistically significant link between environmental factors and the motor abilities of pupils in the tested sample. For this reason, it was unnecessary to carry out an interpretation of canonical factors.

In order to test the impact of the system of variables which assess the environmental factors on each motor ability of the pupils individually, we applied a series of multiple regression analyses.

Table 4.1 *The impact of environmental factors on the motor abilities of pupils (the first six motor tests)*

<div>Motor variables</div> <div>Environm. factors</div>	Tossing horizontally with the hand		Kicking vertically with the foot		Standing on one leg longitudinally on a balance bench		Standing on one leg with eyes closed		Figure eight with bending		Drumming with hands and feet	
	β	p	β	p	β	p	β	p	β	p	β	p
Father's education	-0.041	0.742	0.067	0.585	0.304	0.018	0.052	0.688	0.159	0.226	0.068	0.596
Mother's education	0.170	0.194	0.039	0.759	-0.192	0.147	0.041	0.766	-0.079	0.564	0.028	0.833
Father's work status	-0.221	0.071	0.113	0.345	-0.080	0.516	0.179	0.161	0.060	0.639	-0.126	0.316
Mother's work status	0.142	0.233	0.008	0.946	0.269	0.027	0.069	0.576	-0.058	0.643	-0.057	0.643
Number of children in family	0.101	0.392	-0.460	0.000	-0.023	0.844	0.083	0.500	0.018	0.884	0.117	0.337
Total income of household	-0.081	0.564	-0.070	0.612	-0.060	0.673	-0.109	0.458	0.079	0.592	0.270	0.065
Residential status of family	0.162	0.160	-0.221	0.052	-0.070	0.545	-0.106	0.375	-0.058	0.629	0.087	0.462
R	0.370		0.411		0.339		0.236		0.214		0.278	
R ²	0.137		0.169		0.115		0.056		0.046		0.077	
P	0.072		0.022		0.148		0.653		0.761		0.418	

β – regression coefficient, p – significance level of regression coefficient, R – multiple correlation coefficient, R² – determination coefficient, P – level of statistical significance of multiple correlation coefficient

The results of a multiple regression analysis for the first six motor tests (Table 4.1), as criteria variables, have shown the existing of a significant impact of predictors, that is, environmental factors, on foot precision. The numerical

values of the coefficients of regression ($P=0.022$; $\beta=-0.460$; $p=0.000$) show that the significant impact of the environmental factor is defined by a variable of the number of children in the family on the motor ability of precision (of the foot). The mentioned can be interpreted as a higher probability for physical activities (usually soccer) to be carried out in families with more children (especially of the male gender) and thus indirectly realize an impact on better foot precision. Along with the mentioned environmental factor, the other indicators failed to realize a more significant impact on the motor abilities of the pupils.

Table 4.2 *The impact of environmental factors on the motor abilities of pupils (of the other six motor tests)*

Motor variables Environm. factors	Hand tapping		Foot tapping		Deep bend on the bench		One arm skin the cat with stick		Standing high jump		Pull ups	
	β	p	β	p	β	p	β	p	β	p	β	p
Father's education	-0.092	0.487	-0.167	0.206	0.053	0.671	0.188	0.152	-0.131	0.305	-0.020	0.883
Mother's education	0.101	0.462	0.130	0.343	-0.118	0.368	-0.148	0.279	-0.032	0.811	-0.064	0.648
Father's work status	-0.105	0.416	-0.070	0.583	-0.058	0.636	0.099	0.438	-0.016	0.896	0.020	0.877
Mother's work status	-0.013	0.914	0.012	0.923	0.315	0.009	-0.041	0.743	0.139	0.251	-0.015	0.903
Number of children in household	0.110	0.379	0.134	0.281	-0.232	0.052	-0.039	0.753	-0.249	0.041	-0.064	0.613
Monthly household income	0.086	0.562	0.024	0.871	-0.091	0.517	-0.042	0.775	-0.064	0.658	-0.051	0.736
Residential family status	0.151	0.214	0.121	0.316	-0.118	0.306	-0.078	0.515	-0.076	0.516	-0.060	0.624
R	0.188		0.206		0.364		0.225		0.311		0.124	
R ²	0.035		0.043		0.132		0.051		0.097		0.015	
P	0.869		0.797		0.084		0.707		0.253		0.987	

β – regression coefficient, p – significance level of regression coefficient, R – multiple correlation coefficient, R² – determination coefficient, P – level of statistical significance of multiple correlation coefficient

In the following six of a total of 12 motor tests (Table 4.2), multiple regression analysis did not show a statistically significant impact of the predictors on the criteria variables.

DISCUSSION

Newer research of the correlations between environmental factors and the motor abilities of children has given contradictory results. In some research, the authors have determined that motor abilities are mostly independent from socio-economic status (Bala, Katić, & Mikalački, 2010), and that in boys (ages from 7 to 11) the factors of the socio-economic environment can explain only 4% of the total variability of the general motor factor (Matić, Kuljić & Maksimović, 2010). In an earlier research by Matić and Maksimović (2007), the authors concluded that there are significant links between the physical activity of children and socio-economic status, and that the sports results of parents, the sports engagement of parents in sports organizations, residential status and the factor of informal education have the most important mediating role in the impact of the socio-economic status on physical status.

The results of this research are largely in concordance with the research carried out by Bala, Katić and Mikalački (2010), which was carried out on a younger sample of respondents, and where more significant links between socio-economic status and the motor abilities of respondents were established. Also, Okely and Booth (2004) failed to establish a significant link between socio-economic status and the basic motor abilities of elementary school pupils. There are certain similarities with the research which was carried out by Booth and associates (Booth et al., 1999) who established a link between the socio-economic status with the fundamental motor abilities of pupils from grades 4 to 10 but only on the female part of the sample.

The results of current research, in spite of the fact that canonical correlation analysis failed to determine a link between environmental factors and the motor abilities of pupils, shows the an impact of one environmental factor (the number of children in the family) on foot precision. The mentioned can probably be interpreted in the way that the research was carried out with boys of elementary school age who most often played football (Radojević, 2006; Đorđić, 2010; Šekeljić, Stamatović and Marković, 2012). On the other hand, it is logical that in families with several children there is an increased probability of a more frequent physical engagement of children in sports activities, especially football, which can without doubt contribute to better foot precision. The fact that the results of other environmental factors have no significant impact on the motor abilities of pupils of this age is a little surprising, but it is probably a consequence of using a smaller sample, that is, the fact that all the respondents come from a smaller area (the suburbs). Another explanation can be sought in hereditary factors, i.e. a more significant impact of genetics on the motor abilities of pupils than environmental factors in the test sample.

CONCLUSION

In researching the correlations between some environmental factors and the motor abilities of 6th grade elementary school pupils, we have reached the conclusion that in the test sample there have not been established any statistically relevant correlations between the mentioned. Thus, based on the obtained results of the research, we can assume that motor abilities in the test sample are more under the impact of some other factors and not environmental.

Along with the fact that this research does not establish more significant correlations between motor abilities and some environmental factors, it is necessary to stress that the research had certain limitations. Primarily, this relates to the size of the sample and the set of applied measures for assessing environmental factors. Namely, the research did not encompass all the possible environmental factors which could have a significant impact on the motor abilities of the pupils (the technical equipment of schools, access to sports fields, clubs and similar).

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