

THE DIFFERENCES IN MOTOR SKILLS IN SECOND AND THIRD GRADERS IN PRIMARY SCHOOLS IN MOSTAR AND ZAGREB

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ABSTRACT

The aim of this study was to determine the differences in motor skills between second and third grade primary school boys and girls living in two different geographical regions. The differences in motor skills were investigated on the sample of 123 second and third grade primary school pupils from Mostar in Bosnia and Herzegovina and Zagreb in the Republic of Croatia. The study used 7 tests to assess the pupils' motor abilities and 1 test for the assessment of pupils' functional abilities. Discriminant analysis confirmed the significance of differences in the system of variables in the subsamples defined on the basis of geographical region in the subsample of boys. It is evident that the boys from Zagreb had somewhat better developed motor skills than boys from Mostar. In the subsample of girls, discriminant analysis did not confirm significant differences in motor skills. The results of discriminant analysis showed that boys who live and attend school in the city of Zagreb had significantly better results on the flexibility assessment test. Based on the obtained results it can be concluded that there were no significant differences in motor skills between second and third grade girls from Zagreb and Mostar, whereas significant differences in motor skills were confirmed for boys. The reason that no significant differences were found in girls may be in the fact that the research was conducted on primary school male and female pupils aged between 8 and 9 when significant differences in motor and functional abilities are not expected. The existence of differences in boys can, among other, be attributed to a different way of life and movement habits of boys from Zagreb and certainly greater number of facilities providing opportunities for physical exercise.

Keywords: motor skills, physical activity, pupils, primary education

INTRODUCTION

The change in the level of motor skills is an integral part of growth and development, and is determined by chronological and physiological age, and gender. It is also affected by a number of endogenous (genetic, hormonal) and exogenous (diet, physical activity, socioeconomic, psychological, climatic, geographic and other) factors (Prskalo, Kraljević, Kovačević, 2011). Motor skills, i.e. their level, are very important for the optimal growth and development of children, and thus for their health. They naturally develop from birth, and their development undergoes certain changes that happen over the years, but especially in youth. In addition, this development is not always the same for boys and girls. For each motor ability there is a period within which the most significant changes take place. Individual differences in the growth dynamics are a significant source of variability in shape, function and capability of the human body (Prskalo et al., 2011). High level of motor skills is extremely important for the daily functioning of every person and its reduction may initiate the appearance of a variety of health-related problems. Daily physical exercise has a high impact on the development of motor skills that have major implications for human health. Only sufficiently developed motor skills can be one of the prerequisites of good health (Badri, 2011). Different lifestyles were created depending on the geographical, cultural and socio-economic background. However, today the life of young people in the developed countries is mainly characterized by modern information technology (Jurak et al., 2011). Motor skills are no longer only important per se, but also for the development of other traits and abilities. If the motor skills are not developed to the level that can objectively be achieved with regard to genetic limitation, it is highly likely that such an individual will not be able to efficiently and easily perform a variety of everyday tasks, nor will it encourage the development of other features and abilities with which motor abilities are associated (Findak, 1999). Previous studies have shown a decline in skills among young people, while being physically active in leisure time was shown to be important for improving the motor skills of explosive strength, coordination and running speed in youth (Wrotniak et al., 2006). It is also evident that a high level of motor abilities in pupils has a significant impact on their participation in kinesiological leisure activities (Hay & Missiuna, 1998; Okely et al., 2001; Taylor et al., 2002; Graf et al., 2004; Fischer et al., 2005; Strong et al., 2005; Riddoch et al., 2007; D'Hondt et al., 2009). Children who have achieved a higher level of the development of motor abilities in childhood are significantly more likely to be physically active in adolescent years (Raudsepp & Pall, 2006; Wrotniak et al., 2006; Barnnet et al., 2009). Geographic differences between respondents in motor or functional abilities were observed in some studies, but they primarily referred to climate, genetics or socioeconomic status of the country. The aim of this paper was to determine the differences in motor skills between second and third grade primary school boys and girls living in two different geographical regions.

RESEARCH METHODS

THE SAMPLE

The study was conducted on a sample of 123 second and third grade primary school pupils in Mostar (67 pupils) and Zagreb (56 pupils). The subsamples defined according to gender consisted of 66 boys and 57 girls. All the respondents were provided with spatial, temporal and situational conditions in accordance with the standards for this kind of research. The tests were conducted in the mornings, in the gymnasiums which satisfied the standards of measurement (light, temperature, etc.), and all subjects were provided with the same measurement conditions. While performing each test, the participants had the appropriate sports equipment. During the planning phase, the order of the tests was taken into consideration to avoid the impact of each test on the results of the following one. The order of measurement was the same for all respondents.

VARIABLES

This study used a battery of seven motor tests and one test for the functional capacity assessment. The flexibility was assessed with the sit-and-reach test (MPRK), the speed of simple movements was measured with hand tapping test (MTR15), explosive strength with standing long jump (MSD) and standing high jump tests (MSV), while static and repetitive strength was measured with bent arm hang (MIV) and sit-ups tests (MPT). Motor coordination was measured on the polygon backwards test (MPOL), and the functional ability by a 3 minute run test (F3). A detailed description of the tests is available in the literature (Findak et al., 1996; Metikoš et al., 1989).

DATA PROCESSING METHODS

Data was analyzed using STATISTICA (data analysis software system), version 7.1. Data processing for all the target variables included the calculation of the basic descriptive parameters: mean, standard deviation, minimum and maximum result. In order to determine the normality of the distribution for individual variables, K-S test, i.e. Kolmogorov - Smirnov procedure was used to calculate the maximum differences between the observed and theoretical cumulative frequencies (MAX D). The significance of differences between the subgroups in the sample defined according to geographical region within the level of their abilities was determined by canonical discriminant analysis for independent samples. The significance of the discriminant function was tested by Bartlett's Chi-Square test. The hypotheses were tested with an error of 5%.

RESULTS

The tables listed in this survey of the results show the basic statistical parameters for all anthropological characteristics that were measured in this study. This review aims to make a comparison of the respondents' results on the basis of the geography region they come from and gender.

Table 1 Descriptive statistical parameters of the motor and functional abilities of boys from Mostar

	N	MEAN	SD	MIN	MAX	Max D	K-S p
MPOL	33	15.98	4.91	9.30	34.00	0.1078	p > .20
MTR 15	33	23.58	3.49	14.00	32.00	0.1486	p > .20
MIV	33	21.16	19.70	2.00	85.10	0.2290	p < .10
MPT	33	34.39	8.33	20.00	50.00	0.0872	p > .20
MPRK	33	16.96	6.22	3.00	29.00	0.0752	p > .20
MSD	33	140.21	22.40	88.00	177.20	0.0898	p > .20
MSV	33	23.79	5.82	7.00	36.00	0.1431	p > .20
F 3	33	501.21	96.19	270.00	690.00	0.1154	p > .20

MPOL-polygon backwards; MTR15-hand tapping, MIV-bent arm hang, MPT- sit-ups; MPRK- sit-and-reach; MSD-standing long jump; MSV- standing high jump; F3- 3 minute run; N-number of subjects, MEAN-mean result, SD-standard deviation, MIN-minimum score; MAX- maximum score; KS-Kolmogorov-Smirnov test

Table 2 Descriptive statistical parameters of the motor and functional abilities of boys from Zagreb

	N	MEAN	SD	MIN	MAX	Max D	K-S p
MPOL	33	16.06	4.01	10.40	27.50	0.0790	p > .20
MTR 15	33	24.36	2.28	19.00	29.00	0.1696	p > .20
MIV	33	17.92	15.70	1.60	59.90	0.1647	p > .20
MPT	33	35.21	7.18	17.00	49.00	0.1801	p < .20

MFLPRK	33	25.64	6.59	12.00	39.00	0.1435	p > .20
MSD	33	137.73	18.92	100.00	175.00	0.1094	p > .20
MSV	33	22.06	4.81	13.00	35.00	0.1024	p > .20
F 3	33	522.12	51.39	391.00	663.00	0.0736	p > .20

MPOL-polygon backwards; MTR15-hand tapping, MIV-bent arm hang, MPT- sit-ups; MPRK- sit-and-reach; MSD-standing long jump; MSV- standing high jump; F3- 3 minute run; N-number of subjects, MEAN-mean result, SD-standard deviation, MIN-minimum score; MAX- maximum score; KS-Kolmogorov-Smirnov test

The descriptive parameters for second and third grade boys from Mostar and Zagreb, shown in Table 1 and 2, indicate that the boys from Zagreb had higher values in motor abilities on the tests used to assess the frequency of movement (MTR15), the flexibility assessment tests (MFLPRK) and the functional capacity assessment tests (F3). The results of the tests used for the assessment of explosive strength (MSV, MSD), and static strength (MIV) show somewhat higher values in favour of boys from Mostar. Kolmogorov-Smirnov test confirmed a normal distribution of the results for all tests.

Table 3 Descriptive statistical parameters of the motor and functional abilities of girls from Mostar

	N	MEAN	SD	MIN	MAX	Max D	K-S p
MPOL	34	18.37	5.22	11.20	31.57	0.1991	p < .15
MTR 15	34	23.24	3.29	16.00	31.00	0.1196	p > .20
MIV	34	16.18	13.39	0.00	50.80	0.1243	p > .20
MPT	34	28.53	10.39	3.00	49.00	0.1151	p > .20
MFLPRK	34	19.55	6.75	6.00	31.00	0.1146	p > .20
MSD	34	125.50	16.45	97.00	159.00	0.1107	p > .20
MSV	34	21.59	4.72	10.00	30.00	0.1123	p > .20
F 3	34	474.71	83.09	320.00	640.00	0.0922	p > .20

MPOL-polygon backwards; MTR15-hand tapping, MIV-bent arm hang, MPT- sit-ups; MPRK- sit-and-reach; MSD-standing long jump; MSV- standing high jump; F3- 3 minute run; N-number of subjects, MEAN-mean result, SD-standard deviation, MIN-minimum score; MAX- maximum score; KS-Kolmogorov-Smirnov test

Table 4 Descriptive statistical parameters of the motor and functional abilities of girls from Zagreb

	N	MEAN	SD	MIN	MAX	Max D	K-S p
MPOL	23	18.20	4.86	10.80	26.80	0.1309	p > .20
MTR 15	23	23.30	2.51	18.00	29.00	0.1569	p > .20
MIV	23	14.48	9.43	1.00	28.90	0.1202	p > .20
MPT	23	34.87	7.73	13.00	47.00	0.1378	p > .20
MFLPRK	23	21.43	7.86	9.00	37.00	0.1025	p > .20
MSD	23	132.61	17.77	85.00	165.00	0.1622	p > .20
MSV	23	22.35	4.00	16.00	34.00	0.1538	p > .20
F 3	23	494.04	57.14	391.00	589.00	0.1002	p > .20

MPOL-polygon backwards; MTR15-hand tapping, MIV-bent arm hang, MPT- sit-ups; MPRK- sit-and-reach; MSD-standing long jump; MSV- standing high jump; F3- 3 minute run; N-number of subjects, MEAN-mean result, SD-standard deviation, MIN-minimum score; MAX- maximum score; KS-Kolmogorov-Smirnov test

The results in Tables 3 and 4 show descriptive parameters for second and third grade girls from Mostar and Zagreb. The presented results indicate that girls from Zagreb had higher values in motor skills on the tests used to assess explosive strength (MSV, MSD), repetitive strength (MPT) and the flexibility assessment test (MFLPRK). Also, it is evident that they have numerically better results on the tests for assessing functional abilities (F3). The results of the test used to assess the static strength (MIV) show somewhat higher values for the girls from Mostar. Kolmogorov-Smirnov test showed normal distribution of the results for all the tests.

Table 5 Discriminant analysis results for motor variables with the level of significance - boys from Mostar and Zagreb

	Eigen-value	Canonical R	Wilks' Lambda	Chi-Sqr.	df	p-level
0	0.59	0.61	0.63	27.78	8	0.0005

Table 6 Discriminant analysis results for motor variables with the level of significance - girls from Mostar and Zagreb

	Eigen-value	Canonical R	Wilks' Lambda	Chi-Sqr.	df	p-level
0	0.26	0.45	0.80	11.68	8	0.1659

The results of the discriminant analysis given in Table 5 indicate one statistically significant discriminant function which shows that there is a statistically significant difference in motor skills between second and third grade boys from Mostar and Zagreb. It is evident that the coefficient of discrimination is 59%, suggesting the existence of a fairly significant difference. The results given in Table 6 show no statistically significant differences in motor skills between girls from Mostar and Zagreb.

Table 7 Results of discriminant analysis for motor variables with the level of significance - boys from Mostar and Zagreb

	Root 1
MPOL- <i>polygon backwards</i>	-0.01
MTR 15- <i>hand tapping</i>	-0.18
MIV- <i>bent arm hang</i>	0.12
MPT- <i>sit-ups</i>	-0.07
MPRK- <i>sit-and-reach</i>	-0.90
MSD- <i>standing long jump</i>	0.08
MSV- <i>standing high jump</i>	0.21
F 3- <i>3 minute run</i>	-0.18
	Root 1
Boys-Mostar	0.76
Boys-Zagreb	-0.76

Table 7 shows that the subsamples of boys from Mostar and Zagreb are at a distance of 1.52 parts of the standard deviation. The largest contribution to the difference in the discriminant function of the

boys from Mostar and Zagreb is ascribed to the following variables: sit-and-reach (MPRK), standing high jump (MSV), hand tapping (MTR15) and 3 minute run (F3).

DISCUSSION

Based on the examined results for the total sample of second and third grade male and female pupils from Mostar and Zagreb, it is evident that between the subsamples there were some numerical differences. Analysing the obtained results for the motor skills it is evident that the boys from Zagreb achieved somewhat better results for flexibility, speed of the frequency of movement and the functional abilities. Boys who live and attend school in Mostar have a numerically higher value in the field of explosive and static strength. For girls, it can be seen that the girls from Zagreb achieved higher results in motor skills in the field of explosive strength, repetitive strength and flexibility. Also, it is evident that they had numerically better results in the area of functional abilities. The girls from Mostar had higher results in the area of static strength. Discriminant analysis was applied to determine statistically significant differences between the subsamples. This provided data on the differences between the groups and the extent to which certain variables contributed to that difference, and only significant discriminant functions were interpreted (Dizdar, 2006). The results of the discriminant analysis of motor variables indicated the significant differences between the male pupils who live and attend school in Zagreb and Mostar, while in girls, there was no significant difference.

The significance of the difference in boys according to the factor structure contributed most to the flexibility which according to the projected centroid dominated in favour of the pupils from Zagreb. Also, the difference in favour of the pupils from Zagreb was further confirmed by the speed of simple movements. The results of the previous studies where the differences in motor skills between students who live in different countries were determined (Jenko et al., 2008; Jurak et al., 2011) showed that there were differences in the explosive and repetitive strength and coordination, and the results of research (Prskalo et al., 2011) also showed differences in the area of flexibility.

The reasons for the existence of differences in motor skills of boys from Mostar and Zagreb can be attributed to several factors. Firstly, in Mostar due to the poor financial situation of schools, lack of gymnasiums and playgrounds, children have fewer opportunities to participate in high-quality physical education lessons. The unsatisfactory financial situation also has an impact on the lack of interest of individual teachers in primary education, but also physical education professors to closely follow and apply the syllabuses and to motivate their pupils and students for future engagement in physical activities both at school and out of school. The rationale for these results may not only be found in the economic underdevelopment of the city of Mostar in relation to the city of Zagreb, but in the significantly greater investments in Zagreb in the construction of sports facilities and grounds, thus providing better opportunities for the involvement of pupils and students in any form of physical activity. In addition to the current poor state of the sports clubs in Bosnia and Herzegovina this may, on the long term basis, have serious consequences for the development of sports in general in Bosnia and Herzegovina. However, these implications are beyond the scope of this research and may be the subject of another more extensive study.

CONCLUSION

Based on the obtained results it can be concluded that there were no relatively significant differences in motor skills between second and third grade girls from Zagreb and Mostar, while in the subsample of boys significant differences in motor skills were confirmed. The reason for the lack of significant

differences in girls can be found in the fact that the research was conducted on primary school male and female pupils aged between 8 and 9, the age when major differences in motor and functional abilities are still not expected. The difference in the subsample of boys can, among other, be attributed to a different way of life and movement habits among Zagreb population, and certainly to a greater number of facilities providing opportunities for physical exercise in Zagreb.

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