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GENDER DIFFERENCES IN MOTOR PERFORMANCE IN 6.5-YEAR-OLD CHILDREN

RAZLIKE MED SPOLOMA V MOTORIČNI UČINKOVITOSTI PRI ŠEST IN POL LETNIH OTROCIH

Abstract

The aim of the research was to study gender differences in the results of motor tests performed by 6.5-year-old boys and girls. The sample of 138 healthy children was measured by selected motor tests that cover the following hypothetical dimensions of motor abilities: movement coordination, speed, strength, and balance. Gender differences in individual motor tests were tested using the Student's t-test for independent samples. Statistically significant gender differences were observed in backward walking through hoops, polygon backwards, standing broad jump, triple jump, and the flamingo balance test on a block lying longitudinally. The established gender differences in performance of the selected motor tests may be due to different reasons. As this research did not deal with these reasons in greater detail, the explanation of the obtained results has to take into consideration the previous findings relating to innate, biological explanations as well as explanations of various stimuli from the environment for motor and sporting activities, which are reflected in the social impact and/or different upbringing of girls and boys. It can be concluded that main gender differences in motor performance in 6.5 years old children existed in coordination and strength tests, while in balance and speed the differences were not significant.

Key words: motor abilities, motor tests, gender differences, children

Izvleček

Cilj raziskave je bil ugotoviti razlike med spoloma v izbranih motoričnih testih med 6.5-letnimi deklicami in dečki. Z motoričnimi testi, ki so pokrivali hipotetične dimenzije motoričnih sposobnosti koordinacijo gibanja, hitrost, moč in ravnotežje smo izmerili 138 zdravih otrok. Razlike med deklicami in dečki v posameznih motoričnih testih smo ugotavljali s t-testom za neodvisne vzorce. Značilne razlike med spoloma so bile ugotovljene pri testih hoja skozi obroče nazaj, poligon nazaj, skok v daljino z mesta, troskok in stoja na ležečem kvadru vzdolžno. Dobljene razlike med spoloma v izvedbi izbranih motoričnih testov je možno pripisati različnim vzrokom. Ker v raziskavi nismo natančneje preučevali tovrstnih vzrokov na preučevani skupini merjencev, je potrebno pri razlaganju dobljenih rezultatov imeti v mislih tako dosedanja spoznanja na področju prirojenih, bioloških razlag, kot na drugi strani tudi na področju razlag različnih vzpodbud iz okolja za gibalno in športno udejstvovanje, ki se odražajo preko socialnega vpliva oziroma različne vzgoje deklic in dečkov. Lahko zaključimo, da obstajajo poglavitne razlike med spoloma v motoričnih sposobnostih pri 6.5 letnih otrocih v testih koordinacije in moči, medtem ko razlike v testih ravnotežja in hitrosti niso značilne.

Ključne besede: motorične sposobnosti, motorični testi, razlike med spoloma, otroci

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INTRODUCTION

The child's development in individual areas of her/his psychosomatic status can be divided into several development phases. The motor development of a 6.5-year-old child is at the level of a mature stage of the fundamental movement phase (Gallahue, 1982; Gallahue & Ozmun, 2002). At that level, basic locomotor, stability and manipulative movements are becoming more and more complex and differentiated, and begin to combine into more complex forms of movement activities. Movement is based on the use and combination of basic moves performed when carrying out skills required for various sports activities (Tancig, 1987).

Several researchers pointed out two major groups of factors that influence the child's development and account for gender differences in results of motor tasks: biological or hereditary factors (body dimensions, anatomical structure, physiological functions) and social factors (Haywood & Getchell, 2001; Hottinger, 1983; Malina, 1983a, 1983b; Zaichkowsky, Zaichkowsky, & Martinek, 1980). Social factors influence the type and intensity of physical activity of children (Darlison, 2000; Eaton & Enns, 1986; Gavarry, Giacomoni, Bernard, Seymat, & Falgairette, 2003; Levy & Hobbes, 1979; Pomerleau, Bolduc, Malcuit, & Cossette, 1990) and may therefore contribute to differences in their motor performance. The impact of heredity does not cease at birth, but lasts the entire life, while the impact of the milieu does not occur at birth, but affects already the embryo. When interpreting the development of motor abilities of girls and boys, one has to take into account both groups of factors, their intertwinement and co-influence.

Numerous studies revealed that during early childhood the child's motor abilities improve with age (Arceneaux, Hill, Chamberlin, & Dean, 1997; Benefice, Fouere, & Malina, 1999; Butterfeld, Lehnhard, & Coladarci, 2002; Davies & Rose, 2000; Toriola & Igbokwe, 1986). Only a few studies, however, attempted to establish differences in motor abilities between boys and girls during this development phase. According to them, early childhood is a period when the first gender differences can be observed between girls and boys performing the same motor tasks. During early childhood, boys achieve better scores in the majority of motor tests. Considerable differences were observed in particular in the tests of strength (Backman, 1988; Benefice et al., 1999), speed (Benefice et al., 1999; Toriola & Igbokwe, 1986) and coordination (Levy & Hobbes, 1979). Davies and Rose (2000) established that gender differences between girls and boys obtained through the application of motor tests of strength existed mainly in the performance of jumps in which the greatest difference between the two sexes was established in favour of boys. Similar results were also obtained by Toriola and Igbokwe (1986) in a sample consisting of 341 3-to-5-year-old Nigerian children. Research on preschool children (Pišot, 2000) also showed that boys scored higher than girls in jumping tests (e.g. high jump, broad jump). They are characterized by the fastest kinetic chain performance, which is mostly depended on the muscle volume, the structure of muscle fibres and appropriate inter- and intra-muscle activation characterized by high firing frequency (Desmedt & Godaux, 1977) and proximal-distal sequence (Bobbert & van Ingen Schenau, 1988). All these factors exert influence upon the rapid development of the muscle force, which is one of the most important factors of the jump length from the bio-mechanical point of view. A number of studies dealing with the latent structure of the child's motor space classified jumping tests under the explosive strength factor, with some of them (Rajtmajer, 1993; Strel & Šturm, 1981; Zimmer & Volkamer, 1984) mentioning also the take-off strength. In preschool children, the factor can be observed in both sexes (Kurelić, Momirović, Stojanović, Šturm, Radojević & Viskić-Štalec, 1975; Rajtmajer, 1993; Strel & Šturm, 1981). The researchers

also pointed out gender differences related to its structure. In girls, the jumps appeared at the latent dimension in relation to the motor tasks whose realization depended on different forms of movement coordination, whereas in boys, they appeared in relation to the motor tasks whose vital element was the performance speed or, in other words, the development of large quantity of force per time unit. In girls, the performance of jumping tests was most strongly depended on the cognitive component, whereas in boys the most influential factor was the energy component (Conzelmann, 1994; Gaschler, 1994; Pišot, 1999, 2000; Rajtmajer, 1993; Roth & Winter, 1994; Scheid, 1994; Schmidtblecher, 1994).

From the youngster's age of seven to that of twelve, gender differences diminish, whereas later on boys' abilities increase rapidly up to the age of seventeen, while those of girls remain at the level reached around the age of twelve (DeOreo & Keogh, 1983). In balance tests, only minor differences were established between the two sexes in the preschool period. Balance ability showed constant development and, in contrast to other abilities, there occurred no significant gender differences between girls and boys (DeOreo & Keogh, 1983; Toriola & Igbokwe, 1986).

In the Maribor region, significant differences in attending sport activities were observed between girls and boys whose average age was 6.4 years (Planinšec, 2003). Sports were chosen in accordance with the expected gender specificity. Therefore, the aim of the present study was to establish whether these gender differences are reflected in motor abilities in 6.5-year-old children from the selected region as well.

METHOD

Participants

The sample consisted of 70 girls and 68 boys who were 6.5 (SD = 3 days) years of age on the day testing was performed. The subjects were randomly chosen, based on a selection of health records of 6.5-year-old children living in the City Municipality of Maribor. The sample of subjects was representative of the population of 6.5-year-old children from the Maribor region, one of the largest in the Republic of Slovenia.

The tests were performed only by children who were completely healthy. The children that failed to finish all the tests were excluded. Testing took place in the paediatric dispensary of the Health Centre of Maribor in 1994. Before being tested, children had performed warm-up exercises under the control of test supervisors. Measurement was done by students of the Faculty of Education of the University of Maribor, who had undergone special training and were supervised by the faculty staff. Each test was performed three times, and only the best score was included in data analysis.

Instruments

Analyzed motor tests covered the following hypothetical motor abilities: movement coordination, speed, strength and balance (Pišot, 1999; Rajtmajer, 1991; Rajtmajer & Proje, 1989). The tests' reliability and the validity of the tests were verified elsewhere (Rajtmajer & Proje, 1990;

Strel, 1982; Videmšek & Cemič, 1991; Zimmer & Volkamer, 1984) and established as adequate for the study of motor abilities in children.

Three different motor tests were employed for each of the included motor abilities in order to achieve higher reliability of generalizations from the obtained results related to individual dimensions of motor abilities. Movement coordination was tested by the application of polygon backwards (PB), backward walking through hoops (BWH) and crawling with a ball (CB); speed by the application of hand plate tapping (HPT2), 4-disc hand plate tapping (HPT4) and foot plate tapping (FPT); explosive strength by the application of standing broad jump (SBJ), triple jump (TJ) and high jump (HJ); and balance by the application of the flamingo balance tests on a block lying longitudinally (FBLL), on a block lying transversally (FBLT) and on a standing block (FBS).

Procedure

When performing polygon backwards, the subject got down on all fours, with her/his hands just behind the starting line and her/his back turned towards the finish line. After the starting signal, the subject began moving backwards on all fours as quickly as possible. First, s/he had to go through the first hoop, and then s/he had to crawl across the mat. When her/his head had been through the second hoop, the task was completed. The distance between the starting line and the first hoop, as well as between the mat and the preceding and following hoops, was 1 metre. The score was the time passed from the starting signal to the moment the subject's head had passed through the last hoop.

Backward walking through hoops required from the subject to move on all fours – with her/his back towards the finish line – through three hoops set between the starting and finishing lines. The distance between the starting line and the first hoop, as well as between the individual hoops, was 1 metre. The score was the time passed from the starting signal to the moment the subject's head had passed through the last hoop.

When tested in crawling with a ball, the subject began by lying behind the starting line with a ball 16 cm in diameter in one of her/his hands and pressed to her/his body. After the starting signal, s/he started to crawl and had to hold the ball tightly in her/his hand, as the ball could not be rolled along the floor. The task was completed when the subject had crawled a 4-metre distance. The score was the time passed from the starting signal to the moment the subject had crawled over the finishing line with her/his whole body.

When performing hand plate tapping, the subject was sitting at a table on which there was a plate with two discs, each 20 cm in diameter. The centre points of the discs were 40 cm apart. After the administrator's signal, the subject started to move her/his dominant hand back and forth between the two discs, as quickly as possible, over the hand in the middle, which had to remain stationary during the whole test. Each touch of both discs scored 1 point. If the subject failed to touch a disc, the repetition did not count. The score was the number of points achieved in 20 seconds.

Four-disc plate tapping was carried out in a similar way. The subject had to move her/his dominant hand clockwise for 20 seconds and touch the four discs as many times as possible. The discs were

20 cm in diameter, with their centre points 40 cm apart. Again, the score was the total number of taps on all four discs.

When performing foot plate tapping, the subject had to be in a sitting position, moving her/his preferred foot back and forth between the two discs lying on the floor as quickly as possible. The discs were 20 cm in diameter, with their centre points 35 cm apart. The non-preferred foot was left aside. The result was the number of points achieved in 20 seconds, with the tap of both discs scoring 1 point.

When performing the standing broad jump, the subject was standing on the mat behind the take-off line. Swinging both her/his arms, s/he took off with both her/his feet and tried to jump as far as possible. The score was the jump length measured from the take-off line to the nearest point of contact on the landing mat.

The triple jump consisted of three successive jumps with both feet. Before taking off, the subject had to stand behind the take-off line. All three take-offs and landings had to be performed with both feet, with no intermediate stops or steps. The jump length was the distance between the take-off line and the nearest point of contact on the landing area.

When being tested in the high jump, the subject was standing sideways by the wall. S/he stretched her/his arm to touch the gauge. The distance from the floor to the subject's point of contact was the height reached. Swinging her/his arms, the subject jumped with both feet upwards and touched the gauge once again. The distance from the floor to the point of contact with the gauge was the jumping height. The score was the difference between the jumping height and the height reached.

When performing the flamingo balance tests on a block lying longitudinally or transversally or on a standing block, the subject had to stand on one leg and remain balanced as long as possible on the wooden block of set dimensions (10 x 6 x 6cm) placed in a certain position (standing, lying, transversal, longitudinal). The other leg was bent backwards. The score was the time passed from the moment the subject had released her/his hold on the administrator, who helped her/him obtain her/his balance, to the moment her/his leg had touched the floor.

Basic statistical parameters were calculated for all variables. The normality of the distribution of results was tested with the Kolmogorov-Smirnov test (two-way testing of statistical significance was employed). All variables that were not normally distributed were normalized before further analysis. The reliability of measurement of individual motor tests was verified separately for girls and boys by using Cronbach's α coefficient. Statistical significance of gender differences in individual motor tests was tested using the Student's t-test for independent samples (5% two-sided alpha error).

RESULTS

The obtained values of the α coefficient for individual tests classified according to sex are shown in Table 1.

Table 1: Reliability of applied motor tests in boys and in girls

Variables	Sex	Cronbach α coefficient
PB(s)	Boys	0.908
	Girls	0.846
BWH (s)	Boys	0.866
	Girls	0.851
CB (s)	Boys	0.873
	Girls	0.903
HPT2 (No. of repetitions)	Boys	0.847
	Girls	0.842
HPT4 (No. of repetitions)	Boys	0.763
	Girls	0.780
FPT (No. of repetitions)	Boys	0.809
	Girls	0.843
SBJ (cm)	Boys	0.817
	Girls	0.791
TJ (cm)	Boys	0.825
	Girls	0.717
HJ (cm)	Boys	0.809
	Girls	0.783
FBLL (s)	Boys	0.752
	Girls	0.679
FBLT (s)	Boys	0.864
	Girls	0.700
FBS (s)	Boys	0.818
	Girls	0.788

Legend:

PB	polygon backwards
BWH	backward walking through hoops
CB	crawling with a ball
HPT2	hand plate tapping
HPT4	four-disc hand plate tapping
FPT	foot plate tapping
SBJ	standing broad jump
TJ	triple jump
HJ	high jump
FBLL	flamingo balance tests on a block lying longitudinally
FBLT	flamingo balance tests on a block lying transversally
FBS	flamingo balance tests on a standing block

Table 1 shows that the reliability of measurement of all motor tests applied was sufficient enough for both girls and boys, since Cornbach's α coefficient ranged between 0.75 and 0.91 for boys, and between 0.68 and 0.90 for girls. The applied motor tests proved more reliable for boys, as in ten tests out of twelve the achieved Cronbach's α coefficient exceeded 0.80. For girls, there were five such tests. The lowest reliability of measurement was perceived in girls in the flamingo

balance test on a block lying longitudinally (0.68) and the flamingo balance test on a block lying transversally (0.70). In these cases the reliability of the measurement of motor skills of balance of the tested group of girls is moderate and therefore still acceptable. The indicated data show that the applied tests were adequately consistent for the implementation of measurement in the selected age group of subjects and concur with the findings of previous research, attesting to a high reliability of measurement of motor tests applied in preschool children (Planinšec, 1995; Rajtmajer & Proje, 1990; Videmšek & Cemič, 1991). The obtained standard deviations (see Table 2) testify to an adequate measurement sensitivity of selected motor tests in both boys and girls.

Table 2: Basic statistics and gender difference testing using motor tests

Variables	Sex	M	SD	Skewness	P (K-S)	t	p (t)
PB(s)	Boys	9.434	1.808	-0.092	0.725	-2.535	0.012
	Girls	10.203	1.755	-0.047	0.726		
BWH (s)	Boys	9.412	2.307	0.478	0.748	-2.865	0.005
	Girls	10.554	2.376	0.528	0.607		
CB (s)	Boys	11.603	3.279	0.336	0.309	-1.428	0.156
	Girls	12.419	3.427	0.108	0.341		
HPT2 (No. of repetitions)	Boys	26.588	4.869	-0.296	0.951	-0.947	0.345
	Girls	27.344	4.485	-0.390	0.673		
HPT4 (No. of repetitions)	Boys	13.456	2.554	-0.102	0.167	-0.331	0.741
	Girls	13.614	3.037	1.498	0.009		
FPT (No. of repetitions)	Boys	22.044	3.739	0.391	0.261	-0.464	0.644
	Girls	22.357	4.174	-0.732	0.560		
SBJ (cm)	Boys	106.765	17.785	-0.281	0.871	2.529	0.013
	Girls	99.700	14.947	0.006	0.879		
TJ (cm)	Boys	319.897	35.043	0.387	0.361	2.172	0.032
	Girls	305.729	41.254	-0.115	0.660		
HJ (cm)	Boys	18.368	4.629	-0.560	0.254	1.131	0.260
	Girls	17.543	3.915	-0.074	0.631		
FBLL (s)	Boys	12.378	8.800	1.050	0.211	1.956	0.053
	Girls	9.653	7.536	1.704	0.031		
FBLT (s)	Boys	7.012	5.300	1.276	0.012	-0.048	0.962
	Girls	7.053	4.827	1.399	0.017		
FBS (s)	Boys	3.493	2.674	1.006	0.201	0.267	0.790
	Girls	3.370	2.732	1.170	0.004		

Legend (see also legend of Table 1):

P (K-S)	Kolmogorov-Smirnov test (two-way testing of statistical significance)
t – coefficient	t-test for independent samples
p (t)	statistical characteristic of the t-test for independent samples

Table 2 shows the average results of motor tests performed by girls and boys, standard deviations, and results of the Student's t-test. With the exception of the flamingo balance test on a block lying

transversally, the results of girls and boys were normally distributed. The only deviations from normal distribution were recorded by girls in 4-disc plate tapping, the flamingo balance test on a block lying longitudinally, and the flamingo balance test on a standing block. The asymmetry test revealed that all variables deviating from normal distribution were asymmetric to the right.

A statistically significant difference between girls and boys appeared in backward walking through hoops, polygon backwards, standing broad jump, triple jump, and flamingo balance on a block lying longitudinally. Differences obtained in all other tests were statistically insignificant.

The motor tests of polygon backwards and backward walking through hoops were performed better by boys, who needed 9.4 s (SD = 1.8 s) and 9.4 s (SD = 2.3 s), respectively, to crawl the required distance, whereas girls needed one second more in each test. Low values of standard deviation obtained in both tests indicate that the majority of subjects performed the tests in time periods shown in the column Arithmetic Mean. Gender differences in the results of the tests of backward walking through hoops and polygon backwards are statistically significant with an alpha error lower than 1% and 5%, respectively.

Statistically significant gender differences with 1% alpha error appeared in the standing broad jump test. The test was performed better by boys, who outdid the girls by as many as 7.1 cm.

Statistically significant gender differences with 3% alpha error also occurred in the triple jump. The average result by boys was 3.19 m (SD = 35.0 cm), whereas that of girls was 3.05 m (SD = 41.3 cm). Interestingly, both sexes recorded a high standard deviation, which was slightly higher with girls, which points to a larger dispersion of the scores and a lesser representative value of the arithmetic means.

The flamingo balance test on a block lying longitudinally was carried out better by boys (P = 0.030), who managed to keep the balance for 12.4 seconds on average, which was by 2.7 seconds longer than girls, whose average result was 9.7 seconds. Again, both sexes exhibited a very high standard deviation (8.8 s for girls and 7.5 s for boys), which indicates a large dispersion of the scores and, consequently, a lesser representative value of the arithmetic means.

There were no statistically significant gender differences in all other tests: crawling with a ball, high jump, hand plate tapping, 4-disc plate tapping, foot plate tapping, flamingo balance test on a standing block, and flamingo balance test on a block lying transversally.

DISCUSSION

Statistically significant gender differences occurred in the tests of backward walking through hoops and polygon backwards, which cover the hypothetical dimension of movement coordination ability; in the tests of standing broad jump and triple jump, which cover the hypothetical dimension of strength ability; as well as in the results of the flamingo balance test on a block lying longitudinally, which covers the hypothetical dimension of balance ability. Boys surpassed girls in all these tests. There were no statistically significant gender differences in the following tests: crawling with a ball, high jump, hand plate tapping, 4-disc plate tapping, foot plate tapping, flamingo balance test on a standing block, and flamingo balance test on a block lying transversally.

Several authors (Benefice et al., 1999; Clapp, 1996; Eckert, 1973; Liebhardt, Sontheimer, & Linderkamp, 2000) support the idea that gender differences in growth and development are the main reason for the occurrence of gender differences in motor test performance. Gender differences occur predominantly as a result of biological factors, such as genetic base, body dimensions (growth, height, and constitution), body dimensions at birth (low birth weight and premature birth), growth and the quickness of maturation (Malina, Bouchard, & Bar-Or, 2004), In early childhood, there are minimum gender differences in motor development and, consequently, in motor tests (Malina et al., 2004). These differences become significant later, from the age of 10 years on (Davies & Rose, 2000; Haywood & Getchell, 2001), when sexual maturation starts.

In infants it is already possible to distinguish girls from boys according to their body movements, with explosive movements being more frequent among boys (Benenson, Liroff, Pascal, & Cioppa, 1997; Kujawski & Bower, 1993). Boys engage more frequently in »masculine« movement activities (for instance, chasing, climbing, and wrestling) than girls from 3 to 18 months (Shirley, 2000).

Our research results lead to similar conclusions. The greatest gender differences were observed in the results of the motor tests of the standing broad jump, triple jump and high jump, which cover the hypothetical dimension of explosive strength ability. Boys scored higher in all these tests, with gender differences in the test results of the standing broad jump and triple jump being statistically significant. The results correspond to those obtained by Rajtmajer (1993), Schmidtblecher (1994) and Kurelić et al. (1975), who pointed out that the explosive strength tests revealed significant quantitative and qualitative gender differences. Similar conclusions were also reached by Pišot (1999, 2000), who, proceeding from research results and partialization of anthropometric measures, suggested that the obtained results of the motor tests of explosive strength should be attributed to the anthropometric characteristics of girls, which hinder the manifestation of corresponding motor abilities. As for boys, he established that their anthropometric characteristics help them obtain better results. Similarly, research in adults (e.g. Kurelić, Momirović, Mraković, & Šturm, 1979) revealed that in men the dimensions of the body volume and weight bear a strong influence not only on manifest, but also on latent motor abilities of the energy type, while in women the influence is considerably smaller or even negative. On the basis of all these arguments, it could be suggested that the obtained results also derive from different anthropometric characteristics of boys and girls. Consequently, further studies of gender differences in results of motor tests of explosive strength should also pay attention to this aspect.

Although the connection between early differences between girls and boys in movement activity, subsequent differences regarding the engagement in sporting activities and the development of motor abilities is not fully established, researchers trying to interpret the established differences formulated the theory that the early development differences between the two sexes result from the biological development of two different sexes, since they occur prior to the period of the child's assuming of a gender identity and prior to assuming any gender form (Leinbach & Fagot, 1986; Shirley & Campbell, 2000).

Nevertheless, one should not by all means ignore the differences in movement/sporting activities existing between the two sexes that are predominantly interpreted as a result of social factors in the child's milieu. Different authors (e.g., Archer & Lloyd, 2002; Cashmore, 1999; Haywood & Getchell, 2001; Levy & Hobbes, 1979; Malina, 1983a, 1983b; Pomerleau et al., 1990; Stern & Karraker, 1989; Zaichkowsky et al., 1980) have highlighted the fact that the wide category of social factors provide an important explanation for the existing gender differences in results of

various motor tests since the development of motor abilities forms part of the child's socialization process. The development of the gender role in children, which forms an integral part of the child's social role, also includes the gender stereotypes of individual societies in which children grow up. Gender stereotypes determine different behaviours, characters and thought for females and males. The gender role, character and identity of a child develop through the process of socialization. The latter is largely influenced by four factors: i.e. routes of cultural transmission, parents' responses to infants, parents' treatment of boys and girls, and the social environment outside the family (for instance, gender-stereotyped messages in television programmes) (Archer & Lloyd, 2002).

Cultural studies (Bee, 1994; Papalia, Olds, & Feldman, 2003) have shown that the differences in a child's movement development are also caused by the characteristics and distinctive cultural features of the society in which the child lives. For instance, the movement development of infants from African cultures is more rapid and the development of infants from Asian cultures slower in comparison to that of their peers from Western cultures. The observed differences are the result of not only congenital intercultural differences in personal characteristics, but also the parents' encouragement (for instance, encouraging children to begin to walk, performance of group strength exercises) or obstruction (for instance, swaddling) of children in their movement activities (Marjanovič Umek et al., 2004; Papalia et al., 2003).

The above seems to be reflected by the results obtained in the present study. Boys especially performed better the motor tasks involving whole body movements, such as jumping or moving backward using the legs and hands simultaneously, requiring a reorganization of stereotypes (Strel, Šturm, & Pistotnik, 1981). On the other hand, gender differences in tests involving single limb movements and balance were statistically insignificant. The obtained differences seem to be supported by the parents' attitude toward infants, depending to a large extent on the infant's sex. For instance, parents consider boys to be louder and noisier than girls (Stern & Karakker, 1989). Further, in children at the age of 5, 13 and 25 months, boys possessed more sporting toys and equipment than girls, who possessed more dolls, picture books, toy furniture and toys intended for drawing, cutting and modelling (Pomerleau et al., 1990). Thus, even before the age of two, boys spend more time engaged in sporting activities that require the performance of gross movements, while girls of the same age are predominantly trained in fine motor activities. Gender differences in movement/sporting activities continue to occur throughout the entire preschool period, with boys being statistically shown to be more active than girls (Eaton, & Enns, 1986; Gavarry et al., 2003; Goggin, 1975). Consequently, the parents' expectations and involvement regarding the gender role of the child will influence gender differences in child motor activity and behaviour.

The sex differences observed in motor tests corresponded well to the sex differences observed in the physical activity of children of a similar age (6.4 years) and of the same region. Teachers and parents estimated that boys were more physically active than girls. The study also revealed statistically significant gender differences with a 5% alpha error related to the place of the performance of movement activities (indoors, outdoors). Regardless of the day of the week on which a certain activity was conducted, more girls proved to be moderately or highly physically active indoors, where they were engaged in dancing, sports gymnastics, rhythmic gymnastics, etc. Boys, on the other hand, were more active outdoors. Activities in nature – i.e. in an open space – demand greater dynamics of movement and greater ability to adapt oneself to the environment. This can be observed in greater adaptability of boys in the solving of new and complex movements and

in the ability to reorganize stereotyped movements, the two abilities being related to movement coordination. Thus, it could be concluded that mothers of the Maribor region are more protective towards their daughters, whom they allow less freedom, and, consequently, fewer possibilities to be physically active, which can then be reflected by specific motor abilities, as observed in the present study.

In addition to parental influence, one can also suppose that an important role in the child's physical activities in the preschool period is also played by the realization of curriculum in kindergartens, with the curriculum representing the sole systematic educational process in the given age period. Previous studies confirmed the existence of connections between the presence of learning differentiation according to gender in physical education lessons and contests, frequency and form of out-of-school motor/sports activity (Zurc, 2004).

According to Malina (1983b), the exclusion of young girls from activities that demand physical strength and proficiency could be the most important reason for the occurrence of gender differences in results of various motor tests. If the rule were turned upside down, boys and girls would develop different motor skills from those they do now. However, indications are by all means not as simple as suggested by the proposition that boys and men are traditionally more frequently encouraged to participate in physical activities, while girls and women are advised to engage in less demanding movement activities. As late as in the first half of the 20th century, women were still excluded from many sporting activities such as the marathon, fighting sports and football (Cashmore, 1999). For decades, the exclusion of women from sport was the result of the medical opinion that participation in certain sporting categories is too exhausting and dangerous and therefore unsuitable for the female body (Archer & Lloyd, 2002; Cashmore, 1999).

When interpreting the results obtained and attributing the share of biological and sociological factors to gender differences in the development of motor abilities, one has to bear in mind at all instances that both factors exert influence on the development of an individual. Their influence is reciprocal, interactive. None of the factors bears individual influence on development. Therefore, it is generally not possible to verify the share of influence contributed by individual factors (Malina et al., 2004; Papalia et al., 2003).

Results of the present study demonstrated gender differences in the performance of motor tests in 6.5-year-old children from the Slovenian region studied. Differences occur in motor tests that cover two hypothetical motor abilities: coordination and strength. It is suspected that the observed differences between boys and girls mainly originate from the social milieu that favours specific gender roles in children. However, the role of other factors (e.g. genetic) cannot be ruled out.

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