

## PRESCHOOL CHILDREN'S RESULTS IN MOVEMENT ABC TESTS: DIFFERENCES BETWEEN GIRLS AND BOYS IN MOVEMENT DEFICIT

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### ABSTRACT

*The aim of our study was to assess the children's motor skills on a sample of preschool children between the age of 4 and 5 ( $\bar{x} = 4.44$ ,  $SO = 0.46$ ), using a checklist questionnaire and movement assessment battery for children. We wanted to know whether the examined sample shows any deficits in movement or any physical difficulties, as well as what are the differences in gender. The study included 100 children from three kindergartens on the Slovenian coastal region. We used the percentile norms for common evaluation of movement problems. The total score below 15 percentile which indicates movement problems, was determined in 27 % of children, of which 66.7% in girls and 33.3% in boys. Statistically significant gender difference was found in the skipping rope test ( $p = 0.005$ ), where boys performed better ( $\bar{x} = 0.21$ ) than girls ( $\bar{x} = 1.08$ ). The findings show a high incidence of movement difficulties in preschool children, as a quarter of children do not reach the expected level of motor development, thus, this indicates the suspected occurrence of developmental coordination disorder. Further research is needed in the field of movement ABC tests application and in the incidence of movement deficits on a representative sample. It is also advisable to identify the factors that are associated with movement deviations in preschool children. In encouraging a child's motor development a greater attention should be given to girls in particular. The results of the movement ABC tests needs to be considered from the perspective of the child's holistic development and their motivation to perform.*

**Keywords:** preschool children, motor development, clumsy child, developmental coordination disorder, movement ABC – movement assessment battery for children.

## DOSEŽKI PREDŠOLSKIH OTROK NA TESTIH ABC GIBANJA: RAZLIKE MED DEKLICAMI IN DEČKI V PRIMANJKLJAJIH NA GIBALNEM PODROČJU

### IZVLEČEK

*Namen naše raziskave je bil s pomočjo vprašalnika in baterije testnih nalog ABC oceniti otrokovo gibanje na vzorcu predšolskih otrok v starosti med 4. in 5. letom (=4,44, SO=0,46). Zanimalo nas je, ali se na proučevanem vzorcu pojavljajo primanjkljaji na gibalnem področju oziroma gibalne težave ter kakšne so na tem področju razlike med spoloma. V raziskavi je sodelovalo 100 otrok iz treh obalnih vrtcev. Uporabili smo percentilne norme za skupno oceno gibalnih težav. Skupna ocena pod 15 percentili, ki nakazuje prisotnost gibalnih težav, se je pokazala pri 27 % otrok, od tega pri 66,7 % deklicah in 33,3 % dečkah. Statistično značilna razlika med spoloma se je pokazala v testu preskakovanje vrvi ( $p=0,005$ ), v katerem so se bolje izkazali dečki (=0,21) kot deklice (=1,08). Ugotovitve raziskave kažejo visoko pojavnost gibalnih težav pri predšolskih otrocih, saj jih četrtnina ne dosega pričakovane stopnje gibalnega razvoja in kaže na sum pojava razvojne motnje koordinacije. Potrebne so nadaljnje raziskave na področju uporabe baterije testov ABC in pojavnosti primanjkljajev na gibalnem področju na reprezentativnem vzorcu ter ugotavljanje dejavnikov, ki so povezani s pojavom gibalnih odstopanj pri predšolskem otroku. Pri spodbujanju otrokovega gibalnega razvoja je potrebno večji poudarek posvetiti zlasti deklicam. Rezultate na testih ABC gibanja je potrebno obravnavati iz perspektive otrokovega celostnega razvoja in motivacije za izvedbo.*

***Ključne besede:*** predšolski otrok, gibalni razvoj, neroden otrok, razvojna motnja koordinacije, ABC gibanja – baterija za oceno otrokovega gibanja

### THEORETICAL GROUNDS

Preschool period is the period of fundamental motor development. The child's body is most receptive for environmental influences in early childhood, moreover, this affects the development of the child's personality as well. In this period of the child's development, the individual areas, such as movement, physical, cognitive, emotional and social development, are closely linked. Therefore, it is important not to miss the most suitable period, when the child's development is the most sensitive for the various effects that can be achieved with physical / sports activities (Pišot & Planinšec, 2005). The development of motor skills and abilities is connected to the chronological age, but not dependent on it, so it does not take place in all children equally fast (Videmšek &

Pišot, 2007). Gallahue and Ozmun (2006) point out that motor development continues through different periods, which are called development stages, in which certain types of conduct can be detected, which apply to the majority of children at each stage of development. Due to individual differences, individual stages of development may occur in different age groups, although the order of their occurrence is generally the same (Videmšek & Pišot, 2007). As every child has his or her own biological clock (Gallahue & Ozmun, 2006), it is possible to notice among the children of the same age that some children are more adept than others, but some children stand out as being more clumsy than the others. The most common reason to this is a delayed motor development, which can be recognized also from the child's late development of the ability to sit and / or to walk (Kalar, Videmšek, & Karpljuk, 2005).

Delayed development of motor skills and abilities of a child represents a developmental coordination disorder, or the so-called clumsiness. Clumsiness in motor skills may give the impression that the child is also lagging behind in his or her intellectual development. However, it has been proven that clumsy children are without any localized brain damage and are intellectually on the level of their physically more developed peers (Kalar et al., 2005). Gubbay (1975, in Hamilton, 2002), called this clumsiness "a clumsy child syndrome", which used to be considered a description of a child of adequate intelligence, who had no diagnosed medical or neurological problems. The term described the child's difficulties in movement, without a recognized medical or neurological condition. Difficulties were encountered in the child's daily operations and, in particular, in socialization. In recent years, the term "a clumsy child syndrome" has been replaced with the term "developmental coordination disorder" (hereinafter DCD) or "dyspraxia".

Hamilton (2002) points out that the clumsiness is not that insignificant a problem as it may seem, so it is advisable to consistently monitor a child and the possibility of the occurrence of any movement problems. Any evolving physical discrepancy in a child needs to be professionally addressed, as clumsiness may be the potential indicator of DCD. DCD indicators vary depending on the age and the stage of development. Younger children may also show signs of clumsiness and developmental delays and do not reach the milestones in motor development in basic motor activities such as walking, crawling, sitting, tying shoes, opening and closing buttons or zippers (Gubbay, 1975, in Hamilton, 2002; Kirby & Drew 2003; Terčon, 2013). Children have difficulties planning their own movement, describing it or changing it (Clark, Getchell, Smiley-Oyen, & Whitall, 2005; Filipčič, 2006). DCD causes problems with movement, coordination, organization and processing of sensory information and low self-esteem, which can also lead to a variety of learning and socialization problems (Losse et al., 1991; Kremžar & Petelin, 2001; Terčon, 2013). In the preschool age, children suffering from DCD (Clark et al., 2005; Filipčič, 2006; Kirby & Peters, 2007; Harris, Mickelson, & Zwicker, 2015) often have difficulty with orientation in space. Problems and slower development are also reflected in crawling and creeping, seating, activities in standing position, walking, climbing stairs (upstairs and downstairs), running, jumping, catching and throwing the ball. They are noted for being slower at dressing and feeding, their

drawing is less developed in comparison with their peers and they have more difficulties in establishing social contacts. However, Losse et al. (1991) note that there are individual differences among children regarding how they can cope with the continuous difficulties for a long period.

Developmentally conditioned clumsiness typically occurs in the earliest years of life and can continue well into adulthood (Kremžar & Petelin, 2001). Problems can occur in adult with continuing effect on their lives. Physically impaired adults refuse to perform physically demanding tasks, which excludes them from the important activities of daily life (Cousins & Smyth, 2003).

Early detection of children with DCD in the earliest years of life is therefore crucial for offering professional support to both children and their parents before the child starts attending school (Jongmans, 2005, in the Van Waelvelde, Peersman, Lenoir, Smits Engelsmand, & Henderson, 2008). According to some estimates (Kirby, 2005; Harris et al., 2015), the DCD occurs in one of twelve individuals (5% - 6%) in the population, and is three times more common in boys than in girls. The dysfunction is often disguised as children do not have visible physical signs and, they have great difficulty in motor activities at home and at school. Children with such problems are perceived as clumsy, sometimes even as lazy.

## AIM OF THE STUDY, OBJECTIVES AND HYPOTHESES

The aim of the research was to assess the children's motor skills on a sample of preschool children, aged between 4 and 5, with the help of a checklist questionnaire and movement ABC tests.

The objectives of the research:

- To identify the presence of impairments in motor skills or deficits in movement when testing a group of preschool children;
- To identify differences in performance on movement ABC tests between girls and boys,
- To identify statistically significant correlations between the movement ABC tests.

In this study, we surveyed the following hypotheses:

- H1: There are significant differences between girls and boys in the results of the movement ABC tests:
  - H1.1: We assume that boys perform better in the tests of gross motor skills.
  - H1.2: We assume that girls perform better in the tests of fine motor skills.
- H2: There is a statistically significant relationship between all movement ABC tests:
  - H2.1: There is a statistically significant relationship between movement ABC tests that assess hand skills and the tests that assess statistical-dynamic balance.

- H2.2: There is a statistically significant relationship between movement ABC tests that assess ball skills and the tests that evaluate the static-dynamic balance.
- H2.3: There is a statistically significant relationship between movement ABC tests that assess hand skills and the tests that assess ball skills.

## WORK METHODS

### Sample

Three kindergartens from the coastal slovenian region were invited to participate in the survey, 570 children all together. The prior consent to participate in the survey was given by 107 children, of which 52 boys and 55 girls. In fact, 100 children from 10 departments from the selected kindergartens participated in the survey, of which 47 (47%) boys and 53 (53%) girls. The realization of the sample was 17.54%. Our sample was represented by the children in these kindergartens, the average age of  $4.44 \pm 0.46$ .

### Tools

Data were collected with movement ABC tests (Henderson & Sugden, 1992). We chose single test tasks for all children, namely, eight test tasks for the first age group of 4 to 6 year olds, which include hand skills tasks (inserting coins, stringing blocks, following cycling track) ball skills (catching a bag of beans, rolling a ball into a goal) and the skills of the static and dynamic balance (balancing on one foot, skipping the rope, tiptoeing).

Movement ABC tests were designed to identify and describe the less efficient movement of children of the ages between four and twelve. Movement ABC tests (Henderson & Sugden, 1992) are considered to be commonly used in children for the detection of deficits in the development of coordination.

### Test Results, their Conversions and Interpretation

In each individual movement ABC test, the child could have a different number of attempts to perform the required physical task successfully and, thus, reach the score of 0, which means very good. In hand skills tasks two attempts were allowed and in ball skills ten attempts. In the task of balancing on one leg, two attempts were allowed for each leg, and in the tasks of dynamic balance (skipping the rope and tiptoeing), two attempts were allowed. (Henderson & Sugden, 1992).

In each task, the number of seconds needed for the child to successfully complete the task was noted down. If the child did not carry the task out, the test performer marked whether it was an unsuccessful attempt, an inappropriate task that the child

could not perform due to their physical characteristics, or whether the child refused to participate.

The first score of each test, expressed in seconds, was converted to the rating on a scale from 0 to 5. In converting the results, we used the table by Henderson and Sugden (1992), attached the summary sheet, where we looked for the value of a child's result in relation to the his or her age group. The converted result was then entered into the box titled "Total task results" (Figure 1). If the child received an assessment rate higher than 0, namely, any other assessment (i.e. from 1 to 5), and the instructions for each test allow so, the task was repeated until the child reached his or her highest result. If the child still has not reached the rate 0, we considered the best result which we converted into the corresponding rating from 1 to 5, according to the table of Henderson and Sugden (1992). A higher score indicates higher difficulties. If the child did not carry out a task in any of the attempts, he or she got the score 5. In the case of functions test, where the activity of both hands or feet was assessed, we got the overall result by adding up all the results for each arm or leg and then halving the sum.

Motor impairment of children on the movement ABC tests was interpreted by using the percentile norm where higher results means lower motor skills and efficiency (Henderson & Sugden, 1992). The percentile refers to the placement of the child in the rank of the standardization sample according to the identified motor efficacy in the overall population of children of a certain age. In interpreting the percentiles, according to Henderson and Sugden (1992), we used the norms in three intervals: 1) the results under the fifth percentile, pointing to a sign of undoubted movement difficulties; 2) the results between the 5th and 15th percentiles, pointing to borderline level of difficulty; 3) the results above the 15th percentile, pointing to appropriate motor skills of the child. A suspicion of DCD was identified in children whose results were below the 15th percentile (Henderson & Sugden, 1992).

### **Data Collection Method**

Testing has been subject to prior written consent of the parents and the management of the kindergarten and was conducted on the premises of the three kindergartens on the Slovenian coastal area that were included in the study. The tests were performed in April and May 2010, following a previously confirmed schedule. In performing all tests, we took care of equivalent test conditions (in the morning, in ventilated area with adequate light, the same test material, the same evaluators). On the day of the testing, the children were healthy and wore appropriate sports clothing (short-sleeved T-shirts and shorts). In one testing, normally in the morning, from 3 to 4 children were tested. The testing was conducted in two stages, at each stage two children were jointly tested by two test performers. Children had met their test performers in January 2010, when they were tested for elementary movement patterns. The child, who was waiting for testing, could draw or play with soft toys while waiting. The playground area was on the other side of the waiting room, so that the tested children were not distracted by the

children waiting for the test and playing. The test performers also had different roles and assignments. One was directly with the child, demonstrating and explaining the tests. Other test performer was recording, photographing and writing down important notes during the completion of each test. The testing time for one child was 20-25 minutes.

### **Data Analysis Methods**

The collected data were initially analyzed using descriptive statistics (frequency, percentage, average value, median, mode, minimum and maximum values, standard deviation). Gender differences in the results of the movement ABC tests in children were analyzed using nonparametric Mann Whitney U test. The correlations between the measured tests were determined by Spearman's correlation (Newell, Aitchison, & Grant, 2014). In order to achieve statistical significance, the differences by gender were considered, as well as the correlations between the tests at the level  $p \leq 0.05$ . All data analyzes were performed in the SPSS statistical program, version 20.0.

## **RESULTS**

The results show the distribution of children according to the percentile rank following the movement ABC tests results that indicate the presence of interference in the motor skills or deficits in movement in the studied group of preschool children. Below we present the results of the studied sample of children on movement ABC tests, with respect to the performance resulting on a scale of 0 to 5 (0-best score, 5-worst result), which was used to determine the presence of statistically significant differences between the achievements of boys and girls and statistically significant correlations between individual movement ABC tests.

Table 1: Percentage of children according to the percentile rank in movement ABC tests results.

		<b>GIRLS</b> n (% rank, % gender)	<b>BOYS</b> n (% rank, % gender)	<b>AGE (<math>\bar{x}</math>)</b>
≤ 5: sign of undoubted motor difficulties (n=4)	n	3	1	4.32
	% rank	5.7	2.1	
	% gender	75.0	25.0	
5 – 15: borderline level of difficulties (n=23)	n	15	8	4.45
	% rank	28.3	17.0	
	% gender	65.2	34.8	
≥ 15: no difficulties (n=73)	n	35	38	4.45
	% rank	66.0	80.9	
	% gender	47.9	52.1	
Total (n=100)	n	53	47	/
	% rank	100.0	100.0	
	% gender	53	47	

Note: n=number of children, %=percentage of children regarding the percentile rank and gender,  $\bar{x}$ =average value.

Table 1 shows that the results ranking below 15th percentile, which draws attention to the suspicion of deficit in motor skills development, showed in 27% of the studied preschool children, the average age of 4.4, of which 66.7% in girls and 33.3% in boys (Table 1). The assessment results of undoubted movement problems were found in four of the children included in the study, namely, in three girls and one boy. Three-quarters of the tested children (75 %) reached the percentile rank above 15, which indicates proper physical functioning. The average age of children from the 5th percentile rank upwards and does not change ( $\bar{x} = 4.45$ ), but is somewhat lower in children who were ranked in the interval below the 5th percentile rank ( $\bar{x} = 4.32$ ).



Table 2: Children's results in individual movement ABC tests.

	Minimum	Maximum	$\bar{x}$	SD
Inserting coins	0.0	4.0	0.99	1.027
Stringing blocks	0.0	5.0	1.41	1.634
Following a cycling track	0.0	0.0	0.00	0.000
Catching a bag	0.0	3.0	0.16	0.564
Rolling a ball into a goal	0.0	5.0	0.59	1.181
Balancing on one leg	0.0	4.5	1.06	1.278
Skipping the rope	0.0	5.0	0.67	1.602
Tiptoeing	0.0	5.0	2.48	1.956

Note: =average value, SD=standard deviation.

Table 2 shows that the tested 4 to 5-year old preschoolers performed best in the task of following the cycling track, which was carried out without any observed errors. Second most successfully performed tests were catching a bag ( $\bar{x} = 0.16$ ), rolling a ball into a goal ( $\bar{x} = 0.59$ ) and skipping the rope ( $\bar{x} = 0.67$ ). Less successful they were in performing tiptoeing test ( $\bar{x} = 2.48$ ).

Standard deviations point to considerable differences between the tested children in the results of movement ABC tests, ranging from 1 to 2 points. Deviations are the largest in the results of the test of tiptoeing (SD = 1.96). The exceptions were the tests of following a cycling track (SD = 0.00) and catching a bag (SD = 0.56), which both show the the homogeneity in motor development of the tested children, which is required in the conduct of such tests.

Table 3: Differences between boys and girls in the results of individual movement ABC tests.

	Gender	$\bar{x}$	SD	Mann Whitney U test (p)
Inserting coins	Boy	0.93	1.073	0.405
	Girl	1.05	0.992	
Stringing blocks	Boy	1.57	1.791	0.407
	Girl	1.26	1.483	
Catching a bag	Boy	0.15	0.510	0.656
	Girl	0.17	0.612	
Rolling a ball into a goal	Boy	0.57	1.281	0.524
	Girl	0.60	1.098	
Balancing on one leg	Boy	1.21	1.322	0.237
	Girl	0.93	1.234	
Skipping the rope	Boy	0.21	1.020	<b>0.002</b>
	Girl	1.08	1.900	
Tiptoeing	Boy	2.49	1.988	0.977
	Girl	2.47	1.947	

Note:  $\bar{x}$ =average value, SD=standard deviation, t=coefficient of the t-test for independent samples, p=level of statistical significance.

Mann Whitney U test showed a statistically significant difference in the test of skipping rope ( $p = 0.002$ ), in which boys proved to be better ( $\bar{x} = 0.21$ ) than girls ( $\bar{x} = 1.08$ ) (Table 3). Girls ( $SD = 1.90$ ) in this test were more non-uniform as compared with boys ( $SD = 1.02$ ). In other tests, statistically significant differences between the genders did not occur.

The first hypothesis, which anticipated that there are statistically significant differences between girls and boys in the results of the movement ABC tests measurement, where boys achieve better results in the tests of gross motor skills (H1.1 hypothesis) and girls in tests of fine motor skills (H1.2 hypothesis) can be confirmed in H1.1 and rejected in H1.2. Boys showed statistically significant, better results in the tests of gross motor skills, whereas girls did not show significantly better results in any of the measured motor skills tests.

Correlation between individual movement ABC tests shows statistically significant correlations between the tests of inserting coins and stringing blocks ( $p < 0.001$ ), between the tests of stringing blocks and skipping the rope ( $p < 0.001$ ) and between the test of balancing on one leg and walking on tiptoe ( $p = 0.023$ ), catching a bag ( $p = 0.053$ ) and

skipping the rope ( $p = 0.055$ ) (Table 4). The correlations between the test of stringing the blocks and inserting coins ( $\rho = 0.428$ ) and skipping the rope ( $\rho = 0.345$ ) have a medium intensity, the rest of the statistically significant correlations have a low intensity. All statistically significant correlations are positive regarding the integration direction, which means that the scores on the correlated tests rise or fall in the same direction.

Table 4: Spearman's correlation in movement ABC tests.

		Inserting coins	Stringing blocks	Catching a bag	Rolling a ball into a goal	Balancing on one leg	Jumping the rope	Tip-toeing
Inserting coins*	rho (p)	1						
Stringing blocks*	rho (p)	<b>0.428</b> ( <b>&lt;0.001</b> )	1					
Catching a bag**	rho (p)	0.116 (0.252)	0.053 (0.601)	1				
Rolling a ball into a goal**	rho (p)	-0.050 (0.620)	-0.010 (0.924)	-0.028 (0.781)	1			
Balancing on one leg***	rho (p)	0.064 (0.527)	0.095 (0.348)	<b>0.194</b> ( <b>0.053</b> )	0.042 (0.679)	1		
Jumping the rope***	rho (p)	0.181 (0.072)	<b>0.345</b> ( <b>&lt;0.001</b> )	0.141 (0.163)	0.084 (0.403)	<b>0.193</b> ( <b>0.055</b> )	1	
Tiptoe-ing***	rho (p)	0.101 (0.319)	-0.051 (0.611)	0.056 (0.579)	0.112 (0.265)	<b>0.227</b> ( <b>0.023</b> )	0.185 (0.065)	1

Note: rho = Spearman's correlation coefficient, p=level of statistical significance, \*=hand skill tests, \*\*=ball skill tests, \*\*\* = static-dynamic balance tests.

The second hypothesis, in which we anticipated that there are statistically significant correlations between the movement ABC tests that assess hand skills and the tests that assess a statistical-dynamic balance (H2.1 hypothesis), between the tests that assess ball skills and the tests that assess statistical and dynamic balance (H2.2 hypothesis), and the tests that assess hand skills and the tests that assess ball skills (H2.3 hypothesis), can be confirmed in H2.1 and H2.2 and rejected in H2.3. The results of Spearman's correlation showed statistically significant correlations between the movement ABC tests, assessing hand skills (putting cubes on a string task), and the tests that assess a statistical-dynamic balance (skipping the rope task), and the tests that assess ball skills (catching a bag task) and tests that assess the statistical-dynamic balance (balancing on one leg task), but did not show any statistically significant correlations between the tests that assess ball skills and the tests that assess hand skills.

## DISCUSSION

Our study, which was conducted with movement ABC tests on the sample of 4- and 5-year-old preschool children on the Slovenian coast, showed that three quarters of the tested children have adequate motor skills without any problems occurring. An overall rating below 15 percentile rank, which indicates the presence of deficits in movement or difficulties in motor development, however, was shown in a quarter of the tested children. A high risk degree with the results under the 5 percentile rank was shown in 4% of the tested children, in which case it is possible to conclude that motor difficulties are already present. The results of the present research regarding the proportion of children with motor difficulties is slightly lower compared to the Australian study, which showed that 6% of the children included in the tests were placed in the group with a high degree of DCR risk (Pridham, Hillier, & Estermann, 2011 in Terčon, 2013). The deviations of the related research findings from ours could be attributed to the non-randomized sample of preschool children who participated in our study.

Henderson and Sugden (1992) point out that it is, nevertheless, necessary to be cautious when finalizing the findings of the child's status on the basis of the movement ABC tests achievements. Lower achievements can be expressed as "physical problems", "motor difficulties", "a deficit in movement", "delay in motor skills development" or "developmental coordination disorder". In any case, on the basis of the movement ABC tests achievements it is not possible to establish any medical diagnoses. Before we in any way connect the movement ABC tests results with physical or motor deficit, a precise diagnostic medical treatment needs to be applied. Due to misdiagnosis or labeling a child can suffer irreparable damage, that is why the researcher is supposed to know well the characteristics of the child's age group in order to avoid technical errors and thereby the negative effects on the child's development. Diagnostic assessment of DCD in children is recommended only after the child is five years old (Blank, Smits-Engelsman, Polatajko, & Wilson, 2012), before that we can talk only about the higher risk for DCD occurrence (Pridham, Hillier, & Esterman, 2011; in Terčon, 2013).

The preschool children included in the study were more successful in the following movement ABC tests: following a cycling track, catching a bag, rolling a ball into the goal and skipping ropes, however, they were less successful in tiptoeing. Explaining the results obtained should be based on the theoretical knowledge of the characteristics of the child's motor development, which is characterized by a sequence of development from mastering coarse to fine motor skills. In the period between four and five years of age, children become increasingly adept in dressing and buttoning visible buttons (Papalia, Olds, & Feldman, 2001; Vander Zanden, 1993; in Marjanovič Umek, Zupančič, Kavčič, & Fekonja, 2009). The latter was also shown with a correlation analysis in our study, which showed statistically significant correlations between the tests of fine motorics or hand skills, such as inserting coins and putting play cubes on a string and gross motor skills tests, such as catching a bag and balancing on one leg.

The correlation analysis also showed statistically significant connections between the tests of static-dynamic equilibrium (skipping ropes, balancing on one leg) and the

tests that require hand skills (stringing blocks) and ball skills (catching a bag). When catching, a child must assess the speed or the force of the approaching object. Power control is also an important factor, or the effort that is put in the task, which is also characteristic of the motor exercises in static-dynamic balance. The way in which a child throws and catches things varies systematically with the child's age. Targeting and catching require fairly accurate skills of mastering space. With the former, the movement plan needs to contain the correct targeting of the ball, while at the latter, the child needs to find the appropriate body and hands postures (Henderson & Sugden, 1992).

Static and dynamic balance are the most common tasks in the neurological development test instruments (in clinical practice and in research). In compliance with the definition of balance, which is the ability of quick formation of compensatory movements, necessary for returning the body in a balanced position when it is destroyed, the functions of the dynamic balance require the movement of the body from one point to another and various means for monitoring the movement (Antolović, 2014). Pišot and Videmšek (2004) emphasize that the child's coordination of movement and balance are crucial in the realization of motor tasks. In particular, balance is the filter that allows or prevents (hinders) the realization of most motor tasks. Similar to our study, in the study performed by Van Waelvelde et al. (2008), 4-year-old Flemish children showed few errors in the task of following the cycling track. In contrast to the tested children in our study, Flemish children were significantly less successful in the task of rolling a ball into the goal and they also needed more attempts in the task of jumping over the rope. The children included in our study reached similar good results as the Chinese children aged 4 to 6, in the tests of dynamic balance (e.g. the task of following a cycling track and skipping the rope) and similar to the American preschoolers in the tasks of accepting / catching items (e.g. the task of catching a bag, rolling a ball into the goal) (Chow, Henderson, & Barnett, 2001). Clarification of the movement ABC test results in preschool children could be also found in looking into the socio-demographic differences among children. The Engel-Yeger, Rosenblum and Josman (2010) survey results, which included 249 Israeli children, have shown that the performance of motor tasks in preschool children are affected by age, gender, the level of the mother's education, and socio-economic status of the family. Pridham, Hillier and Esterman (2011; in Terčon, 2013) performed a research in 4-year-old Australian children which showed as much as 3.6 times greater incidence of high risk of DCD in boys. Other authors (Kadesjö & Gillberg, 1998; Pridham, Hillier, & Esterman, 2011 in Terčon, 2013) also indicate an increased incidence of DCD in boys. In contrast to the survey mentioned, our study showed that the boys reached statistically significantly better results in the skipping rope task, even more, a greater deficit in motor skills was shown in girls. Malina (2004) stresses that when considering the differences between the genders as regards the movement competences, it is necessary to take into account the opportunities for acquiring and consolidating certain motor skills, the adequacy of approaches and the instructions given. Many stereotypical attitudes to girls make it impossible for them to be as physically adept as boys in certain activities such as jumping, running and ball games (Malina, 2004; Venetsanou & Kambas, 2010). In completing and generalis-

ing the results obtained, it is necessary to take into account also certain limitations of our study, such as a deliberately selected sample of children from three kindergartens on the Slovenian coastal region, the age of the children in the study (4-5 year olds) and the sample size. The findings therefore predominantly apply to the studied sample of children and should be re-tested on a representative sample of Slovenian preschool children for any further or broader generalizations. The study looked at differences in motor development with regard to the gender of the children. According to the obtained findings and the findings of other studies, in future it would be necessary to examine the correlations with other socio-demographic and behavioral factors that the analysis of our study did not include.

Nevertheless, we need to consider that in younger children, the test results depend primarily on how the children are motivated and prepared to perform the tasks. Supposedly, though, different test performers had a different impact on motivation and preparation of children, which may be reflected in the findings showing differences between the genders. Any testing of preschool children is undoubtedly an extremely demanding task, as it is to be adapted to the characteristics of the early developmental period (Pišot & Planinšec, 2005; Videmšek & Pišot, 2007; Zajec, Videmšek, Karpļjuk, & Štihec, 2009). Henderson and Sugden (1992) similarly consider that the assessment of preschool children can be very difficult and brings a lot of unpredictability. Therefore, working methods, approach and attitude in working with children play a key role (Pišot & Planinšec, 2005).

## CONCLUSION

Our study showed that a quarter of children aged 4 to 5 years, does not reach the expected level of motor skills and suspected occurrence of developmental coordination disorder (DCD) is thus indicated. Girls under-perform compared to boys in the skipping rope test.

Further research is needed in the field of movement ABC tests application and in the incidence of movement deficits on a representative sample. The factors that are associated with the occurrence of DCD in a preschool child also need to be further identified. In promoting the child's motor development, a greater emphasis ought to be given to girls in particular.

It is recommended to be cautious in establishing the findings regarding the child's status on the basis of the test achievements in order to avoid technical errors and negative effects on the child's development.

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