



EXTRACURRICULAR SPORTS ACTIVITIES IN PRESCHOOL CHILDREN: IMPACT ON MOTOR ACHIEVEMENTS AND PHYSICAL LITERACY

IZVANKURIKULARNE SPORTSKE AKTIVNOSTI DJECE PREDŠKOLSKE DOBI: UTJECAJ NA MOTORIČKA POSTIGNUĆA I TJELESNU PISMENOST

Romana Caput-Jogunica¹, Darko Lončarić², Sergio De Privitellio³

¹Faculty of Agriculture, University of Zagreb

²Faculty of Teacher Education, University of Rijeka

³ Fitness Centar „Studio S“, Rijeka

SAŽETAK

Istraživanje je provedeno u svrhu utvrđivanja utjecaja izvankurikularnog sportskog programa na motorička postignuća i tjelesnu pismenost djece u dobi od 4 do 6 godina. U tu svrhu primjenjena je baterija od šest motoričkih testova poznatih metrijskih karakteristika namijenjenih procjeni koordinacije, tjelesne snage, gibljivosti i ravnoteže.

Na rezultatima su izračunati parametri osnovne deskriptivne statistike, multivarijatnom analizom varijance izračunate su promjene u motoričkim sposobnostima između dva mjerenja (početno i završno) te interakcijski efekt pojedine varijable u ponovljenom mjerenju na globalne rezultate motoričkih sposobnosti u odnosu na točku mjerenja i u odnosu na spol. Rezultati su potvrdili dosadašnje spoznaje koje se odnose na pozitivan utjecaj redovitog tjelesnog vježbanja na razvoj motoričkih sposobnosti i međupovezno tjelesne pismenosti predškolaca. Osim toga sukladno rezultatima prethodnih istraživanja utvrđene su statistički značajne razlike u motoričkim postignućima između djevojčica i dječaka, dominacija dječaka u rezultatima motoričkih testova namijenjenih procjeni eksplozivne snage i koordinacije, a djevojčica u testovima dinamičke snage, gibljivosti i ravnoteže.

Ključne riječi: predškolci, motorička postignuća, tjelesna pismenost

SUMMARY

The aim of the research was to determine the influence of an extracurricular sports program on motor abilities and physical literacy of preschool children aged from 4 to 6 years. For this purpose, the battery of six motor tests of known metric characteristics was used to measure the following motor abilities: coordination, strength, flexibility and balance.

The data were calculated by descriptive statistics. The differences in motor abilities between two time points (initial and final), as well as the interactional effect of a single variable on the global results of motor abilities in repeated measurement with regard to the point of measurement and gender, were calculated by multivariate analysis of variance. The obtained results have confirmed the previous findings describing the benefits of continuous physical activity for the development of preschool children motor abilities and physical literacy. The results are also consistent with the previous research showing that boys have better achievements in explosive strength and coordination, whereas girls have better achievements in dynamic strength, flexibility and balance.

Key words: preschool children, motor achievements, physical literacy

INTRODUCTION

According to EU Physical Activity Guidelines physical activity is usually defined as „any bodily movement associated with muscular contraction that increases expenditure above resting levels.“ This broad definition includes all contexts of physical activity. Children and young people take part in various kinds of physical activity, but in the last ten years we have noticed significant changes due to new leisure patterns (TV, internet, video games, etc.) and these changes has coincided with increasing rates of childhood overweight and obesity. According to the available data, between 40 and 60% of the EU population lead a sedentary life style. It is important to emphasize that physical activity among children and young people has been replaced by more sedentary activities in recent years. (14) According to Canadian Medical Association project, the data shows that 38% of children are physically active for less than 30 minutes a day. In the same project they found that 92% of caregivers believed they needed more support to promote and implement structured physical activity of children in their care. (3) Furthermore, opportunities to be physical active tend to decrease as to become adults and recent lifestyle changes have reinforced this phenomenon. Due to the great inventions as well as IT, there has been a marked decrease in the amount of physical effort necessary to do daily household cleaning activities, to go from place to place by car and went to reach leisure activities including those with a physical activity content.

Physical Activity Guidelines exist in various forms in the USA and a number of EU member States as well as in the context of the World Health Organization (WHO). According to the Recommendation school aged youth should participate in 60 minutes or more of moderate to vigorous physical activity daily, in forms that are developmentally appropriate, enjoyable and involve a variety of activities. Development of motor skills should be emphasized in early age groups. Specific types of activity according to the needs of the age group should be addressed as following; aerobic, strength, weight bearing, balance, flexibility and motor development. (14)

The Croatian studies have determined the problems of sedentary life style, especially among the university students populations.(2) Some of the Croatian national documents have recognized the problem of preferences of sedentary lifestyle and its circumstances on citizens health. Concerning the well known fact that development of motor skills should be emphasized in early age groups, the aim of this paper is to confirm the influence and benefits of the extracurricular sports program adjustable for kids which has been approved by the Ministry responsible for education and sport. The program is provided in four kindergartens in city of Rijeka as a extracurricular form of organization. Its main aims are the following;

1. According to the initial state of the physical conditioning, developing the motor development and abilities till optimum level for each of the participant

in the program.

2. To influence and develop children habits for regular physical activity.
3. To educate parents through meetings and trainings how to monitor the children development.

The extracurricular sports program for preschools children in Rijeka consists of different activities such as; basic motor movements appropriate for the development of basic motor abilities, elementary games and basic elements from some sports activities; arthystic gymnastic, track and fields, football, volleyball, dance and aerobics.

The Program was realized over a nine-month period (from September to June), four time per week, in duration of 45 minutes and in kindergartens sports gyms. Professors of kinesiology and kindergarten teachers are the main responsible people for the program as well as other profesional staff in kindergartens which have been involved with the aim to monitor the programs effects on the participants.

In early childhood, children are most affected by influences from society and the surrounding environment, which also influences the development of their personalities. Experts have established that whatever is missed in early childhood is hard to be compensated for in later periods of life. (12) „*Children who possess inadequate motor skills are often relegated to a life of exclusion from organised and free play experiences of their peers, and subsequently, to a lifetime of inactivity because of their frustrations in early movement behaviour.*“ (7) Balancing children's development requires cooperation of all who are involved in a child's growing-up process. It is essential that parents, kindergarten teachers and physical education teachers communicate and cooperate well. (12)

The study of motor abilities of younger subjects uses a less number of tests if compared to the study of adults. (9) Usually, some experts have recommended around 6-10 motor tests (1,5, 9) only very rarely for large research this number is exceeded (4, 10, 11, 13)

In this study we used six battery test with the aim to determine the effects of the extracurricular sports programme on some children's motor abilities. The main reasons why we have selected these six motor tests are the following; 1. These tests have well- known measure characteristics, 2. The tests are the part of the recommendation list of motor tests, especially concerning the sensitivity of age and its suitability regarding childrens motor abilities and safety, (8) and 3. The tests are very simple regarding creation necessary conditions in kindergartens gym for the measure procedures.

According to the study there are significant differences in motor efficiency between the genders in the preschool period as well as more expressed during the school period. Concerning that, the analysis of motor abilities should be carried out for each gender. (9)

Regarding all mentioned above, the main objective of this study is to determine the differences in the six motor tests (motor achievements) between the two points;

¹Recommended Policy Actions in Support of Health – Enhancing Physical Activity, Brussels, October 2008

first on the beginning (September 2007) of the extracurricular sports program and on the end (June 2008) of the programme. The second aim of the study is to identify the differences in the six motor tests achievements between the girls and boys.

SUBJECTS AND METHODS

The sample of subjects included 136 preschool

children, 61 girls and 75 boys, aged 4 to 6 years, from 4 kindergartens in Rijeka (Maestral, Galeb, Zamet and Krnjevo). The sample is representative only for the city of Rijeka. The measures were collected at two points in time, first on the beginning of the programme in September 2006 and second time at the end of the programme in June 2007. As we already noticed, the sample of variables includes the battery of six motor tests presented in Table 1.

Table 1. Motor tests

Tablica 1. Motorički testovi

Variable	Motor test	Motor ability
MSDM (cm)	Long jump	Explosive strength
MBPBO (ciklus repetition)	Side jump over rope in 20 sec	Dynamic strength
MPUL (sec)	Creep forward with ball	Coordination
MTPS (sec)*	Running with change directions	Coordination (agility)
MPKL (cm)	Tuch- toe in bench	Flexibility
MSPK (sec)	Standing up on one leg	Balance

*lower values indicate better performance

The following parameters of descriptive statistics were calculated at the initial and final testing; arithmetic mean (Mean), standard deviation (SD), minimum result (min), maximum result (max) as well as kurtosis and skewness. The differences between the different measure points were tested with a multivariate and univariate analysis of variance.

RESULTS AND DISCUSSION

The parameters of descriptive statistics, calculated for the initial and final results are shown in the table 2. It is

obvious that the preschools children have achieved a certain positive quantitative changes in the results of final testing, especially in following variables; long jump, side jump over the rope and etc. The results of test measure for dynamic strength (MPBPO – side jump over the rope) shows significant deviation of the normal distribution (positive asymmetry) as well as the test measure for agility (MTPS – running with the change of direction). Results of the balance test (MSPK - standing up on one leg on the parallelepiped) show significant deviation (negative asymmetry) in initial and final testing.

Table 2. Parameters of descriptive statistics for initial and final testing

Tablica 2. Deskriptivni pokazatelji prvog i drugog mjerenja

VAR	Measurement point in time	Mean	SD	MIN	MAX	KURTOZIS	SKEWNESS	D
MSDM	1	95.48	18.44	53.00	137.00	-.68	-.15	.087
MSDM	2	106.85	18.44	65.00	145.00	-.70	-.27	.091
MPBPO	1	9.94	4.26	2.00	22.00	.21	.74	.137**
MPBPO	2	16.47	5.29	6.00	30.00	-.48	.36	.087
MPKL	1	-2.95	4.52	-15.00	9.00	.33	-.19	.062
MPKL	2	-4.84	4.63	-16.00	8.00	.22	.04	.073
MPUL	1	10.45	3.68	4.42	24.50	2.22	1.36	.140*
MPUL	2	8.09	2.50	3.80	16.20	.47	.66	.080
MTPS	1	7.38	1.20	5.20	11.90	1.24	.91	.105
MTPS	2	6.76	1.05	3.00	11.90	4.06	.74	.082
MSPK	1	6.08	3.24	.00	10.00	-1.21	-.20	.152**
MSPK	2	8.54	1.81	3.90	10.00	-.36	-.98	.245**

¹ Kolmogorov-Smirnov D coefficient that indicates deviation from empirical to normal distribution (* p<0,05; ** p<0.01)

Table 3. Parameters of descriptive statistics regarding gender for first and second points of measurement
 Tablica 3. Deskriptivni pokazatelji motoričkih testova prema spolu u prvom i drugom mjerenju

VARIABLES	Measurement point in time	GIRLS		BOYS	
		Mean	SD	Mean	SD
MSDM (long jump)	1	94.69	18.53	96.12	18.47
MSDM	2	105.75	18.53	107.73	17.93
MPBPO (side jumps)	1	10.61	4.34	9.40	4.15
MPBPO	2	17.48	5.52	15.65	4.99
MPKL (touch toe)	1	-4.34	4.30	-1.81	4.39
MPKL	2	-6.23	4.61	-3.71	4.36
MPUL (creep forward)*	1	11.01	3.69	9.99	3.64
MPUL	2	8.17	2.53	8.03	2.50
MTPS (running)*	1	7.36	0.91	7.41	1.40
MTPS	2	6.76	0.83	6.77	1.21
MSPK (standing up 1/l)	1	6.42	3.23	5.81	3.24
MSPK	2	8.96	1.61	8.20	1.91

Table 3 shows the parameters of descriptive statistics regarding gender in two points. Findings presented in Table 3 indicate that girls and boys improved their results in final (second) measurement. Regarding the gender differences in achievements, we can see better results in column for boys for the following motor tests; MSDM – long jump (explosive strength), MPUL – creep forward with ball (coordination) and MTPS – running with changing directions (coordination). Unlike boys, the results in the table 3 show that girls have better

achievements in other motor tests such as; MPBPO – side jumps (dynamic strength), MPKL – touch toe (flexibility) and MSPK – standing up on one leg (balance). The smallest difference regarding gender is obtained in agility motor test; MTPS – running with change directions. With the purpose to determine whether results obtained at two different time points are statistically significant we used multivariate analysis of variance MANOVA (Table 4).

Table 4. Multivariate analysis of variance between the initial and final testing
 Tablica 4. Multivarijantna analiza varijance između početnog i završnog mjerenja

Groups	Wilks' lambda	F	Df
Effects regarding test measure (1-6)	.024	1084.114**	131
Effect of testing (1-2)	.417	189.001**	135
Interaction between the testing and trening	.149	149.096**	131

** p<0,01

The results have confirmed the findings of the many studies and positive influence of the extracurricular sports activities on children and youth. (18, 20) It is evident that preschool children have achieved better results in all motor tests in second measure which is directly connected with the regular participation in the extracurricular sports program. It can, therefore, be concluded that extracurricular sports program as well as interaction of the training and testing, generate significant developmental effects. However, the effect size estimation between the initial and final measure shows

that we haven't achieved equal progress in all applied motor tests. The progress is determined by the partial Eta squared (η^2) coefficient. (Table 5)

The results of the MANOVA showed that the all dependent variables were significantly different between two measure points. (Table 5) The highest significant differences are in the following motor tests; MPBPO – side jumps over the rope and MSDM – long jump and the lowest for the MPKL – touch toe and the minimum differences is determined for the motor test for balance MPKL – touch toe.

Table 5. Partial estimation between the initial and final measuring for each motor tests
 Tablica 5. Parcijalna procjena između početnog i finalnog mjerenja za svaki motorički test

Effects of variables - dependent measurement	F (1, 135)	η^2
1. MSDM (1-2) long jump	134.776**	.500
2. MPBPO (1-2) side jump	386.373**	.741
3. MPKL (1-2) touch toe	64.572**	.324
4. MPUL (1-2) creep forward with ball	125.938**	.483
5. MTPS (1-2) running with change directions	114.712**	.459
6. MSPK (1-2) standing up on one leg	126.188**	.483

** p<0,01

We can observe that extracurricular sports program has maximum effect on the motor test for dynamic strength. By the training effects we can explain 50% variance of dependent variable (progress from initial to final measuring). In the other hand, motor test for balance shows minimum effect of progress from first to second measuring.

The progress as well as significant difference between the first and second measure points is minimum for the balance motor test, 32,4% variance explained due to the training effects. Such great achievement in side jumps over the rope can be explained by the effect of the learning process. The motor test touch – toe is an task dominated by the flexibility of the back side of the legs which is at the same time determined by heredity. It is important to emphasize that the result in test can be strongly influenced by the position of performance in the 40 cm bench and unnatural position by the head downwards.

CONCLUSION

The conducted study has confirmed the results from the previous studies on the sample of preschool children concerning positive effects of extracurricular sports activities on the children motor achievements and its progress between two measure points. Regarding the results which have explained the differences between the girls and boys, it can be said that boys have better results in motor movements whose domination requires explosive strength and coordination. As opposed to boys, girls has better progress as well as achievements in dynamic strength, flexibility and balance. In conclusion, it can be emphasized that influence of the extracurricular sport programe on children motor abililites has positive effects in general but these effects aren't equally in all applied motor tests and motor abilities.

Physical activity is essential for healthy child development during the critical first six years of life, and it

is especially important during the first three years since brain growth is extremely rapid, and learning creates more brain cell connections than in later years. Some of the most important physical activity' benefits according to Council of Physical Education and Children, 2000 and other documents such as the study from Canada; „Developing physical activity literacy“ are the following;

1. Lays the foundation for future success in skill development, by helping children enjoy being active, learning to move efficiently, and improving coordination and balance,
2. Creates neural connections across multiple pathways in the brain particularly when rhythmic activities are used,
3. Enhances development of brain function, coordination, social skills, gorss motor skills, emotional development, leadership and imagination. Helps children to build confidence and develop positive self-esteem.,
4. Helps builds strong bones and muscles, improves flexibility, develops good posture, improves fitness, promotes a health body weight, reduces stress and improves sleep.(6)

All results of the studies which have been provided on the sample of preschools children in Croatia as well as its results can be a usefull frame for the national educational documents with the aim to improve the position of physical education and extracurricular sports activites, its monitoring process and methods for evaluation its achievements and expected results.

Aknowledgements

This study would not have been possible without the collaboration among the kindergartens Maestral, Galeb, Zamet and Krnjevo in town Rijeka and its kindergarten teachers as well as our collegagues, the professors of kinesiology.

References

1. Bala G. Quantitative differences in motor abilities of preschool boys and girls. *Kinesiologia Slovenica* 2003; 9:2, 5-16.
2. Caput-Jogunica R, Čavlek T, Ćurković S, Džepina M. Tjelesna aktivnost i zdravlje studenata. *Specijalizirani medicinski časopis, MEDIX XIV* 2008;79:159-162.
3. Clark D et al. Physical Activity in Preschool Aged Children; Enhancing Physical Literacy. Canadian Institute of Health Research 2004.
4. De Privitellio S. Faktorska struktura tjelesne snage dječaka i djevojčica. Zagreb. *Kineziološki fakultet*. 2009; Magistarski rad.
5. Findak V, Mraković M, Delija K. Obilježja opterećenja u radu s djecom predškolske dobi. U: Vladimir Findak (ur.) *Zbornik radova 10. ljetne škole pedagoga fizičke kulture «Programiranje opterećenja u području edukacije, sporta i sportske rekreacije» Hrvatski kineziološki savez*. Poreč: 2001;165-6.
6. Higgs C et al. Developing Physical Literacy. A guide for parents of Children Ages 0 to 12. Canadian Sport for life 2004.
7. Jess M, Collins D. Primary Physical Education in Scotland: the future in the making. *Europ J Physic Educ* 2003; 8:103-118.
8. Pejčić A. Kineziološke aktivnosti za djecu predškolske i rane školske dobi. *Visoka učiteljska škola, Sveučilište u Rijeci*. Rijeka, 2005.
9. Planinišec J. The Qualitative Changes of Human Motor Dimension in Boys Between the Ages of 10 and 14. *Coll Antropol*. 2001; 25: 2: 561-71.
10. Rajtmajer D, Proje S. Analiza zanesljivosti in faktorska struktura kompozitnih testov za spremljanje in vrednotenje motoričnega razvoja predškolskih otrok: *Šport* 1999; 38:1-2;48-51.
11. Trajkovski-Višić B. Utjecaj sportskog programa na promjene morfoloških i motoričkih obilježja djece starosne dobi četiri godine. Zagreb. *Kineziološki fakultet*. 2004; Magistarski rad.
12. Videmšek M et al. The Analysis of the arch of the foot in three-years-old children – a case of Ljubljana. *Kinesiology* 2006; 38: 1:78-85.
13. Živčić K, Trajkovski-Višić B. and Senterderdi M. Changes in some of the motor abilities of preschool children (age four). *Facta Univeristatis; Physical Education and Sport* 2008; 6: 1: 41-50.
14. EU Physical Activity Guidelines, Recommended Policy Actions in Support of Health – Enhancing Physical Activity. Brussels, 2008.