

EVALUATION OF AN INTEGRATED PROGRAMME OF PHYSICAL EXERCISE WITH NURSERY-AGED CHILDREN: IMPACT ON MOTOR ACHIEVEMENTS

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Keywords:

children of an early age; integrated programme of physical exercise; comprehensive motor development

Abstract/Povzetek The aim was to determine if there is a possibility of conducting an integrated programme of physical exercise with nursery-aged children, as well as to evaluate its impact on their motor achievement. The sample consisted of nursery-aged children. The sample of variables comprises four tests for evaluating motor achievement based on the various movement structures that allow mastery of space, obstacles and resistance, as well as the manipulation of objects. The differences between the experimental and control groups were tested with Student's t-test. The results show that these programmes yielded exceptional results with regard to motor achievement.

Ključne besede:

Mlajši predšolski otroci; integrirani program telesne vadbe; celosten gibalni razvoj.

Vrednotenje integriranega programa telesne vadbe s predšolskimi otroki: vpliv na gibalne dosežke

Cilj je bil ugotoviti, ali obstaja možnost izvedbe integriranega programa telesne vadbe z otroki v predšolski starosti, in ovrednotiti vpliv na njihove motorične dosežke. V raziskavo so bili vključeni predšolski otroci. Vzorec spremenljivk obsega štiri teste za vrednotenje motoričnih dosežkov na osnovi različnih gibalnih struktur, ki omogočajo obvladovanje prostora, ovir, vzdržljivosti in ravnanja s predmeti. Razlike med eksperimentalno in kontrolno skupino smo preizkusili s Studentovim t-testom. Rezultati so pokazali, da so otroci v evalviranih programih dosegli izjemne rezultate glede gibalnih dosežkov.

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Introduction

Early childhood is extremely important for perfecting motor knowledge and abilities among children (Nikolić, Mraković and Kunješić, 2016), i.e. for the development of motor achievement. Nursery school represents the period when physical exercise is both a joy and a challenge for children, and where they quickly adopt new and varied motor skills, which are stored as motor data. Rapid acquisition of new and varied content and forms enables the nervous system to be ready for learning (Alić, Petrić, Badrić, 2016). In terms of content, great significance is given to the acquisition of natural forms of movement, such as walking, jumping, carrying, crawling, rolling, hopping, catching, throwing and crawling through a space. This is knowledge that enables the child to master space, obstacles and resistance, while manipulating objects, and it is important to conduct these by means of games. Games are primary media for the development of children's divergent abilities by activating their intellectual, physical, social and emotional resources (Šagud, 2000). The implementation of games in the physical activities conducted with very young children and preschoolers ensures the creation of positive emotions (satisfaction, happiness, laughter and joy), and it also makes possible the acquisition of many kinds of knowledge, skills and habits used by children in their everyday lives (Alić et al., 2016).

Integrated programmes of physical exercise in educational institutions have proven to be very successful for advancing children's levels of physical activity (Ahmed, McDonald, Reed, Naylor, Liu-Ambrose, McKay, 2007; Murtagh, Mulvihill, Markey, 2013; Domika, Armano, Petrić, 2018). It is known that intervention programmes conducted in the classroom or some other space and lasting from 5 to 20 minutes can significantly influence children's physiological changes and anthropological characteristics (Holt, McHugh, Tink, Kingsley, Coppola, Neely, McDonald, 2013; Knox, Baker, Davies, Rees, Morgan, Cooper, Brophy, Thomas, 2012; Gašparović, Petrić, Štemberger, Rakovac, Blažević, 2017).

Although it is obvious that children should begin physical exercise as early as possible, the official situation is that there is no organised physical exercise in educational institutions for children of nursery-school age. Previous research directed at evaluating sports programmes in educational institutions attended by nursery-aged children have regularly confirmed significant differences in measured anthropological characteristics in favour of experimental groups (Domika et al., 2018). In contrast to those already evaluated programmes, which fostered

exclusively one sport, this programme has a broad orientation and includes biotic motor knowledge that enables the child to master space, obstacles and resistance, along with the manipulation of objects.

Therefore, the aim of this research is to determine whether it is possible to conduct an integrated programme of physical exercise with nursery-aged children, as well as to evaluate its impact on their motor achievement in the domain of mastering movements, obstacles, resistance and the manipulation of objects.

Methods

The sample consisted of 63 nursery-aged children, from 1.5 to 3.5 years old. The total number of children was divided into an experimental group consisting of 33 children, and a control group consisting of 30 children. These were children attending Rijeka kindergartens which are at the same time training schools for the Faculty of Teacher Education in Rijeka, and also a kindergarten in Srdoči.

The sample of variables consists of four tests for estimating motor achievement created after instructions given by Findak (2003) and based on various movement structures that enable mastery of space, obstacles, resistance and the manipulation of objects.

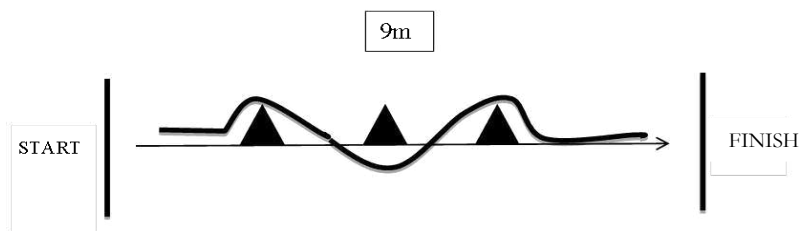


Figure 1: Sketch of the suggested test for estimating motor achievements in the domain of mastering space

The first test aims at estimating motor achievements in the domain of mastering space (Figure 1). Children have to go from the start to the finish line as fast as possible, at the same time avoiding the set cones. The distance between the two lines is 9 m, the first cone being at 3 m, the second at 5 m, and the last at 7 m. The test result represents the time needed by the child to perform the task correctly, i.e. the time necessary for the child to go from the start to the finish line in a slalom run around

the cones. As far as equipment is concerned, it is necessary to have three cones, a stopwatch and coloured tape to mark the start and finish lines.

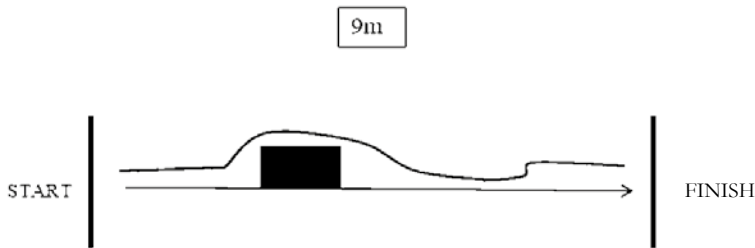


Figure 2: Sketch of the suggested test for estimating motor achievement in the domain of mastering obstacles

The second test aims at estimating motor achievement in the domain of mastering obstacles (Figure 2). The child runs from the start line, reaches the Swedish box, climbs it and descends from it, and then runs to the finish line. The distance between the start and finish line is 9 m, while the beginning of the 40 cm-high Swedish box comes at 3 m. The test result represents the time needed by the child to perform the task correctly, i.e. the time necessary for the child to go from the start to the finish line. As far as equipment is concerned, it is necessary to have a Swedish box, a stopwatch and coloured tape to mark the start and finish lines.

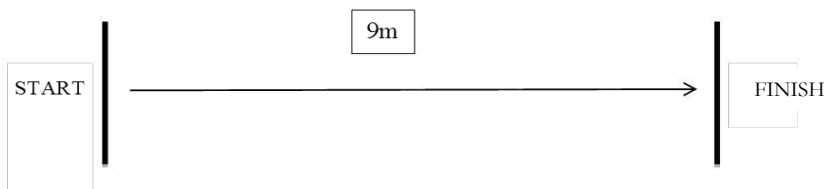


Figure 3: Sketch of the suggested test for estimating motor achievement in the domain of object manipulation

The fourth test aims at estimating motor achievement in the domain of mastering the manipulation of objects (Figure 4). Children advance while rolling a ball with both arms around the set cones from the start to the finish line. The distance between the two lines is 9 m, the first cone being at 3 m, the second at 5 m, and the last at 7

m. The test result represents the time needed by the child to perform the task correctly, i.e. the time necessary for the child to go from the start to the finish line. As far as equipment is concerned, it is necessary to have three cones, a ball, a stopwatch and coloured tape to mark the start and finish lines.

To make possible the realisation of the syllabus, attention was paid to the spatial-material conditions of the kindergarten where the program was to be conducted with the experimental group. Taking into consideration the conditions offered by the given space, i.e. the gym, and the variety and quantity of equipment, a syllabus was created containing 28 motor items belonging to all domains (Table 1), which means that there were seven items for each domain. The programme was carried out in the gym, with 70 activities arranged over 35 weeks, that is two per week, each lasting 30 minutes.

Table 1: Depiction of motor content per domain

NO.	DOMAIN	MOTOR CONTENT
1.	Mastering space	Crawling in different ways Walking to music Running on various surfaces Rolling on a mat in different directions Running to music Crawling through various sports equipment Walking between various sports equipment
2.	Mastering obstacles	Crawling through the frame of the Swedish box Jumping in different ways Skipping rope on the floor Crawling through a tunnel Crawling through a ring Drop jumps, depth jumps and hop jumps on or from varied surfaces Surmounting obstacles in different ways
3.	Mastering resistance	Lifting and carrying various objects Pushing a ball with the arms Pushing a ball with the legs Pushing a plastic pole with the arm Pulling a plastic pole Moving in a push-up position with arms to the front Pulling a rope on the floor
4.	Manipulation of objects	Throwing a ball at the wall Throwing a ball upward with two arms Throwing a ball into a marked space Catching a ball with two arms Throwing a ball to the ground with one arm Throwing a ball through a ring Directing a ball with a leg

Before conducting the research, the research coordinators in the Rijeka kindergarten were contacted. After a meeting about the planned course of research, an agreement with the coordinators was reached, and collection of data from the Srdoči kindergarten was allowed. Two mixed nursery groups were chosen from this kindergarten. Their preschool teachers were informed about the details of the study and participated in the creation and implementation of the experimental programme. Later, the preschool teachers informed parents about it during the parent-teacher meeting. Data collection was conducted in the gym of the Srdoči kindergarten, with parental cooperation and consent. The programme was conducted from November 2017 to May 2018.

All the measured data were processed and analysed by the STATISTICA 12.5 program (StatSoft, Inc., Tulsa, OK, USA). The differences between the experimental and control groups were tested with Student's t-test for independent samples, while Student's t-test for dependent samples was used to test differences in the same group between the initial and final measurements. The statistical level of significance was tested with an error of $p = 0.05 \%$.

Results

Table 2 shows the differences in motor achievement between the experimental and control groups. In the initial measurement, before the start of the integrated programme of physical exercise with the experimental group, there were no significant differences in any of the variables. The children had almost equal motor achievements in all domains.

Table 2: Results of differences in motor achievement between the experimental and control groups.

Measurement	Variables	M ex.	M con.	t-value	p
Initial	Space	7.19	7.80	-0.73	0.47
	Obstacles	13.64	13.37	0.18	0.86
	Resistance	15.15	15.36	-0.20	0.84
	Manipulation	28.47	30.86	-0.61	0.55
Final	Space	4.40	6.58	-4.32	0.00
	Obstacles	7.59	11.44	-3.86	0.00
	Resistance	11.67	14.29	-2.45	0.02
	Manipulation	11.04	24.11	-3.85	0.00

With regard to the final measurement, after completion of the research, and in terms of statistics, those in the experimental group achieved significantly better results on all variables. They showed significant improvement in their motor achievement, allowing them to master space, obstacles, resistance and the manipulation of objects.

The Table 3 shows the differences between groups in initial and final measurements. In terms of statistics, the experimental group made significant improvement on all variables of motor achievement, while the control group improved only in the variable of motor achievements in the domain of mastering resistance.

Table 3: Results of differences in motor achievement between the control and experimental group

Group	Variables	Measurement	M	SD	t	p	
Experimental	Space	Initial	6.72	2.28	4.61	0.00	
		Final	4.13	0.75			
	Obstacles	Initial	13.69	5.62	4.52	0.00	
		Final	7.22	2.38			
	Resistance	Initial	15.87	3.13	5.16	0.00	
		Final	11.41	3.15			
	Manipulation	Initial	29.40	12.25	5.22	0.00	
		Final	10.26	2.13			
	Control	Space	Initial	7.72	1.97	2.64	0.02
			Final	6.79	2.29		
Obstacles		Initial	13.50	4.41	2.56	0.02	
		Final	11.63	4.66			
Resistance		Initial	15.05	3.62	1.86	0.08	
		Final	14.08	4.01			
Manipulation		Initial	29.60	13.53	2.13	0.04	
		Final	25.77	15.07			

Discussion

The results show that the exercise programme achieved excellent results in the improvement of motor achievement. For very young children and pre-schoolers, involvement in physical activity is vitally important for their growth and development, and one of the basic aims of physical exercise for preschool children is its positive effect on children's motor development (Biberović, Malović, Mikić, Džibrić, Huremović, 2013).

The results obtained in this study are certainly the product of a continual work and a detailed syllabus of activities encompassing all the domains to an equal level. The sports programmes that have previously been evaluated were usually directed toward one sport (Domika et al., 2018). Those results indicated a specific impact on the children's anthropological characteristics in favour of experimental groups and determined by the particular sport. Unlike to other programmes, the one in our study showed how important it is to direct attention to comprehensive motor development that will develop children's motor knowledge and ability in the domains of mastering space, obstacles, resistance and the manipulation of objects to an equal level. Moreover, the experiment included child development in a range of areas such as cognitive, social and motor development. Analysis of the results of

previously conducted research, shows poorer results of children's motor and functional abilities (Petrić, 2016).

The evaluation of the motor knowledge and abilities of very young children and preschoolers, along with an awareness of their influence on children's growth, development and health, yields numerous new possibilities and could lead to better organisation and conceptualization of physical activities intended for children of that age (Farkaš, Tomac, Petrić, Novak, 2015). If parents are disadvantaged financially, organised physical exercise in educational institutions offers the only opportunity for children to engage in physical activity at a period crucial to their growth and development. This fact itself emphasizes the invaluable importance of physical activity in today's world, where a sedentary way of life prevails (Petrić, Novak, Matković, Podnar, 2012). Moreover, regular physical activity from early childhood is crucial for a healthy life. Therefore, regular physical activity should have an important role in the whole set of children's activities, both in educational institutions and at home (Sindik, 2009). The motor knowledge and abilities acquired by children in early childhood will certainly be useful in later life, for instance, to satisfy their biotic needs, for the development of their abilities and characteristics and the fulfilment of existential needs (Findak et al., 2003). Motor knowledge is an important factor in the development of toddlers and preschool-aged children, enabling them to effectively master space, obstacles, resistance and the manipulation of objects (Nikolić, Mraković and Kunješić, 2016). Motor abilities are responsible for an infinite number of motor reactions; they can be measured and described and are developed by various methods and modalities of physical exercise. The early period is crucial for children's development and for the perfection of motor knowledge and abilities (Nikolić et al., 2016). Motor knowledge acquired in early childhood forms the base for the acquisition of more complex contents later in life (Nikolić et al., 2016). The connection of these two components leads to the notion of motor achievement. After analysis of the initial and final measurements, it became evident that the control group had made significant improvement in the domain of mastering space, obstacles and the manipulation of objects, while in the domain of mastering resistance, there was no significant improvement. This group's improvement can be attributed to the children's growth and development, which are clearly attained by pre-school children on a monthly basis. Besides, the motor development of early and preschool-aged children is intensive, and the achievement of motor skills can occur spontaneously. Since there was no improvement in the domain of mastering resistance, it is possible that natural development is not the only component that can influence gains in

children's achievement. The content of this component must necessarily be implemented through physical education activity and thus has a targeted incitement to children's development in the same. Since motor achievement represents the coupling of motor knowledge and abilities, it is necessary to enrich physical activities with content to help children develop and establish their potential in certain areas. That is why the domain of resistance mastery should be continually reinforced, because quality and significant development cannot be manifested only in a certain spectrum of knowledge displayed by children, but also in the children's ability to apply their knowledge in their everyday lives (Findak, 2003).

Conclusion

The results of this study show the enormous potential for working with very young children who, in adequate conditions, with qualified experts and their support and leadership, can achieve significant results. This paper confirms the importance of well organised physical exercise that fosters development among very young children. The results indicate that physical activity and exercise can improve children's motor abilities and significantly influence their motor knowledge, which is manifested in their motor achievement.

This research represents a basis for further advancement and breakthroughs in the area of physical activity with nursery-aged children. Establishing a regular exercise habit in early childhood has been identified as one of the important and constituent parts of the educational process. During the creation of the programme, the children's age, their abilities and developmental possibilities should be considered, so that all the activities can contribute to health maintenance. It is possible to conduct organised physical exercise with nursery-aged children. The physical activity programme should be based on biotic motor knowledge directed towards comprehensive motor development, i.e. it should include motor knowledge that contributes equally to the mastery of space, obstacles, resistance and object manipulation.

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