

ORIGINAL SCIENTIFIC PAPER

The effect of mini-basketball on physical development and motor skills in 8 year old children

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Abstract

A person's physical development is a complex concept, which can be considered as a dynamically changing state from the moment of birth till the person's death. The beginning of sports education in school is set for children through the game. The study aims to determine the dynamics of physical development and motor skills in 8-year-old students under the influence of mini-basketball activities within one school year. Ninety-five primary school students were studied. The applied methods are an overview study of specialized literature and sports-pedagogical testing on 18 indicators, carrying information about physical development and some motor skills. The data were processed mathematically and statistically using a variation, comparative, and correlation analyses. The obtained results indicate that for 8-year-old children, organized mini-basketball activities raise the level of physical development and favor the development of motor skills.

Keywords: *physical development, mini-basketball, school*

Introduction

With the implementation of various games in the educational and training process, the PE teacher tries to develop motor abilities and skills. For instance, the reaction time and frequency of movements are abilities that can be developed from early childhood (Tsarov, 2008). The coach should not only implement the numerous exercises and games but also be able to classify and apply them in the appropriate context and change the type of the exercises and games according to children's abilities (Maaßmann, Mayer, 2020).

There are two methods for implementing mini-basketball – a game and a competitive method. This requires the inclusion of many movement activities and competitive and relay games. The parts of the lesson should flow smoothly into each other, and the main goal is not to disturb the density of the activity. In order to be able to keep the children's interest and at the same time carry out the educational process, the teacher should show creative thinking while teaching basic technical skills. Lessons need to be dynamic and full of games (Borukova, 2018).

This study aims to determine the dynamics of physical development and motor skills of 8-year-old students under the influence of organized mini-basketball activities for one school year.

Material & Methods

This study was conducted in September 2021 and June 2022.

Participants

Ninety five children, students in the 2nd grade in a primary school, were studied.

Intervention

Within a school year, students have two compulsory physical education and sports lessons (PES) and one additional lesson in which the teacher can choose which sport to conduct. In our case, the sport is mini-basketball. The additional lessons planned for one school year are 32 of 35 minutes each, which occur once a week. The same teacher conducts the lessons with all students, and the same methods and means of teaching mini-basketball are applied according to the thematic curriculum. Thirty-two mini-basketball sessions were conducted with the 2nd-grade students. Students' attendance in this additional class was 90%, and no one missed more than one lesson.

Anthropometric abilities, motor abilities and skills assessment

Anthropometric measurements, motor abilities and skills were conducted at the beginning and the end of the school year, as

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one lesson for each was required (Aleksieva, 2009). The children's anonymity is guaranteed; each was registered under a different number known only to the teacher. All participated in the study voluntarily, provided informed consent, and received no money or financial compensation for their contribution.

Data analysis

All statistical operations were carried out by mathematical-statistical processing with SPSS for Windows, Release 23.0.;

depending on the research tasks, the following statistical methods were applied: variation analysis – for defining the average values, normality of distribution, and variety of the indicators under study; comparative analysis using Student's t-test for dependent samples and Mann-Whitney U test.

Results

Table 2 presents the descriptive statistical parameters and the results of the applied variation analysis of the initial data.

Table 1. Description of the test battery

Nº	Indexes	Measurement units	Exact. of measur.	Direction of increase
1.	Height – H(cm)	Cm	1,0	+
2.	Weight - W(kg)	Kg	0,5	
3.	Body Mass Index – BMI (kg/m ²)	kg/m ²	1,0	
4.	Chest measurement – Pause – ChMP (cm)	Cm	1,0	+
5.	Chest measurement - respiratory difference – ChMD (cm)	Cm	1,0	+
6.	Horizontal extension – HE (cm)	Cm	1,0	+
7.	Vertical extension – VE (cm)	Cm	1,0	+
8.	Squat jump - SJ (cm)	Cm	1,0	+
9.	Vertical jump 2 legs - VJ (cm)	Cm	1,0	+
10.	Vertical jump 1 leg - VJ (cm)	Cm	1,0	+
11.	Sprint 10 m - S 10m (s)	S	0,01	-
12.	Throwing a solid ball from a standing position – Tb (cm)	Cm	1,0	+
13.	Flexibility - F (cm)	Cm	1,0	+
14.	Pass with two hands from chest to wall – PW (n)	N	1	+
15.	Running between cones – Rc (s)	S	0,01	-
16.	Dribble between cones - Dc (s)	S	0,01	-
17.	Abdominal presses – A (n)	N	1	+
18.	Index for leading the ball – lb (s)	S	0,01	-

Table 2. Descriptive characteristics of the physical and motor abilities development in II grade students (8 years old)

N	Indicators	n	min	max	R	X	S	V	As	Ex
1.	Height	95	116.00	143.00	27.00	132.00	0,062	4.69	-0.654	-0.276
2.	Weight	95	20.00	50.00	30.00	29.15	0,595	20.42	2.939	1.453
3.	BMI	95	12.43	25.51	13.08	16.71	2,704	16.19	2.223	1.383
4.	Chest measurement – Pause	95	50.00	90.00	40.00	65.26	6,357	9.74	2.315	0.929
5.	Chest measurement - respiratory difference	95	0.00	11.00	11.00	5.94	1,956	32.94	0.462	-0.093
6.	Horizontal extension	95	116.00	150.00	34.00	133.04	7,015	5.27	-0.029	0.031
7.	Vertical extension	95	145.00	184.00	39.00	167.26	7,896	4.72	-0.244	-0.022
8.	Standing long jump - SLJ(cm)	95	80.00	170.00	90.00	129.24	19,149	14.82	0,535	-0,048
9.	Vertical jump 2 legs	95	3.00	27.00	24.00	16.37	4,747	29.00	-0.284	-0.324
10.	Vertical jump 1 leg	95	2.00	25.00	23.00	10.98	5,147	46.88	0.357	-0.516
11.	Sprint 10 m	95	2.09	3.83	1.74	2.83	0,431	15.24	0.258	-0.818
12.	Throwing a solid ball from a standing position	95	200.00	600.00	400.00	348.63	72,002	20.65	0.623	1.155*
13.	Flexibility - F(cm)	95	70.00	110.00	40.00	96.06	8,884	9.25	-0.738	0.265
14.	Pass with two hands from chest to wall	95	6.00	34.00	28.00	18.96	5,422	28.60	0.295	0.327
15.	Running between cones	95	6.05	12.82	6.77	8.61	1,187	13.79	0.892	2.519*
16.	Dribble between cones	95	10.63	37.45	26.82	20.92	6,765	32.34	0.718	-0.329
17.	Abdominal presses	95	3.00	48.00	45.00	26.69	7,913	29.64	-0.163	0.538
18.	Index for leading the ball	95	2.91	30.65	27.74	12.38	6,866	55.44	0.776	-0.173

The results show that the study population has a higher growth rate than the national average since 2012 according to the Bulgarian Academy of Sciences (2012). The coefficient of variation presented in Table 2 shows that the studied group is homogeneous in four indicators, which are mainly related to body lengths: height ($V_1=4.69\%$), chest measurement - Pause ($V_4=9.74\%$), horizontal ($V_6=5.27\%$) and vertical extension ($V_6=4.72$). According to the other two indicators, the group is relatively homogeneous. According to the indicator 'chest measurement - respiratory difference', in the group of 8-year-old students, the high value of the coefficient of variation indicates that the group appears to be ($V_5=32.94\%$) heterogeneous.

The analysis of Table 2 shows that the average achievement in the 'Standing long jump' is 129.24 cm, in the 'Vertical jump - 1 leg' it is $X_8=16.37$ cm, and in the 'Vertical jump - 2 legs' $X_8=10.98$ cm. A one-leg vertical jump requires good coordination, developing with growing up, and improving technique. The indicators 'Passing with two hands from chest to a wall,' 'Running between cones,' and 'Dribble between cones' do not require special skills but accuracy and coordination, as well as the ability to move along a set route using dribble.

For most of the indicators, the distribution of the values is average, but there are also those where it is different from the normal one. These are the indicators related to the explosive power of

the lower and upper limbs, in which the values of A_s are ≥ 1.00 . We consider this normal because the sample size is large ($n \geq 30$), and in the studied group, there are children of both genders (boys and girls) - a prerequisite for an asymmetric distribution of the values for some indicators. This is also confirmed by the values of the coefficient of variation 'V', which are above 10% and above 30% for all indicators. According to sports statistics, this proves that the population we studied is relatively homogeneous and heterogeneous regarding these indicators. The group is highly homogeneous only regarding flexibility 'Depth of bent' ($V_{13}=9.25\%$). Although the group is highly homogeneous, the mean values show ($X_{13}=96.06$ cm) that the children are not flexible enough because the value is below 100 cm.

Our research aims to determine the impact of organized mini-basketball activities on the level of physical and motor development of 2nd-grade students. For this purpose, it is necessary to establish whether a statistically significant difference has been obtained between anthropometric characteristics, motor abilities and skills after the intervention applied during the academic school year. A second test was conducted at the end of the school year to establish the impact of mini-basketball activities on the physical ability of 2nd-grade students.

Table 3 presents a comparative analysis and the significant differences after applying the Student's t-test for dependent samples.

Table 3. Comparison between physical and motor development indicators in 2nd-grade students after the end of the intervention

Indicator	n	I measurement		II measurement		Increase in results		Significant difference	
		X_1	S_1	X_2	S_2	d	d%	t/U	$p \leq 0.05$
1. Height	95	132,00	6,00	136,00	7,00	4,00	30,30	4,53	$p < 0.05$
2. Weight	95	29,15	0,60	33,99	6,76	4,84	16,60	5,51	$p < 0.05$
3. BMI	95	16,71	2,70	18,27	2,89	1,56	9,34	4,23	$p < 0.05$
4. Chest measurement -Pause	95	65,26	6,36	66,18	6,39	0,92	1,41	1,17	$p < 0.05$
5. Chest measurement - respiratory difference	95	5,94	1,96	5,48	1,90	-0,46	-7,74	1,62	$p < 0.05$
6. Horizontal extension	95	133,04	7,02	136,55	7,34	3,51	2,64	3,37	$p < 0.05$
7. Vertical extension	95	167,26	7,90	172,39	7,98	5,13	3,07	4,45	$p < 0.05$
8. Standing long jump - SLJ(cm)	95	129,24	19,15	138,16	16,98	8,92	6,90	3,40	$p < 0.05$
9. Vertical jump 2 legs - VJ(cm)	95	16,37	4,75	17,73	4,71	1,36	8,29	1,98	$p < 0.05$
10. Vertical jump 1 leg	95	10,98	5,15	13,03	4,99	2,05	18,68	2,79	$p < 0.05$
11. Sprint 10 m	95	2,83	0,43	2,73	0,37	-0,10	-3,38	1,60	$p < 0.05$
12. Throwing a solid ball from a standing position	95	348,63	72,00	393,68	74,49	45,05	12,92	4,24	$p < 0.05$
13. Flexibility - F(cm)	95	96,06	8,88	98,92	7,32	2,86	2,97	2,42	$p < 0.05$
14. Pass with two hands from chest to wall	95	18,96	5,422	23,13	4,99	4,17	21,97	5,51	$p < 0.05$
15. Running between cones	95	8,61	1,19	8,13	0,99	-0,48	-5,53	2,99	$p < 0.05$
16. Dribble between cones	95	20,92	6,77	16,76	4,36	-4,16	-19,88	5,04	$p < 0.05$
17. Abdominal presses	95	26,69	7,91	28,47	7,75	1,78	6,68	1,57	$p < 0.05$
18. Index for leading the ball	95	12,38	6,87	8,56	4,47	-3,82	-30,84	4,39	$p < 0.05$

After the second measurement, a statistically significant positive increase was observed for all the investigated indicators (Table 3. Regarding the indicators that provide information about the students' anthropometric data, there is an increase in the average height by 3.5 cm. In the horizontal extension, the value is approx-

imately the same. As expected, body weight increased slightly, as did body mass index. The limits for a normal degree of obesity for children in this age group remained the same. Only for chest measurement - Pause, no statistically significant difference was observed.

The presented values show that the results have improved for all the examined indicators. In the standing long jump, the children jump nearly 10 cm farther; in the two-leg vertical jump, the results have improved by 1.5 cm and the one-leg vertical jump by 2 cm. The strength in the upper limbs has increased by nearly 50 cm, as have the abdominal muscles; the children are now 0.10s faster in the 10 m sprint, run faster between cones, and dribble better.

The high values of the t-test show that statistically significant differences exist for nine characteristics; only for the characteristics related to speed abilities $t_{11}=1.60$ and abdominal muscle strength $t_{17}=1.57$, no such differences are observed. We can summarize that mini-basketball activities positively impact second-grade students' motor abilities.

Discussion

The results of the present study indicate that 32 organized mini-basketball sessions in 8-year-old children, positively impacted the physical and motor development of the children, as well as the level of ball handling skills. No statistically significant differences in chest circumference and speed abilities was observed after the mini-basketball sessions.

The results of the present study corroborate with the findings of the study of Akbari (2009), which showed a positive influence of the selected motor program on the progress of fundamental movements, and that gross motor skills can be influenced by an appropriate motor program. Furthermore, Aleksieva and Petkova (2015) found that under the influence of normal biological development, as well as under the influence of physical exercises specific to minibasketball, occur significant positive changes in anthropometric signs in 8 year old children. Comparing the results of this study with a similar study conducted by Fotrousi, Bagherly and Ghasemi (2012), we find that the implementation of a minibasketball training program has a positive impact on motor abilities in children aged 7-10 years.

During the school-age period, significant and dynamic changes occur in the biological development and ability, mental maturation, and intellectual and social development of the personality (Tsarov, 2008). Children at this age can perform complicated actions regarding coordination, combining the movements of the arms and legs. The educational content in the mini-basketball programs envisages precisely this assimilation of knowledge and skills at a basic level. With the creation of mini-basketball in 1948, Jay Archer defined the goal of the game, namely that not winning is important, but the fact that children learn to love the sport and respect the rules of the game, the referees, and the opposing team players. Mini-basketball allows working in mixed groups during training, and competitions are like festivals. It is not the victory that is important, but the participation and attraction of children to sports and popularizing sports, especially basketball. The motto of mini-basketball is 'Come and try with us!'.

The content of mini-basketball is very similar to that of movement activities and games, allowing it to be combined with them or studied separately. Thus, the basketball lessons can include a continuous learning process for mini-basketball. The regular participation of students in mini-basketball activities would help them to increase the level of their physical ability. In addition to

applying numerous exercises and games, the teacher should be able to classify exercises, apply them in the appropriate context, and change the type of exercises and games according to the children's abilities (Maaßmann, Mayer, 2020). From the age of 7-8, children have the anatomical and physiological prerequisites to cope with the requirements of the mini-basketball game, thus exercises to develop coordination abilities, flexibility, and conditioning abilities are emphasized. Practicing and developing basic motor skills (technique improvement) continues so that they can gradually be transformed into specific motor skills. Children of this age group learn to play together by dribbling, passing, shooting, and defending. The sports pedagogue must provide them with all these actions in a standard form to gain experience for the diverse game situations typical for basketball (Aleksieva, 2012).

Conclusions

As found in our research, mini-basketball activities have a positive effect on some indicators of physical and motor development. More precisely, height and horizontal extension, improved strength of the upper limbs and abdominal muscles, flexibility, speed of movement along a set route, dribbling at maximum speed, as well as coordination while passing.

Received: 12 May 2023 | **Accepted:** 02 September 2023 | **Published:** 15 October 2023

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