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Implementing the Kids' Athletics Program in the System of Increasing the Level of Physical Performance of Youth

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Abstract

Objectives. The objective of this study was to verify the impact of the IAAF project "Kids' Athletics" on the physical performance of pupils in primary education through the design and implementation of an athletics program.

Materials and methods. The present study was conducted using a two-group non-concurrent experiment, in which the experimental group (decimal age 8.64 years) consisted of 50 probands and the control group (decimal age 8.55 years) consisted of 60 probands aged 8-9 years. Additionally, 8 physical abilities tests were used to obtain selected indicators of the level of motor performance and probands' skill. The effectiveness of the 7-month experimental program was evaluated using comparative analysis through non-parametric statistical methods: Wilcoxon and Mann-Whitney U test and substantive significance assessment: Cohen (r). The difference in the progress of both samples was also determined.

Results. From a total of 8 motor tests in the experimental sample, a progress was observed in all 8 cases, of which the following changes were significant in 6 tests: Movement Set with Bar ($z = 3.84$, $p < 0.00$, $r = 0.54$), Static Pull-Up Hold ($z = 3.53$, $p = 0.00$, $r < 0.50$), Sit-Up ($z = 5.29$, $p < 0.00$, $r = 0.75$), 3-Way Ball Rolling ($z = 4.31$, $p < 0.01$, $r = 0.61$), the 4×10m Shuttle Run ($z = 4.20$ m, $p < 0.01$, $r = 0.59$) and the Beep Test ($z = 4.64$, $p < 0.01$, $r = 0.66$). In the case of the control group, there was a progress at the level of statistical significance in the Sit-Up ($z = 2.87$, $p < 0.01$, $r = 0.37$), in the 4×10 m Shuttle Run ($z = 4.94$, $p < 0.01$, $r = 0.64$) and the Beep Test ($z = 2.98$, $p < 0.01$, $r = 0.38$).

Conclusions. It has been proven that the "Kids' Athletics" program, composed of selected disciplines of Kids' Athletics supplemented by athletic movement games, has a significant impact on a wider range of physical abilities in 8- to 9-year-old children compared to the traditional content of the ISCED 1 state education program. Based on the findings of this study, as well as the comparison of other research works devoted to related issues, it is pointed out the feasibility of implementing such an athletic program into the annual timetables of Physical Education and Sports in primary education at this particular age period.

Keywords: Kids' Athletics, physical performance, primary education.

Introduction

Physical education and sport, like all education, is closely related to the life around us. They influence each other and are dependent on each other. The educational process in schools should reflect the needs of society and vice versa, individual educational constructs should be modified based on the awareness gained through empirical knowledge from the surrounding world. Currently, the movement aspect of youth is one of the most important topics penetrating various areas. Experts from sports, education, medicine, psychology, sociology, as well as the lay public are interested in a certain way and devote themselves to this issue. The reason is the well-known negative phenomena, which we find based on motor (overall) testing, medical examinations, evaluation of interpersonal relationships, but also by simple observation of the way of life of young people.

The findings of the World Health Organization (WHO) published in the newsletter of the Ministry of Health of the Slovak Republic from 2020 are alarming, pointing to a high global incidence of obesity. More than 340 million children and adolescents between the ages of 5 and 19 suffer from it in the world. Since the 1970s, this number has almost doubled. In most European countries, the prevalence of overweight and obesity is around 50% in the adult population and is responsible for the development of up to 80% of type 2 diabetes cases.

Today, perhaps no one doubts that movement and its' lack is one of the main problems of today's young population, along with unhealthy eating habits. Therefore, it is incomprehensible that in several European schools, pupils of younger school age are only required to have 2 PES lessons, during which pupils can move actively and do not have to sit on chairs. The World Health Organization recommends at least 60 minutes of mild to moderately intense exercise per day for people of this age (WHO, 2024). Since physical and sports education is the only or majority source of exercise for most children, we fear that the recommendation of the World Health Organization remains largely unfulfilled. Bielik, Hamar, Penesová, Babjaková, Antala, Labudová and Kovács (2017) point to serious facts that speak of a sedentary way of using free time among school-age children practically throughout the afternoon, i.e. from the time they arrive from school to the end of the day (Bielik, Hamar, Penesová, Babjaková, Antala, Labudová and Kovács 2017). The overall problem is wide-ranging and interdisciplinary. When solving it, we therefore consider it necessary to combine the knowledge and experience of experts from several fields.

In our work, we focus on the implementation of selected athletic elements in the teaching of secondary education with a traditional (2 lesson) time allowance from primary education. At the same time, the research builds on the results of the intervention we carried out in 2020 on a sample of 2nd grade probands. At that time, the high effectiveness of the experimental stimulus in the form of an athletic program implemented in the increased (3 hours) time allowance of the subject of the PES was found. The main reason why we decided to focus on this issue is the great potential in the combination of knowledge and experience from the field of athletics and the education of PES in primary education. It is necessary to point out the fact that in the current prevailing time allocation of two or three lessons a week, we cannot expect miraculous changes in the level of movement performance, or the health side of pupils. Therefore, we understand the main role of PES in providing such activities that, in addition to the development of basic locomotion, will motivate students to do sports and voluntary movement in their free time. Through the implementation of the athletics program in the form of lesson plans, we are trying to provide teachers of this subject with a way to teach athletics at the first level of elementary school more attractively, more efficiently, and considering the age characteristics of the students. The benefit of athletics lies in the improvement of basic locomotion, as well as the development of many movement abilities and skills (Čillík, Blanárová, Nemec and Kozolková, 2018; Katzenbogner et al., 2018; Doležalová and Lednický, 2012; Kuchen, 1986). Often those skills, which are not at the required level when pupils move to the second level of primary school. Katzenbogner et al. (2018) adds that the development of these movement skills is a fundamental task of athletics for children (Katzenbogner et al., 2018). When compiling the athletics program, we were inspired by the practical handbook of team disciplines of the IAAF Kids' Athletics project by the authors Gozzolli, Simohamed and El-Hebil (2006), which serves as a manual for organizers of athletic team competitions of the youngest to middle age of school age almost all over the world. Another important element that we included in the design of the lessons are movement games focused on athletics. These appropriately supplement and dynamize the lessons and, as experts say, in a relatively short time of their application, they also effectively develop motor skills and contribute to the socialization of pupils. In their selection and organization, we were inspired by authors such as Argaj et al. (2009), in addition to our own experience. Adamčák and Nemec (2014) or Katzenbogner, Killing, Fröhlich, Ulrich and Müller (2018). In addition to the mentioned sources, when implementing the athletics program into the annual time-thematic plan for the subject PES, we relied on documents issued by the State Institute of Pedagogy (ISCED 1, 2015) and the Ministry of Education, Science, Research and Sport of the Slovak Republic (Law on Education and Training, 2008). and publications by experts in the field of didactics of PES (Kampmiller, 2002; Šimonek, 2005), didactics of athletics (Čillík et al., 2009), as well as in the field of sports training and development of movement skills by Friedrich (2007) and a team of experts the concept of long-term sports training (Balyi, et al., 2013).

Material and Methods

Study Participants

The basis of the study is the motor performance of boys and girls divided into experimental (n = 50, decimal age 8.64 years, height 134.7 cm, weight 29.9 kg) and control group (n=60, decimal age 8.55, height 134.8 cm, weight 9.9 kg). Between body height, or weight in the experimental and control groups, we did not notice significant differences (p=n.s.).

Study Organization

We used a longitudinal two-group pedagogical experiment to verify the impact of Kids' Athletics on the motor performance of the probands.

To diagnose the entry and exit level of the probands' movement performance, we chose the test battery compiled by the established commission at the Ministry of Education, Science, Research and Sports from 2016/2017. Since 2018, it has been used for full-scale testing of the movement abilities of students in the first and third year of primary education.

The battery of tests consisted of the: Seated Forward Bend (cm), Movement Set with Bar (s), Static Pull Up Hold (s), Standing Long Jump (cm), Sit-up (n/min), 3-Ball Rolling (s), 4x10 m Shuttle Run (s) and Beep test (n).

Statistical Analysis

We assess the statistical significance of changes and differences with the Wilcoxon and Mann-Whitney tests at the significance levels $p < 0.05$ and $p < 0.01$. Material significance is assessed by Cohen's (1988) "r" coefficient: 0.1 – small, 0.3 – medium, 0.5 – large effect. Empirical data were evaluated in MS Excel and SPSS programs.

Results

As a result of the experimental stimulus containing the means of the "Kids' Athletics" program, there were significant improvements in physical movement performance in

Table 1. Physical performance level

Indicators	Experimental sample (n = 50)				Control sample (n= 60)			
	Input		Output		Input		Output	
	M	SD	M	SD	M	SD	M	SD
Height (cm)	134.57	5.93			134.83	6.05		
Weight (kg)	29.98	6.40			29.93	6.64		
Seated F. Bend (cm)	-4.06	8.02	-3.48	8.59	0.18	9.17	-1.71	10.34
Movement Set (s)	23.44	5.42	20.98	4.31	24.43	5.11	26.10	5.90
S. Pull Up Hold (s)	9.90	6.58	12.55	7.67	10.25	6.89	8.98	7.55
Standing L. Jump	135.24	18.37	138.14	16.91	126.63	19.53	127.03	19.13
Sit-Up (n)	34.18	7.47	39.42	7.99	37.88	6.54	40.53	7.08
3-Ball Rolling (s)	27.70	6.05	23.86	5.77	30.85	8.91	28.71	8.46
4x10 m Run (s)	13.90	0.91	13.41	0.77	13.78	0.94	13.35	0.95
Beep Test (n)	26.62	10.08	31.68	11.33	25.00	9.69	28.23	11.85

Performance in individual disciplines (table 1) is characterized by basic descriptive statistics (N – number, M – average, SD – standard deviation)

Table 2. Statistical significance and effect size of physical performance changes in experimental and control sample

Indicators	Sample					
	Experimental			Control		
	z	p	r	z	p	r
Seated F. Bend (cm)	1.41	0.16	0.20	3.08	0.00	0.40
Movement Set (s)	3.84	0.00	0.54	1.82	0.07	0.23
Static P. Up Hold (s)	3.53	0.00	0.50	2.99	0.00	0.39
Standing L. Jump (cm)	1.65	0.10	0.23	0.02	0.99	0.00
Sit-Up (n)	5.29	0.00	0.75	2.87	0.00	0.37
3-Ball Rolling (s)	4.31	0.00	0.61	0.82	0.41	0.12
4x10 m Run (s)	4.20	0.00	0.59	4.94	0.00	0.64
Beep Test	4.64	0.00	0.66	2.98	0.00	0.38

Notes: Wilcoxon test, p value, Cohen's r

Table 3. Statistical significance and effect size of physical performance differences between experimental and control sample in initial and final testing

Indicators	Experimental <> Control sample					
	Input			Output		
	z	p	r	z	p	r
Seated F. Bend (cm)	2.85	0.00	0.40	1.06	0.29	0.15
Movement Set (s)	1.37	0.17	0.19	5.33	0.00	0.75
Static P. Up Hold (s)	0.47	0.64	0.07	2.66	0.01	0.38
Standing L. Jump (cm)	2.08	0.04	0.29	2.78	0.01	0.39
Sit-Up (n)	2.36	0.02	0.33	0.31	0.76	0.04
3-Ball Rolling (s)	1.47	1.14	0.22	3.43	0.00	0.49
4x10 m Run (s)	0.40	0.69	0.06	0.45	0.65	0.06
Beep Test	0.55	0.58	0.08	1.38	0.17	0.19

Notes: Mann Whitney test, p value, Cohen's r

the experimental sample (tables 1 and 2). Performance improvements were noted in the following tests: Movement Set with Bar ($z = 3.84$, $p < 0.00$, $r = 0.54$), Static Hold Pull Up ($z = 3.53$, $p = 0.00$, $r < 0, 50$), Sit-Up ($z = 5.29$, $p < 0.00$, $r = 0.75$), 3-Ball Rolling ($z = 4.31$, $p < 0.01$, $r = 0.61$), 4×10 m Shuttle Run ($z = 4.20$ m, $p < 0.01$, $r = 0.59$) and Beep Test ($z = 4.64$, $p < 0.01$, $r = 0.66$). The level of Seated Forward Bend and Standing Long Jump remained unchanged ($p > 0.05$, $r < 0.23$).

The control sample completed the stimulus with the traditional teaching content of the state education program. The control stimulus had a positive effect on the improvement in the Sit-Up test ($z = 2.87$, $p < 0.01$, $r = 0.37$), $r = 0.32$), in the 4×10 m Shuttle Run ($z = 4.94$, $p < 0.01$, $r = 0.64$) and the Beep Test ($z = 2.98$, $p < 0.01$, $r = 0.38$). Performance level in Standing Long Jump ($z = 0.02$, $p > 0.05$, $r < 0.00$) and Movement Set with Bar ($z = 1.82$, $p > 0.5$, $r = 0.23$) remained

unchanged. The control stimulus negatively affected the level of Seated Forward Bend ($z = 3008$, $p < 0.01$, $r = 0.40$) and Static Hold Pull Up ($z = 1.82$, $p < 0.01$, $r = 0.39$).

It has been shown that the "Kids' Athletics" program, made up of selected disciplines of Kids' athletics supplemented with athletic movement games, has a significant impact on a wider range of physical abilities in 8- to 9-year-old children compared to the traditional content of the ISCED 1 state education program (table 1, 2 and 3). From the physical abilities, positive performance changes were recorded in coordination skills (Movement Set with Bar and 3-Ball Rolling), strength abilities (Static Hold Pull Up and Sit-Up), coordination speed (4×10m) and endurance (Beep Test). The level of mobility and explosiveness of the lower limbs remained unchanged, which can be a positive indicator given the peculiarities of development at this age.

Discussion

The inclusion of athletic elements in the conditions of school physical education, or in children of younger school age, can be observed in several research works. Some are focused on a smaller number of selected monitored indicators; other studies are more complex. Kremnicky (2009) observed the influence of athletic equipment on the development of gymnastic skills. In this work, with the help of a one-group pedagogical experiment, positive changes in the acquisition of selected gymnastic skills were recorded on a sample of 6-7-year-old boys, while among the tools used were basic athletic elements such as running alphabet, sprints and jumps. In the case of the work of Čillik and Willwéber (2018), a positive influence of Kids´ athletics on individual parameters of body composition was found. Similarly, in the case of the work of Willwéber (2016), where a better performance in the general motor performance of 6–7-year-old pupils engaged in athletics was found than in their peers playing tennis.

A team of experts in a series of research conducted in 2013-2015 under the leadership of Čillik devoted themselves to verifying the impact of Kids´ Athletics on a wider complex of movement skills. Experiments on younger school-age probands revealed a significant impact of "Athletics for children" on general motor performance in children aged 7-9 years. The practical part of these researches was carried out on athletics rings at selected elementary schools. The joint results of the works of the involved authors point to the progress of the level of general physical performance. These were proven using the EUROFIT and UNIFIT test batteries. In most cases, the most significant changes in fitness abilities occurred from a series of experiments. When testing coordination skills, similar to our case, the most significant changes in reaction speed and kinesthetic-differentiation skills were recorded. Compared to the pedagogical experiments that we carried out as part of the PES subject at a selected elementary school in the years 2019-2020 and 2023-2024. The subjects of the research under the leadership of Čillik were pupils attending an interest club with an athletic focus. Based on this, in this case we can assume a higher performance homogeneity within groups than when working with students in compact groups (school classes). When working with students of individual classes, in the practice of the subject of PES, we encounter significantly outlier performances of the probands. For this reason, the choice of activities and such means for experimental stimulation, which can be implemented without substantial modifications by the teachers, is more demanding. Nevertheless, we consider the acquired findings of the mentioned team to be beneficial not only for the comparison of results, but also from a methodological point of view.

More comprehensive studies can be found by Petros, Ploutarhos, Vasilios, Vasiliki, Konstantinos, Stamatia and Christos (2016) or Abhaydev and Bhukar (2021). In their studies, Petros, Ploutarhos, Vasilios, Vasiliki, Konstantinos, Stamatia and Christos (2016) devoted themselves to verifying the influence of "Kids's Athletics" on the level of physical skills, performance in selected athletic disciplines and the degree of motivation to continue competing in athletic disciplines. The research was carried out on a wide sample of probands (n = 215) from Greek primary schools aged 11-12 years. Using the division into experimental and control groups, not only changes in the level of physical performance, but also the motivation of the students was observed. We consider this research to be the most widespread pedagogical experiment in natural conditions focused on the implementation of Kids´ Athletics in the teaching of physical education in schools. Similar to our case, here too the experimental stimulus was implemented in the form of modification of the traditional teaching content and then compared with the usual procedure. Compared to CS, more significant changes were recorded in the ES probands in the physical as well as the emotional side, resp. in the motivation of future continuation in athletic competition. The results of the experiment showed an increase in the average motivation of ES probands in performing athletic activities and in (voluntary) continuation of athletic disciplines in the next period. From a statistical point of view, there were no significant changes, however, compared to CS, where a slight decrease in observed interest was recorded, the initiative of Kids' Athletics is evaluated as more successful. When assessing changes in the level of physical abilities (T1: Seated Forward Bend, T2: 10 × 5 m, T3: Standing Long Jump, T4: 20m Shuttle Run, T5: T-Test) as well as performance in athletic disciplines (50 m Sprint, Long Jump, High Jump, Shot Put, Cricket Ball Throw) higher efficiency was recorded in favor of the experimental stimulus in all cases. In addition to the more attractive nature, the authors attribute the success of the experimental program to a higher degree of motivation of the students as well as the teachers themselves when teaching using elements of Kids' Athletics. We agree with the opinion that it is difficult to evaluate the extent to which the results of such research are influenced by the personality of the teachers, their involvement, personal involvement and affection for the chosen method of teaching athletics. From this point of view, we can consider the involvement of a larger number of schools and thus also teachers in the experiment as a slight disadvantage. On the contrary, we consider the size of the sample as well as the comprehensive approach in verifying the effectiveness of research stimuli to be a big positive.

Abhaydev and Bhukar (2021) conducted a two-group pedagogical experiment in a selected elementary school in India on a sample (n = 40) of probands. It was aimed at verifying the impact of Kids' Athletics on selected physical

abilities and skills. Even in this case, statistically significant changes in favor of the experimental set were recorded during the 12-week period. According to the authors, these occurred in all measured indicators (flexibility, explosive leg strength, speed endurance, agility and speed). We see the advantage of the shorter and more intensive intervention period, which was used in the previous two cases, in the reduction of other influences that can have a disruptive effect due to the long-term nature of the research. In the case of our current research in the school year 2023-2024, the effect of the stimuli is concentrated on a longer period of time. For this reason, we emphasized the setting of equal conditions for all "non-experimental" teaching hours of PES and also thorough statistics when evaluating the results.

Conclusions

The main purpose of the contribution was to point out the possibilities of use and effectiveness of the "Kids' Athletics" project in primary education with the help of implementing a special athletics program for 3rd graders. We investigated the influence of the experimental stimulus on the motor performance of the students using input and output measurements. As a battery of motor tests, we used selected tests from the comprehensive testing of movement prerequisites. As such testing is carried out annually in most schools, the data obtained thus provide information not only about the physical level of the probands of both research groups before and after the introduction of stimuli, but also the possibility of comparing these results in a long-term time perspective, or with other sets of tested pupils. While the experimental stimulus was composed of selected disciplines of Kids' Athletics supplemented with athletic games, the control stimulus was based on the original content based on the state educational plan. In both cases, the initiative was implemented in the traditional (2-hour) time allowance of the PES subject.

When evaluating the effectiveness of the experimental stimulus, we start from a comparison of the results achieved in the physical ability tests. Through mutual comparison, we found performance homogeneity between the sets at the beginning of the experimental period using statistical and substantive assessment. When comparing the output tests, we observe a more significant progress in the performance of the experimental sample. We recorded statistically significant changes in the Seated Forward Bend, Static Pull Up Hold, Sit-Up, 3-Ball Rolling, 4x10 m Shuttle Run and Beep Test. Thus, we note the positive influence of Kids´ Athletics and athletic games on physical performance. Based on the above results, as well as the practical applicability of the individual elements of Kids' Athletics, we consider the inclusion of an athletics program in this age period to be effective and thus recommend the creation of sufficient space in the annual schedules of Physical Education and Sports in primary education.

Conflict of Interest

The authors declare that is no conflict of interest.

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Впровадження програми «Дитяча легка атлетика» в системі підвищення рівня фізичної працездатності юного покоління

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 6 с., 3 табл., 24 джерела.

Мета дослідження. Метою цього дослідження було перевірити вплив проекту Міжнародної асоціації легкоатлетичних федерацій (IAAF) «Дитяча легка атлетика» на показники фізичної працездатності учнів початкових класів через розроблення та впровадження програми з легкої атлетики.

Матеріали та методи. Дослідження проведено із застосуванням методу двогрупового непаралельного експерименту, в якому експериментальна група (децимальний вік 8,64 років) складалася з 50 досліджуваних, а контрольна група (децимальний вік 8,55 років) — з 60 досліджуваних учасників віком 8-9 років. Крім того, застосовано 8 тестів для визначення рівня розвитку фізичних здібностей з метою отримання окремих показників рівня рухової активності та навичок досліджуваних осіб. Ефективність 7-місячної експериментальної програми оцінювали за допомогою порівняльного аналізу із застосуванням непараметричних статистичних методів: U-критерій Вілкоксона, Манна-Уітні та оцінка змістовної значущості: коефіцієнт детермінації Коена (r). Також визначено різницю в прогресі обох вибірок.

Результати. Загалом із запропонованих 8 рухових тестів в експериментальній вибірці прогрес спостерігався у всіх 8 випадках, з яких наведені нижче зміни виявилися значущими у виконанні 6 тестів: Комплекс рухових вправ зі штангою ($z = 3,84$, $p < 0,00$, $r = 0,54$), статичне підтягування на перекладині ($z = 3,53$, $p = 0,00$, $r = 0,50$), підйоми корпуса ($z = 5,29$, $p < 0,00$, $r = 0.75$), прокочування гімнастичного м'яча у напрямку трьох сторін ($z = 4,31$, $p < 0,01$, $r = 0,61$), човниковий біг 4×10 м ($z = 4,20$ м, $p < 0,01$, $r = 0,59$) та багатоступеневий фітнес-тест ($z = 4,64$, $p < 0,01$, $r = 0,66$). Що стосується контрольної групи, прогрес спостерігався на рівні статистичної значущості у підйомах корпуса ($z = 2,87$, $p < 0,01$, $r = 0,37$), човниковому бігу 4×10 м ($z = 4,94$, $p < 0,01$, $r = 0,64$) та виконанні багатоступеневого фітнес-тесту ($z = 2,98$, $p < 0,01$, $r = 0,38$).

Висновки. Доведено, що програма «Дитяча легка атлетика», яка складається з окремих дисциплін дитячої легкої атлетики, доповнених спортивними рухливими іграми, має суттєвий вплив на розвиток ширшого спектру фізичних здібностей у дітей 8-9 років порівняно із традиційним змістом державної освітньої програми Міжнародної стандартної класифікації освіти (ISCED 1). На основі результатів цього дослідження, а також порівняльного аналізу інших наукових праць, присвячених суміжній проблематиці, наголошується на доцільності впровадження запропонованої легкоатлетичної програми до річного розкладу занять з фізичної культури і спорту в початковій школі у зазначений віковий період.

Ключові слова: дитяча легка атлетика, фізична працездатність, початкова освіта.

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