

Influence of kids' athletics and athletic movement games on the development of general physical performance of pupils in the primary education

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Abstract:

The goal of our research paper was to create and implement an athletic program that would prove that Kids' Athletics and athletic movement games influence the general physical performance of pupils in primary education. Our research was carried out using a two-group simultaneous experiment in which an experimental group and a control group each had 35 members. The members' ages range from 7 to 8 years old. We used 5 condition tests and 5 coordination tests to gain the required coefficients of the members' level of general physical performance. The effectivity of our 10-month experimental program was evaluated by means of comparative analysis using nonparametric statistic methods: The Wilcoxon signed rank test and Mann-Whitney U test. We assessed the differences in the progress of the members of both groups and we found out that the experimental group reached statistically more significant changes in 8 from 10 monitored coefficients compared to the control group. The members of the experimental group had better achievements in condition tests: the 3-minute run test, standing broad jump, medicine ball throw, shuttle run 4 x 10 m, and sit-ups and also better achievements in coordination tests: stopping a rolling ball, accuracy throw and running to the target. We noted that there was higher efficiency of the experimental coefficient regarding general physical performance than in the case of the control impulse. With this paper, we would like to point out the influence and ways of using the athletic program as a possible teaching alternative for a disposable lesson of psychical education in primary education.

Key Words: Kids' Athletics, Athletics Games, General Physical Performance, Primary Education..

Introduction

The movement aspect of children's and youth's life is becoming an increasingly topical topic these days. The level of movement abilities and skills of students, which can be observed primarily in their movement performances in physical education classes, or from the results of comprehensive tests, does not achieve the desired results.

Fitness and coordination abilities are also often not sufficiently developed through leisure activities (Katzenbogner, Killing, Fröhlich, Ulrich & Müller, 2018). However, the level of motor skills itself is only one of the problems we encounter today in physical education practice, as well as in everyday life. We also observe negativity in the field of health, social or psychological. Katzenbogner et al. (2018) also point to changes in the way of life of children at the level of family, school and free time (Katzenbogner et al., 2018). It is known that children and youth have significantly less natural or "voluntary" movement, further less personal social contact with peers during free time, and, last but not least, a worsened state of health-related mainly to metabolism, cardiovascular and locomotor system. Bielik, Hamar, Penesová, Babjaková, Antala, Labudová & 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 rest of the day (Bielik, Hamar, Penesová, Babjaková, Antala, Labudová & Kovács, 2017). The World Health Organization recommends at least 60 minutes an average of 60 minutes per day of moderate-to-vigorous intensity for people of this age (WHO, 2022). As physical education becomes the only "source" of movement for many children, we consider its function, especially in primary education, to be increasingly important. Due to the current situation, it is necessary that physical education at the first level should be able to compensate as well as possible for the mentioned negative influences of today's times. We can talk more and more intensively about the need for better physical training of children on a quantitative as well as a qualitative level. Some schools respond to this situation by strengthening the number of hours from the original two by adding a third available hour to a total of three hours per week. Of course, we consider increasing the number of hours to be the right first step, but at the same time, two fundamental questions arise: 1. Who and how should teach physical education in the first grade of elementary school? 2. What should be the content of the third disposable lesson?

Although finding a solution to this problem is not easy, we tried to create a certain proposal that could help the current situation. We focused on the creation of an athletic program that will be able to be implemented in the annual time-thematic plans of physical and sports education in primary education. According to more authors

such as Čillík, Blanárová, Nemec & Kozolková (2018), Katzenbogner et al. (2018), Doležalová & Lednický (2012), Čillík, Pupiš & Kremnický (2009) or Kuchen (1986) 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 & Kozolková, 2018; Katzenbogner et al., 2018; Doležalová & Lednický, 2012; Čillík, Pupiš, & Kremnický, 2009; Kuchen, 1986). Precisely those that should not be neglected in students aged 6-10 and whose level is often not at the required level when moving to the second grade. Katzenbogner et al., (2018) adds that the development of these movement abilities is the basic task of kid's athletics (Katzenbogner et al., 2018).

Kids' Athletics is the basis of the experimental program implemented by us in primary education. This project, guaranteed by the International Association of Athletics Federations (IAAF), was created for the purpose of developing, making accessible and popularizing athletics among children and parents all over the world. Athletics, as we know it from the junior or senior categories, does not represent a varied and fun physical activity for children of preschool and younger school age. In other words, athletics in the youngest age categories represented a kind of „miniature” of adult athletics and was not sufficiently adapted to children. That is why the initiative of the "IAAF Kids' Athletics" working group to create a fun, collective and varied form of athletics for children, launched in 2001, has become very successful and welcomed by many national athletic associations around the world. As stated by Čillík et al. (2018), the new concept should serve to prevent premature specialization and, on the contrary, support the harmonious all-round development of children, taking into account their developmental needs (Čillík et al., 2018). As the IAAF (2018) adds, the program is not only intended for sports clubs, but also for schools and all institutions interested in the well-being of children (IAAF, 2018). The aim of the program is to introduce children to athletics at a grassroots level, filling the gap between young children, beginners and experienced athletes (IAAF, 2018; Čillík, 2015). This concept brings a new, more attractive and fun intentional organizational form of competition in groups, where one of the biggest advantages is the opportunity to enjoy successes but also to overcome failures with a team (Deister, Dreisbach, Eberle, Fittko, Katzenbogner, Ripper, Scheer, Schwarz, Ullrich & Voigt, 2020; Čillík et al., 2018; IAAF, 2018; Nemec, 2017; SAZ & Kids' Athletics, 2015). Although the Kid's Athletics project officially focuses on three age categories: a) children aged 7 and 8, b) children aged 9 and 10, c) children aged 11 and 12 (IAAF, 2018), but its usability also extends to younger or older categories.

The methodological basis of Kids's Athletics is a practical guide from the collective of authors Gozzoli, Locatelli, Massin and Wangemann, published in 2002. It was created not only to describe the disciplines of children's athletics, but also to clarify the content and organizational goals of the program. This was created not only to describe the disciplines of kids's athletics, but also to clarify the content and organizational goals of the program. The manual was further developed in 2006 by the collective of authors Gozzoli, Simohamed and El-Hebil. The mentioned authors state as the main goals: involving a larger number of children at the same time, using lively forms of movement, involving even children with lower performance, changes in difficulty taking into account the age and movement abilities of the competitors, an adventurous and child-friendly program, simple and unambiguous evaluation of teams, the possibility of both boys and girls competing together in mixed teams, health support consisting in a variety of movement activities, harmonious and versatile development of the individual, social interaction based on teamwork and adventurous character. (Deister et al., 2020; Gozzoli, Simmonhamed, Elhebil, 2006; Gozzoli, Locatelli, Massin & Wangemann, 2002). The main protagonists of the project try to transfer such principles to experts through various internships and coaching or teaching seminars. The reason is the interest in implementing the ideas of the project in school physical education as well as sports training in sports clubs. All over the world there are organized trainings aimed at further education of trainers and lecturers and teachers who want to participate in the IAAF Kid's Athletics project (IAAF, 2018).

The statistics published in the IAAF periodical "Kids and Youth News" from 2013 also speak of the success and great expansion of the project, indicating the constant growth of participating countries, new lecturers and, of course, athletic kindergartens. A significant increase occurred in 2012. Many trainings were organized this year instructors of children's athletics, 171 new instructors were trained, who can educate and practically prepare coaches for children's athletics. Furthermore, 413 sets of athletic aids were distributed to 40 different countries of the world (Kids and Youth News, 2013). Today we can already talk about a firmly anchored system, which, according to the 2021 update of the official website IAAF, lists the membership of over 100 federations and over 13 million children and youth from around the world (<https://worldathletics.org>, 2022).

Another important part of our experimental program are athletic movement games. The concept of athletic games is closely related to the concept of movement games. Their characteristics and meaning are basically the same. Athletic games can therefore be understood as movement games focused on athletics. When defining the term "movement game", we find different theories of experts, but without significant differences. Movement games represent a conscious activity with voluntarily chosen rules performed between two or more players (Mazal, 2000), that is influenced by the rules, accompanied by entertainment and a game form with possibilities of rules modification (Pokorný, 2019; Adamčák & Nemec, 2014; Argaj, 2009) which at the same time also trains important sporting skills as well as extracurricular key qualifications (Hofmann, 2014). When choosing athletic movement games, we were based on the fact that movement games focusing on any sport serve

to develop several movement skills at the same time. Therefore, they cannot be specified only for a specific sports discipline. Therefore, the movement games we have chosen also develop other movement skills and abilities in addition to athletic movement prerequisites. In the experimental athletics program, selected athletic games complement and at the same time diversify the content of Kids' Athletics. The entire program can thus be understood as a combination of these two components: Kids' Athletics disciplines and athletic movement games.

Material & methods

The goal of the paper was to verify and point out the influence of Kids' Athletics and athletics movement games on the general physical performance of pupils in primary education through the creation and inclusion of an athletic program.

The research sample consisted of 70 pupils of II. class aged 7-8 years attending ZŠ Lichardova in Žilina. The students were divided into two 35-member groups. The average decimal age on the first day of testing was 7.77 years in the experimental group and 7.53 years in the control group.

The experimental factor was an athletics program composed of selected and modified for the needs of the school TSV disciplines of Kids' Athletics (based on the successful project "Kids' Athletics") as well as athletic games with a different focus. The factor was implemented in the annual time-thematic plan of physical and sports education in the second year of elementary school as the content of the third, available lesson on this subject. The frequency of the experimental intervention was one hour per week or 33 hours per year. In the case of the control group, the content of the available lesson was a traditional stimulus in the form of extended content from the original two lessons.

When compiling the experimental model, we took into account the expertise of authors dedicated to the development of movement skills: Valová & Vala (2009), Friedrich, (2007), Ahnert (2005) as well as information from experts in the field of didactics of physical education and sports: Feč & Matúš (2015), Lange (2014) and Šimonek (2005). In order to find out the influence of the athletic training program on the general physical performance of pupils in primary education we used a two-group time-parallel pedagogical experiment. We verified its effectiveness using input measurements, which we carried out at the beginning, and output measurements, which were carried out at the end of the school year.

When selecting and compiling the motor tests, we were based on the theoretical and practical experience of experts in the field of sports metrology such as Oberger (2015), Laczo, Buzgó, Cihová, Cvečka, Kalinková & Rupčík (2014) or Sedláček & Cihová (2009). We obtained the monitored indicators in the probands using a test battery consisting of 5 condition (T1-T5) and 5 coordination (T6-T10) tests:

Motor test

T1 3-minute Run
T2 Standing Long Jump Test
T3 Kneeling Power Ball Overhead Throw (forwards)
T4 4x10m Shuttle Run
T5 Sit Up
T6 Bench Walk with 3 Turns
T7 Stopping a Rolling Ball
T8 Repetitive Movement Set with Bar
T9 Throw at the Target
T10 Running to the Goals with Changes of Directions

Tested movement ability

aerobic endurance
explosive power LL
explosive force UL
acceleration speed
dynamic strength of trunk muscles
dynamic balance
reaction speed
connecting movements ability
kinesthetic-differentiation ability
spatial orientation

When processing and evaluating the obtained data, we used non-parametric statistical methods: Wilcoxon and Mann-Whitney test. The determined level of significance ($p < 0.05$) represented a 95% probability of the correctness of the decision. Among the most observed statistical characteristics of the comparative analysis were the median and the standard deviation. Other accompanying indicators were: the maximum, minimum, and average value of the observed signs.

Results

When summarizing the results achieved from the individual conditioning and coordination tests, **we can observe significant changes in the performance of the experimental group.** Statistically significant changes in this set occurred in **all 10 measurements.** While all these changes are positive and represent progress in the performance of this ensemble. **In the control set,** there were also positive changes in performances in all 10 measurements, but from the point of view of statistical significance, we can talk about significant changes only **in the case of 6 of the total 10 measurements.**

In the case of the other four tests, the changes were minimal. A comparison of the level of performance between the two sets before the application of individual stimuli points to performance homogeneity. This means that the difference in measured values between these sets was minimal

and statistically insignificant in all input tests. Based on this, we can subsequently consider the resulting comparison of the performance of both sets as determining the effectiveness of the individual implemented stimuli.

When evaluating the results of the output measurements, the performance difference between the files was significantly larger. This is indicated by the fact that **in only 7 of the total 10 tests** the measured values were different and statistically significant. And **in all seven cases**, the achieved performance was better in the experimental group. In the remaining three measurements, we also recorded better results in the experimental group, but without reaching the established statistical significance.

Since in tests no. 1, 2, 3, 4, 5, 9, and 10, significant changes were statistically confirmed in the experimental set, and in test no. 7 occurred on significant positive changes only in the experimental set, we can state that, out of the total number of motor tests, **in 8 cases** a more pronounced and statistically significant improvement in performance was measured in the experimental set than in the control set. In the case of test no. 6 and 8, we consider the progress in terms of statistical significance to be the same for both sets.

Table 1 Statistical significance of changes in research sets in particular tests

Monitored changes in:	Achieving a statistically significant change									
	Motor ability test									
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Experimental file	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Control file	no	yes	yes	no	no	yes	no	yes	yes	yes
Input file comparison	no	no	no	no	no	no	no	no	no	no
Output file comparison	yes	yes	yes	yes	yes	no	no	no	yes	yes

T1: 3-minute run, **T2:** Standing long jump, **T3:** Kneeling full ball throw, **T4:** 4 x 10 m rowing, **T5:** Sit-up, **T6:** Bench run with 3 turns, **T7:** Stopping a rolling ball, **T8:** Repeated assembly with a pole, **T9:** Throw for accuracy, **T10:** Run to the goals.

We present the changes in the level of motor skills achieved during the experimental work in both research sets using box plots. Each of them points to one of a total of 10 monitored movement abilities. The values measured in the experimental set are placed in green boxes and the values measured in the control set are in blue boxes. On the graph, we can observe several indicators representing the changes achieved during the experimental period: the median (indicated by a horizontal line), the average (indicated by a cross), the upper and lower quartile as well as the maximum, minimum and outlier values of both sets.

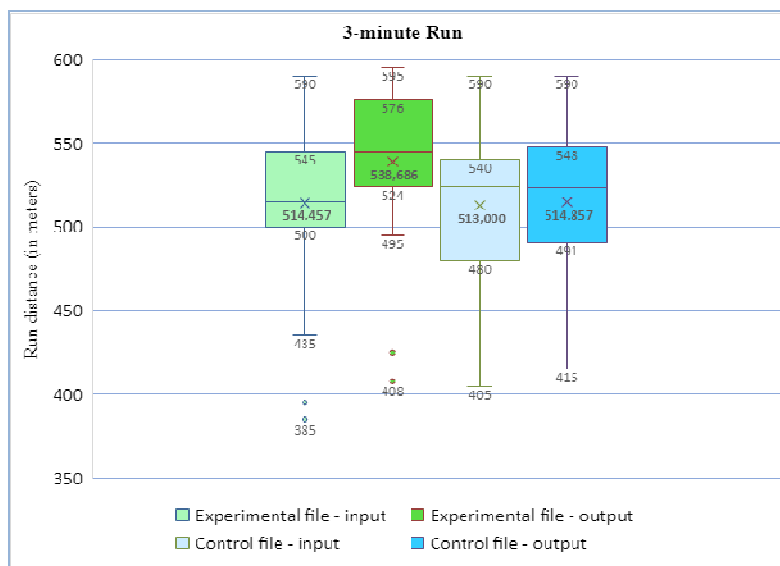


Figure 1 Test results: 3-minute Run

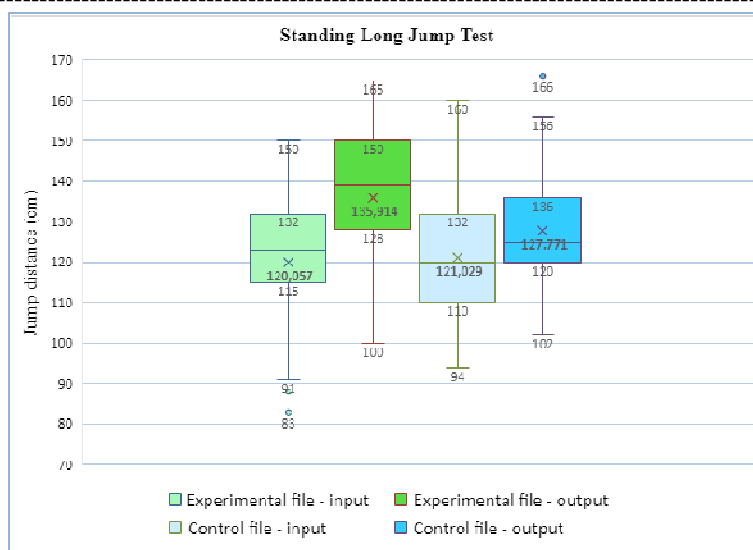


Figure 2 Test results: Standing Long Jump Test

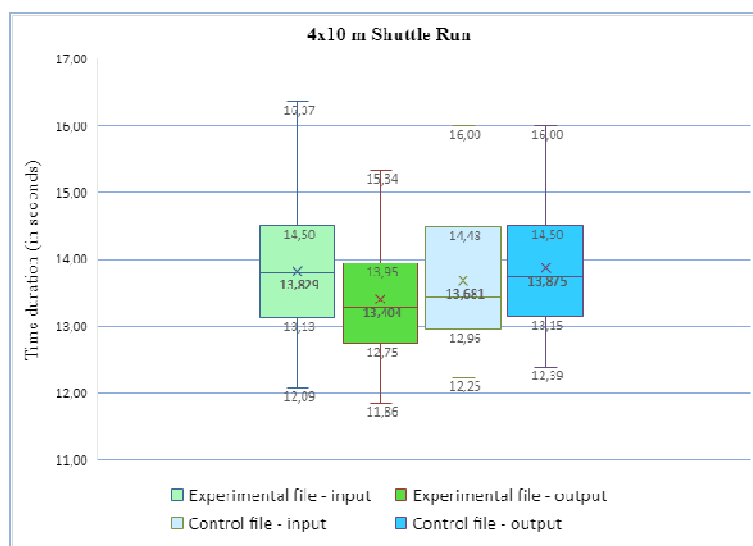


Figure 3 Test results: 4x10 m Shuttle Run

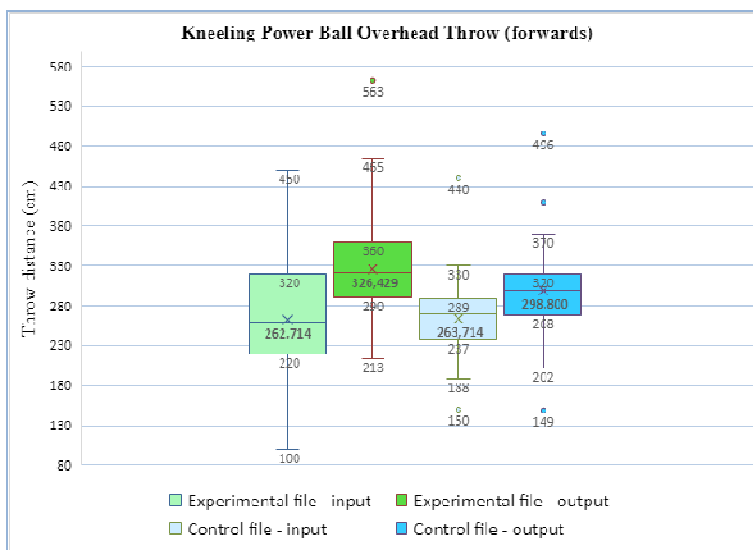


Figure 4 Test results: Kneeling Power Ball Overhead Throw (forwards)

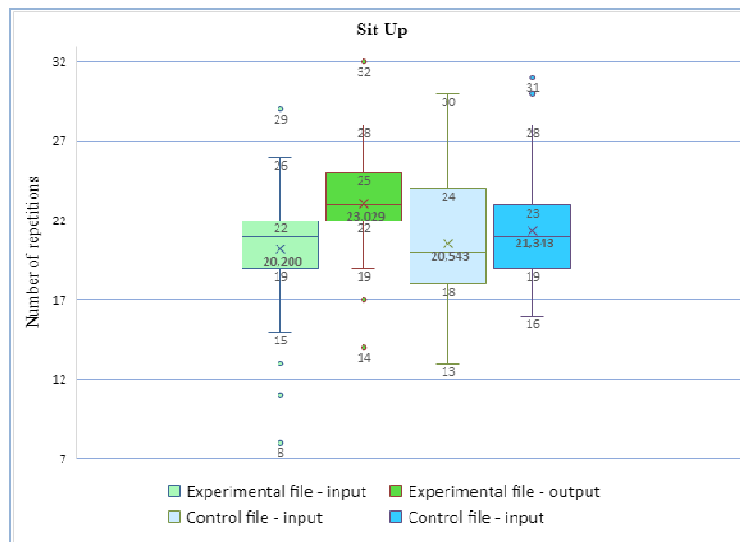


Figure 5 Test results: Sit Up

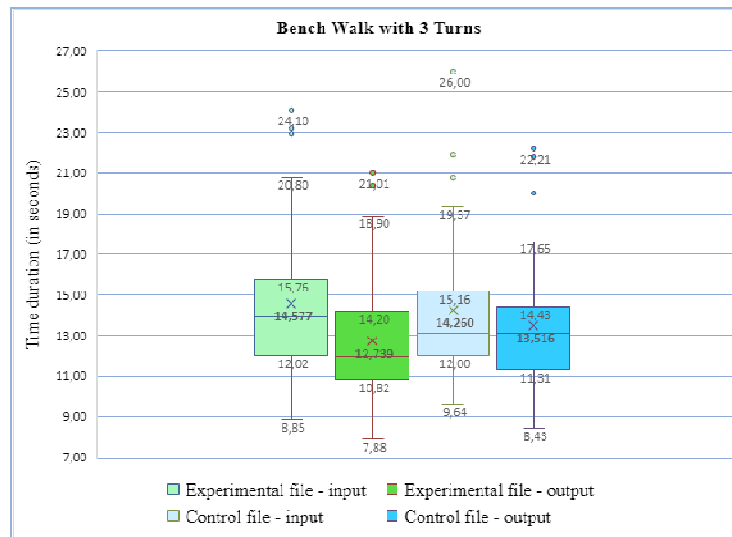


Figure 6 Test results: Bench Walk with 3 Turns

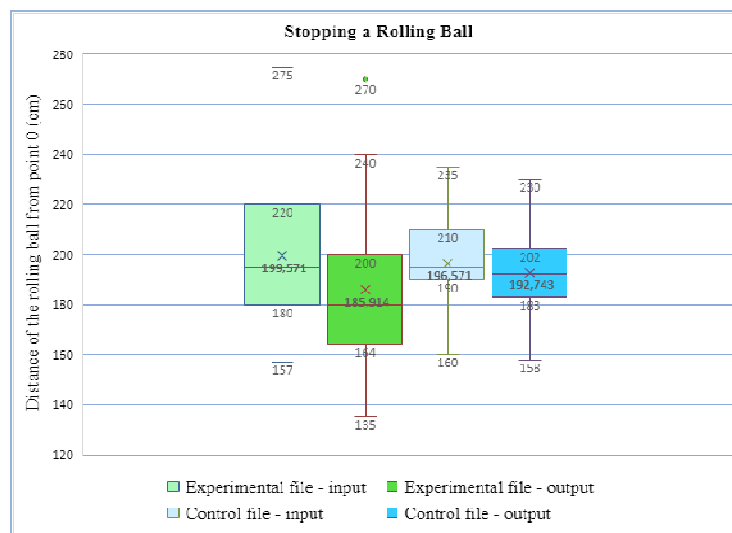


Figure 7 Test results: Stopping a Rolling Ball

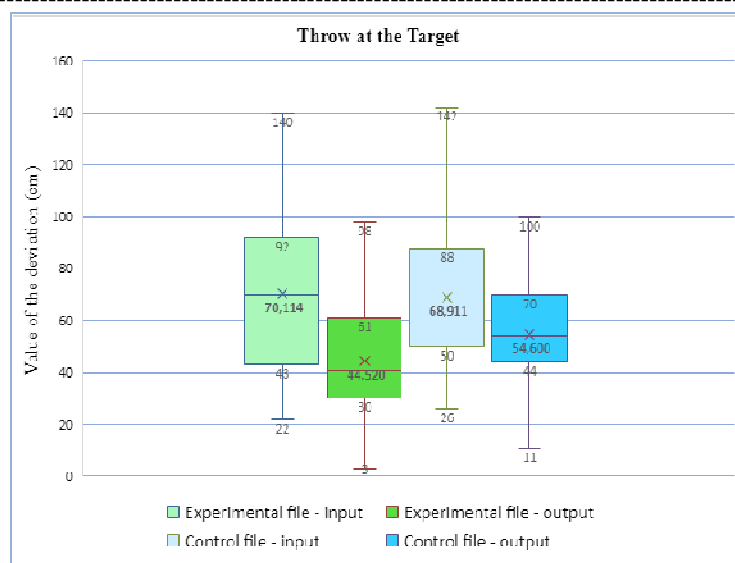


Figure 8 Test results: Throw at the Target

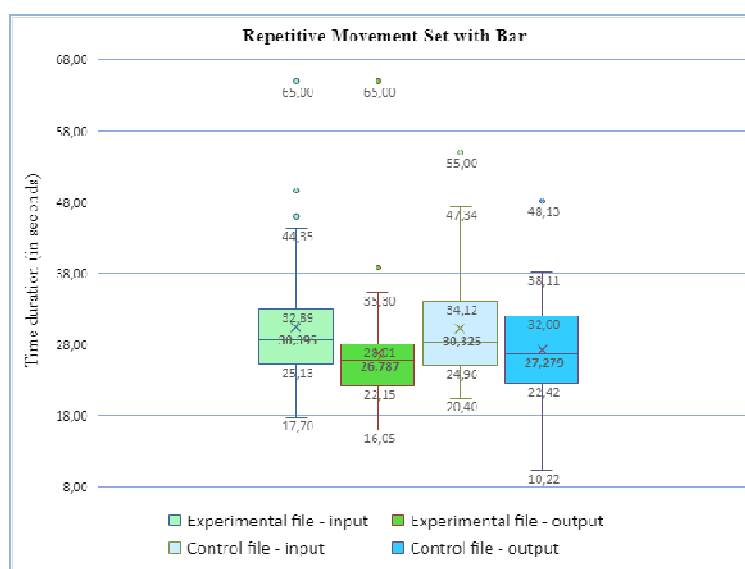


Figure 9 Test results: Repetitive Movement Set with Bar



Figure 10 Test results: Running to Goals with Changes of Direction

Discussion

By verifying the hypotheses using individual tests of our research, we managed to create a relatively wide complex of data on changes in the movement level of the probands, which in the case of the experimental group represent significant progress. 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, while sometimes these are studies more specifically focused on a smaller number of selected monitored indicators, as in the case of Kremnický (2009), dealt with monitoring the influence of athletic equipment on the development of gymnastic skills. In this work, using a one-group pedagogical experiment on a sample of 6-7-year-old boys, positive changes in the acquisition of selected gymnastic skills were recorded, while among the tools used were basic athletic elements such as the running alphabet, sprints, and jumps. The verification of the influence of Kids's Athletics on a wider complex of movement skills was dealt with by several authors in research from 2013 - 2015, which was conducted under the leadership of Professor Čillik. Through experiments on younger school-age probands, they found a significant impact of "Athletics for children" on general movement performance in children aged 7-9 years. In most cases, the most significant changes occurred in fitness abilities. When testing coordination skills, similar to our case, the most significant changes in reaction speed and kinesthetic-differentiation skills were recorded. We can also mention the research work of Čillik & Willwéber (2018) pointed out the positive influence of children's athletics on individual body composition parameters. 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. We were also interested in the comparison with the results of the research by the authors Abhaydev & Bhukara (2021) also carried out in a school environment aimed at verifying the impact of Kid's Athletics on selected movement abilities and skills. There were several statistically significant changes in favor of the experimental set. For example, in the case of speed and explosive strength, which in our case were also among the skills in which we recorded significant progress. A more complex research was created by a group of authors Blatsis, Saraslanidis, Barkoukis, Manou, Tzavidas, Palla & Hatzivassileiou (2016), who devoted themselves to verifying the influence of Kids's Athletics on the level of motor abilities and the degree of motivation to continue competing in athletic disciplines. Compared to the control group, the 11-12-year-olds had significantly more positive results in physical terms, as well as in motivation to continue athletic competition in their future.

In our research from the total number of 10 tests, with which we evaluated changes in the level of general motor performance of the probands, in some cases we recorded significant and in other cases only slight changes. The performances of both research groups in individual tests were expectedly better in the output measurements than at the beginning in the input measurements. It is based on the natural motor development that occurs during the entire school year in students of II. year expected. Based on this, the level of these changes is significant when evaluating and comparing the effectiveness of both research files. We evaluated this level based on statistical methods with a set significance level of $\alpha = 0.05$, guaranteeing a 95% certainty of the correctness of the decision.

Conclusions

When evaluating the results, we proceed from established hypotheses, which, based on the obtained data, provide an important overview of the effectiveness of the implemented incentives. From the total number of 10 hypotheses, expressing the relationship of both sets between performance in motor tests and the duration of individual stimuli, **8 hypotheses were confirmed and 2 were not**. This means that in the performances of the probands of the experimental group, in 8 cases, we recorded more significant performance progress than in the control group. In the remaining two cases, there were no statistically significant changes. Marked and statistically significant changes occurred in performance in all five fitness tests focused on: *aerobic endurance, explosive strength of the lower limbs, explosive strength of the upper limbs, acceleration speed, and dynamic strength of the trunk muscles*. In the coordination tests, we recorded the predicted results in three cases: *reaction speed, spatial orientation ability* and *kinesthetic-differentiation ability*. In the case of testing dynamic balance and the coordination ability of combining movements, there was also a significant improvement in the experimental set, but without statistically significant changes.

Based on summarizing the performances of the experimental and control group probands in the mentioned motor tests, we can evaluate changes in the levels of general motor performance. The results that we managed to obtain with the help of a two-group parallel pedagogical experiment show a significant positive influence of children's athletics and athletic games on the general physical performance of second-year primary education students. Since in the development of fitness abilities there was a significant improvement in the observed conditions and even in the case of coordination abilities, there were no negative results compared to the control group, but on the contrary, we can also talk about the fulfillment of our assumptions to a greater extent here, we note *the positive impact of the athletic program on the general movement performance*. As already indicated in this work, we consider the very nature and diversity of athletics, as well as its adaptation to the age needs of the students, to be an important determinant of the achieved results. In some cases, however, we also observe a relative similarity of movement structures occurring in some disciplines of children's athletics, athletic

games, and motor tests themselves. Also for that reason, we used a relatively large number of motor tests to achieve the credibility of our findings.

Despite the quantitative nature of our research, we consider it important to also mention an important motivational aspect. Although physical education is one of the favorite subjects of primary education students, it would often be a "problem" to find physical activities that would not be fun for students at the age of 7-8, but in the case of using children's athletics and athletic games, physical education lessons were a joy and the pupils' activity is even more pronounced. In some places, we were pleasantly surprised by the activity and determination of the students when performing some athletic (often physically demanding) activities. Also, for this reason, we consider the inclusion of such an athletic program in this age period to be justified and practically applicable.

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