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EFFECT OF INTERVENTION PROGRAMME ON CHANGES IN SELECTED PHYSICAL ABILITIES OF ELEMENTARY SCHOOL PUPILS

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Abstract

In our paper we focus on the BUBO intervention programme applied on elementary school pupils for the period of 2 years. The intervention programme we have chosen is a part of an extended grant for Physical Education and Sports lessons at the Elementary School in Ružomberok. The focus of the intervention programme is on health-oriented physical education.

The experimental group consisted of 49 pupils in the fifth and sixth grades, and included 28 girls and 21 boys. The original total number of the tested pupils was higher, but those who did not undergo the input or output evaluation for health reasons were excluded. The test took place in the school years 2015/2016 and 2016/2017. The programme was conducted in 15-minute time slots during Physical Education lessons three times a week.

The principal research method was a one-group pedagogical experiment. The primary method of verifying the mobility ability levels was the Eurofit battery tests. In the results section we established that both tested groups of girls and boys exhibited positive changes after the application of the BUBO intervention programme. Both groups have improved in standing broad jump and sit and reach tests.

Key words: *physical education, mobility abilities, intervention mobility programme, elementary school*

Introduction

The role and benefits of exercise cannot be overestimated nowadays. Sedentary lifestyles have reduced spontaneous physical activity, which should be encouraged in PE curricula. Compulsory physical education classes create a significant contribution to changing priorities, the effect of which is expected to have a beneficial impact on our health [1-3].

Growing awareness of the problem and support from responsible parents in cooperation with school managements and extracurricular organizations create an optimal space for positive attitudes and the development of permanent sporting habits in children and youth with an emphasis on a healthy lifestyle [1, 2, 4]. In terms of physical education and sports lessons, schools create a space where these habits can be effectively encouraged. In response to changing attitudes, both in Slovakia and abroad we can see a significant increase in the emphasis on improving motor skills [3-6]. In this area, novel and more interesting programmes are being developed to steer the attention of the youth away from all the technology that is an integral part of their lives nowadays [2, 3]. That is one of the reasons why we had decided to carry out research that deals with these issues, with the intervention programme BUBO being an important part of our physical education lessons [2, 4]. Intervention programmes have been implemented by physical education teachers all over the world. They have also been researched by scientists such as R. Sutherland, B. Beurden, and the World Health Organization (WHO) [3, 7, 8].

Interventions designed to increase physical activity in physical education classes were proven to be successful by studies conducted in the United Kingdom by Fairclough & Stratton. These studies have

incorporated high intensity activities into their physical education classes, for example, shuttle running or rope jumping. Colleagues from Sweden have also demonstrated that their intervention programme called "School in Motion" was a success in an article published in the Journal of School Health in 2014 [9-11].

This study was conducted with the objective of verifying the impact of the applied content of the intervention programme within physical education and sports lessons on selected physical abilities of pupils at the second stage of elementary school.

Hypothesis 1: we expect a statistically significant improvement in the standing broad jump test.

Hypothesis 2: we expect a statistically significant improvement in the sit and reach test.

Materials and methods

The research was conducted during two school years, 2015/2016 and 2016/2017, and covered 49 subjects, fifth and sixth graders, including 28 boys and 21 girls. The expected total number of participants was higher, but some participants were excluded due to health problems or absences in classes. The procedure of the intervention programme stipulates the inclusion of BUBO exercises, as an experimental factor, at the initial stage of each lesson, following the usual introductory and preparatory parts. Standard statistical characteristics, such as the arithmetic mean, the standard deviation, the minimum of measured values and the maximum of measured values were applied in the quantitative part of the analysis.

In the descriptive characteristics of the statistics we used the arithmetic mean (x) and the standard deviation (SD) from the measure of position. Normalization of data distribution was verified in all statistical analyses using the Shapiro-Wilk test. A paired t-test was used to determine the significance of the differences of the studied parameters between the input and output measurements. In the case of rejection of data distribution normality, the Wilcoxon nonparametric test was used for 2 dependent selections. The probability of type I error was set to $\alpha = 0.05$ in all analyses.

Characteristics of the experimental group

The BUBO intervention programme was established in order to develop the fitness and coordination skills in elementary school pupils. It makes use of elements of athletics, gymnastics and sports games. Its specificity lies in its arrangement of the means of movement so that it can be applied throughout the school year, without limiting the main content of the physical and sports education lesson. While the original program was primarily focused on the primary level of primary school, its updated version was meant to verify the inclusion of modified content in teaching in physical and sports education classes within the lower secondary education.

The exercise programme was included in the introduction of the main part of the lesson at a frequency of 2 times a week. The main part of the lesson was thus divided into two stages. In the first one, the exercises of the experimental stimulus were performed in class with their content modified in the range of 10 minutes in the same way for all grades. Individual exercises are presented in the form of a video recording on methodical DVDs, which are the property of the author of the BUBO project, but due to the scope and nature of the work, they are not part of this publication.

We focused on the development of fitness (strength and endurance) and fitness-coordination skills (mobility and speed) by combining them within the nature of the games, exercises and activities while maintaining the diversity of the standard teaching content. The equipment in the lessons, i.e. cones, mallets, gymnastic rings, steppers, ladders, obstacles, balls, and canvas targets, can be used in any environment as well as disassembled and assembled effortlessly.

Exercises within the experimental factor were supervised by teachers of physical and sports education in schools participating in the programme.

Diagnostics and tests used in the study

Broad jump test. During the broad jump test, the explosive power of the lower limbs was determined. The subjects were instructed to assume a slightly crouching position and jump forward from the take-off

line. The distance covered between the take-off line and the landing was measured. Two attempts were allowed.

Sit and reach test. This test was intended to determine the flexibility of the lower back and hamstring muscles. It involved the subject sitting in a forward bend position with the legs outstretched at the knees and the feet resting on the front wall of the test table. The subject slid his/her hands over an aluminium pole to roll it forward across the test table (D: 35x45x32cm). The distance covered by the shifted pole in the maximum forward bend was measured.

Results and discussion

In our first test, we compare input and output measurements in the standing broad jump test. In the group of boys in the 2015/2016 school year we observed statistically insignificant changes (t stat: -1,28759, t – crit: 2,0930), for which we have used paired T test. In the female group in the 2015/2016 school year, statistically significant changes were recorded (t stat: -2.77029, t – crit: 2.05529). Output measurements have shown minimal improvements: 4 cm in the male group and 6.1 cm in the female group. The effect size in the group of boys was d = -0.0320 and in the group of girls d = -0,3162, which according to Cohen (in: [4]) is considered to indicate low effects.

In the same test in the 2016/2017 school year statistically significant changes in boys were observed (p: 0.016) in an analysis using the Wilcoxon test. In the female group we also observe statistically significant changes (t stat: -2.89507, t - crit: 2.05529) for which we have used paired T test. Output measurements have shown minimal differences in the increase of performance, 4.9 and 6.4, for boys and girls respectively.

The differences in the input and output results confirmed the tests as significant in three tested groups at 5% significance level [2]. The effect size in the group of boys was d = -0.2286 and in the group of girls d = -0.25661, which according to Cohen (in: [4]) is considered low.

Table 1. Input and output measurements of the observed groups with significance differences in the standing broad jump test

	Boys 2015/2016	**Girls 2015/2016**	**Boys 2016/2017**	**Girls 2016/2017**
Input measurements	146.857143	128.892857	162.09524	143.92857
Output measurements	150.904762	135	167	150.37037
Input and output difference	+4.047619	+6.107143	+4.90476	+6.4418
Significance difference	$p > 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$

In our second test, we compare the input and output measurements in sit and reach tests. In the first male group in the 2015/2016 school year, we used a paired T test to find out that the changes were statistically insignificant (t stat: -0.19978, t – crit: 2.0930). In the female group in the same school year, we also concluded that there were statistically insignificant changes (t stat: -1.98221, t – crit: 2.05529). Output measurements in the male group in the 2015/2016 school year increased by 2.66cm and in the female group by 1.60cm. The effect size in the group of boys was d= -0.0320 and in the group of girls d = -0.1928, which according to Cohen (in: [4]) is considered to indicate a low effect size.

In our group of boys in the 2016/2017 school year, we also used a paired T test to determine that the changes were not statistically significant (t stat: -0.5571, t – crit: 2.0930). In the group of girls of the same school year, we also concluded that there were no statistically significant changes (p: 0.108). The Wilcoxon test was applied for those measurements. Output measurements in the group of boys in the 2016/2017 school year increased by 0.33cm and in the group of girls by 2.75cm. The effect size in the group of boys was

d = -0.06807 and in the group of girls the value was d = -0.1928, which according to Cohen (in: [4]) is a low effect size. The differences in the input and output results confirmed the tests as insignificant at a significance level of 5% [3].

Table 2. Input and output measurements of the observed groups in the sit and reach test

	Boys 2015/2016	**Girls 2015/2016**	**Boys 2016/2017**	**Girls 2016/2017**
Input measurements	12	17.25	17.4	20.928571
Output measurements	14.666667	18.857143	17.736842	23.68
Input and output difference	2.666667	1.607143	0.336842	2.751429
Significance difference	$p > 0.05$	$p > 0.05$	$p > 0.05$	$p > 0.05$

After analysing the data obtained in our standing broad jump tests and the sit and reach tests, we came to the conclusion based on the results in the 2015/2016 school year that those for three out of all four groups were significant at a significance level of 5%.

On the other hand, in the 2016/2017 school year in our standing broad jump test and the sit and reach tests, only one out of four tested groups was confirmed as significant at a significance level of 5%.

We have also reached the conclusion that all but one tested female group exhibit more significant improvement than the tested male groups, which may result from differences in the developmental stages of puberty and age differences [4, 6, 8].

Additionally, our data suggest that intervention programmes developed around the world are growing in significance in the field of physical education and health [1, 4, 5]. Hypothesis 1: we expect a statistically significant improvement in the standing broad jump test.

Statistically significant improvements were proven in one male group in the 2015/2016 school year and in both gender groups in the 2016/2017 school year. In the male group in the 2015/2016 school year, the changes recorded were statistically insignificant, therefore Hypothesis 1 was not confirmed.

Hypothesis 2: we expect a statistically significant improvement in the sit and reach test. No statistically significant changes were recorded in any of the groups tested in the sit and reach test. Therefore, it seems that hypothesis 2 was not confirmed.

Conclusion

In conclusion, the intervention programme applied in physical education and sport classes revealed positive effects in terms of changes in the explosive power of the lower limbs, tested with the standing broad jump test. Additionally, the results of the sit and reach test demonstrate that the intervention programme had positive effects on changes in the flexibility of the lower back and hamstring muscles.

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