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NUTRITIONAL STATUS AND PHYSICAL DEVELOPMENT OF HIGH-PERFORMANCE COMBAT ATHLETES IN LITHUANIA

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ABSTRACT

Background. Adequate nutrition is inseparable from athletes' optimal physical development and achieved sports performance. Preparing for the Olympic Games athletes' nutrition must meet certain requirements. Only under appropriate nutrition conditions athletes are enabled to maximize their adaptation to physical loads. Hypothesis: nutrition of Lithuanian high performance athletes in combat sports is adequate. *Research aim* was to assess nutrition profile and physical development of Lithuanian high performance athletes in combat sports.

Methods. During the competition preparation period of 2012, the actual diets of Lithuanian elite boxers (n = 14), and the Greco-Roman wrestlers (n = 29) were tested and evaluated. Body composition parameters and physical development of combat athletes were assessed using BIA tetra - polar electrode method. Athletes' actual diets were established using the actual dietary survey method.

Results. Muscle and fat mass indexes of boxers and Greco-Roman wrestlers, 7.5 ± 3.8 and 5.4 ± 2.0 respectively, show that effective complex preparation measures ensure optimal body condition status of athletes. Nevertheless, the diets of combat sport athletes do not meet the requirements: irrational use of proteins, not enough carbohydrates and polyunsaturated fatty acids, including omega-6 and omega-3 fatty acids, vitamins D, B_1, PP, minerals, manganese, zinc, calcium and copper, too much intake of fat, saturated fatty acids and cholesterol.

Conclusion. The existing diets of Lithuanian elite combat sports athletes cannot ensure their maximal adaptation to physical loads and must be optimized, individualized and adjusted, adding dietary supplements with extra carbohydrates, essential fatty acids, vitamins, minerals, and in exceptional cases, nutritional supplements with essential amino acids.

Keywords: high sports performance, combat sports, boxing, Greco-Roman wrestling, athlete nutrition, nutrition profile.

INTRODUCTION

Athletes and specialists training them should pay special attention to diets because proper nutrition is an integral part of optimal physical development of athletes and their achieved optimal performance (*American College of Sports Medicine*, 2009). Aiming at developing targeted measures to improve planning and management of training high performance athletes, it is clearly important to highlight the nutrition characteristics of different groups of athletes. Preparing for the Olympic Games, athletes' nutrition must meet certain requirements. Only under the conditions of adequate nutrition athletes can ensure their increased energy consumption and

the body's nutrient needs and thus allow maximum adaptation to physical loads.

There is a lack of research about the nutrition profile of Lithuanian combat athletes. So far, it has not been established whether nutrition of elite combat athletes meets the requirements, no recommendations have been provided for the optimization of combat athletes' diets. Therefore, in order to more effectively manage the training of Lithuanian combat athletes for excellence, their actual nutritional studies are among the most important and relevant. Only after the assessment of their nutrition profile it is possible to rationally combine it with organized training process so as to reach the best possible sports results and at the same time protect and preserve athletes' health. This determined our *research aim* – to assess actual nutrition profile and body composition of Lithuanian high performance boxers and Greco-Roman wrestlers.

METHODS

During the competition preparation period of 2012, the actual diets and physical development of Lithuanian elite combat athletes (n = 43) were evaluated. Research sample involved combat athletes who trained 155 ± 40 min a day (years of training – 7.2 ± 3.8). All in all, 95% of elite combat athletes included in the lists of those training for the Olympic Games were tested: 14 boxers and 24 Greco-Roman wrestlers. The mean age of research participants was 20.5 ± 3.8 years (18.4 ± 0.8 years for boxers and 21.5 ± 4.3 years for Greco-Roman wrestlers).

Athletes' body composition analysis was performed. Athletes' height was measured using electronic scales at the Lithuanian Sports Medicine Centre. Body weight and body weight of the individual components: lean body weight (kg and %), muscle mass (kg and %), fat mass (kg and %) measurements were performed in the Lithuanian Olympic Sports Centre applying body composition analyser X-SCAN and using BIA tetra-polar electrode method which had been used in the studies with other athletes used and recommended by other researchers (*American College of Sports Medicine*, 2009; Moon, 2013). In addition, athletes' body mass index (BMI) as well as muscle and fat mass index (MFMI) were calculated and assessed (Skernevičius, Raslanas & Dadelienė, 2004).

Athletes' actual diets were established using the actual dietary survey method. Respondents were surveyed by a trained interviewer applying in-depth interviews at the Lithuanian Olympic Sports Centre. Following the actual dietary survey method, consumed foods and dishes were recorded for each athlete. The actual nutrition survey was performed using special Atlas with pictures of foods and dishes, which contains different portions of foods and meals evaluated in grams in order to capture all food and dishes eaten as well as their and quantities (*Maisto produktų ir patiekalų porcijų nuotraukų atlasas*, 2007). Athletes' average daily food rations were measured, and their chemical composition and energy value were determined using the chemical composition tables (Sučiliene & Abaravičius, 2002). Nutrient intake was assessed taking into account the recommendations provided in the scientific literature (*American College of Sports Medicine*, 2009; Burke, 2010; Kreider et al., 2010). Assurance of the energy body needs was set by method of indirect alimony calorimetry (*American College of Sports Medicine*, 2009; Ainsworth et al., 2011). Intake of biologically active substances in the quantities of the recommended daily intake (RDI) was assessed by approved vitamins and minerals RDI in Lithuania (*Rekomenduojamos paros maistinių medžiagų ir energijos normos*, 1999).

In accordance with the recommendations, the adequacy of intake of nutrients to the recommended quantities was estimated and expressed as a percentage of the recommended amount (intake/ recommended amount x 100). As the RDI of vitamins and minerals depends on age and gender, the intake of these substances was expressed as a percentage (%) of the RDI (intake/RDI x 100). Referring to the intake levels of macronutrients and micronutrients, athletes were divided into appropriate groups: athletes consuming less than the recommended amount (or) RDI, consuming the recommended amount (or) RDI, and consuming more than the recommended amount (or) RDI.

Statistical data analysis was performed using the statistical programme SPSS (*Statistical Package for Social Sciences*) v. 15.0. Hypothesis about the data normality was tested as follows: a visual comparison of actual histograms with normal distribution was performed additionally applying Kolmogorov-Smirnov two-sample test and Shapiro-Wilk tests. Data analysis applied conventional descriptive statistics methods to calculate the arithmetic means and standard deviations (*SD*). Student's (t) test was used for the comparison of the mean values for two independent groups of respondents. Categorical data analysis

was performed using Fisher's exact test. The level of significance to verify the hypothesis was $\alpha = .05$. The difference of results was considered statistically significant when the p value obtained was less than or equal to .05.

RESULTS

The assessment of body composition of combat athletes showed that boxers' and wrestlers' body weight ranged within the normal values (Table 1). This is confirmed by the BMI of the Lithuanian Olympic boxers and wrestlers, which was 20.7 ± 3.2 kg/m^2 and 23.5 ± 3.2 kg/m^2 respectively. The duration, intensity, volume, developed physical abilities and characteristics of energy expenditure of the investigated athletes during their sports activities were similar. In case of long-term sports experience (in our research – 7.2 ± 3.8 years), in the preparation period for the Olympic Games, physical development of boxers and wrestlers should not particularly differ and must meet the nutrition profile requirements for high-performance athletes. Advanced athletes' body composition analysis showed that the lean body weight (%), fat mass (%) and muscle mass (%) of boxers and wrestlers were not different. Meanwhile boxers' BMI was significantly higher than the wrestlers' BMI (p = .001). Nevertheless, combat athletes according to MFMI were identical (boxers' MFMI was 7.5 ± 3.8, and the Greco-Roman wrestlers' MFMI – 5.4 ± 2.0, p = .070). MFMI indicators of athletes in both sports are rated as high, indicating a particularly good physical development status of Lithuanian elite combat athletes.

The analysis of the actual diets of athletes showed that the energy intake (EI) of combat athletes (3292.9 ± 800.6 kcal or 48.6 ± 15.1 kcal/kg) was slightly less than the daily estimated energy requirement (EER) (3628.2 ± 763.8 kcal or 51.6 ± 5.9 kcal/kg) (Table 2). This is confirmed by the percentage ratio of EI and EER. The overall negative ratio (EIx100/EER) – 94.4 ± 29.3% – is largely determined by the lower energy values of Greco-Roman wrestlers' rations. Meanwhile boxers' energy intake with food 101.3 ± 37.4% corresponds to the body's daily energy expenditure.

In our study, quantities of boxers' and wrestlers' consumed carbohydrates, proteins and fat do not different. Boxers' and Greco-Roman wrestlers' average consumption of carbohydrates are respectively 6.3 ± 2.1 g/kg and 5.6 ± 2.0 g/kg.

Table 1. **Anthropometric data of combat sports athletes in Lithuania**

Anthropometrics	Boxers (n = 14)	Greco-Roman wrestlers (n = 29)	Recom-mended	p value	t-test
	Mean ± *SD*				
Height (cm)	171.2 ± 7.6	176.8 ± 8.4		.044	–2.080
Body weight (BW) (kg)	62.1 ± 14.4	74.9 ± 14.9		.011	–2.666
Total body fluid, kg)	38.3 ± 5.9	45.1 ± 8.0		.007	–2.841
Total body fluid (% of BW)	62.4 ± 4.5	60.5 ± 3.0	55–65	.114	1.613
Lean body mass (kg)	53.0 ± 7.9	62.7 ± 11.1		.006	–2.904
Lean body mass (% of BW)	86.6 ± 6.4	84.1 ± 4.2	80–85	.136	1.520
Muscle mass (kg)	49.4 ± 7.1	58.3 ± 10.3		.006	–2.907
Muscle mass (% of BW)	80.7 ± 6.3	78.3 ± 4.1	74–80	.133	1.534
Fat mass (kg)	9.1 ± 7.0	12.3 ± 5.0		.095	–1.709
Fat mass (% of BW)	13.4 ± 6.4	15.8 ± 4.1	10–14	.155	–1.447
Body mass index (BMI) (kg/m$^{2)}$	20.7 ± 3.2	23.5 ± 3.2	18.5–24.9	.010	–2.712
Muscle and fat mass index (MFMI)	7.5 ± 3.8	5.4 ± 2.0	4.7–6.0	.070	1.938

Note. BW – body weight.

Table 2. **Energy intake of combat sports athletes in Lithuania**

Estimated energy requirement and energy intake	Boxers	Greco-Roman wrestlers	Total
	Mean ± *SD*		
Estimated Energy Requirement (EER) (kcal)	3176.8 ± 722.4	3846.2 ± 694.0	3628.2 ± 763.8
Estimated Energy Requirement (EER) (kcal/kg/BW)	51.6 ± 8.4	51.6 ± 4.4	51.6 ± 5.9
Energy intake (EI) (kcal)	3034.6 ± 711.0	3417.6 ± 823.0	3292.9 ± 800.6
Energy intake (EI) (kcal/kg/BW)	51.4 ± 17.1	47.2 ± 14.2	48.6 ± 15.1
% EEI	101.3 ± 37.4	91.0 ± 24.5	94.4 ± 29.3

Note. BW – body weight.

Regardless of the branch of sport, combat athletes consume the same amount of proteins (1.7 ± 0.6 g/kg) and similar amounts of essential amino acids, fat, saturated and polyunsaturated fatty acids (Table 3).

A more detailed analysis of the research results confirmed that the recommended amount of carbohydrates is not consumed by 74.4% of athletes, polyunsaturated fatty acids – 55.8%, omega-6 fatty acids – 32.6%, omega-3 fatty acids – 100.0% combat athletes (Table 4). Meanwhile, 60.5% combat athletes consume too much fat, 100.0% – too much saturated fatty acid, and 81.4% – too much cholesterol. It should be noted that proteins are consumed irrationally by combat athletes. Dietary intake of 46.5% athletes is too low and 41.9% – too high in protein content. Only 11.6% of the Lithuanian elite combat athletes consume proteins and essential amino acids according to the recommendations. More often athletes' diets lack essential amino acids leucine and phenylalanine. In

Table 3. **Macronutrient intake of combat sports athletes in Lithuania**

Macronutrients	Boxers	Greco-Roman wrestlers	RDI
	Mean ± *SD*		
Carbohydrate (g/kg/BW)	6.3 ± 2.1	5.6 ± 2.0	7.0–10.0
Protein, g/kg/ BW	1.7 ± 0.6	1.7 ± 0.6	1.6–1.8
Non-essential amino acids (mg/kg/BW)	643.6 ± 227.7	614.8 ± 214.4	436–491
Valine (mg/kg/BW)	96.3 ± 34.9	92.5 ± 31.8	63–71
Leucine (mg/kg/BW)	136.9 ± 48.5	131.8 ± 48.3	95–106
Isoleucine (mg/kg/BW)	80.5 ± 29.2	77.2 ± 26.8	48–55
Lysine (mg/kg/BW)	119.6 ± 40.8	112.5 ± 38.7	73–82
Methionine (mg/kg/BW)	38.2 ± 13.3	37.5 ± 14.0	24–27
Threonine (mg/kg/BW)	68.7 ± 24.7	65.6 ± 22.0	36–41
Tryptophan (mg/kg/BW)	23.6 ± 9.1	21.5 ± 7.2	10–11
Phenylalanine (mg/kg/BW)	79.7 ± 29.0	76.2 ± 26.9	61–68
Histidine (mg/kg/BW)	51.2 ± 18.4	49.7 ± 17.9	24–27
Fat (%)	36.6 ± 5.8	38.8 ± 6.3	20–35
Saturated fatty acids (%)	14.5 ± 2.5	14.2 ± 2.4	≤ 10
Polyunsaturated fatty acids (%)	5.3 ± 1.3	6.4 ± 1.7	6–10
Omega-6 fatty acids (%)	4.8 ± 1.3	5.9 ± 1.6	5–8
Omega-3 fatty acids (%)	0.3 ± 0.1	0.4 ± 0.1	1–2
Cholesterol (mg)	754.3 ± 446.4	789.7 ± 361.4	≤ 500

Note. BW – body weight, RDI – recommended daily intake.

Table 4. **The distribution of athletes' (in per cent) intake of macronutrients**

Macronutrients	Intake of macronutrients		
	Is less than RDI	Meets the RDI	Exceeds the RDI
	(%)	(%)	(%)
Carbohydrate (g/kg/BW)	74.4	20.9	4.7
Protein, g/kg/ BW	46.5	11.6	41.9
Non-essential amino acids (mg/kg/BW)	20.9	11.6	67.4
Valine (mg/kg/BW)	16.3	11.6	72.1
Leucine (mg/kg/BW)	25.6	7.0	67.4
Isoleucine (mg/kg/BW)	11.6	9.3	79.1
Lysine (mg/kg/BW)	14.0	7.0	79.1
Methionine (mg/kg/BW)	16.3	9.3	74.4
Threonine (mg/kg/BW)	7.0	4.7	88.4
Tryptophan (mg/kg/BW)	4.7	2.3	93.0
Phenylalanine (mg/kg/BW)	32.6	9.3	58.1
Histidine (mg/kg/BW)	7.0	2.3	90.7
Fat (%)	–	39.5	60.5
Saturated fatty acids (%)	–	–	100.0
Polyunsaturated fatty acids (%)	55.8	39.5	4.7 (2)
Omega-6 fatty acids (%)	32.6	60.5	7.0 (3)
Omega-3 fatty acids (%)	100.0	–	–
Cholesterol (mg)	–	18.6	81.4 (35)

Note. BW – body weight.

order to assess the actual dies of combat athletes, we analysed the composition of biologically active elements in their rations (Table 5). The evaluation of boxers' and the Greco-Roman wrestlers' body supply with vitamins and minerals, it appeared that 88.4% of athletes do not get vitamin D with food. Average intakes of vitamin D for boxers and Greco-Roman wrestlers respectively equal to 3.3 ± 1.4 mg and 3.2 ± 1.6 mg, do not reach the recommended amount and represent only 63–66% RDI. In addition, regardless of the branch of sport, 34.9% combat athletes consume vitamin B1, 23.3% – vitamin PP, 30.2% – calcium, 34.9% – zinc, 60.5% – manganese and 23.3% – copper below the RDI with their dietary intake (Table 6).

Table 5. **Micronutrient intake of combat sports athletes in Lithuania**

Vitamins and minerals	Boxers		Greco-Roman wrestlers	
	Intake	% of RDI	Intake	% of RDI
Vitamin A (mg)	1.1 ± 0.4	107.0 ± 36.2	1.2 ± 0.4	132.7 ± 56.0
Vitamin D (μg)	3.3 ± 1.4	66.0 ± 28.8	3.2 ± 1.6	63.6 ± 31.8
Vitamin E (mg)	17.5 ± 6.7	178.4 ± 67.3	22.1 ± 6.6	226.9 ± 68.0
Vitamin C (mg)	146.8 ± 127.7	247.0 ± 212.0	109.5 ± 94.4	184.6 ± 154.9
Vitamin B_1 (mg)	1.8 ± 0.6	127.4 ± 45.1	2.2 ± 1.0	128.0 ± 54.9
Vitamin B_2 (mg)	2.7 ± 0.9	159.4 ± 57.0	2.9 ± 1.0	169.4 ± 60.0
Vitamin B_6 (mg)	3.4 ± 1.0	171.8 ± 49.5	3.3 ± 0.9	183.9 ± 58.0
Vitamin B_{12} (mg)	5.3 ± 2.6	175.7 ± 87.5	6.6 ± 2.9	218.4 ± 95.6
Vitamin B_9 (mg)	254.8 ± 58.9	130.7 ± 33.3	280.0 ± 117.7	128.8 ± 57.6
Vitamin PP (mg)	23.0 ± 4.4	129.0 ± 26.5	26.5 ± 7.1	130.6 ± 38.2
Sodium (mg)	3786.4 ± 1271.8	252.4 ± 84.8	4762.2 ± 1683.3	317.5 ± 112.2
Potassium (mg)	4761.7 ± 1634.2	190.5 ± 65.4	4523.4 ± 1489.1	180.9 ± 59.6
Calcium (mg)	1081.2 ± 423.9	135.1 ± 53.0	1269.2 ± 489.9	148.6 ± 58.3
Magnesium (mg)	422.9 ± 118.8	106.6 ± 29.2	510.1 ± 146.3	142.7 ± 49.2
Zinc (mg)	15.1 ± 3.5	100.6 ± 23.3	17.2 ± 4.8	124.2 ± 40.5
Phosphorus (mg)	1662.9 ± 414.2	138.6 ± 34.5	1931.3 ± 502.8	178.1 ± 55.4
Manganese (mg)	4.2 ± 1.7	83.5 ± 33.2	5.0 ± 1.9	99.7 ± 37.2
Iron (mg)	24.4 ± 6.3	203.1 ± 52.8	24.4 ± 6.0	218.2 ± 65.5
Cooper (mg)	2.3 ± 0.5	117.1 ± 23.9	2.5 ± 0.7	124.5 ± 34.5

Note. RDI – recommended daily intake.

Table 6. **The distribution of athletes' (in per cent) intake of micronutrients (according to the type of combat sports)**

Vitamins and minerals	Boxers		Greco-Roman wrestlers		Total		Difference between group 1 and group 2 (*p* value*)
	Intake is less than RDI	Intake meets or exceeds the RDI	Intake is less than RDI	Intake meets or exceeds the RDI	Intake is less than RDI	Intake meets or exceeds the RDI	
Vitamin A (mg)	57.1	42.9	27.6	72.4	37.2	62.8	.050
Vitamin D (μg)	85.7	14.3	89.7	10.3	88.4	11.6	.531
Vitamin E (mg)	7.1	92.9	0.0	100.0	2.3	97.7	.326
Vitamin C (mg)	7.1	92.9	34.5	65.5	25.6	65.5	.049
Vitamin B_1 (mg)	42.9	57.1	31.0	69.0	34.9	65.1	.507
Vitamin B_2 (mg)	14.3	85.7	3.4	96.6	7.0	93.0	.243
Vitamin B_6 (mg)	14.3	85.7	3.4	96.6	7.0	93.0	.243
Vitamin B_{12} (mg)	28.6	71.4	10.3	88.7	16.3	83.7	.142
Vitamin B_9 (mg)	14.3	85.7	34.5	65.5	27.9	72.1	.050
Vitamin PP (mg)	14.3	85.7	27.6	72.4	23.3	76.7	.287
Sodium (mg)	–	100.0	–	100.0	–	100.0	–
Potassium (mg)	7.1	92.9	3.4	96.6	4.7	95.3	.550
Calcium (mg)	28.6	71.4	31.0	69.0	30.2	69.8	.581
Magnesium (mg)	42.9	57.1	10.3	89.7	20.9	79.1	.022
Zinc (mg)	35.7	64.3	34.5	65.5	34.9	65.1	.589
Phosphorus (mg)	14.3	85.7	0.0	100.0	4.7	95.3	.101
Manganese (mg)	71.4	28.6	55.2	44.8	60.5	39.5	.247
Iron (mg)	0.0	100.0	0.0	100.0	–	100.0	–
Cooper (mg)	14.3	85.7	27.6	72.4	23.3	76.7	.287

Note. group 1 – boxers (%), group 2 – Greco-Roman wrestlers (%), RDI – recommended daily intake, * – Fisher's exact test.

The assessment of vitamin and mineral intake of different branches of combat sport revealed differences (Table 6). Significantly higher proportion of boxers does not get the recommended dietary vitamin A (57.1%) (p = .050) and the mineral magnesium (42.9%) (p = .022) were found. Meanwhile, intake of vitamin C (p = .049) and vitamin B9 (p = .050) is insufficient in the Greco-Roman wrestlers' (34.5%) diets.

DISCUSSION

Proper nutrition is one of the key determinants of the adaptation to physical loads. One of the most important nutritional requirements for athletes is the optimal supply of carbohydrates for athletes' bodies (Burke, 2010). The findings of our study show that Lithuanian elite combat athletes do not get the recommended carbohydrate content of 7–10 g/kg body weight with food. A similar carbohydrate intake (3.9–4.7 g/kg) not reaching the recommended amount has been established for combat athletes in Greece, France, Spain, England, and Israel (Finaud et al., 2006; Prouteau, Benhamou, & Courteix, 2006 ; Fleming & Costarelli, 2007; Simatos, 2007; Sillero Quintana, Garcia Aparicio, Torres Garcia, & Garrido Pastor, 2010).

Low-carbohydrate diets are often associated with excessive consumption of fat. No exceptions are Lithuanian elite combat athletes traditionally taking too high-fat foods. We found that the combat athletes consumed too much fat and saturated fatty acid. In contrast, in other countries combat athletes consume lower-fat foods and the energy value supplied by fat in their nutrition (26–35%) does not exceed the recommended dose (20–35%) (Finaud et al., 2006; Rossi, Goya, Matayoshi, Pereira, & Bernardo da Silva, 2009; Clarys, Ramon, hagman, Deriemaeker, & Zinzen, 2010; Martins & e Rocha, 2010; Sillero Quintana et al., 2010). Besides, in other states combat athletes consume only 307–566 mg of cholesterol and this amount does not exceed the recommended one (Martins & e Rocha, 2010; Sillero Quintana et al., 2010). Meanwhile, our research participants consumed cholesterol twice as much (754–790 mg) as in other countries, and over 1.5 times the recommended amount (≤ 500 mg).

According to the research data about athlete nutrition, high contents of fat consumption are not associated with the increase of cholesterol and triacylglycerol concentrations in the blood, when the energy intake with food does not exceed the energy expenditure. Consuming increased fat content in the diet, athletes' fat mass, resting heart rate, blood pressure, oxidative stress and lipid peroxidation in the body do not increase and has no negative impact on the immune system of athletes (Venkatraman & Pendergast, 2001). On the other hand, strenuous exercise promotes amino acid methionine metabolism and increases the level of the homocysteine in the body, which is the stimulating risk factor of cardiovascular disease emergence. Higher homocysteine levels are also caused by higher fat and saturated fat intake (Czajkowska, Lutosławska, Mazurek, Ambroszkiewicz, & Zmijewskiet, 2011). Thus, it would be reasonable for Lithuanian Olympic combat athletes to reduce fat and saturated fatty acids in their diets and increase the intake of deficient polyunsaturated fatty acids (especially omega-3 fatty acids).

In addition, using too much fat Lithuanian elite combat athletes consume too little carbohydrates. Low-carbohydrate diet slows down the body's adaptation to physical loads (Hawley, Burke, Phillips, & Spriet, 2011), weakens the immune system, and athletes faster start feeling fatigue during exercise (Burke, 2010). It should be noted that Lithuanian elite combat athletes train 3–4 hours every day and overcome physical loads in the work area of high intensity. Consumption of a small amount of carbohydrates does not fully restore endogenous carbohydrate stores in the body between sports practice sessions and requires more efforts of the central nervous system to deal with physical stress; it is also a risk factor of overtraining (Burke, 2010).

One of the sports nutrition requirements is an adequate intake of proteins and essential amino acids. As shown by the research results, in other countries dietary protein deficiency in combat athletes is rarely determined (Simatos, 2004; Finaud et al., 2006; Fleming & Costarelli, 2007). On the contrary, in many countries - Spain, Belgium, Brazil, Israel and Iran – the dietary intake of combat athletes meets or exceeds the recommended protein content (Rossi et al., 2009; Clarys et al., 2010; Sillero Quintana et al., 2010; Moran et al., 2012; Daneshvar et al., 2013). Our research results are different. We found that more than 40% of our surveyed Lithuanian combat athletes consume insufficient of or excessive amounts of protein. It can be noted that protein

deficiency in Lithuanian combat athletes' nutrition is one of the nutritional disadvantages potentially causing slower adaptation to physical loads. Therefore, supplementation of essential amino acids in food supplements in exceptional cases is reasonable and advisable. On the other hand, higher amounts of proteins than the recommended ones do not slow down the body's adaptation to physical loads. Depending on the duration, intensity, and volume of physical loads, higher protein content in the diet may be recommended for combat athletes. Scientific studies have shown that body's need for protein in elite athletes increases, and the dietary intake of 1.8–2.0 g/kg body weight of protein is considered optimal (Burd, Tang, Moore, & Philips, 2009).

With their food athletes must consume not only the recommended nutrients, but also vitamins and minerals. In our study, Lithuanian combat athletes' diets lack vitamin D, B1, PP, minerals, manganese, zinc, calcium and copper. Similarly, in other countries combat athletes' lack vitamins B1 and D, minerals, calcium and zinc. Insufficient amount of vitamin B1 in the diets of athletes in countries is 1.0–1.4 mg (Filaire, Maso, Degoutte, Jouanel, & Lac, 2001; Simatos, 2004; Martins, e Rocha, 2010), vitamin D – 2.8–3.0 µg (Martins, e Rocha, 2010; Moran et al., 2012), calcium – 600–1000 mg (Simatos, 2004; Fleming & Costarelli, 2007; Martins & e Rocha, 2010; Moran et al., 2012), and zinc – 11.9–12.5 mg (Moran et al., 2012; Daneshvar et al., 2013). In addition, our obtained results also revealed inequalities arising from the branch of sport. It turned out that boxers' diets lacked vitamin A and mineral magnesium, and Greco-Roman wrestlers' diets lacked vitamins C and B9. It should be noted that in other countries, the deficiency of vitamins C, B9 and magnesium has not been determined in combat athletes (Simatos, 2004; Rossi et al., 2009; Martins & e Rocha, 2010; Moran et al., 2012; Daneshvar et al., 2013), which shows that in other countries athletes optimize the supply of their bodies with vitamins and minerals. There is no doubt that nutrition of our Lithuanian combat athletes must be optimized and additional vitamins and minerals in food supplements must be consumed.

CONCLUSIONS

1. Under the influence of complex training tools, Lithuanian elite boxers and Greco-Roman wrestlers have developed an optimal physical condition, but the peculiarities of current athletes' diets still cannot induce maximal adaptation to long-term and (or) an intensive, large-scale physical loads. Combat athletes' diets do not fully meet the requirements of proper nutrition due to irrational use of proteins, not enough carbohydrates, polyunsaturated (omega-6 and omega-3) fatty acids, vitamin D, B_1, PP, minerals, manganese, zinc, calcium and copper, and excessive consumption of fat, saturated fatty acids and cholesterol. Boxers' diets are deficient in vitamin A and magnesium, and the Greco-Roman wrestlers' diets lack vitamin C and B_9.
2. Nutrition of Lithuanian elite combat athletes must be optimized, individualized and adjusted. In order to ensure optimal body needs with nutrients and vitamins as well as minerals, it is recommended to supplement boxers' and Greco-Roman wrestlers' diets with carbohydrates, essential fatty acids, vitamins, minerals, dietary supplements, and in exceptional cases, with essential amino acids, and nutritional supplements.

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THE SHIFT OF STUDENTS ATTITUDES TOWARDS THE TEACHER OF PHYSICAL EDUCATION

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ABSTRACT

Background. The aim of the research was to identify the shift of the attitude of students towards the physical education teacher. Hypothesis of the research: Students attending compulsory physical education classes view physical education teacher worse than those who have a possibility of physical education as an optional subject at the university.

Methods. The first study was conducted in the spring semester of 2009 and the second study was conducted after four years (in the spring semester of 2013). First year students took part in the research, 362 females participated in the first study and 343 females in the second study. The total number of male participants in the first study was 129, in the second study – 169. Research participants were students selected from several universities using convenience sampling strategy. The data were analysed using the statistical data software package SPSS 21.0 for Windows.

Results. The analysis of the research data about the most appealing traits of physical education teacher revealed that male students appreciated the teacher's ability to be calm, interested in each student, to be creative and be able to apply innovations.

Conclusions. For students the most appealing traits of physical education teachers are good knowledge of the subject and friendliness. The female students also emphasized the importance of good appearance of the teacher of physical education as well as good interaction with the group, the male students appreciated a good sense of humour and possibility of easy communication with the teacher. In four years' time students' attitudes towards the teacher of physical education improved.

Keywords: students' attitudes, physical education teacher, university physical education.

INTRODUCTION

The teacher's profession just like any other is judged by its psychological content, e.g. by its the object, aim, methods, motivation, product and the result (Зимняя, 2006). The object of teacher's performance is a student who manages to take subjective position and become an active participant of the educational process with their own purposes, beliefs, motives, logical behaviours and whose role is to acquire the given information during the learning process (Adamonienė, Daukilas, Krikščiūnas, Maknienė, & Palujanskienė, 2001, 2003). Therefore, speaking about deep and meaningful understanding of the teacher's role in the educational process it could be claimed that in the social environment of a teacher they are the best seen by the direct participants of the same process – students. The nature of the educational process predicts a close interaction between these two subjects, thus educational psychology often deals with the topic of the subjects of the common educational process; as a student and a teacher are the elements of the same link where the major difference is that they are located on the different sides of that link (Зимняя, 2006).

The most important factor for physical education in higher school is physical education teacher, since his/her qualifications, educational excellence depends on how he is able to create

a positive learning environment and talk about the emotional aspects (Tamošauskas, 2007; Poteliūnienė, 2010). Even though it is doubtful whether the positive students' attitude towards the teacher is significant during the process of conveying and receiving information, still there is a lack of the research carried out to identify the male and female students' attitudes towards the teacher in Lithuania especially physical education teacher's work, behaviours and students' position.

The aim of the research was to identify the shift of the attitudes of students towards the physical education teacher.

Hypothesis of the research. Students attending compulsory physical education classes view physical education teacher worse than those who have a possibility of physical education as an optional subject at the university.

METHODS

Research methods applied were a questionnaire survey and statistical analysis. Students' attitudes towards studies and the teacher of physical education were established with the help of the provided questionnaire.

The first study was conducted in the spring semester of 2009, and the second study was conducted after four years (in the spring semester of 2013). First year students took part in the research (Table 1).

Table 1. **Characteristics of subjects**

	Study	Males	%	Females	%
Gender	I	n = 129	26.3	n = 362	73.7
	II	n = 169	33.3	n = 343	67.0
Age	I	< 20 > 20	84.5 15.5	< 20 > 20	85.6 14.4
	II	< 20 > 20	52.1 47.9	< 20 > 20	76.7 23.3

There were 362 female students who participated in the first study and 343 females in the second study. The total number of male participants in the first study was 129 and 169 in the second study. The research sample included a representative group of students selected from several universities using convenience sampling strategy.

The prevailing characteristics of the physical education teacher were determined with the help of 11 statements in the questionnaire. Students were asked to choose one of the options from "strongly agree" (5 points) to "strongly disagree" (1 point). Internal consistency of the whole scale, Cronbach's alpha was .91.

The data were analysed using the statistical data software package *SPSS 21.0 for Windows.* Chi-square test (χ^2) was used to evaluate statistical differences between the groups. The significance level was set at $p < .05$.

RESULTS

While analysing the responses of the female students about the appealing traits of the physical education teacher it was found that the majority of responses to the questionnaire statements differed a lot ($p < .05$) in the first study and in the second study (Table 2). The analysis of the female students' responses revealed that students most of all liked that the teacher of the physical education had good knowledge of the subject; responses "strongly agree" and "agree" were marked by 93.3% of the participants in the first study and 91.3% of the second study participants, ($p = .399$). Secondly, the students pointed out the importance of the teacher's being friendly (86.9 and 87.7% of the female students respectively). However, the responses about the third most important trait of the physical education teacher differed. During the first study it was found that the good shape of a physical education teacher was a significant factor for the students (77.7%) but the second study revealed that the interaction between the physical education teacher and the students was important (80.5%). The analysis of the research data about the appealing traits of the physical education teacher revealed that the female students wanted the teacher to have a good sense of humour (responses "strongly agree" and "agree" were chosen by 77.2 and 77.1% of females respectively, $p = .985$).

Analysing the data received from the male students about the most appealing traits of physical education teacher it was established that male students' responses differed from those of the female students ($p < .05$) (there were no significant differences between the responses to the statements about the good shape of physical education teacher, friendliness and considering students' opinions while giving the tasks) (Table 3). Both studies revealed that male students mostly appreciated the friendliness of the physical education teacher: responses "strongly agree" and "agree" in the first study were chosen by 82.5% of

Table 2. **Female students' responses to the question "What traits of the physical education teacher do you like?"**

No.	Statements	Study	Responses			χ^2 and *p* values
			Strongly agree/agree	I don't know	Disagree/ strongly disagree	
1.	Nice shape	I	77.7	20.9	1.4	$\chi^2(2) = 26.070$
		II	60.4	34.8	4.8	$p = .001$
2.	Friendliness	I	86.9	11.7	1.4	$\chi^2(2) = 0.387$
		II	87.7	11.4	0.9	$p = .824$
3.	Good knowledge of the subject	I	93.3	6.7	0	$\chi^2(2) = 1.835$
		II	91.3	8.4	0.3	$p = .399$
4.	Calm	I	61.6	33.4	5.0	$\chi^2(2) = 2.075$
		II	56.2	38.4	5.4	$p = .354$
5.	Interaction with the group	I	74.9	18.9	6.1	$\chi^2(2) = 6.536$
		II	80.5	17.1	2.4	$p = .038$
6.	Sense of humour	I	77.2	20.3	2.5	$\chi^2(2) = 0.031$
		II	77.1	20.2	2.7	$p = .985$
7.	Interested in every student	I	40.9	39.6	19.5	$\chi^2(2) = 16.619$
		II	55.1	33.7	11.1	$p = .001$
8.	Easy-going	I	69.4	27.0	3.6	$\chi^2(2) = 5.338$
		II	77.1	20.5	2.4	$p = .069$
9.	Creative	I	46.8	46.5	6.7	$\chi^2(2) = 8.429$
		II	57.8	37.0	5.1	$p = .015$
10.	Applies novelties	I	55.2	34.7	10.1	$\chi^2(2) = 4.337$
		II	60.4	33.5	6.0	$p = .114$
11.	Considers students' opinions while distributing the tasks	I	57.3	32.7	10.1	$\chi^2(2) = 8.051$
		II	67.7	25.5	6.8	$p = .018$

Table 3. **Male students' responses to the question "What traits of the physical education teacher do you like?"**

No.	Statements	Study	Responses			χ^2 and *p* values
			Strongly agree/agree	I don't know	Disagree/strongly disagree	
1.	Nice shape	I	54.3	32.3	13.4	$\chi^2(2) = 4.493$
		II	60.1	33.7	6.1	$p = .106$
2.	Friendliness	I	85.2	10.9	3.9	$\chi^2(2) = 1.774$
		II	89.7	8.5	1.8	$p = .412$
3.	Good knowledge of the subject	I	82.9	12.4	4.7	$\chi^2(2) = 7.839$
		II	87.3	12.7	0	p = .020
4.	Calm	I	70.1	22.8	7.1	$\chi^2(2) = 6.110$
		II	81.1	16.5	2.4	$p = .047$
5.	Interaction with the group	I	71.3	21.7	7.0	$\chi^2(2) = 6.767$
		II	83.0	14.5	2.4	$p = .034$
6.	Sense of humour	I	73.4	16.4	10.2	$\chi^2(2) = 7.289$
		II	74.5	22.4	3.0	$p = .026$
7.	Interested in every student	I	58.1	28.7	13.2	$\chi^2(2) = 8.539$
		II	69.1	26.7	4.2	$p = .014$
8.	Easy-going	I	69.0	21.7	9.3	$\chi^2(2) = 12.809$
		II	84.3	13.9	1.8	$p = .002$
9.	Creative	I	51.9	39.5	8.5	$\chi^2(2) = 7.567$
		II	63.8	33.7	2.5	$p = .023$
10.	Applies novelties	I	54.7	32.8	12.5	$\chi^2(2) = 11.029$
		II	69.9	26.4	3.7	$p = .004$
11.	Considers students' opinions while distributing the tasks	I	65.3	28.2	6.5	$\chi^2(2) = 2.288$
		II	70.9	26.1	3.0	$p = .319$

male respondents and 89.7% in the second study. Moreover, the male respondents preferred teachers who knew their subject well (responses "strongly agree" and "agree" were chosen by 82.9% of male respondents in the first study and 87.3% in the second study, $\chi^2(2) = 7.839$, $p = .020$), good sense of humour (respectively 73.4 and 74.5%, $\chi^2(2) = 7.289$, $p = .026$); teacher's ability to be easy-going (responses "strongly agree" and "agree" were chosen by 69.0 and 84.3% of the male students respectively, $\chi^2(2) = 12.809$, $p = .002$), interaction with the group (71.3 and 83.0% of male students, $\chi^2(2) = 6.767$, $p = .034$).

The analysis of the research data about the most appealing traits of physical education teacher revealed that male students appreciated the teacher's ability to be calm, interested in each student, to be creative and be able to apply innovations.

DISCUSSION

The most important factor for physical education in the institution of higher education is a physical education teacher since their qualifications and educational excellence depend on how they are able to create a positive learning environment (Miškinis, 2000; Tamošauskas, 2007; Poteliūnienė, 2010). The majority of scientists deal with students' attitudes towards the university studies, and the importance of the teacher (Pukelis & Pileičikienė, 2005; Savickienė, 2005; Louw, 2008; Balasooriya, Hughes, & Toohey, 2009; El Hassan, 2009; Ellis, Ginns, & Piggott, 2009; Pamuk & Thompson, 2009; Bobrova, Grajauskas, & Norkus, 2010) stressing the fact that good academic results, teacher competences and the importance of the clear objectives are of great importance. The results of the research proved that the most important characteristic of a teacher of physical education is knowledge of their subject and friendliness with the students. According to Tamošauskas (2012), the personality of the student should not be considered as the object of educational performance and the activity must be organized in such a way that the innate powers could be revealed. If the education is organized relying on these principles the psychological pressure and constraint are illuminated from the educational process. Partnership, democratic style of communication and the norms of human relationships are the most significant factors of the educational performance.

Our hypothesis that students attending compulsory physical education classes view physical education teacher worse than those who have the possibility of physical education as an optional subject at the university was confirmed.

Physical education teacher's ability to interact with a group student, to have a sense of humour and good physical appearance are very important to our respondents. Bobrova, Grajauskas and Alūzas (2012), Neimane and Rupeika (2012) revealed that according to the students the most important qualities are: teacher's communication skills, interesting content of the classes and original representation of information. Introduction of the evaluating criteria and the individual tasks are also considered as some of the most important advantages. These authors suggest that students notice teacher's effort to discuss the learning process with them, analyse their academic achievements, learning materials, students also agree with the distribution of individual work, they appreciate teacher's effort to motivate them. Our survey results confirm this.

Constant communication and close teacher-student interaction encourage people to form certain attitudes towards each other. The nature of teaching process organization projects students' better and clearer understanding of the teacher as the teacher in the communication process is believed to be in the dominant position and the teacher is in charge of the process direction. Hence, the understanding of the teacher is grounded according to this interaction and the fulfilment of functions as well as the evaluation of the personal traits. However, it is possible to claim that this category is rather subjective, complicated and complex as it is determined by such diverse factors as students' senses, assumptions, expectations and experiences which are affected by the environmental context, students' psychology and possible halo effect (Mackelo, 2009; Druteikienė & Mackelo, 2010). The teacher is not only an information provider, but also the manager and supervisor-controller of the student's knowledge (Morkūnienė & Jucevičienė, 2010). According to Liukinevičienė (2003), the aim of the university is the priority relationship between the student who is an active participant in the knowledge creation process and ever improving teacher (consultant, advisor, intermediator of change). The relationship develops and finally turns into student/teacher/employer relationship.

From the description of teacher's profession, the aims which have creative background and aim to influence students' psychological development as well as students' competences arise. However, they are not standard, not patterned, stereotypical or the same and they totally depend on the social background changes (new technologies, the educational reform, changes in the law system). This is a complex element of professional context disclosure which links cognition (disclosure of phenomenon interaction, ties and significance), education (developing students' competences of performance), nurturing (meant to form individual's emotions, values, behaviour worldview and gospels) and aims (Adamonienė et al., 2001, 2003).Therefore it is possible to form such essential teachers' performance aims as suitable conditions for students to absorb the culture, values, adequate knowledge, the revelation of students' inner potential, students' identity development encouragement as well as adequate personal assessment development) (Смирнов, 2001; Трухачёв, Тарасова, Таранова, & Скрипкин, 2014). Bobrova et al., (2012), Neimane and Rupeika (2012) revealed that students observed teachers' efforts to discuss with them about learning to analyse their progress in learning the material that supports students to promote self-employment, recognizes the efforts of teachers to motivate students.

We think that for each university physical education teacher it is important to know students' expectations and try to meet them; thus positive communication and cooperation will help achieve expected outcomes.

CONCLUSIONS

For students the most appealing traits of physical education teachers are good knowledge of the subject and friendliness. The female students also emphasized the importance of good appearance of the teacher of physical education as well as good interaction with the group, the male students appreciated a good sense of humour and possibility of easy communication with the teacher. In four years' time students' attitudes towards the teacher of physical education improved.

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FROM COOPERATION OF PARENTS AND EDUCATORS TOWARDS EMPOWERING PARTNERSHIP

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ABSTRACT

Background. Partnership in this thesis is interpreted as the responsibility of children education which is taken by the members and their activity. The main role of the partners is to organize the environment of preschool education for children to use their prior knowledge and experience to understand new information and meaningful context.

Methods. Two questionnaires were included in this research, 191 parents and 199 educators were questioned.

Results. Educators and parents generally see the purpose of preschool education institution to stimulate the child's social and cognitive development (88.9%) and considerably rarely the purpose is related to meeting the natural needs of a child (32.2%). Educators more often than parents thought that it was necessary to strengthen the education of parents in partnership with their children's education ($p < .001$). Mutual ambition to collaborate (67.3%), better education of parents (49.2%), the maintenance of permanent connection (41.7%), information exchange (49.7%) and better confidence in each other (45.7%) would be helpful in seeking for more effective cooperation.

Conclusions. Only a small percentage of parents understand that preschool education is most important to meet the natural needs of children, create healthy situations for the development of children's inborn inclinations. Educators are not reoriented enough to the tendencies of nowadays and only one third of them believe in its importance to meet the natural needs of a child.

In most cases parents and educators indicated the same factors which might influence empowering of parents and educators for the education cooperation which would develop into to partnership, but the importance of the factors was often different.

Keywords: empowering, cooperation, communication, preschool education, partnership.

INTRODUCTION

After the decentralization of preschool education content and considering tendencies of the most advanced development of science and the society, preschool education institutions are trying to create conditions which help children satisfy their natural, cultural as well as ethnic, social and cognitive needs. The development of these conditions requires partnership in managing educational institutions, teachers of preschool education and parents. The partnership in this article is considered as participants' activities and taking responsibility for the education of children. Children are the central figure of partnership ensuring holistic education of children.

According to constructivist point of view, the main role of the partners is to organize preschool education environment so that children would accept and assimilate new information with authentic and meaningful context using their prior knowledge and experience.

According to Epstein et al. (2002), when educators and parents are partners in children education, parents trust themselves more supporting education in educational institution and at home, they become helpers solving various problems. According to the research, when parents are included in children education their children show better academic achievements (Christenson, 2004).

Epstein et al. (2002) identified six features of parents' educational involvement: parents' skills, voluntary assistance for teachers (further volunteering), education at home, decision-making, cooperation with community and communication. This research confined to the partnership aspects of parents and teachers of preschool education institutions.

Hoover-Dempsey and Sandler (1995) believe that parents can decide whether to cooperate with educators after they realize that it is part of their participation in children education and when parents believe that, their activity will be helpful to children and also they will realize that both children and school wants them to be involved in cooperation.

Researchers (Christenson, 2004) indicate that partnership between parents and educators is significant to children education and their holistic development.

According to Epstein et al. (2002), their theory of education institution, family and community partnership, this partnership is perceived as responsibility of educators, parents and community for children education and the roles that should be performed by every partner. Epstein et al. (2002) believe that education institution should be responsible for the strategy creation of partnership with parents. The roles of parents and educators are seen in the interaction of partnership.

Christenson (2004) distinguished several factors which influence the partnership of parents and educators: socio-economic status, parents' education, family dynamics, cultural differences, the lack of knowledge about family involvement, insufficiency of time and resources. Ashby (2006) indicates that the lack of parents' education and skills can strongly influence their intentions to participate in partnership of family and educational institution.

As research results show (Fantuzo, Mcwayn, Perry, & Childs, 2004), good relationship between parents and employees of preschool education institution is also useful to employees, children and parents. Bailey (2006) emphasises cooperation as a priority of preschool education institutions. With reference to the research of Ihmeideh, Khasawhneh, Mahfouz, and Khawaldeh (2008), Tlougan (2011), Anupama (2010), it is possible to maintain that parents' participation in cooperation with preschool institutions has a positive influence for children's academic achievements, improvement and rapid development of social skills.

The purpose of this thesis was to reveal empowering of parents and educators of preschool education institution for education cooperation developing into partnership.

Research object was empowering partnership for educational cooperation of parents and educators of preschool education institutions.

Hypothesis: neither parents, nor educators of preschool education institutions alone are properly ready for the comprehensive revelation of the natural needs of a child.

Background. This research holds the attitude that empowered parents and educators of preschool institutions are those who have power to act as it is necessary for the education of children. They are also capable of creating external environment which could be beneficial for children's education and taking responsibility for it.

Anupama (2010) emphasizes that the support of parents is always critical in child's life but there are some particular moments in life when parents should be active choosing an institution for the child's education pursuing the child's welfare. While meeting the child needs in preschool education institution, the relation is formed which creates strong environment for children's education. Amini (2011) highlights specific and definite roles between parents and educators as the condition to pursue cooperation. He also proposes that parents and educators would request a bigger parent involvement in educational activity and related cooperation.

Parents are the partners of educational institution, and their duty and responsibility, according to Schiller and Bryant (2004), are directed towards the implementation of the general objective of education and cooperation enables them to accelerate and facilitate this process.

Ihmeideh et al. (2008) suggest that often parents would like to be involved in cooperation and do everything they can but they simply do not know how to do this. Amini (2011) indicates that it is necessary to take such activity into consideration in preschool environment which stimulates parents' involvement and requires insignificant resources of time and finances and also is easily integrated into daily activity and meetings with parents.

The empowering of parents proceeds through their pedagogical education (Sealender, 1997), involving into home and school education and participating in school activity (Smit, Driessen, Sluiter, & Sleegers, 2007).

Hill and Taylor (2004) explain the connection between parents' involvement in education and children's achievements as the interaction between two components: increasing social capital and social control. Social capital is increasing when parents' skills and knowledge about children's education is also increasing and the pursuit of common goal with the school maintains the social control of (self-) education.

Pomerantz, Moorman and Litwack (2007) claim that parents' involvement in the activity of educational institution stimulates the development of cognitive and metacognitive skills of their children and it is useful for children's achievements because parents involved in education can be as an example to children and raise motivation to participate in school activity more actively. Parents from higher social-economical layer, which means they have better education themselves, are more often involved in the activity of education institution (Pomerantz et al., 2007; Smit et al., 2007). Increasing parents' involvement in children's education determines the development of social skills (El Nokali, Bachman, & Votruba-Drzal, 2010).

Sad and Gürbüztürk (2013) identified the importance of equivalent partnership of parents and educators in the process. Positive impact is presented through better learning achievements of children, decreasing behaviour problems, and higher self-assessment, positive and safe children's feeling at school, improving social relations between children, better opportunities for pursuing the quality of life. Children's success in school is assured if the work initiated at school is maintained and proceeded at home by parents (Şad & Gürbüztürk, 2013). Parents are more inclined to get involved in children's education when the relationship between parents and teachers in partnership is equivalent.

METHODS

Research participants. Research sample consisted of 191 parents of preschool age children attending nursery-kindergarten. Parents up to 30 years old accounted for 41.4 percent and parents over the age of 30 years constituted 58.6% of respondents. Their 87 children attended nursery groups and 104 attended kindergarten groups. The study included 199 pre-school teachers working in education institutions, among them 19.1% were tutors, 70.4% – senior tutors and 5.5% – tutor-supervisors. There were 12% of educators under the age of 30 years and 88% were older.

Parents participated in the study voluntarily and pre-school educators also volunteered, but they had to have the agreement of the institution administration.

Two questionnaires were used for data collection – one for the parents and the second for educators.

Statistical analysis. Data were processed using SPSS 21 for Windows. The percentage distribution of answers to questions was calculated in this paper. The verification of hypothesis about the equality of groups was carried out using Chi-Square test. The significance of differences was set at $p < .05$.

RESULTS

During the survey parents were questioned about the purpose of preschool education institution. Parents most often associated the purpose with the promotion of child's social, cognitive development (68.6%), enrichment of experience cooperating with others (64.9%) and preparation for school (65.4%). Less frequently the parents linked the purpose of preschool education institution with meeting natural child's needs (34.6%).

The survey revealed that in the education process organized by educators, parents of younger children more often than parents of older children perform the role of an observer ($p < .05$).

According to the data of the survey, 67.0% of the parents indicated that educators presented the programme of education to them during the parent meeting. Respectively 22.3% of parents admitted that they read it personally. Only 5.8% of parents indicated that teachers coordinated the content of education program with them. It should be noted that some parents were not aware (13.1%) or did not hear anything (9.4%) about the education programme applied in preschool education institution.

Most of the parents have heard about the programme of Montessori and Vėrinėlis. Fewer of them heard about Waldorf, healthy, safe lifestyle education, Reggio Emilia and programmes of social skill development and least of the parents have heard about Gardner, Piaget programs. The knowledge about education programmes was significantly higher ($p < .05$) among the parents of kindergarten age children than among parents having nursery aged children.

The research revealed that the majority of parents would request the education programmes for gifted children (75.9%). Whereas only a few indicated that they would like programmes constituted for children with developmental disorders (1.6%), children with behavioural disorders (3.7%), programmes for children where families return from abroad (2.1%) or the programmes created for the children of immigrants (1.6%). Only one parent indicated he would request the programme for bilingual children.

More than a half of parents (59.2%) communicate with a tutor of the group every day and 27.7% indicated that each day they are informed about the child's activity by the tutor of the group. The parents of older children more often helps to organize events in kindergarten ($p < .05$).

During the research of parent opinions about the partnership between them and education institution, most often (84.3%) parents indicated that the success of the partnership between them and the education institution depended on the sincere cooperation between parents and educators of the preschool education institution. It was also indicated that cooperation contributed to the versatile child's education (78.0%) and interaction between both sides was especially significant (73.8%), and parents' participation in educational activity was useful to children (77.5%). Fewer parents agreed that educational activities of the group should be only the responsibility of the tutor (49.2%). About a half of the parents (52.9%) agreed with the statement that their opinion was considered while solving the questions about children's education and both parents and teachers were equal in the process of education (54.5%). It was observed that less than a half parents (41.4%) agreed with the statement that they were encouraged to participate in the activities of the modernization of the education institution.

Parents commonly agreed that the most acceptable forms of cooperation with education institution were individual dialogues (67.0%), parent meetings adopting corporate decisions (62.8%), joint parent-child activities (57.1%) and also cooperation with experts solving problems (44.5%).

According to the opinion of parents, the cooperation between them and teachers was prevented by the employment of the parents (57.6%), parents' unwillingness to participate in activity (34.6%) and their indifference (31.4%). However, 30.4% of parents indicated that, overall, there were no cooperation interferences between them and teachers.

Exploring the problems of partnership between parents and teachers, parents mostly indicated the low activity of the parents (60.7%), the lack of responsibility for children education (27.7%) and also poor parents' approach towards the educators and preschool education institution (20.9%). Parents of differently aged children had different opinions about the partnership problems between parents and educators. More often ($p < .05$) parents of nursery children than parents of older children mentioned the low activity and insufficient educational culture of parents.

According to parents' opinion in pursuing more efficient cooperation the mutual aspiration to cooperate is necessary. It also requires permanent maintenance of the connection, changing information and bigger confidence in each other. Parents think that higher competence of educators and more often organized events would stimulate cooperation the least of the cases.

It was identified that younger parents related preschool education institution with meeting natural child's needs ($p < .001$) compared to older parents.

Educators often associated the function of preschool education institution with the stimulation of child's social and cognitive development (88.9%), enrichment of experience cooperating with others (51.8%) and preparation for school (46.2%). Less frequently they associate the function with the satisfaction of natural child's needs (32.2%).

Referring to the opinion of educators, the cooperation of parents and educators contributes to the recognition of their learners (67.8%) and determines successful education of the children (59.8%). Teachers over 30 years old more often emphasised the benefit of cooperation bringing together parents and educators than younger teachers (respectively 37.1 and 12.5%, $p < .05$).

The majority (93.0%) of educators agreed that the success of partnership between parents and education institution depended on sincere cooperation and cooperation helped fully educate the child (90.5%), and the interaction between the two of them was useful and very important (91.0%).

More than a half of educators (52%) only partially agreed that parents had the knowledge about the methods applied in educational institution, also about the influence of educational environment

to child's education, about the programme of the education institution, peculiarities of child's development. Educators thought that parents had less knowledge and competence in forming the educational guidelines in school. They considered that the most reasonable forms of cooperation with parents were the dialogues while bringing in and picking up the child from educational institution (86.9%) and parent meetings (69.8%).

Parents in preschool education institution were often interested in child's health and diet (73.4%), meeting their needs (72.9%), knowledge (60.8%) and safety (59.8%). The least parents were interested in artistic activity, games and physical conditioning.

The cooperation between parents and educators was impeded by the employment of the parents, their unwillingness to participate in the activity and also the distance during the cooperation.

Educators thought that the main problems of partnership between parents and educators were: too low parental involvement (80.4%), conflicting demands (33.2%), and poor attitude of parents towards educators and preschool education institution (39.7%). The lack of parents' responsibility for children's education (21.6%) and the lack of parental educational culture (19.6%) were mentioned less frequently. In order to facilitate the most effective form of cooperation, mutual desire to cooperate would be helpful (67.3%), also better education of parents (49.2%), the maintenance of constant connection (41.7%), information exchange (49.7%) and greater confidence in each other (45.7%). Cooperation would be the least encouraged by more often organized events (6.5%) and higher competences of teachers (2.0%). Compared to younger teachers, older teachers more often stated that the parents themselves should demonstrate the bigger initiative to solve problems of their children's education ($p < .05$).

The results of the research revealed different opinions of teachers and parents about the purpose of preschool education institution. The teachers more than parents associated it with the social, cognitive development of the child ($p < .05$) and parents associated it with enrichment of experience cooperating with others ($p < .05$) and preparation for school ($p < .05$).

Comparing parents' and teachers' opinions about the partnership between them and education institution it was identified that all nine statements of the survey distinguished the opinions of parents and teachers about the partnership between parents and educational institution ($p < .05$). The most notable differences in assessing the statements that educator took into consideration the opinion of parents about the problems of education; parents were encouraged to participate in the development of educational institution activity ($p < .05$). Educators more often agreed with the statement that tutor should take care of educational activity but not the parents of children ($p < .001$). Whereas parents more often agreed with the statements that their participation in activity of the group helped the tutor and also it was useful to children ($p < .01$) and educators more often agreed with statements that interaction of both sides was especially significant to cooperation ($p < .05$).

Comparing with parents more educators, while accentuating the basic problems of partnership between parents and educators, mentioned too low activity of parents, poor attitude towards educators and preschool education institution.

For more effective cooperation educators more often mentioned the need to strengthen parents' education ($p < .001$). Whereas the parents more often indicated that it was necessary to maintain constant cooperation ($p < .01$); presentation of systematic information about the progress of the child ($p < .01$) and higher competence of educators ($p < .001$) were also important.

DISCUSSION

During the research it was found that educators often associate the purpose of preschool education institution with the encouragement of social, cognitive development of the child, enrichment of experience cooperating with other and preparation for school. Research by Tlougan (2011), Anupama (2010) revealed the fact that educators in preschool education institutions emphasize social, emotional and academic development as the main factor. The study of Suizzo and Stapleton (2007) identified that parental involvement in the process of children's education and development both at home and at the educational institution should become family's everyday practice and followed value.

In this study the educators often dedicated the roles of observer and participant to the parents. In other studies they assigned the roles of helper and initiator which were significant in the process of

education and pursuing the quality of it (Anupama, 2010).

It was found that most parents were familiar with the educational programme of preschool education institution that their children attended and also were aware of other alternative programmes. Research shows that understanding and absorption of parents in particular content of preschool education program allow them to join the role of educators. Furthermore, should not be forgotten the fact that perception of preschool education programme by parents and educators should be possibly brought closer (Fantuzzo et al., 2004).

The results of the study indicate the tendency that equivalent and double-sided educational process is significant both at home and at the institution of preschool education. Daily and the most meaningful experience of child, discoveries of recognition and academic achievements should be responsibly and constantly revealed to the educators by parents and vice versa.

According to Schiller and Bryant (2004), the forces which are required for the achievement of general education goal were named as cooperation. The study revealed that looking at the creation of partnership relations in the process of preschool education institution it is significant that relations should be based on the sincerity and mutual trust. It needs to note that the data received in other research coincide with our data and also reflect the aspect of sincerity.

It is argued that the most effective method to achieve high-quality communication is friendly and open dialogue about what each of us think and feel here and now and also the search of better ways of behaviour.

Bailey (2006) points out that if parents and educators feel comfortably communicating to each other about the education and development of the child, then cooperation goes smoothly and healthily.

It was found that 54.5% of the parents agree and 38.7% partially agreed that they are equal partners in preschool education institution.

Studies by Anupama (2010), Tlougan (2010) and Amini (2011) demonstrate the uniqueness and authenticity of relations based of partnership which keeps children safe from threatening difficulties of socialization. Relationships based on partnership involve parents and educators feel equal to each other. These relationships allow individuals to achieve and use such instruments, methods and resources which encourage and develop social, intellectual abilities of children.

The study also analysed the most important forms of cooperation. The results of the study revealed that they were identified as individual dialogues, parent meetings while accepting corporate decisions and joint events of parents and children in the preschool institutions. It is also confirmed by the study of Anupama (2010) that individual dialogues and meeting are of very great importance in discovering the most effective relationship of cooperation based on partnership.

On the other hand, the study showed that there was some interference in partnership relations between parents and educators based on the cooperation. While naming the obstacles to cooperation with educators, parents highlight their own employment, reluctance to participate in the environment and indifference. This is related to the intense work schedules of modern parents and child caring after the working hours and for educators this is their direct work and the time of their work. By the way, passivity or unwillingness to engage in educational activities can also be exposed to direct parents' work. The studies of others confirm this tendency that increasing and intensifying employment of parents is becoming a decisive factor in building collaborative empowerment (Anupama, 2010). The study of Tlougan (2011) also provides the information that parents often hesitate to participate and be the part their children's education because of the lack of self-confidence and thus they become passive participants of education. Ihmeideh et al. (2008) also confirm that participation of parents is more intensive when the expectations and needs coincide with parents and educators about the development of children's educational process.

The study of Leliūgienė and Simonavičiūtė (2010) reveals that cooperation and communication between parents and preschool education institution is mostly damaged by formal, useless meetings because only children's cognitive skills and discipline are discussed. Also the major part of respondents said that successful communication and cooperation between parents and preschool education institution was interrupted by the poor interest of educators in parental expectations.

Participation of parents in the process of preschool education can be complicated by the fact

that parents have a lack of educational experience. But on the other hand, this study revealed that parents had the knowledge about the methods applied in preschool education institution, about the influence of educational environment for their children's education, about the programme of the education institution and also about the peculiarities of child's development.

It was revealed that competence and educational abilities of educators to involve and interest parents of different characters were very important to parents. While analysing the factors of partnership in preschool education institution Ihmeideh et al. (2008) present the information that educators must use their expertise and intelligence. Such educators with the professionalism of this field have the ability to involve even the most passive and indifferent parents into the process of education through the partnership relations and cooperation. Bailey (2006) also confirms that a qualified preschool educator has the ability to express and engage parents with professional, educational and personal skills. Educators should follow or occupy the leading position in the process of cooperation. Anupama (2010) points out that the educators should not ignore the ideas of the parents, proposed changes or novelties in the process of educational organization. The study of Bakker, Denssen and Brus-Leaven (2007) reveals that the perception of educators about the participation of parents in the process of education has positive influence to the direct achievements of children.

The analysis of factors influencing effective cooperation revealed a tendency that these relations require creation of constant, regular and unbroken relation support, exchanging available information about the child and the trust in each other is the most important.

If parents communicated for at least ten minutes with the educators while bringing in and picking up the child from the institution of preschool education, continuous cooperation would provide the form of partnership to the relations of communication. The most important point in this time spending together is not the things that are discussed or what information is exchanged but the fact of being and communicating together. On the other hand, unlike the quantity, the quality of communication becomes more important for the development of communication process. Green, Walker, Hoover-Dempsey and Sandler (2007) highlight the thread of natural and genuine communication and cooperation between parents and educators and it is becoming the core of partnership influencing quicker and more effective links.

The results of Leliugiene and Simonaviciute survey present the information which is provided to parents during the communication. Parents say that most of the information they receive from educators is about children's physical, social and psychological development, peculiarities of their behaviour, the acquisition of knowledge and artistic activities. The participants of the study revealed that there was the lack of information introduction about the civil education, peculiarities of healthy lifestyle education.

The results show that parents are more willing to participate in education of their children when the relations between parents and teachers are equal, when parents feel that teachers understand and support them. And conversely when the relationship between parents and teachers is not equivalent then the chance decreases that cooperation will be effective and useful to the child. According to the Oostdam and Hooge (2013) more than to start the dialogue with the parents of the learner, educators are inclined to tell parents what they should do or keep parents from themselves at "a safe distance". Our study showed that only the one-third of the parents during the communication with educators truly felt equal partners. Less than a half felt equal partially and a little less than one tenth of the parents did not feel equal partners while communicating with educators. The parents with higher education felt more equal partners (63.9%). More acceptable forms of communication for them were individual dialogues with teachers, consultations of experts, group conversations. Meanwhile, only a quarter of parents with lower education were totally satisfied with the communication of the teachers. The tendency should be noted that for parents with lower education the form of pedagogical education is parent meetings when more general issues are discussed and less attention is paid to the discussion of individual cases. According to Şad and Gürbüztürk (2013), the education of parents is not the important factor assessing parental involvement into the education of children. Though Smit et al. (2007), Pomerantz et al. (2007) argued that parent's education could be an obstacle to the involvement of children's education. Parents with lower education often observe the lack of knowledge when it comes to explaining the child how to carry out homework assignment. Also the

parents with lower education think that teachers better than they know how to educate children and these parents hesitate to communicate with teachers as equal partners. Meanwhile, according to these scientists, the parents with university education are more involved in their children's education. Our study also showed that, compared to parents with lower education, parents with university education were more often involved in the education of their children.

CONCLUSIONS

Only some parents understand that the most important thing from preschool education is to meet natural child's needs, create beneficial circumstances for the development of inborn inclinations. The majority of parents are familiar with the process of preschool education; they are also interested in children's activity and participate rather actively in the process of education as well as cooperate with educators.

Educators are not yet fully switched to the tendencies of nowadays and only one third of them believe it is important to meet natural child's needs. According to their opinion, the most important thing is to encourage social, cognitive development.

Both parents and educators in the majority of cases indicated the same factors influencing the empowerment of parents and educators for the education with cooperation developing to partnership but their significance was usually different. Both parents and educators indicated the main problems of partnership in this order: too low activity of the parents, poor attitude towards educators and uncoordinated demands. Parents and educators commonly mentioned five factors that might enhance the empowerment of cooperation: both of the sides should seek cooperation, strengthen mutual exchange of information, bigger reliance and constant maintenance of connection is necessary. Most of the opinions of respondents differed concerning the necessity to increase the education of parents ($p < .001$).

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EMPOWERMENT FOR EDUCATION OF STUDENTS WITH SPECIAL EDUCATION NEEDS

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ABSTRACT

Background. Teachers who are in favour of education of students with special needs (SEN) together with their peers (inclusive education) appreciate the role of parents in the education process of students. However, Čiuladienė and Paužienė (2012) indicate that the majority of Lithuanian general education schools are not sufficiently prepared for inclusive education.

Methods. The sample consisted of 170 parents of students with SEN in grades 5–10. The scale of Parental Involvement in School was used to establish parental involvement in children's education process.

Results. The parent involvement levels in children's education process were established using three five-point scales: Parent Involvement with Teacher/School – 1.60 points; Teacher Involvement with Parent – 2.22 points; Parent Involvement with Child's Schoolwork – 3.03 points.

More educated parents compared to parents with lower education indicated that communicating with teachers they really felt equal partners ($\chi^2 = 20.37$, $p < .001$).

Parents admit that better collaboration between parents and teachers can more encourage open and honest communication between them (63.5%). A little less than three-quarters of parents often or very often received information from teachers about their children's learning and behaviour. Parents who claimed to have sufficient knowledge of educating their children sometimes indicated that they needed teachers and other professionals to help them with their children's development problems ($\chi^2 = 14.11$, $p < .001$).

Conclusions. Most parents were involved in the education of pupils with SEN at home but they were little involved in their children's educational process at school and other school activities.

Keywords: student, special education needs, parent, teacher.

INTRODUCTION

According to the data of Lithuanian Department of Statistics, in the academic year of 2012/2013, as many as 9.5% of students with special education needs (SEN) attended general education schools. A variety of education methods can be applied in schools in Lithuania for pupils with SEN. However, research results obtained by Gudonis, Ališauskas, and Rusteika (2011) show that about 60% of secondary school teachers claim that all students with special education needs should be educated along with their peers in mainstream schools and the education of students with special education needs together peers is beneficial for both parties. Only about 17% of teachers believe that the most appropriate way to meet the special educational needs of students is a special school.

Teachers who are in favour of education of students with special needs (SEN) together with their peers (inclusive education) appreciate the role of parents in the education process of students. However, teachers who oppose inclusive education, disregard parental involvement in their children's education (Gudonis et al., 2011).

Accordingly to Prunty, Dupont, and McDaid (2012), special education needs is not a reason to choose a special school for the child. Rix, Hall, Nind, Sheehy, and Wearmouth (2009) found that

co-operation between parents and teacher is not only sharing knowledge and experiences about children with SEN, but also seeking to ensure the continuity of students' with SEN education.

However, Čiuladienė and Paužienė (2012) indicate that the majority of Lithuanian general schools are not sufficiently prepared for inclusive education.

How and why does parental involvement influence children's outcomes?

According to Hill and Taylor (2004), parental involvement increases parents' knowledge and skills so they are better prepared to help their children in activities related to school, in addition to this, parents and school have the same aim in general. Pomerantz, Moorman, and Litwack (2007) believe that the involvement of parents in school activities encourage the development of their children's cognitive and meta-cognitive skills and is beneficial for children because parents' involvement in education can be an example to children. It can also raise their motivation to actively participate in school activities.

Increasing parental involvement in children's education leads to the growth of social skills and thus behaviour problems decrease (El Nokali, Bachman, & Votruba-Drzal, 2010). Parents from higher socio-economic classes, who accordingly have a better education, are often involved in school activities (Pomerantz et al., 2007).

Sad and Gürbüztürk (2013) argue that equal partnership of parents in the education process positively effects children's learning outcomes and ensures better future perspectives for children, as well as improves children's mental health and social relationships. Children's school success is guaranteed if the work of the school is supported and extended by parents at home.

Increased parental involvement in a child's learning in school at a younger age can forecast higher student achievement of learning in later years (McDonnall, Cavenaugh, & Giesen, 2012).

The most common parental involvement in children's education is going through assistance in homework assignments. As Carr (2013) suggests, students with SEN experience more difficulties in performing homework assignments than their peers. Parents can structure the children's learning at home, creating a supportive work environment (Carr, 2013). According to Thurston and Navarrete (2010), most parents help their children with SEN to perform homework assignments.

Askeland and Velsvik (2013) claim that relationships with teachers of those parents whose children receive needed special assistance are better than those of other parents.

In our opinion, the empowerment of students with special education needs for education is creation of the potentially favourable environment at school and at home for education which helps reveal the child's strengths and abilities allowing the student to become a potentially valuable member in the society.

Not much is known about the influence of parental activities on the empowerment for education of students with special education needs, the level and importance of parents' self-involvement and their involvement in the education process of general education school.

The goal of this research was to reveal the peculiarities of parental activities for empowering students with special educational needs for the education. The object of research was the parental activity for empowering the students with special education needs for education.

Hypothesis: parents of students with special educational needs are not sufficiently involved in empowering these students for education.

METHODS

Research participants. The sample consisted of 170 parents of students with SEN in grades 5-10. There were 148 mothers and 22 fathers among them. According to the educational classification, the parents were divided into two groups: without higher education and with higher education (university and non-university education).

The empirical study involved a questionnaire survey method. The scale for Parental Involvement in School (Miller-Johnson, Sullivan & Siman, 2004) was used to investigate the parental involvement in children's education process. This scale consists of 18 statements and includes three subscales: Parent Involvement with Child's Schoolwork and Parent Involvement with Teacher/School, and Teacher Involvement with Parent. There were five possible answers for each of statement (5-point Likert scale).

Factor analysis was performed to examine the Lithuanian version of the scale's structure. The data was suitable for factor analysis (KMO ratio = 83.7, $p < .001$). The three factors explained 57.72% of the total variance. These factors and component corresponded to the statements abstracted in the

original version of the scale. All three subscales' internal consistency Cronbach's alpha indicators were respectively .89, .78 and .83.

Percentage distribution of responses was calculated, the mean differences of statistical significance were checked by χ^2 and Mann–Whitney U tests and the level of significance was set at $p < .05$.

RESULTS

The parent involvement level in children's education process according to the three five-point scales reflects the following data: Parent Involvement with Teacher/School – 1.60 points; Teacher Involvement with Parent – 2.22 points; Parent Involvement with Child's Schoolwork – 3.03 points.

Parent Involvement with Teacher/School. The parents of children with SEN communicated with teachers and other school professionals usually on the phone (70.6%) or directly face to face (65.9%). We found that 32.9% of parents that communicated with teachers really felt equal partners and 43.5% equal felt so only partly. Only part (8.2%) of parents did not feel equal partners in the process of communication with teachers.

More (63.9%) parents with higher education compared to parents with lower education (24.6 percent) indicated that communicating with teachers they really felt equal partners ($\chi^2 = 20.37$, $p < .001$).

The parents of children with SEN supposed better collaboration between parents and teachers could encourage open and honest communication between them (63.5%) as well as organized activities for families (31.2%). However, they preferred the form of pedagogical communication to the individual discussions with teachers (72.9%).

The research findings revealed that higher educated parents than parents with lower education more often considered open and sincere communication as a means to promote cooperation (respectively 80.6% and 59.0%. $\chi^2 = 4.18$, $p < .05$).

We found that there were parents (12.4%) who did not know what learning problems their child had. Some parents (18.8%) said that their children did not have any learning problems. The remaining part of parents reported that their children had learning difficulties (52.4%), learning disorders (14.1%) and learning disabilities (2.4%). Only 32.4% of parents reported that their knowledge was sufficient for their children's education, 55.9% indicated that their knowledge was partially sufficient and 11.8% pointed out that their knowledge was insufficient.

The results of this research demonstrated that the majority of parents (70.0%) would like to have help with their children's learning and health problems (4.1%).

More than half (60.6%) of the parents with children who had special educational needs were involved in their children's education process, 29.4% of parents were involved sometimes and the rest (10.0%) said that they were not involved in their children's education. Parents who claimed to have enough knowledge of how to educate their children, compared to parents having less or lack of knowledge were involved in ongoing school activities (Mann–Whitney $U = 1842.0$, $p < .001$).

Teacher Involvement with Parents. A little less than three-quarters of parents of children with special education needs often or very often received information from teachers about their children's learning and behaviour. But one-quarter of respondents reported receiving this information rarely or did not receive it at all.

Analysis of the results revealed that those parents who were felt equal partners with teachers, were more likely to engage in school activities (Mann–Whitney $U = 1871.5$, $p < .01$) and more often believed that teachers were involved in the interaction with them (Mann–Whitney $U = 1775.0$; $p < .01$).

Table 1. **Levels (score) of parent involvement in education via partnership with teachers**

The field of parent involvement in the education	Parent groups according to the level of partnership with teachers	
	Equal partners	Unequal partners
Parent Involvement with Child's Schoolwork	3.08	2.83
Parent Involvement with Teacher/School	1.68	1.33*
Teacher Involvement with Parent	2.33	1.85*

Note. * – $p < .01$.

Table 2. **Levels (score) of parent interest in children's success in school via partnership with teachers**

Interest rate	Parent groups according to the level of partnership	
	Equal partners (%, *n*)	Unequal partners (%, *n*)
Never	3.1(4)	10.0(4)
Monthly	0	7.5(3)
Weekly	6.9(9)	7.5(3)
Several times a week	13.8(18)	12.5(5)
Every day	76.2(99)	62.5(25)

Those parents who were involved in children's education problems were often interested in children's learning outcomes (Mann–Whitney U – 741.0, $p < .01$). Also these parents compared to parents not interested in the education problems of their children, were likely to engage in school activities more often (Mann–Whitney U – 464.0, $p < .01$).

Parents who were involved in dealing with children's education problems much more preferred direct communication with teachers and other school professionals (respectively 68.6% and 41.2%, $\chi^2 = 5.13$, $p < .05$).

Parents who claimed to have sufficient knowledge of educating their children sometimes indicated that they needed teachers' and other professionals' help with child development issues (respectively 50.9% and 79.1%, $\chi^2 = 14.11$, $p < .001$). On the other hand, more of these parents, compared to those having less or no knowledge how to educate their children, said that they were involved in education of their children (respectively 76.4% and 53.0%, $\chi^2 = 8.51$, $p < .01$).

Parent Involvement with Child's Schoolwork. Children with special educational needs usually receive help from their mother (51.2%) and much less from their father (21.2%) to do their homework. Higher grade students more often performed their homework independently than with their parents. The majority did their homework independently ($\chi^2 = 14.62$, $p < .01$).

Parents' involvement in their children's education at home was assessed as follows: having enough knowledge of how to educate children with SEN – 3.20 points, while having non enough or no knowledge – 2.94 points ($p < .001$).

DISCUSSION

The study hypothesis was confirmed as the parents evaluated their involvement in the empowerment of education of students with SEN in three areas of its activities on a scale of five possible points, from 3.03 to 1.6 points on average.

The study revealed that only less than one-third parents (32.9%) actually felt equal partners while communicating with teachers.

Kim et al. (2012 a) found that parents were more likely to become involved in their children's education, when the parents and teachers' relationship was tantamount and parents felt that teachers understood and supported them. Conversely, when the relationship between parents and teachers is not equivalent, decreasing the probability that cooperation will be effective and beneficial for the child (Kim et al., 2012 b). According to the Oostdam and Hooge (2013), rather than engaging in dialogue with parents, teachers more frequently tend to tell parents what to do or keep parents at a "safe distance".

The study found that parents who felt equal partners communicating with teachers often asked about their children's success at school compared to those who did not feel like equal partners ($\chi^2 = 13.70$, $p < .01$).

Although parental involvement in children's education is often cited as one of the school's priorities for action, it still not acceptable to involve parents as partners in their children's education process (Oostdam & Hooge, 2013).

Oostdam and Hooge (2013) argue that parents usually take more interest in the child's achievements and try to find the contact with the teacher, but they become disillusioned, dissatisfied with their children's academic achievements. Thus, both the teacher's educational goals and parental involvement in the education process can have a significant impact on children's learning outcomes (El Nokali et al., 2010).

It is very important to note that parents engaged in education can better plan, influence and control the situation at home. This factor is very important in order to create a safe and intellectual environment for the stimulation of the child's development at home (Oostdam & Hooge, 2013).

Our study shows that more (63.9%) of parents with higher education communicating with

teachers feel equal partners. Hornby and Lafaele (2011), Pomerantz et al. (2007) argue that parental education may be a barrier to involvement in children's education. Lower educated parents lack knowledge when they have to explain the child how to do the homework assignments. Also lower educated parents think that the teachers better than they know how to educate children and are hesitant to interact with teachers as equal partners.

Thus, the school could promote parent-teacher collaboration. Even 63.5% of our respondents mentioned the open and frank communication between teachers and parents as a means to promote cooperation.

Al-Shammari and Yawkey (2008) indicated that parents engaged in the education of their children obtained useful information from teachers about helpful education methods of students with SEN at home. Cooperation with parents is beneficial for teachers as well because it allows a more comprehensive knowledge of having students with SEN, their families and home environment.

Comparing the answers of parents of differently aged children showed a statistically significant difference ($p < .05$), indicating less frequent involvement of older children's parents in their children's education. Results from this study confirm the study results McDonnall et al. (2012), which show that the parents of students in higher grades were less involved in school activities.

Our results revealed that almost two-thirds of parents would like to have more knowledge of their child's education. This may indicate a complexity of the curriculum content and the parents need knowledge of how they can help their child at home to carry out homework assignments. This tendency was found by others researchers as well (Sad & Gürbüztürk, 2013; Patall, Cooper, & Robinson, 2008), pointing to the lack of parent involvement. This study showed that higher educated parents than parents with lower education more often indicated that they would like teachers and other professionals to help them in understanding how they could help their children with SEN at home.

CONCLUSIONS

The parents of children with SEN are not enough involved in their children's education at home and especially at school, which would empower their children for education.

Most parents are involved in the education of students with SEN at home, but they are little involved in the education process at school and other school activities.

Less than one-third of parents actually feel equal partners when communicating with teachers, but among them only 63.9% of parents were with higher education.

Parents who communicate with teachers feel equal partners, they will more likely engage in ongoing school activities and teachers more often cooperate with them.

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DEVELOPMENT OF PHYSICAL AND SELF-CONTROL ABILITIES OF JUNIOR SCHOOLCHILDREN (10–11 YEARS OLD)

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ABSTRACT

Background. The goal of the research is to reveal the dynamics in physical abilities of junior school learners (10–11 years old) and their links with development of self-control abilities by applying the programme for development of self-control abilities in physical education classes during the experimental period. The pedagogical experiment was carried out with 4th forms of general education schools of Klaipėda, Kaunas and Raseiniai from 2011 to 2012 and lasted for one school year. The research included 178 school learners in the experiment group (n = 85) and in the control group (n = 93).

Methods. The questionnaire method was applied to evaluate the change in self-control abilities, whereas the testing method was used to identify the change in physical abilities (flexibility, explosive power, agility, speed, balance, abdominal muscle strength and stamina).

Results. Statistically significant differences were identified among boys from the experimental and the control groups considering the results of flexibility, long jump, abdominal muscle strength and stamina ($p < .01$), dexterity and speed ($p < .05$) and among girls when measuring the results of flexibility, long jump, speed, balance, abdominal muscle strength and stamina ($p < .01$). Application of Pearson's correlation, correlating links between the abilities of physical and psychosocial self-control, revealed that school learners with better abilities of psychosocial self-control also demonstrated a number of better physical abilities: linear correlation links were established between psychosocial control and flexibility, explosive power, speed, stamina and balance abilities. These links showed that improvement of self-control skills had an effect on self-development of physical abilities.

Conclusion. The research has revealed a positive impact of the programme due to which development of self-control abilities determined a change in physical abilities.

Keywords: self-control, physical abilities, junior schoolchildren.

INTRODUCTION

Physical education in early school years increases the ability to adapt to ever-changing conditions and requirements, as well as enables pupils to self-actualize, assess their physical senses and psychical condition, and develop self-control abilities. Kauffman, Davis, & James, (2001) define self-control as an individual ability to control one's behaviour (application of strategies for problem solving) and it is related to metacognition. Metacognitive skills are self-control abilities which are formed by learning; they are thoughts about what we know, and how we control learning (Gage & Berliner, 1994; Feuerstein, 1990; Wulf, Raupach, & Pfeiffer, 2005; Ekflides, 2011).

Human motion is expressed by different features, skills, physical peculiarities. The education of pupils' self-control abilities to monitor their learning and its application in new situations enables them to significantly improve their problem-solving skills (Chiviacowsky, Wulf, de Medeiros, Kaefer, & Tani, 2008; Kolovelonis & Goudas, 2012). The development of self-control

abilities allows mastering correct movement techniques since self-control helps to understand general cognitive strategies, which leads to achieving better physical skill related results. In order to develop pupils' physical abilities, it is important to research the correlation between self-control abilities and physical education among 9–10 year-old pupils as these processes interact (Baumeister & Exline, 2000; Chiviakowsky et al., 2008; Kaefer, Chiviacowsky, Meira, & Tani, 2014), however, in general, we may state that there is a gap in research analysing self-control abilities of elementary school learners.

Research object was the development of physical and self-control abilities of junior schoolchildren (aged 10–11) through the physical education classes.

Research aim was to reveal the junior schoolchildren's (aged 10–11) change in physical abilities and their relation with the development of self-control abilities during the experiment by applying an experimental education programme of self-control abilities during the physical education classes.

Research hypothesis. Development of self-control abilities during the physical education classes positively influences physical abilities of the junior schoolchildren.

Research objectives:

1. To research and evaluate 10–11-year-old learners' change in physical abilities during one academic year experiment and to conduct a comparative analysis of the obtained results.
2. To reveal the links of self-control abilities with the development of physical abilities.

METHODS

Research methods: analysis of scientific literature, questionnaire survey, educational experiment, testing, mathematical statistics. Research data were analysed by applying the Cronbach's alpha coefficient, Pearson's correlation analysis, Student's *t*, Mann-Whitney criteria.

Research methodology. The experimental group (E) had an additional workload during the physical education classes according to our designed *Developmental program of self-control abilities during the physical education classes*, whereas the control group (C) proceeded following the standard physical education program, designed for the mainstream schools and was not involved in the experimental program. The pedagogical experiment was based on a theoretical model on development of self-control abilities (Figure), referring to which an assumption was made that self-control abilities as a *metacognitive ability to learn and control* may be transferred to a developmental area of physical abilities, and in this way creates preconditions for the development of physical abilities among the junior school learners. During the physical education classes, learners were provided with information on self-control and underwent a practical development of self-control abilities. Preconditions for the development of the self-control abilities are considered as the following factors: favourable pedagogical and psychological environment, learner education by emphasizing the importance of efforts, successful learning experience, feedback, application of the behaviour learnt (generalization).

Questionnaire survey evaluates the change in self-control abilities, while testing examines the change in physical abilities (flexibility, explosive strength, agility, speed, balance, abdominal muscle strength, and stamina). The tests were chosen according to the methodology (*Lietuvos gyventojų fizinio pajėgumo testavimo ir fizinės būklės nustatymo metodika,* 2007) of testing the Lithuanian residents' physical potential and assessment of physical condition, as well as Lithuanian physical education programme "Grow and Strengthen" (*Lietuvos kūno kultūros ženklo programa „Augti ir stiprėti",* 2004). Mathematical statistical data analysis pertaining to a change in physical abilities was conducted by applying a *t* – test for independent groups and additional measurement *t*-test procedures.

The self-control questionnaire to assess physical and psychosocial control was based on the above mentioned programme "Grow and Strengthen" (*Lietuvos kūno kultūros ženklo programa „Augti ir stiprėti",* 2004) and Riggio and Friedman's (1982) inventory of social skills. The assessment scale (Cronbach's Alpha .911, n = 37) of self-control abilities was divided into physical and psychosocial self-control subscales.

All the measurements were conducted twice – before the experiment and after it.

Research organization. The pedagogical experiment was conducted among the fourth grades of Klaipėda, Kaunas, and Raseiniai basic schools in 2011–2012. The pedagogical experiment lasted for one school year. To conduct the

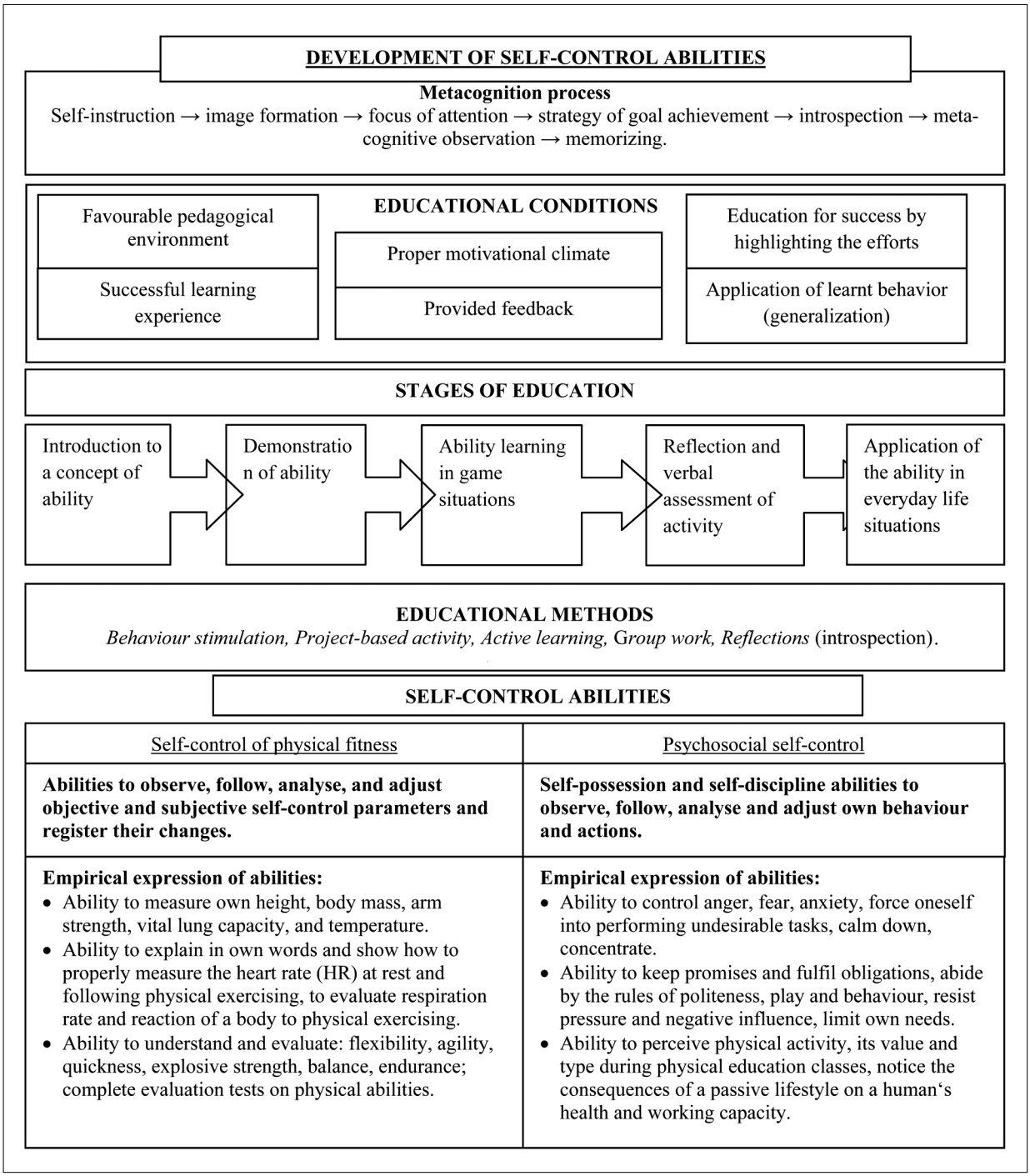

Figure 1. **Theoretical model on development of self-control abilities**

experiment, the schools were selected by criterion sampling considering such factors as qualification of participating teachers (senior teacher), work experience (years), number of classes, consent to participate in the experiment as well as a material base. Teachers, involved in the experimental group, were instructed in how to work with material of the experimental program. The research sample consisted of 178 pupils: experimental group (E, n = 85), control group (C, n = 93).

RESULTS

The change in results of physical skills. After the first study, it was determined that the differences of the mean results in both the E and C groups of both genders were statistically insignificant, i.e. the groups were homogenous and met the prime provision for the reliability of the experiment. Results with recorded changes in female learners' physical abilities are presented in Table 1.

To assess the *flexibility* a "sit and reach" test was used. Having compared flexibility among the girls from both E and C groups, it was established that having the results only slightly different at the beginning of the experiment, flexibility abilities in both groups improved statistically significantly, however, the E group showed higher mean results.

During the experiment, the girls within the E group significantly improved the long jump results: during Study II, the average results of this test were 136.60 ± 20.44 cm, thus, the girls improved the results of *explosive power* by 12.50 cm on average. Such change is statistically significant ($p < .001$). Results of the girls within the C group also improved; however, they were statistically insignificant. Having compared the results obtained

Table 1. **Change results of girls' physical abilities**

Physical abilities, test	Researched group, number *n*	Studies		Difference of mean results	Minimum and maximum values	Test of independent groups *p*	Repeated measurement *t* test		
		Study I mean results *X* ± *Sx*	Study II mean results *X* ± *Sx*				*t*	*df*	*p*
Flexibility „Sit and Reach" (cm)	E girls (*n* = 40)	16.85 ± 4.73	21.11 ± 5.29	4.26	12.12 26.40	Study I .367	8.84	39	**.000** ***
	C girls (*n* = 48)	16.96 ± 4.96	19.88 ± 7.15	2.92	12.00 27.03	Study II .343	5.36	47	.000 ***
Explosive strength "Long Jump from a Standing Position" (cm)	E girls (*n* = 40)	124.10 ± 20.05	136.60 ± 20.45	12.50	104.05 157.05	Study I .052	3.58	39	**.000** ***
	C girls (*n* = 48)	127.50 ± 20.77	132.46 ± 23.18	4.96	106.73 146.64	Study II **.003** **	1.92	47	.060
Agility 10x5 shuttle run (s)	E girls (*n* = 40)	24.64 ± 2.02	23.04 ± 5.28	–1.6	22.62 28.32	Study I .226	–2.69	47	**.010** *
	C girls (*n* = 48)	24.81 ± 3.21	23.68 ± 1.85	–1.13	21.6 25.53	Study II .603	–2.79	39	.008 **
Speed 20 m running (s)	E girls (*n* = 40)	4.81 ± 0.37	4.52 ± 0.53	–0.29	3.99 5.18	Study I .344	–3.46	38	**.000** ***
	C girls (n = 48)	4.89 ± 0.86	4.73 ± 0.60	–0.16	4.13 5.75	Study II **.002** **	–4.65	67	.001 **
Balance "Flamingo" test (times/min)	E girls (*n* = 40)	7.56 ± 0.77	5.58 ± 0.53	–1.98	0.00 22.00	Study I .115	–3.75	47	**.000** ***
	C girls (*n* = 48)	8.28 ± 5.21	7.25 ± 4.98	–1.03	7.25 19.00	Study II **.024** **	–1.77	39	.084
Abdominal muscle strength and stamina "sit-ups" (times/30s)	E girls (*n* = 40)	21.20 ± 4.81	24.10 ± 4.16	2.9	12.00 33.00	Study I .386	4.19	39	**.000** ***
	C girls (*n* = 48)	21.42 ± 4.28	23.96 ± 3.98	2.54	9.00 31.00	Study II **.041** *	4.59	47	.010 *

Note. *** – significance level $p < .001$, ** – significance level $p < .01$, * – significance level $p < .05$.

during the second study in relation to the girls from groups E and C, a statistically significant difference was identified by applying an independent samples *t*-test ($p = .003$).

In order to measure *agility*, a shuttle run test 10 x 5 m was used. Results demonstrate that during the first study the girls within E group completed the agility test in 24.63 ± 2.02 s on average, whereas C group – within 24.81 ± 3.21 s. At the end of the experiment, i.e. during the second study, the girls from group E improved the agility results to 23.04 ± 5.28 s, whereas the change among the girls within the C group was not that significant (23.68 ± 1.85 s, $p > .05$). Results within the E group have improved by 0.95 s, and this difference is statistically significant ($p = .010$). Change in agility test results among the girls from group C demonstrates that results within this group of girls changed statistically significantly ($p = .008$), however, comparing the results obtained during the second study in relation to groups E and C, no statistically significant differences were identified between those groups.

The 20 m running test was used to measure the physical abilities of *speed*. Even though improvement in results was observed in both of the groups, however, having compared the results obtained during the second study in relation to groups E and C, a statistically significant difference was identified ($p < .01$). The best test result within the group E was 3.99 s, and the worst – 5.18 s, while within the group C – respectively 4.14 s and 5.75 s.

Balance results among the girls within the experimental group increased: during the first study, the girls in group E lost their balance on average 7.56 ± 0.77 times/min, while during the second study – 5.58 ± .532 times/min, and this difference was statistically significant ($p < .001$). No statistically significant differences were identified in C group between the first and the second studies. Analysis of the second study results obtained from the independent samples *t*-test reveals that group E had bigger balance test changes compared to group C, and a statistically significant change was identified between the results of those groups ($p = .024$).

Abdominal muscle strength and stamina was measured with a "sit-ups" test. During the one academic year, results of this test in group E increased and reached 24.10 ± 4.16 times/30 s, $p < .001$), while in group C – up to 23.96 ± 3.98 times/30 s ($p = .010$). Having compared girls' mean results obtained during the second study in respect with groups E and C, it was revealed that results in group E of girls improved more than in group C and such change was statistically significant ($p = .041$).

Changes in results of the male learners' physical abilities are presented in Table 2. Having compared the changes in *flexibility* results between male groups E and C, it was identified that at the beginning of the experiment having the results almost the same, during the experimental program their further change was different: change in results in group E was more significant compared to group C, however, it was not statistically significant ($p = .335$). Flexibility results in group E improved statistically significantly ($p < .001$).

Data obtained in the *explosive leg power* test reveals that long jump results in the experimental group of boys improved: mean results obtained during the first study were 141.57 ± 18.16 cm, while during the second study – 155.64 ± 20.69 cm, ($p < .001$). Difference in results of the second study was statistically significant ($p = .005$), as mean results of group E boys in long jumps changed more dramatically compared to group C.

Having compared the change in *agility* in group E boys recorded during the first and second study, statistically significant change in results was identified ($t = 2.191$, $df = 44$, $p = .034$). Difference in results within group C boys recorded during the first and the second study was statistically insignificant ($p > .05$). Independent samples *t*-test results demonstrated that agility test results in group E boys during the second study improved more than in group C and a statistically significant difference was identified ($p = .047$).

Speed results among the boys from group E changed positively: mean results obtained during the first study were 4.68 ± 0.08 cm, while during the second study – 4.22 ± 0.47 s ($p = .008$). Results obtained during the second study between groups E and C were statistically significant ($p < .01$), as mean results concerning the speed of group E boys increased more significantly than that compared to group C ($p < .01$).

During the first study the boys from group E lost their *balance* approximately 10.18 ± 5.06 t./min, while during the second study – 9.34 ± 0.81 times/min, even though no statistically significant difference was identified ($p > .05$), the same as in group C. *T*-test results in the independent groups both during the first study and the second

Table 2. **Change results of boys' physical abilities**

Physical abilities, test	Research group, number *n*	Research		Difference of mean results	Minimum and maximum values	Test of independent groups, *p*	Repeated measurement *t* test		
		Study I mean results *X* ± *Sx*	Study II mean results *X* ± *Sx*				*t*	*df*	*p*
Flexibility "Sit and Reach" (cm)	E boys (*n* = 45)	13.71 ± 6.05	17.36 ± 5.38	3.65	2.00 25.00	Study I .321	10.09	44	**.000** ***
	C boys (*n* = 45)	14.20 ± 6.54	15.04 ± 7.03	0.84	8.00 28.00	Study II .335	1.73	44	.090
Explosive strength "Long Jump from a Standing Position" (cm)	E boys (*n* = 45)	141.58 ± 18.16	155.64 ± 20.69	14.07	123.42 176.33	Study I .555	4.46	44	**.000** ***
	C boys (*n* = 45)	138.27 ± 21.98	143.27 ± 24.38	5.00	102.00 183.00	Study II **.005** **	2.25	44	.052
Agility 10 x 5 shuttle run (s)	E boys (*n* = 45)	24.04 ± 2.59	22.27 ± 2.15	–1.77	21.45 24.42	Study I .409	–2.19	44	**.034** *
	C boys (*n* = 45)	23.77 ± 2.07	23.09 ± 2.15	–0.68	18.80 29.59	Study II **.047** *	–3.34	44	.752
Speed 20 m running (s)	E boys (*n* = 45)	4.68 ± 0.08	4.22 ± 0.47	–0.46	4.67 4.44	Study I .991	–2.77	44	**.008** **
	C boys (*n* = 45)	4.62 ± 0.49	4.46 ± 0.51	–0.16	4.621 14.46	Study II **.001** **	–1,93	44	.060
Balance "Flamingo" test (times/min)	E boys (*n* = 45)	10.18 ± 5.06	9.34 ± 0.81	–0.84	9.33 23.00	Study I .532	–1,08	44	.288
	C boys (*n* = 45)	11.31 ± 5.30	10.85 ± 6.37	–0.46	10.84 24.00	Study II .145	–0.77	44	.444
Abdominal muscle strength and stamina "Sit-ups" (times/30 s)	E boys (*n* = 45)	22.09 ± 0.08	27.58 ± 4.71	5.49	22.00 34.00	Study I .629	3.89	44	**.000** ***
	C boys (*n* = 45)	22.76 ± 3.76	24.07 ± 3.83	1.31	19.00 27.91	Study II **.030** *	–2.77	44	.008 **

Note. *** – significance level $p < .001$, ** – significance level $p < .01$, * – significance level $p < .05$.

study were statistically insignificant. Balance test among the boys proved that female learners' balance was better compared to that of boys.

Mean results of the first study of the *abdominal muscle strength and stamina* test within the group E boys were 22.09 ± 0.08 times/30 s, while during the second study the results were more positive: 27.57 ± 4.70 times/30 s ($t = –3.89$, $df = 44$, $p = .000$). Results of this test among group C boys also improved, however, not so significantly as in group E ($p > .05$). Individual differences are rather substantial: the highest number of sit-ups within the C group reached 27.91 times/30 s, the lowest – 19.00 times/30 s. According to the t-test results of the independent groups, the first study results of the boys' sit-up test between groups E and C were not statistically different ($p = .629$), while in the second study they were statistically significant ($p = .030$).

The research revealed a positive influence of the educational programme for self-control abilities on the change of physical abilities: statistically significant ($p < .05$) differences in physical abilities between the experimental and control groups were identified. Results among the boys from groups E and C in relation to speed, long jump ($p < .01$), agility, abdominal muscle strength, and stamina ($p < .05$) as well as among girls in long jump, speed, balance ($p < .01$), abdominal muscle strength, and stamina ($p < .05$).

Our research aimed at identifying the correlation between the development of self-control abilities and physical abilities. After the

comparative analysis of the change in physical abilities, correlations between learners' physical abilities and psychosocial self-control abilities were examined by applying Pearson's correlation (Table 3). Data of psychosocial self-control abilities were transformed into quantitative variables.

Table 3. **Correlations between pupils' physical and psychosocial self-control abilities**

Physical abilities	Psychosocial self-control	
	Pearson's correlation coefficient *r*	**Statistical value *p***
Flexibility "Sit and Reach" *	–.187	***p* = .012**
Explosive strength "Long Jump" **	.211	***p* = .005**
Agility 10 x 5 shuttle run	.005	*p* = .942
Speed "20 m" **	.204	*p* = .006
Stamina "Skipping with the rope"**	.227	***p* = .002**
Balance "Flamingo"**	.219	***p* = .003**
Abdominal muscle strength and stamina (torso strength) "Sit-ups"	.069	*p* = .357

Note. ** – significance level $p < .01$, * – significance level $p < .05$.

Having applied the Pearson's correlation coefficient, correlations between pupils' physical and psychosocial self-control abilities revealed that pupils with better psychosocial self-control abilities had better developed some of the physical abilities: direct correlations between psychosocial self-control and flexibility, explosive strength, speed, stamina, and balance abilities were identified. These correlations show that improvement in self-control abilities influences development of physical abilities: development of self-control as a metacognitive ability allowed better mastering of correct movement techniques, and thus created the preconditions to achieve better physical abilities.

The analysis of psychosocial self-control scale variables leads to the assumption that pupils who are able to control and suppress soreness ($p < .01$) and to adapt easily to different requirements ($p < .05$) had better balance abilities, were able to feel and assess tiredness and their pulse rate showed better stamina abilities. These findings are essential for the development of pupils' physical abilities during the physical education classes.

DISCUSSION

Our conducted research has revealed that self-control abilities can be successfully developed at a younger school age (10–11) through the physical education classes. According to some authors, social skills necessary to overcome everyday life difficulties and critical situations can be started to improve even at an earlier age (Monkevičienė, Mishara, & Dufour, 2006). Cecchini, Montero, Alonso, Izquierdo, and Contreras (2007), having investigated the influence of personal and social responsibility of school age learners on self-control and playing by the rules by using Hellison's model (1995, as cited in Cecchini et al., 2007), confirmed that a junior school age is the optimum age for the development of self-control abilities through the physical education and sport-related training. Data obtained during our research established that development of self-control abilities during physical education classes positively influenced physical abilities of children at a junior school age.

Statements on significance of self-control pertaining to the ability to learn confirm the use of metacognitive strategies in teaching (learning) movement. This is consistent with the studies, conducted by different authors (Zimmerman & Kitsantas, 1996, 2005). According to the data obtained by Kolovelonis and Goudas (2012), students who received more accurate feedback outperformed in the chest pass test than those who received less accurate feedback.

Self-controlled practice enhances motor learning (Kaefer et al., 2014). Studies conducted by Chivacowsky et al. (2008) with 10-year-old children validate the benefit of self-control ability for learning the movement techniques. Wulf et al. (2005) argue that learning through observation, or modelling, is a commonly used technique in teaching motor skills. A recent study examined whether giving the learner control over the model presentation schedule could enhance learning, if observational and physical practices are combined. In fact, several studies demonstrated that self-controlled practice could benefit the effectiveness of motor skill learning. Results obtained during the present research are consistent with such insights.

Our research shows that self-control abilities are important for everyone in order to develop

physical abilities, therefore, self-control should be taught in primary schools by explaining its meaning and importance in order to facilitate the proper organization and implementation of physical education process. It is purposeful to conduct further research which could reveal whether pupils are able to apply developed self-control skills in a long-term run, because if skills are not continuously developed, they become weaker (Bandura, 1997).

Similar self-control research was conducted by Riggio and Friedman (1982), Malinauskas, Klizas, and Šniras (2008), but they researched self-control in a wider context of the basic social skills. As basic social skills are automatic abilities, it is obvious that pupils can develop and strengthen them. Self-control abilities enable to timely notice negative changes in the body and help avoid unfavourable consequences. Physical education enables self-control not only to follow and analyse, but also to improve health condition, physical development, and physical fitness, psychical condition, emotions and actions, recognize one's body changes. This idea is also supported by the *Primary and General Education Programmes* (*Pradinio ir pagrindinio ugdymo bendrosios programos,* 2008), which state that physical activity encourages the ability to adapt to constantly changing conditions and requirements and enables the person to know oneself, one's individuality, develop physical and mental stamina, self-control abilities, which are necessary in different critical life situations.

Research by Batutis and Kardelis (2002) confirms links between the students' physical self-development and mental health. Physical balance has improved statistically significantly ($p < .05$) together with the students' mental self-control abilities, which reveal that physical self-development positively influences mental health. Students who possess strong self-control tend to flexibly react to changing situations, manage their emotions and effectively seek good sport results (Cecchini et al., 2007).

In conclusion, it is obvious that self-control abilities of the primary school learners have been little researched. We have not revealed all the factors which influence person's control in certain situations; for example, some pupils can be unable to use self-control skills due to numerous cognitive, emotional, and environmental factors, while others simply do not possess them. Strong emotions (e.g. anger, euphoria) can prevent from using one's social skills. We suggest conducting further studies, which might shed some light upon an analysis of how long children manage to apply their self-control abilities developed if such are not constantly improved. According to some authors, neglected self-control abilities weaken (Bandura, 1997) or fade away after a major pressure, however, they recover after rest and improve with exercising (Baumeister & Exline, 2000). Based on the data obtained during the studies conducted by Monkevičienė et al. (2006), abilities developed and attained by children are enduring, even in the cases when children neglect their improvement.

CONCLUSIONS

1. Statistically significant differences between the experimental and control groups' physical abilities revealed positive influence of the educational programme for self-control abilities on the change of physical abilities: the mean results of boys' flexibility, long jump, abdominal muscle strength, and stamina ($p < .01$), agility and speed ($p < .05$) statistically significantly improved. During the experiment, girls' flexibility, long jump, speed, balance, abdominal muscle strength, and stamina ($p < .01$) results also significantly improved. Development of self-control as a metacognitive ability allowed mastering the correct movement techniques, and thus created preconditions to achieve better physical abilities related results.
2. Pupils with better psychosocial self-control abilities possess better physical abilities. Identified direct correlations show the following links between psychosocial self-control and physical abilities: flexibility, explosive strength, speed, stamina, and balance. The improvement of self-control abilities influences the development of physical abilities.

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CHANGES IN PSYCHOMOTOR REACTIONS AND HEMODYNAMIC PARAMETERS DURING A SIX MINUTE WALKING TEST FOR MEN WITH HEARING IMPAIRMENTS

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ABSTRACT

Background. Lately scientists abroad and in Lithuania have been interested in the peculiarities of motor learning and control. As the recent research shows, psychomotor parameters of persons with disabilities receive much attention from the community. However, we could find only a few scientific papers dealing with the psychomotor peculiarities of the disabled people, deaf people among. *Research aim* was to evaluate psychomotor reactions and hemodynamic indices of persons with hearing impairments, athletes and male persons who did not go in for sports.

Methods. Twenty two young persons with hearing impairments took part in the study. Among them there were deaf players from the national basketball team (age 23.80 ± 2.6 years), (45.5%, n = 10). Persons with hearing impairments who did not go in for sports were in the control group (age 21.75 ± 1.8 years), (54.5%, n = 12). Research was carried out in the Lithuanian Sports University (LSU) using the analyser of dynamic parameters DPA – 1 for human hand and leg movements in the laboratory of motor control.

Results. Simple and complex reaction time was statistically different only after physical exercise between athletes with hearing impairments and those who did not go in for sports ($p < 0.05$). Simple psychomotor reaction time of athletes with inborn and acquired hearing impairments before and after exercise was not statistically significantly different. There were no significant changes in simple and complex reaction time and hemodynamic parameters (double product) of athletes with inborn hearing impairment after the 6-minute walking test.

Conclusion. Simple and complex reaction time in athletes with hearing impairment and those who did not go in for sports was statistically different ($p < .05$) only after physical strain in sportsmen. Having tested simple psychomotor time reaction in deaf persons since birth and those with the acquired hearing impairment before and after exercise we found that there was no significant difference ($p > .05$) between them, but the complex reaction time in subjects with acquired hearing impairment before and after exercise was shorter than in persons who were deaf since birth. However, the difference was also not significant ($p > .05$). There were also no significant changes in simple and complex reaction time and hemodynamic parameters (double product) in athletes who were deaf since birth after the 6 min walking test.

Keywords: hearing impairment, psychomotor parameters, reaction time.

INTRODUCTION

Different specialists and scientists of biomedicine, psychology, sports scientists, and educators are interested in people's motor skills and their peculiarities. Voluntary movements are studied analysing the peculiarities of psychomotor skills (Mickevičienė, Motiejūnaitė, Skurvydas, Darbutas, & Karanauskienė, 2008).

Deaf people are often forgotten as this disability is not so seen externally. According the data of the World Health Organization (WHO), in 2012

about 360 million of people had various hearing impairments – from medium to the absolute loss of hearing. Even 30 % of people from the whole population have different hearing problems, thus the topic of psychomotor reaction and motor skills is absolutely relevant.

Research aim was to evaluate psychomotor reactions and hemodynamic indices of persons with hearing impairments, athletes and male persons who did not go in for sports.

METHODS

Research methods applied were:

- A questionnaire survey
- 6 min walking test
- Measuring psychomotor reaction (reaction time, time to target, average speed, time to maximum speed, average asymmetry from the path line and the path of movement), using the analyser of dynamic parameters for hand and leg movements (DPA-1)
- Recording hemodynamic indexes (heart rate and blood pressure)

Twenty two young persons with hearing impairments took part in the study. There were deaf national basketball team players in the research group (age 23.80 ± 2.6 years), (45.5%, $n = 10$), persons with hearing impairments who did not go in for sports were in the control group (age 21.75 ± 1.8), (54.5%, $n = 12$). Research was carried out in the Lithuanian Sports University (LSU) using the analyser of dynamic parameters DPA – 1 (p. No. 5251; 2005 08 25) for human hand and leg movements in the laboratory of motor control.

Research procedures. Initially the heart rate and blood pressure were recorded. Then the subjects had to accomplish two tasks: simple and complex. The simple task demanded reacting to a visual signal as fast as possible and moving the handle of the device. After explaining the task it was allowed to carry out three tests, the results of which were not recorded. Then twenty times in turn the task was carried out and the reaction time (RT) of the right hand was recorded (ms). The complex task was carried out immediately after the simple task. The person had to respond to the target which appeared the screen and push the handle of the device as soon as possible in such way that the circle of the handle symbol would reach the target and stop with the precise trajectory as fast as possible. The target appeared in the same place. The end of the movement was recorded when the centre of the handle symbol stopped in the circle of the target and stayed there no shorter than 0.03 s. After explaining the task it was allowed to accomplish three tests, the results were not recorded. The task was performed twenty times in turn in five series and the reaction time (RT – T) (ms) of the right hand was recorded. After the evaluation of psychomotor reaction, BP (blood pressure) and heart rate were measured after a six min walking test. After the test, when BP and the heart rate were measured, the psychomotor reaction was evaluated (complex and simple tasks).

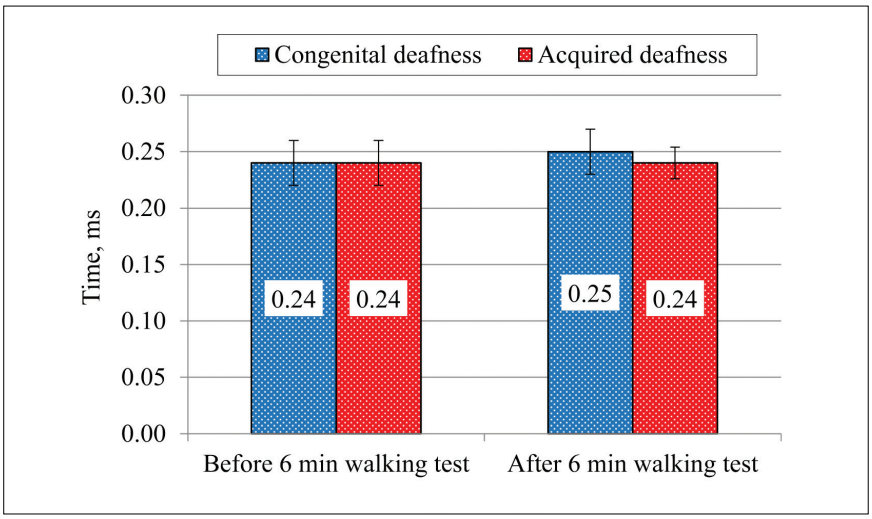
Statistical analysis. The statistical analysis of the survey data was performed using SPSS 17.0 programme and Excel 2007 programme. Quantitative data are presented as arithmetic means (M) with standard deviation (*SD*). Mann–Whitney *U* test was used for the comparison of mean values of non-parametric variables of two independent samples, Friedman test was used for the comparison of mean values of non-parametric variables of more than two independent samples. Spearman's correlation coefficient (r) was used to estimate the strength of the relationships of parameters. If $0 - |r| \leq .3$, the values are weakly dependent, if $.3 < |r| \leq .8$ – moderately dependent, if $.8 < |r| \leq 1$ – strongly dependent. The correlation coefficient is positive when one value increases and the other value decreases. When the significance level is set at $p < .05$, the difference in parameters in the groups was considered statistically significant. The results are given in charts and tables.

RESULTS

During the analysis, simple psychomotor reaction time before and after six min walking test was evaluated. For athletes with congenital and acquired deafness, simple reaction time before six min walking test was 0.24 ± 0.02 ms, after the test for those with congenital deafness it was 0.24 ± 0.01 ms. Comparing the results statistically significant differences were not received ($p > .05$) (Figure 1).

The investigation evaluated the DPA – 1 measurement data of the average values of all five series and compared them for athletes with different nature of deafness. The maximum speed before and after six min walking test for athletes with inborn deafness was higher, but after the test – lower and less asymmetry of the path of movement ($p < .05$). The average values of the other measurements did not differ significantly ($p > .05$) (Table 1).

Figure 1. **Simple reaction time before and after 6 min walking test for the participants in the group depending on the nature of deafness**



Note. $p > .05$.

Table 1. **DPA – 1 measurements depending on the nature of deafness**

Measurements	Evaluation	Congenital deafness (n = 5)	Acquired deafness (n = 5)	Total (n = 10)	p*
Reaction time (ms)	Before test	0.27 ± 0.03	0.25 ± 0.01	0.26 ± 0.03	> .05
	After test	0.24 ± 0.04	0.20 ± 0.02	0.22 ± 0.03	> .05
Time to target (ms)	Before test	0.66 ± 0.08	0.69 ± 0.08	0.68 ± 0.08	> .05
	After test	0.62 ± 0.07	0.63 ± 0.03	0.62 ± 0.05	> .05
Average speed (mm/s)	Before test	279.73 ± 32.7	255.24 ± 11.6	267.46 ± 26.2	> .05
	After test	292.95 ± 43.9	272.86 ± 11.9	282.91 ± 32.1	> .05
Maximum speed (mm/s)	Before test	795.73 ± 261.76	611.55 ± 92.6	703.64 ± 209.0	**< .05**
	After test	857.67 ±3 56.3	622.30 ± 75.8	739.99 ± 272.7	**< .05**
Time to maximum speed (ms)	Before test	0.19 ± 0.04	0.22 ± 0.02	0.21 ± 0.03	>.05
	After test	0.19 ± 0.04	0.21 ± 0.03	0.20 ± 0.04	> .05
The average asymmetry from the path of movement (mm)	Before test	-12.41 ± 2.8	-14.07 ± 21.4	-13.24 ± 2.3	> .05
	After test	-10.62 ± 2.0	-14.11 ± 1.3	-12.37 ± 2.4	**< .05**
Path of movement (mm)	Before test	170.49 ± 5.5	165.68 ± 2.7	168.08 ± 4.8	> .05
	After test	170.21 ± 6.4	164.86 ± 2.0	167.54 ± 5.3	**< .05**

Note. * – Mann–Whitney U test.

During the investigation we evaluated hemodynamic indicators and psychomotor reactions. To do that we performed correlation analysis between the changes of dual characteristics and DPA – 1 measurements that took place after six min walking test for athletes. In general the moderate positive statistically significant link was found between the change in the dual characteristics and average complex reaction time (r = .588, $p <$ .05) and athletes with congenital deafness showed a strong positive statistically significant relationship between the parameters (r = .900, $p < .05$). This means that if the average speed of performing the task is higher, even more after six min walking test the systolic blood pressure and heart rate increase. Statistically significant changes were not observed between other indicators of psychomotor reactions and hemodynamic indicators ($p > .05$) (Table 2).

Analysing the correlation of the dual change and the average reaction time, a very strong statistically significant correlation was found ($r = .9$, $p < .05$). This shows that when systolic

blood pressure increases, the average reaction time increases as well (Figure 2).

Simple reaction of athletes before six min walking test lasted 0.24 ± 0.02 ms, for those who did not go in for sports – 0.26 ± 0.03 ms ($p > .05$). After six min walking test this reaction time of the athletes was 0.25 ± 0.03 ms , of those who did not go in for sports – 0.30 ± 0.02 ms. After the test the simple reaction time and the control group time statistically significantly differed ($p < .05$) (Figure 3).

Comparing the athletes and non-athletes with hearing impairment and their complex reaction time before six minutes walking test there was no significant difference ($p > .05$) while complex reaction time was longer of those who do not do sports. After six minutes walking test in tested and control groups, complex reaction time was statistically and significantly different ($p < .05$) complex reaction time of athletes was 0.22 ± 0.06 ms and those who do not go in for sport – 0.30 ± 0.01 ms (Figure 4).

Measurements	The change in the dual system (*r/p*)		
	Congenital deafness	Acquired deafness	Total
Simple reaction time (ms)	– .564 / .322	– .410 / .493	– .418 / .230
Complex reaction time (ms)	– .051 / .935	– .200 / .747	– .258 / .471
Time to target (ms)	– .100 / .837	– .667 / .219	– .207 / .565
Average speed (mm/s)	.200 / .747	**.900 / .037**	**.588 / .047**
Maximum speed (mm/s)	.400 / .505	.600 / .285	.382 / .276
Time to maximum speed (ms)	– .359 / .553	– .738 / .155	– .483 / .157
The average asymmetry from the path of movement (mm)	– .700 / .188	– .500 / .391	– .515 / .128
Path of movement (mm)	.400 / .505	.200 / .747	.236 / .511

Table 2. **Links between the changes in the hemodynamic indicators and simple and complex reaction time depending on the nature of deafness**

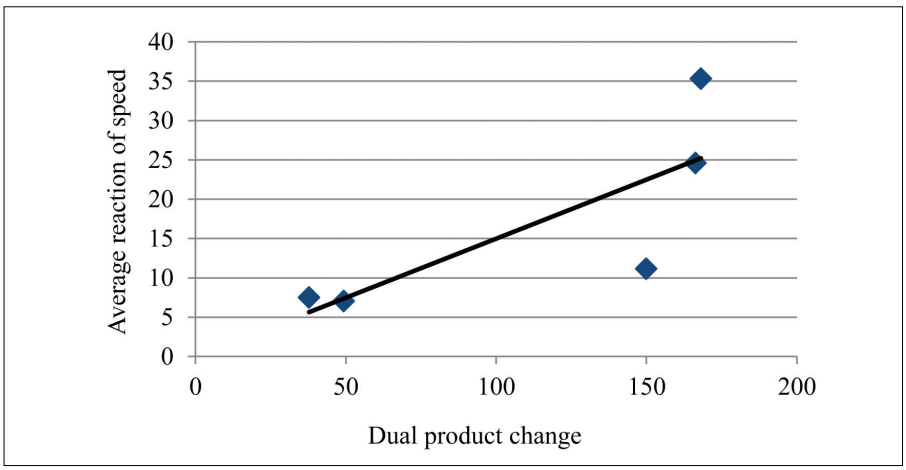


Figure 2. **Links between the changes of the average reaction time and dual product for athletes with acquired deafness**

Note. $r = .900$, $p < .05$.

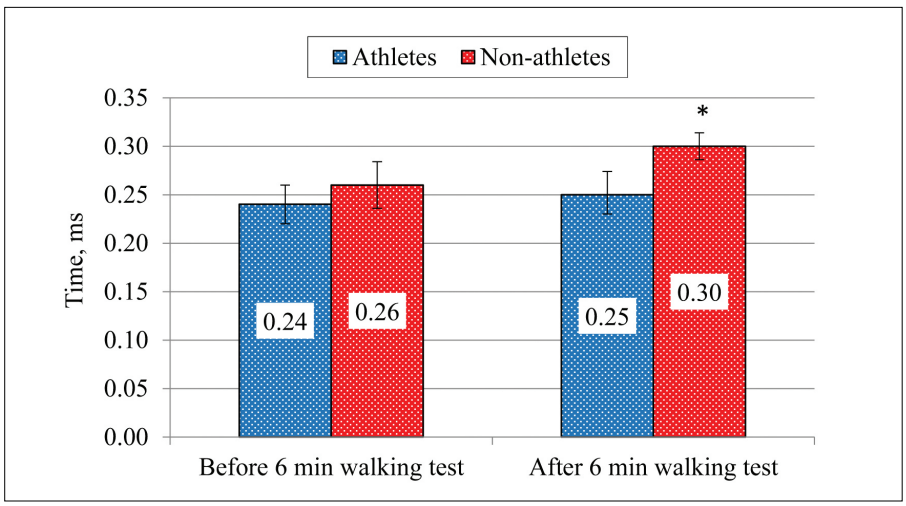
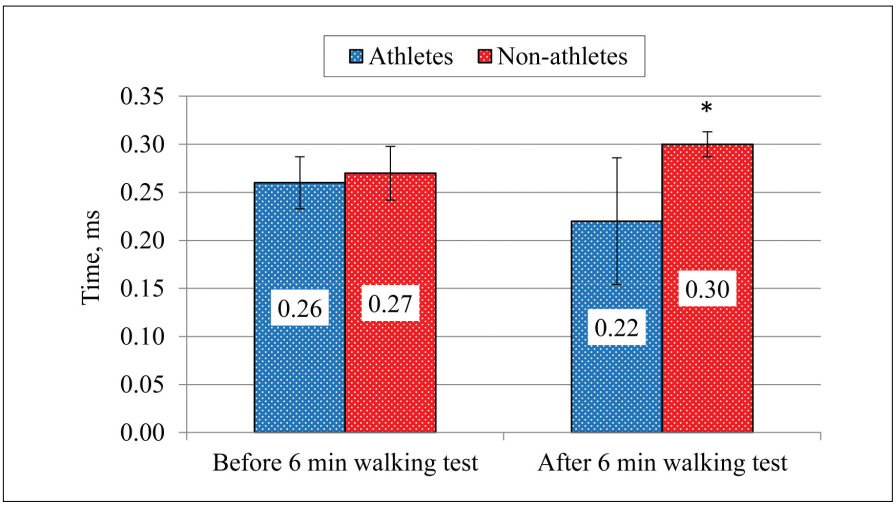


Figure 3. **Simple reaction time of the research and control groups**

Note. * – $p < .05$, Mann–Whitney *U* test.

Figure 4. **The complex reaction time of tested and control groups**



Note. * – p < 0.05, Mann–Whitney *U* test.

DISCUSSION

After the analysis of psychomotor reaction time for athletes with inborn and acquired hearing impairments before and after physical exercise between groups, no statistically significant difference was observed, while the complex reaction time for those with acquired impairment before and after physical exercise was shorter, however it did not differ significantly ($p > .05$).

Hartman et al. (2011) study coincides with our investigation of psychomotor reaction, because the latter explains that deaf basketball players have better motor skills than those who do not go in for sport. We realised that sportsmen with congenital and acquired deafness the simple reaction before six minutes walking test lasted 0.24 ± 0.02 ms and after test with inborn deafness lasted 0.24 ± 0.01 ms. Comparing the results there was no statistically significant difference ($p > .05$). Our received results confirm Hick's law, which states that reaction time is directly proportional to the difficulty of the task (Jensen, 1998). However, there are other studies where authors state that the results of reaction time do not differ significantly taking into account the complexity of the task (Yin-Chen Shen & Franz, 2005). Wilson et al. (1997) investigated the deaf people's memory and found that they have better spatial memory than people who hear and that perhaps could have an impact on the results of the psychomotor reaction investigation. Alejandra et al. (2003) state that deaf people have a better peripheral vision and therefore the reaction may be better than people who hear have. However, our study confirms the opinion of others that the reaction time men who do not go in for sport with hearing impairment in worse than among athletes (Dummer et al., 1996).

Gurkan (2013) proved that the balance of the national men's basketball team and members of the sedentary individuals significantly are different. Statistically significant difference was found evaluating the balance of basketball players and inactive, carried out by hearing impairment having athletes. So it can be claimed that the sport effect for static and dynamic balance is positive.

Analysing deaf people the most common question is whether the hearing loss cause changes of the rest sense. Because of the lack audible informatikon deaf individuals must use visual senses and get informatikon from the environment. There were researches and it was demonstrated that visual senses of deaf people do not change (Brozinsky & Bavelier, 2004). The results of our study which present the results of a simple and complex reaction coincide with Bavelier (2006) and scientific works of other authors. It was found that vision senses of deaf people become better of there are moving stimuli of peripheral vision, particularly when complex attention focus is needed.

Stevens and Neville (2006) found that individuals with total loss of hearing notice static and moving peripheral stimuli faster than people who hear, while other studines sugest that deaf people have bigger field of vision than those who hear (Codina et al., 2011). Also our study confirms Lavie's (2005) "the theory of load" for deaf individuals, because deaf people can keep attention up to a certain stimulus complexity, perhaps due to this the complex reaction time was slower of those deaf men who do not go in for sport. It is stated tha psychomotor reaction depends on tiredness. After a good rest it is faster and a person is tired the reaction is slower. Emotional status also is important. Psychomotor reaction time of hands and legs is also different (Skernevičius et

al., 2004). During the investigation we estimated hemodynamic indicators and psychomotor reactions. We did an analysis of the correlation between the dual characteristics of the product changes and DPA – 1 measurement changes, which were estimated after six minutes walking test done by sporstmen. In general the moderate positive statistically significant link between the change in the dual of the product change and medium complex reaction speed change (r = 0.588, p < .05) and athletes with congenital deafness received a strong positive statistically significant link among there parameters (r = 0.900, p < .05). This means that after six minutes walking test tested people with more increased systolic blood pressure and rapid heart rate, they reflect a greater average speed of performing the task. Among the other measurement indicators of psychomotor reactions and changes hemodynamic indicators there were no statistically significant links (p > .05). Skernevičius et al. (2004) payed significant attention to good athletes of different sports and young people who do not do sports and did not notice that this speed of sporstmen is reliably bigger but there are authors who claim that physical exercises and sports trainings affect psychomotor reaction.

CONCLUSIONS

1. Simple and complex reaction time was only statistically significantly different after physical exercise sample (p < .05) of sportsmen and those who do not do sport with hearing impairment athletes time was shorter.

2. After examination of simple and complex psychomotor reaction times of athletes with congenital and acquired hearing impairment before and after physical strain test, there was no statistically significant difference.

3. There was absence of simple and complex reaction time and hemodynamic indicators (dual product) change of athletes with congenital hearing impairment practising six minutes walking test. Statistical difference was observed only in a complex reaction of average speed record of sportsmen with acquired hearing impairment.

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PECULIARITIES OF PSYCHOMOTOR REACTION OF SCHOOLCHILDREN WITH INTELLECTUAL DISABILITIES: ASPECTS OF MODERATE INTENSITY EXERCISING AND AGE

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ABSTRACT

Background. Intellectual disability is defined as significantly reduced ability to understand new or complex information, to learn and to apply new skills. Integration into the society and independent living for intellectually disabled people is demanding because of slowdown decision processing. Quick enough response time is of vital importance not only for the motor development but also for faster and better adaptation to the changing life conditions.

Methods. The subjects were 112 persons with and without intellectual disability aged 11 to 18 years and recruited for the study. The Reaction Timer RA-1 was used to measure reaction time and to determine the speed characteristics of the person's psychomotor response before and after moderate intensity exercising. Heart rate monitor Polar RS800 was used to measure the person's heart rate.

Results. The best reaction time was demonstrated by 16-year-old normally developed individuals and those with mild intellectual disability ($p < .05$). The slowest were 11 and 12-year-old individuals ($p < .05$). The best reaction time was demonstrated by 14-year-old individuals with moderate intellectual disability and the worst – by 12 and 16 year-old persons with this disability ($p < .05$).

Conclusion. Moderate-intensity exercising has a positive influence on the execution of the complex reaction task (LRHL). The considerable reaction time increase was observed for individuals with moderate intellectual disability.

Keywords: intellectual disability, reaction time, moderate intensity exercising.

INTRODUCTION

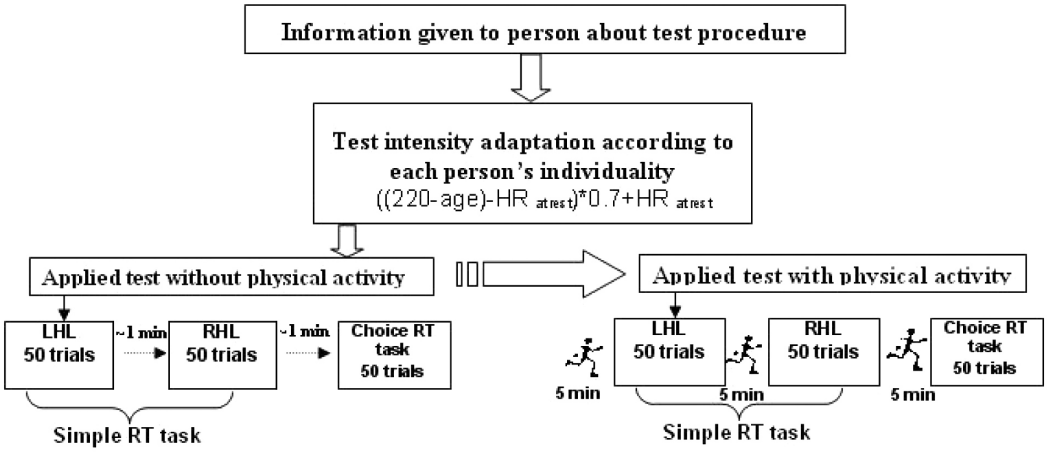
World Health Organization and researchers (Hilgenkamp, van Wijck, & Evenhuis , 2010; Muijen & Negru, 2010; Merrill, 2004; Heikura et. al., 2008) define intellectual disability as significantly reduced ability to understand new or complex information, to learn and to apply new skills. It affects the decrease of social functions of those people. The regional Director for Europe of WHO Z. Jacobi (Muijen & Negru, 2010) states that mentally retarded children and young people should have the same rights to health and social care, to education and security services, as well as their peers. Fredheim, Lien, Danbolt, Kjønsberg, & Haavet (2011) conducted a study which showed that people with intellectual disabilities exhibited poorer health status which was affected not only by disability, but also by external reasons, such as lack of information, low quality of provided social services, and insufficient level of physical activity. According to Maulik, Mascarenhas, Mathers, Tarun, & Shekhar (2011), one percent of the world population has intellectual deficiency, which is most prevalent among children and adolescents. Therefore, it is necessary to think seriously about and look for the ways to improve their quality of life and to empower individuals with intellectual disabilities for equal participation in the community and to have active social life.

Cognitive, psychomotor skills and appropriate behaviour may produce much better outcomes than expected if they receive attention and are actively developed (Song & An, 2004; McGeown, Johnstone, McKirdy, Owens, & Stanfield, 2013; de Bildt, Sytema, Kraijer, Sparrow, & Minderaa, 2005). One of the reasons why the independence and integration into the society of mentally retarded people are complicated is their slow decision making and long information processing time (Standen, Rees, & Brown, 2009 a; Standen, Karsandas, Anderton, Battersby, & Brown, 2009 b; Hilgenkamp et al., 2010). Rather short response time is of vital importance not only for their motor development, but also for faster and better adaptation to the changing life conditions. Recently it has been one of the objects that modern scientists are interested in (Weeks, Chua, & Elliott, 2000; Un & Erbahceci, 2001, Song & An, 2004; Merrill, 2004; Vicari, Verucci, & Carlesimo, 2007; Heath, Grierson, Binsted, & Elliott, 2007; Carmeli et al., 2008; Rėklaitienė, Selickaitė, & Požėrienė, 2011). Therefore, studies are needed in this area to help with following CNS functional changes in children and adolescents considering age and also the developmental proccess, the impact of adapted training and education measures for people with intelectual disabilites. All this would also contribute to creation and implementation of better social conditions for people with intellectual disabilities and reduce their exclusion in our modern society.

Participants. Biomedical study was conducted with the authorization of Kaunas Regional Biomedical Research Ethics Committee, received permit of the educational institution administration and consent of children's parents/foster parents. The study recruited 112 persons agef 11 to 18 years and divided them into three groups by intellectual disability. Classification of persons as cognitively impaired or not was based on the degree of ID according to Educational Psychological Service: IQ score for mild intellectual disability is 50–69 and for moderate intellectual disability it is 35–49. Persons in Group I (persons without intellectual disability) (n = 37, 16 males and 21 females, mean age = 14.43, SD = 2.39) were randomly selected from untrained schoolchildren aged 11–18 years in Kaunas, Lithuania. Persons in Group II (mild intellectual disability) (n = 35, 14 males and 21 females, mean age = 14.31, SD = 2.31) were randomly selected pupils from special education classes in a special education school and persons in Group III (moderate intellectual disability) (n = 40, 14 males and 26 females, mean age = 14.50, SD = 2.32) were randomly selected pupils from developmental education classes in a special education school in Kaunas, Lithuania, with age groups ranging from 4 to 5 subjects.

Intervention. The study consisted of reaction time measurement and heart rate monitoring methods. Reaction Timer RA-1 (JSC Baltec CNC Technologies, Kaunas) was used to measure the person's reaction time to the appearance of red and green light signals and to determine the speed characteristics of person's psychomotor response controlled by the central nervous system. The device was used alongside with the standard personal computer and a special computer program. When measuring the reaction to light, the subject sits in front of the device and presses a button whenever he/she sees a light signal. The device records the interval of time between the moment when the subject sees the light and he/she presses the button. Reaction time (RT) was measured in milliseconds (ms). RT in simple tasks (simple reaction time (SRT) task)) is measured since the appearance of the green or red light until the respective key is pressed (right click when the green light appears and left click when the red light appears). RT in complex tasks (choice reaction time (CRT) task)) is measured using the randomness factor as the green or red light appears at random: right click at green light and left click at red light. RT is measured since the appearance of the light until the clicking of respective key. Heart rate monitor Polar RS800 was used to measure the person's heart rate at rest. Afterwards, moderate intensity exercising (70 percent of maximum heart rate) was selected and adjusted according to person's age and heart rate at rest.

Design and procedure. *Test procedure.* Before the start of test each person was introduced with the test design and procedure. Using a pulse meter the heart rate of each person was measured and with respect to the results, the intensity of physical exercising for each person was selected and applied in a test. A test procedure before the moderate-intensity exercising: the person was comfortably seated at the desk holding a finger next to the button that must be pressed as soon as the light comes on. Before the start of the reaction test task a person was given 5 tries. Fifty reaction time tasks were performed after making sure that person understood the testing procedure correctly. The sequence of reaction time tasks: simple reaction time tasks – left hand response



Note. HR – heart rate, LHL – left hand response to light, RHL – right hand response to light, RT – reaction time.

Figure 1. **The reaction time test pocedure**

to light (LHL), right hand response to light (RHL). Choice reaction time tasks: left – right hand response to light. One minute break was made between separate tasks (Figure 1). The test procedure after moderate intensity exercising: moderate intensity running lasted 5 minutes (moderate intensity exercising for each person was calculated individually according to the formula ((220-age)-$HR_{at\ rest}$))*0.7 + $HR_{at\ rest}$). Moderate intensity exercising was followed by 50 reaction-time evaluation tasks (Figure 1). Sequence of reaction time tasks: simple reaction time tasks – moderate intensity running, left hand response to light (LHL), moderate intensity running, right–hand response to light (RHL), moderate intensity running, left – right hand response to light (choice reaction time task) (Figure 1). Heart rate recovery was monitored after the completion of running tasks and reaction time tasks. Repeated running and next reaction time task was started only when the person's heart rate returned to the level of heart rate at rest.

Statistical analysis. Prior to processing the reaction time data, response times below 100 ms and above 1000 ms were rejected. The rejection made up 1.5%. Data were processed using a Statistical Package for the Social Science (SPSS), Version 20.0. The software calculated means of trials, tasks in different intellectual development groups; standard deviation was used in this study as an indicator to evaluate response inconsistency; statistical significance to evaluate the reliability of results. Non-parametric methods were used to determine the statistical significance: Mann–Whitney *U* test was used between groups of different age and disability level; Wilcoxon's matched pairs test was used between different tasks. A *p*-value less than .05 was regarded as statistically significant.

RESULTS

The comparison of normally developed different age subjects revealed that 16-year-old subjects had a faster response rate before and after moderate intensity exercising. Before moderate intensity exercising LHL $\bar{x}$ = 203 ± 27 ms, RHL $\bar{x}$ = 204 ± 28 ms, LRHL $\bar{x}$ = 362 ± 65 ms; after moderate intensity exercising LHL $\bar{x}$ = 229 ± 21 ms, RHL $\bar{x}$ = 238 ± 26 ms, LRHL $\bar{x}$ = 377 ± 12 ms. The slower reaction before and after moderate intensity exercising was demonstrated by 11-year-old subjects. After moderate intensity exercising LHL $\bar{x}$ = 274 ± 11 ms, RHL $\bar{x}$ = 283 ± 25 ms, LRHL $\bar{x}$ = 466 ± 42 ms; before moderate intensity exercising LHL $\bar{x}$ = 327 ± 12 ms, RHL $\bar{x}$ = 306 ± 27 ms, LRHL $\bar{x}$ = 511 ± 62 ms (Figure 2). Statistically significant difference was found between 11-year-olds' group and all the senior groups (p = .01).

Subjects aged 16 years demonstrated a faster response rate before and after moderate intensity exercising in comparison with all age groups with mild intellectual disability. Before physical activity LHL $\bar{x}$ = 207 ± 13 ms, RHL $\bar{x}$ = 213 ±15 ms, LRHL $\bar{x}$ = 386 ± 62 ms; after moderate intensity exercising LHL $\bar{x}$ = 217 ± 20 ms, RHL $\bar{x}$ = 218 ± 52 ms, LRHL $\bar{x}$ = 387 ± 42 ms, the slowest were 12-year-old subjects. Before moderate intensity

exercising LHL $\bar{x}$ = 346 ± 100 ms, RHL $\bar{x}$ = 343 ± 55 ms, LRHL $\bar{x}$ = 505 ±6 6 ms; after moderate intensity exercising LHL $\bar{x}$ = 369 ± 78 ms, RHL $\bar{x}$ = 376 ± 88 ms, LRHL $\bar{x}$ = 524 ± 80 ms (Figure 2). Statistically significant differences were found between 11 and 15–16-year-old subjects (p = .01), between 12 and 15–16-year-olds (p = .02), between 13 and 16-year-olds (p = .01), between 14 and 15–16-year-olds (p = .02), between 15 and 16-year-olds (p = .05), between 16 and 17–18-year-olds (p = .05).

Subjects aged 14 years were the fastest with the response in the group of children with moderate intellectual disability. Before moderate intensity exercising LHL $\bar{x}$ = 305 ± 63 ms, RHL $\bar{x}$ = 343 ± 69 ms, LRHL $\bar{x}$ = 553 ± 68 ms; after moderate-intensity exercising LHL $\bar{x}$ = 337 ± 72ms, RHL $\bar{x}$ = 374 ± 109 ms, LRHL $\bar{x}$ = 528 ± 52 ms, the slowest were 12-year-old subjects (before moderate intensity exercising LHL $\bar{x}$ = 566 ± 125 ms, RHL $\bar{x}$ = 513 ± 155 ms, LRHL $\bar{x}$ = 640 ± 110 ms; after moderate intensity exercising LHL $\bar{x}$ = 540 ± 161 ms, RHL $\bar{x}$ = 512 ± 116 ms, LRHL $\bar{x}$ = 655 ± 76 ms,) and subjects 16 years old (before moderate intensity exercising LHL $\bar{x}$ = 576 ± 130 ms, RHL $\bar{x}$ = 519 ± 141 ms, LRHL $\bar{x}$ = 599 ± 155 ms; after moderate intensity exercising LHL $\bar{x}$ = 570 ± 138 ms, RHL $\bar{x}$ = 568 ± 137 ms, LRHL $\bar{x}$ = 613 ± 133 ms (Figure 2). Statistically significant difference while executing the task of simple reaction was found between 11–12 and 14-year-old subjects (p = .05), between 14 and 16-year-olds (p = .03), between 16 and 17–18-year-olds (p = .03).

The analysis of simple reaction time results (LHL and RHL) revealed that reaction after moderate intensity exercising got slower in all age groups of normally developed subjects (except for subjects 14 and 18 years old). Right hand reaction after moderate intensity exercising was faster than before moderate intensity exercising in the group of 14 and 18-year-old subjects. Choice reaction time task (LRHL) after moderate intensity exercising was executed faster in the group of 12, 17, 18-year-old subjects (Figure 2). Statistically significant differences are illustrated in Table 1.

In the group of 13 and 17-year-old subjects with mild intellectual disability the reaction time with left hand was shorter after moderate intensity exercising then before moderate intensity exercising. 18-year-old subjects' right hand reaction time was better after moderate intensity exercising then before moderate intensity exercising. In all other age groups reaction time with both hands was faster before than after moderate intensity exercising (Figure 2). Statistically significant differences are illustrated in Table 1.

In the group of 11, 12 and 15-year-old subjects with moderate intellectual disability the reaction time with left hand was shorter after moderate intensity exercising then before moderate intensity exercising. While performing the task with right hand the reaction time was better after moderate intensity exercising in the groups of 11, 12, 15 and 17-year-old subjects. Choice reaction time after moderate intensity exercising was faster in the groups of 13, 14, 15 and 17-year-old subjects (Figure 2). Statistically significant differences are illustrated in Table 1.

The analysis of simple reaction time results between left and right hand in the groups of normally developed subjects revealed that reaction before moderate intensity exercising in the groups of 11, 13, 14, 15 and 16-year-old subjects was better with the left hand than right. It was different for 12 and 17-year-old subjects, their reactions were better with the right hand. After moderate intensity exercising 13, 15 and 16-year-old subjects were faster with the left hand, while 11, 12, 13, 17 and 18-year-old subjects reacted faster with the right hand. 11, 15, 16 and 18-years old subjects with mild intellectual disability while performing the task before moderate intensity exercising were faster with left hand than with the right one. Other age groups were better with their right hand task. After moderate intensity exercising the subjects aged 12, 13, 15, 16 and 17 years were faster with the left hand while other age groups were better with the right hand; 13, 14 and 17-year-old subjects with moderate intellectual disability while performing the task before moderate intensity exercising were faster with the left hand then with the right one. After moderate intensity exercising the reaction time with the right hand was shorter in all groups except for 14-year-old subjects (Figure 2). Statistically significant differences are illustrated in Table 1.

The analysis of reaction time between groups with different intellectual disability revealed that normally developed subjects had better reaction time then those with intellectual deficiency. Subjects with mild intellectual disability had better reaction then those with moderate intellectual disability (Figure 2). Statistically significant differences are illustrated in Table 2.

Table 1. **Statistical significance between reaction time tasks**

Test	LHL before & after PHA			RHL before & after PHA			LRHL before & after PHA		LHL & RHL after PHA	LHL & RHL after PHA
Group / Age	I	II	III	I	II	III	I	III	III	I
11	.043						.043			.043
12	.043			.043						
14			.043					.043		
15	.043	.043			.043					
16						.043			.043	
17	.043									

Table 2. **Statistical significance between groups of subjects with different intellectual disability**

Groups		Before physical activity			After physical activity		
	Test / Age	LHL	RHL	LRHL	LHL	RHL	LRHL
I & II	12		.03	.02		.05	.01
	13	.03	.05		.05	.05	
	14			.02			
	18			.05		.01	.03
I & III	11	.01	.01		.01	.05	
	12	.01	.01	.03	.03	.01	.01
	13	.01	.01	.01	.01	.01	.05
	14			.01			
	15	.01	.01	.01	.03		.05
	16	.03	.03		.03	.03	.03
	17		.01	.05			.05
	18	.05	.05	.02	.03	.01	.01
II & III	11	.05	.01		.03	.05	
	12	.03					.05
	13		.05				
	14			.01			
	15	.01	.01	.02	.03		.03
	16	.01	.01		.01	.01	.05
	17		.03				

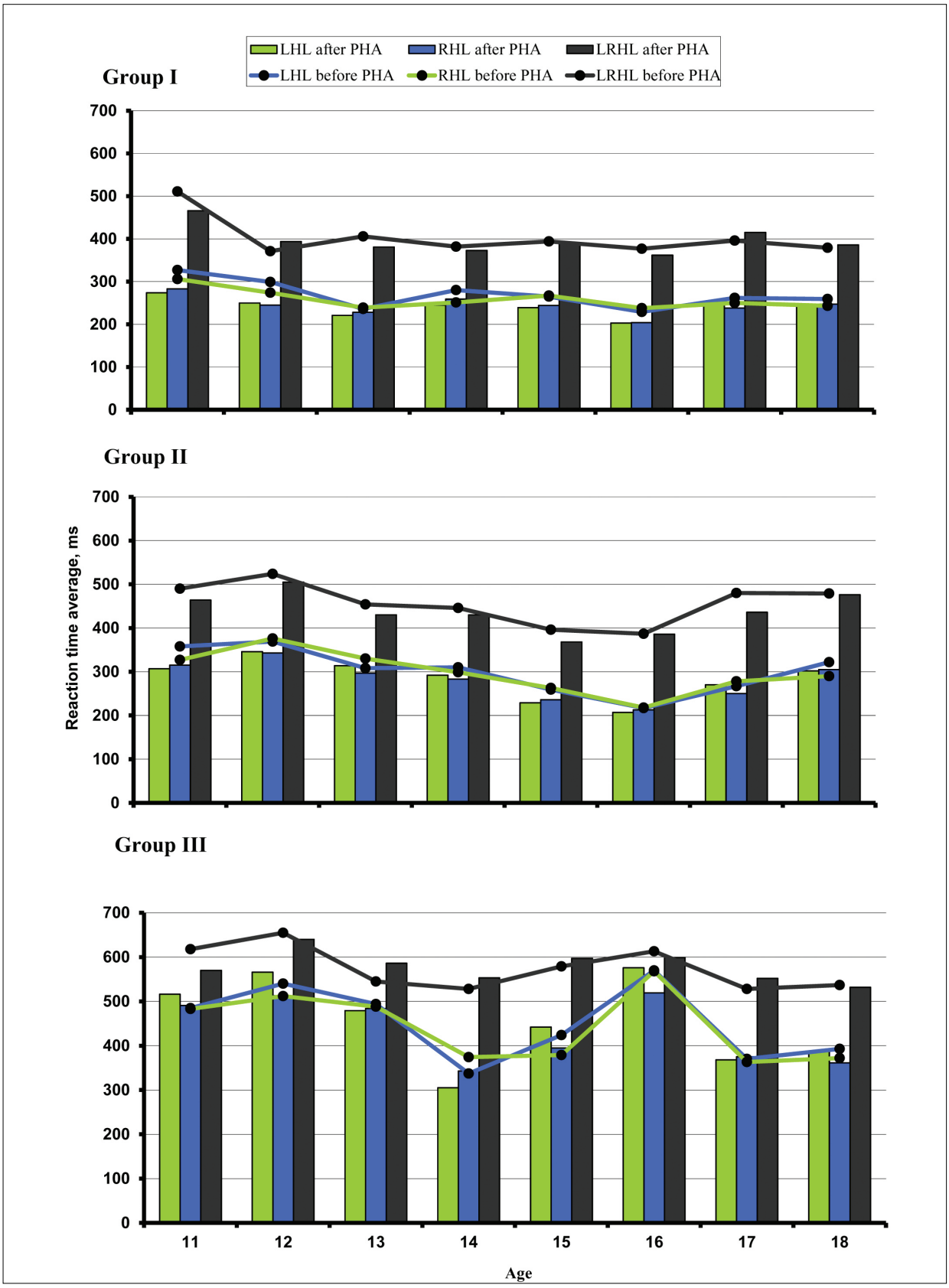


Figure 2. **Average reaction time of 11–18 years old subjects**

DISCUSSION

Scientists studying the dependence of reaction time indicators on age, highlight the significant influence of age and maturation time of CNS structures on reaction time and variability (Rueda, Posner, Rothbart, & Davis-Stober, 2004; Casey, Tottenham, Liston, & Durston, 2005; Somerville, Jones, & Casey, 2010).

The reaction time is used as a primary indicator to assess psychomotor development (Hillman, Weiss, Hagberg, & Hatfield, 2002). Research by Hillman et al. (2002) showed that motor structures and processes going on in the central nervous system were influenced by exercising. Exercising significantly influenced processes related to movement preparation and response to stimulus (Hillman et al., 2002). Safe environment where thinking processes are trained or educated without fear and negative consequences can help to overcome barriers for better decision-making, and also contributes to the increase of self-confidence and a sense of responsibility (Standen et al., 2009 a; Standen et al., 2009 b; Brown et al., 2011).

Mackey, Hill, Stone, and Bunge (2011) conducted a study with school-age children and the reaction time was used as an indicator to assess the effectiveness of training methodology used. The research showed that velocity of task performance could be trained more through exercising and not so much related to knowledge. The results of our survey partly confirmed this providence indicating that simple and choice reaction tasks were faster executed by the subjects who were physically active in comparison with non-active peers. Hillman, Kramer, Belopolsky, and Smith (2006) investigated the effects of moderate intensity exercising on human cognitive function and found that the simple and complex reaction time tasks were executed faster by physically active than sedentary individuals. Scientists propose that aerobic exercise also has general and specific effect on cognitive function. Although the effect of exercising is observed for most of task execution and cognitive processes, the biggest impact is on those tasks which include executive control processes: planning, accuracy, working memory, interference control, and task coordination. Also scientists believe that exercising makes a significant impact on cognitive processes mostly at a younger age, but for proving this statement more research is needed (Haishi, Okuzumi, & Kokubun, 2011).

After analysing and comparing the reaction time tasks' results between differently aged groups (11–18 years old) and individuals with different intellectual abilities (normally developed, mild and moderate intellectual disability), it was founded that in the group of normally developed subjects and individuals with mild intellectual disability before moderate intensity exercising, reaction time was shorter while executing the task with the left hand, and after moderate intensity exercising, reaction tasks were faster executed with the right hand. The subjects with moderate intellectual disability were faster while executing reaction tasks with the right hand in both cases – before and after moderate intensity exercising.

According to Heath et al. (2007) who investigated interhemispheric transmission and links, the left hemisphere is responsible for language and intelligence, the right hemisphere is responsible for the elementary skills and callosum is the one which ensures their sustainable action together. Following these findings it can be assumed that in the group of normally developed individuals and subjects with mild intellectual disability, the right hemisphere was more active while executing the task before physical activity, while the left hemisphere, which is more responsible for intellectual abilities, was more active after moderate intensity exercising. In the group of individuals with moderate intellectual impairment, the left hemisphere was more active in both cases: before and after moderate intensity exercising. This shows that the right hemisphere, which is responsible for the implementation of elementary actions, does not work properly and because of that, simple tasks in the central nervous system are transferred as complicated and therefore more time is needed for information processing. Merrill (2004) explains that CNS structures, which are responsible for the automaticity of actions, are slower-maturing for individuals with intellectual deficiencies.

Normally developed individuals demonstrate better results executing all kinds of tasks connected with reaction time in comparison with individuals with mild and moderate intellectual deficiencies, while those with mild deficiency are faster performing the tasks than individuals with moderate intellectual disability (Merrill, 2004; Haishi et al., 2011). Collins and Long (1996), analysing the peculiarities of simple and complex reaction time of individuals with intellectual disabilities, found a significant correlation between reaction time

and the rate of cognitive dysfunction. Thus, it can be assumed that the reaction time is affected and is reliant on the rate of intellectual disability. These assumptions were also acknowledged by other scientists (Kiuomourtzoglou, Batsiou, Theodorakis, & Mauromatis, 1994; Weeks et al., 2000; Song & An, 2004; Vicari et al., 2007; Lahtinen, Rintala, & Malin, 2007; Carmeli, Bar-Yossef, Ariav, Levy, & Libermann, 2008; Wuang, Wang, Huang, & Su, 2008; Jang, Chang, & Lin, 2009; Lin, Chang, Yeh, & Meng, 2009; Wuang, Lin, & Su, 2009 a; Wuang, Wang, Huang, & Su, 2009 b; Wuang & Su, 2009; Colom & Quiroga, 2009; Haishi et al., 2011). The rate of reaction time and standard deviation was found in the group of subjects with cognitive dysfunction (Colom & Quiroga, 2009). Collins and Long (1996) suggest that dysfunctional intellectual processes which influence cognitive processes cause a lot of problems for sustainable psychological, social and vocational development and improvement. Our study showed that comparing the individuals of different age and rate of intellectual disorder, normally developed individuals had faster reaction and lower response time variability than those with mild and moderate intellectual disability while executing all kinds of reaction tasks before and after physical activity. Individuals with mild intellectual deficiency had better reaction time results and lower response time variability in comparison with individuals with moderate intellectual disability, while executing all kind of reaction tasks before and after exercising (Colom & Quiroga, 2009; Haishi et al., 2011; Rėklaitienė, Selickaitė, & Požėrienė, 2012).

Comparing the variability of reaction time results between the left and the right hand it was found that in the group of normally developed subjects variability was higher before moderate intensity exercising while performing the task with the right hand and after moderate intensity exercising variability was higher while performing the task with the left hand. Individuals with mild and moderate intellectual disability demonstrated higher variability of reaction time results in the left hand than in right one in both cases, before and after moderate intensity exercising.

Hultsch and MacDonald (2004) believe that variability of the results while executing the reaction time tasks indicates and reflects the variability of the central nervous system. Referring to this predication, scientists state that in cognitive tasks variability depends on the age, injury, state of health and intellect rate (Collins & Long, 1996; Hultsch & MacDonald, 2004; Ram, Rabbitt, Stollery, & Nesselroade, 2005; Hillman et al., 2006; Bunce, Handley, & Gaines, 2008; Bunce, MacDonald, & Hultsch, 2004; Lövdén, Li, Shing, & Lindenberge, 2007; Robertson, Myerson, & Hale, 2006; Colom & Quiroga, 2009). According to Kennedy, Partridge, & Raz (2008), cognitive function could be influenced by many factors, such as physical and mental health, environmental changes, social environment, motivation, educational level. Bunce et al. (2008) consider that variability of the results while executing the reaction time tasks could be determined by impaired functioning of neurobiological mechanism and dysfunction of the central nervous system. Scientists who conducted studies using magnetic resonance method found that increased variability was due to frontal cortex impairment (Bunce et al., 2008). Bunce et al. (2004, 2008) and Haishi et al. (2011) observed that higher variability of tasks' results was influenced by slower reaction time, while reaction time instability depended on attention and executive control volatility. Also variability of reaction tasks' results depended on the complexity of reaction time task and fatigue (Bunce et al., 2004; McLaughlin, Borrie, & Murthal, 2010). The meta-analysis of research recently conducted in this area suggests that variability of reaction time tasks' results is influenced by age, mental development and the complexity of the task (Hultsch & MacDonald, 2004; Ram et al., 2005; Bunce et al., 2008; Lövdén et al., 2007; Rėklaitenė, Selickaitė, & Požėrienė, 2010, 2011, 2012; Haishi et al., 2011), personal physical and mental health; individuals having any kind of dysfunction and lower rates in cognitive tasks demonstrate higher variability of the results than the healthy ones (Ram et al., 2005; Bunce et al., 2008; Haishi et al., 2011).

Reaction time data analysis showed that there were differences between the groups of different age and intelectual deficiency. It means that creation and development of motor programs is dinamic process, anda particular prefrontal cortex is more activated during it (Weeks et al., 2000; Casey, Tottenham, Liston, & Durston, 2001; Song & An, 2004; Rueda et al., 2004; Mohr & Nagel, 2010; Ghisletta, Kennedy, Rodrigue, Lindenberger, & Raz, 2010). This explains the fact that at a younger age reaction time is more variable and longer and the maturation of prefrontal cortex influences the development of strategic thinking and in the sequel

the complex tasks are changed from automatic processes to controlled processes (Casey et al., 2005; Schlaghecken & Sisman, 2006). Automatic processes develop earlier than controlled processes (Schlaghecken & Sisman, 2006).

CONCLUSIONS

The best reaction time was demonstrated by 16-year-old normally developed individuals and those with mild intellectual disability. The slowest were 11 and 12-year-old individuals. The best reaction time was demonstrated by 14-year-old individuals with moderate intellectual disability and the worst – by 12 and 16 year-old persons with this disability. Moderate intensity exercising has a positive effect on the execution of the complex reaction task (LRHL). The considerable longer reaction time is typical of the cohort with moderate intellectual disability.

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EFFECTS OF INTERVENTION "HOPSPORT BRAIN BREAKS" PROGRAM ON PHYSICAL FITNESS AND SEDENTARY BEHAVIOUR IN PRIMARY SCHOOL

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ABSTRACT

Background. Sedentary behaviour in children raise concern as the majority of children do not meet the health-related level of physical activity (PA) which is closely related with their physical fitness (PF). Digital facilities may help to solve the problem. *Hypothesis*. After the intervention "HOPSport Brain Breaks" physical fitness improves and sedentary behaviour decreases. *The aim* of the study was to assess the effects of "HOPSport Brain Breaks" video exercise intervention program on physical fitness and sedentary behaviour in a primary school.

Methods. The study included 113 primary schoolchildren from grades 1–4, among them there were 62 children in the experimental group and 51 in the control group (Mean age = 8.24, *SD* = 1.10). PF was assessed using the test battery (Fjortoft, Pedersen, Sigmundsson, & Vereijken, 2011) pre- and post-intervention. Also passivity was measured twice using four questions from "Health Behaviour of School Children" questionnaire. The experimental group received Brain Breaks intervention every school day for three months in 5–9 min sessions during the breaks.

Results. After three months physical fitness (PF) did not improve, but sedentary behaviour reduced in the experimental group compared to the controls ($p < .05$).

Conclusions. The results have shown that fun and enjoyment, which are the background of Brain Breaks intervention, were important factors in reducing sedentary behaviour. Studies also show that the level of PA is proportionally higher when children are given the opportunity to play active games and experience fun (Wickel et al., 2007). It may be concluded that Brain Breaks intervention program contributes to physical health of primary schoolchildren.

Keywords: primary schoolchildren, physical fitness, sedentary behaviour.

INTRODUCTION

Being physically fit is not only a tribute to sports or physical education, but also the most significant factor of happier and more thoughtful life (Volbekiene & Kavaliauskas, 2002). It might be said that the body structure and physiological functions of a physically fit person are in the best condition (United States Department of Health and Human services, 2008). Thus, physical fitness is a condition when a person does not get tired while working normally, i. e. he or she remains agile and feels good (Dreyer & Hanson, 2008).

Most countries pay great attention to the workload, therefore, physical fitness is associated with functional capabilities to perform physical tasks without overworking. What is more, physical fitness is the result of physical activity, i.e. the best physical condition gained as a result of physical

activity. As modern science claims about physical fitness, it is recognized as one of the most important health indicators. Furthermore, physical fitness is improved with the help of physical activity (Corbin et al., 2014).

It should be noted that the physical activity of children has decreased significantly during the last decades (Anderssen et al., 2006). Outdoor games have been replaced by physical activities indoors which require fewer physical attempts (Grund et al., 2000). Children more often are driven to school in a car or by bus than they go on foot or by bike. At the same time, participation in organized sports also decreases (Rice & Howell, 2000). A discussion on possible consequences and recommendations how to change this evolving issue has been taking place in press, scientific articles, and among politicians for many years. However, the largest research on physical activity and physical fitness and their impact on health failed to find the required and specific results (Marshall & Bouffard, 1997).

Sedentary behaviour is mostly defined as an act requiring low levels of energy expenditure while a person is sitting or lying (Katzmarzyk, 2010). Various markers of sedentary behaviour, like TV watching and using of computer, are associated with many chronic diseases (Chinapaw, Proper, Brug, van Mechelen, & Singh, 2011). A lot of countries have generated public health guidelines that include recommendations on limiting presence in sedentary behaviour (Tremblay et al., 2011 a).

Recently studies have shown the increase in sedentary behaviour like TV watching etc. (Must, Barish, & Bandini, 2009). Tremblay et al. (2011 b) state that TV watching for more than 2 hours in a day is closely related to reduced physical health. Sedentary behaviour may be associated with energy expenditure by, for instant, playing outside (de Craemer et al., 2012). This association provides a rationale for the development of interventions to decrease sedentary behaviour.

A rapid growth of popularity of new technologies and TV has been recognized as a significant contribution to the promotion of obesity (Proctor et al., 2003). Importantly, one of the solutions is the use of intervention video games at schools. Electronic games encourage children to be physically active using hands, feet or the whole body movements. These active electronic games depict movements of a wide variety of sports (football, basketball, boxing, martial arts, etc.) or other active actions performed in everyday life (window cleaning, dancing, etc.). An active video game is closely related to the reality, and while playing these video games, the results promote the development of habits of active daily activity (Maddison et al., 2001).

Certain recommendations on improving health through physical activity state that a child must be active for about 60 minutes a day (United States Department of Health and Human Services, Physical activity Guidelines for Americans, 2008). Children are receptive to innovations, therefore, they very quickly get used to a sedentary lifestyle, especially to computer, DVD games or TV. A new generation has improved the aforementioned information technology games and turned them to a method to promote physical activity of children. Previous studies have shown that interactive electronic games can significantly improve children's physical activity, using significantly more energy than sitting in one position and playing electronic games (Wang, Perry, 2006; Graves, Ridgers, & Stratton, 2008).

Direct observation is not an exact measure of monitoring physical activity context; therefore, it is impossible to collect accurate data. This method has been used by many researchers in Hong Kong and America, so the research exactly shows just the scope of physical inactivity of children and how much of their leisure time is spent sedentarily (Sit, Lam, & McKenzie, 2010). "HOPSport Brain Breaks" intervention program helps to develop certain movement habits integrated in games. "HOPSport Brain Breaks" intervention program is a simple, but effective way to solve the above mentioned problems. In case of extending the daily physical activity time, physical activity level would be significantly increased. There is a trend that the prolongation of time of daily physical activity and performance period is likely to result in the achievement of positive changes in physical fitness during the intervention period.

The aim of the study was to investigate the effects of providing Brain Breaks (BB) video lessons during the breaks on children's changes in physical fitness and sedentary behaviour during a three- month intervention program.

Hypothesis. After the intervention "HOPSport Brain Breaks", physical fitness improves and sedentary behaviour decreases.

METHODS

Procedure. The intervention program was implemented in September-November at a primary

school in Kaunas during the fall semester of 2013. Two classes from grades 1, 2, 3 and 4 were selected: one class was the experimental one, while the other – the control one. Before implementing the program, physical fitness of children from all grades was tested. Videos of 5–9 minutes that help to improve physical fitness and reduce the inactivity were shown at least once a day, for the period of three months. The activity of watching the videos was coordinated by the class teacher. After the intervention program, physical inactivity of children was re-tested by a questionnaire survey, and physical fitness was determined with the help of tests of physical fitness.

Participants. Participants were 113 Ist-IVth-grade children (Mean age = 8.24, *SD* = 1.10) from one primary school in Kaunas. Children were divided into two groups: experimental (31 boys and 31 girls) and control (29 boys and 22 girls). A written consent of parents of each participant was obtained.

Measures. Physical fitness tests were performed according to the methodology of tests of Fjortoft et al. (2011), which were selected from other physical fitness tests. All these tests reflect the children's daily physical activity, i.e. jumping, shooting, climbing, and jogging. Moreover, these physical fitness tests are for 5–12-year-olds. All tests were performed without any warm-up.

The following 9 physical fitness tests were used to measure the physical fitness of children:

1. **Standing broad jump (cm). A component of physical fitness – explosive power.**
   A child stands behind a line marked on the ground with feet slightly apart. The knees are bent, and arms are stretched ahead, parallel to the ground. By swinging the arms, the child takes off the land. The child attempts to jump as far as possible. The result is from take-off line to the point of contact on the land. The higher score indicates the better performance.
2. **Jumping a distance of 7 m on two feet as fast as possible (s). A component of physical fitness – muscle strength of legs.**
   A child jumps a distance of 7 m on two feet, as fast as possible. The result of subject (two attempts are made, the best is recorded) is the time needed to cross the distance of 7 m (measured in seconds). The lower score indicates the better performance.
3. **Jumping a distance of 7 m on one foot (the child is free to choose which foot) as fast as possible (s). A component of physical fitness – muscle strength of legs.**
   A child jumps a distance of 7 m on one foot (the child is free to choose which foot), as fast as possible. The result of the child (two attempts are made, the best is recorded) is the time needed to cross the distance of 7 m (measured in seconds). The lower score indicates the better performance.
4. **Throwing a tennis ball with one hand (m). A component of physical fitness – muscle strength of arms.**
   Throwing a tennis ball with one hand (the child chooses which hand) as far as possible. The right-handed child stands with the left foot at start line, while the left-handed one with right fo0ot. The result of child (two attempts are made, the best is recorded) is the distance thrown (from start line to ball falling point, measured in meters). The higher score indicates the better performance.
5. **Pushing a medicine ball from chest (m). A component of physical fitness – muscle strength of arms.**
   It is pushing the medicine ball (1 kg) with two hands as far as possible. The starting position is with the feet parallel to each other and shoulder width apart, with the ball held against the chest. The result of the child (two attempts are made, the best is recorded) is the distance from the start line to the ball (measured in meters). The higher score indicates the better performance.
6. **Climbing up wall bars (s). A component of physical fitness – coordination**
   Climbing up the wall bars (there must be 4 columns of wall bars). Climbing up the first column, crossing 2 columns to the right, and climbing down the fourth column as fast as possible is required. Each column of the wall bars is 2.55 m height and 0.75 m width. The result of a child (two attempts are made, the best is recorded) is the time, recorded as a child puts both feet on the ground (measured in seconds). The lower score indicates the better performance.
7. **10 x 5 m shuttle run (m). A component of physical fitness – agility**
   10 x 5 m shuttle run. Two parallel lines with the distance of 5 metres from each other are marked on the floor. The child stands behind the line and prepares to run. One foot must be very close to start line. The child runs to the

finish line as fast as possible, and then comes back to the start line by overstepping it with both feet. It is one time, and there are 5 runs. When running for the fifth time, the child should not reduce his/her speed at the finish line. The result of a child (two attempts are made, the best is recorded) is the time recorded when start line is crossed at 5th time (measured in seconds). The lower score indicates the better performance.

8. **20 m run (s). A component of physical fitness – speed.**
   Running 20 m as fast as possible from a standing position. It is attempted only once. If the child makes an error, the test is repeated. The result of child is the time required to run the distance of 20 m (measured in seconds). The lower score indicates the better performance.
9. **6 min run (9 x 18), (m). A component of physical fitness – endurance.**
   Reduced Cooper test. The child runs or walks around a marked rectangle (dimensions 9 x 18 m (volleyball field)) for 6 minutes. Both running and walking are allowed. The result of child the distance covered in 6 minutes (measured in meters).

The following materials were needed for administering the tests: masking tape, ruler, stop watch, tennis ball, medicine ball (1 kg), wall bars at least 4 columns wide, and gym mats. Tests were performed one after another, following the specified sequence. The higher score indicates the better performance.

Sedentary behaviour was assessed by the questionnaire Health Behaviour of School Children (HBSC). Outcome variables were the time spent for TV viewing and using a PC (weekday and weekend day).

Physical activity intervention "HOPSport Brain Breaks" is a set of videos of 2–10 minutes, based on physical activity during breaks. Videos have been initiated in Lithuania for the first time in collaboration with the Hong Kong Institute of Education which has successfully been supervising the project "HOPSport Brain Breaks" for some years, in partnership with 40 schools in 26 countries. Without any additional planning and preparations, teachers, with the help of information technologies, show one longer or two shorter videos in their class every day, during a break. Each video, the character of which is a real or animated instructor, demonstrates exercises which improve children's motor skills and practical abilities. The content of movies includes health knowledge and training in healthy nutrition, education of social skills, environmental management, and certain mathematics, writing skills, language, art, music and cultural knowledge. Online access to the official project web site: http://www.hopsports.com/content.php?pgID=289.

Statistical analysis. Statistical analysis was performed using SPSS for Windows 19.0 software (SPSS Inc., Chicago, USA). Descriptive statistics were used to describe the sample. Paired sample t-test was used to determine whether there is a significant difference between the average values of the same measurement made between two time points. Results were considered significant at $p < .05$.

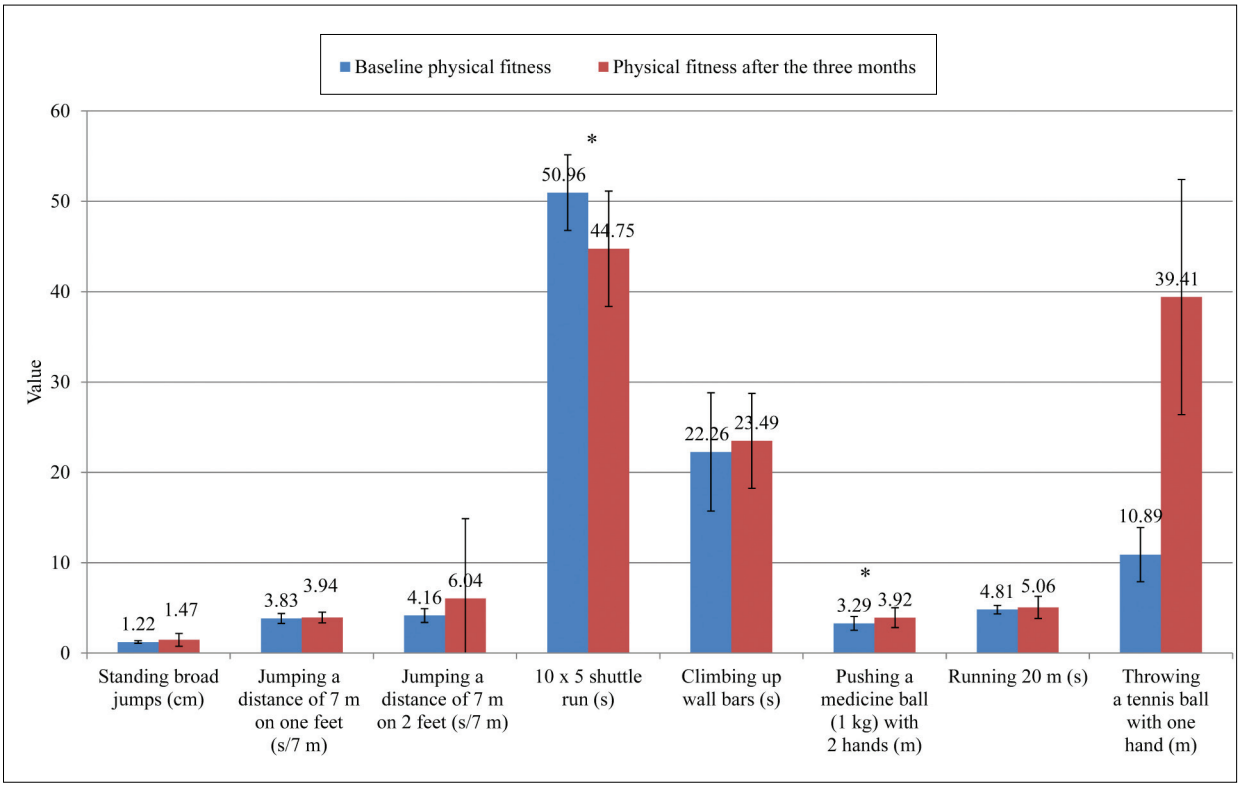
RESULTS

Initially changes from the baseline to the follow-up in three months were evaluated in both control and experimental groups (results revealed performance in two physical fitness tests in the control group of girls after three months):

Pushing a medicine ball from chest (m) and 10 x 5 m shuttle run (m) significantly ($p < .05$) improved. Performance in other fitness tests did not change significantly. Standing broad jump (s), jumping distance of 7 m on one feet (s/7 m), jumping distance of 7 m on two feet (s/7 m), 10 x 5 shuttle run (s), pushing a medicine ball (1 kg) with both hands (m), running 20 m (s), throwing tennis ball with one hand (m) (Figure1).

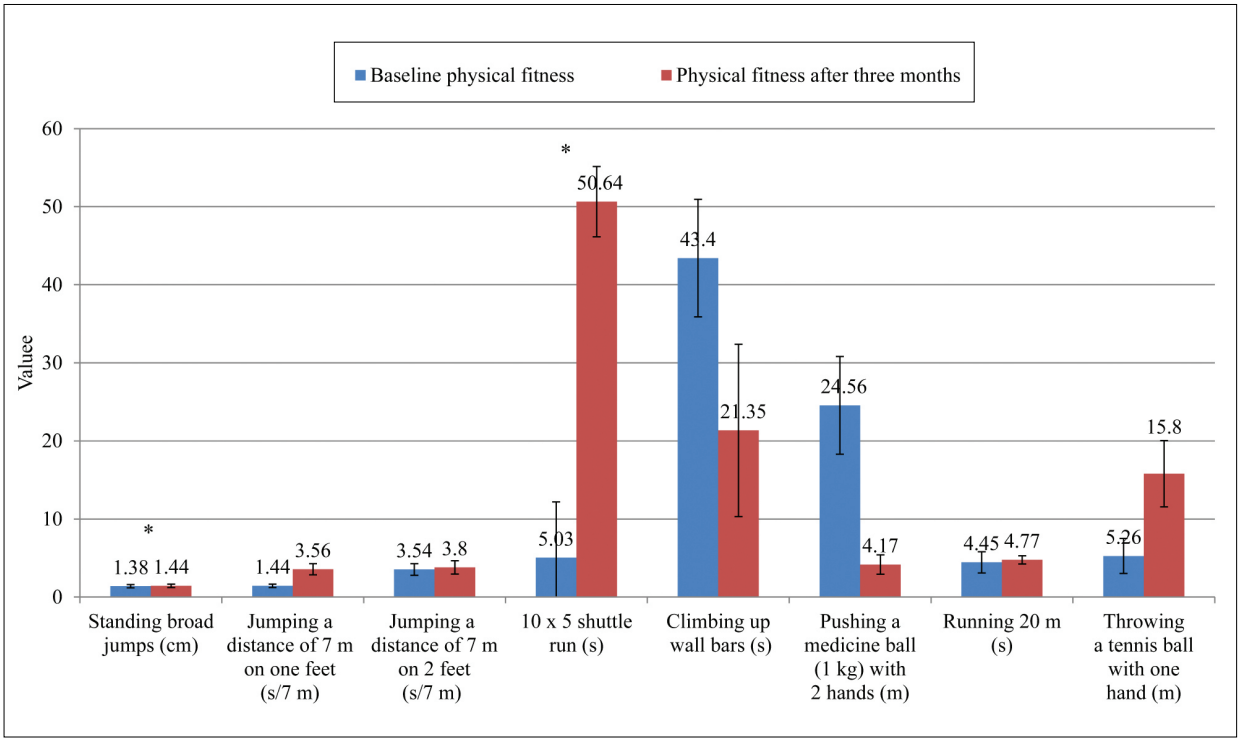
After three months, scores in standing long jump (cm) increased, but scores in 10 x 5 m shuttle run (m) significantly ($p < .05$) decreased and fitness worsened in the control group of boys. The performance in other fitness tests did not change significantly. Results of tanding broad jump (s), jumping distance of 7 m on one feet (s/7 m), jumping distance of 7 m on two feet (s/7 m), climbing up wall bars (s), running 20 m (s), throwing a tennis ball with one hand (m) are given in Figure2.

In the experimental group of girls after three months of intervention, the scores in jumping a distance of 7 m on two feet (s) significantly ($p < .05$) increased and muscle strength of leg fitness worsened, however, the scores of pushing a medicine ball from the chest (m) increased and muscle strength of arm fitness improved. Results of standing broad jump (s), jumping distance of 7 m on one feet (s/7 m), 10 x 5 shuttle run (s), climbing up wall bars (s), running 20 m (s), throwing tennis ball with one hand (m) are given in Figure3.



Note. * – p < .05.

Figure 1. **Changes of physical fitness in three months in the control group of girls**



Note: * – $p < .05$.

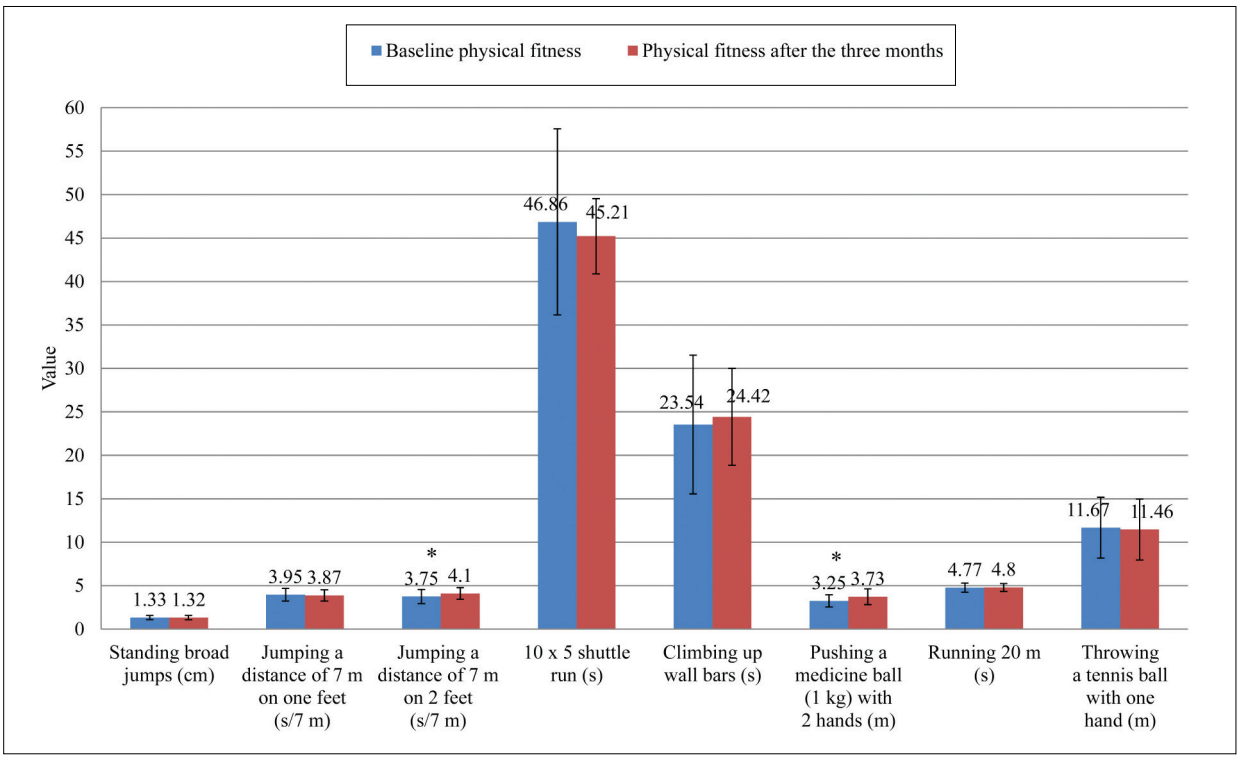
Figure 2. **Changes of physical fitness in three months in the control group of boys**

In the experimental group of boys, the scores in jumping a distance of 7 m on one foot (s) and climbing up wall bars (s) significantly ($p < .05$) increased, respectively coordination fitness worsened, but performance in 10x5 m shuttle run (m) test improved ($p < .05$). Results of standing

broad jump (s), jumping distance of 7 m on two feet (s/7 m), running 20 m (s), and throwing a tennis ball with one hand (m) are given in in Figure 4.

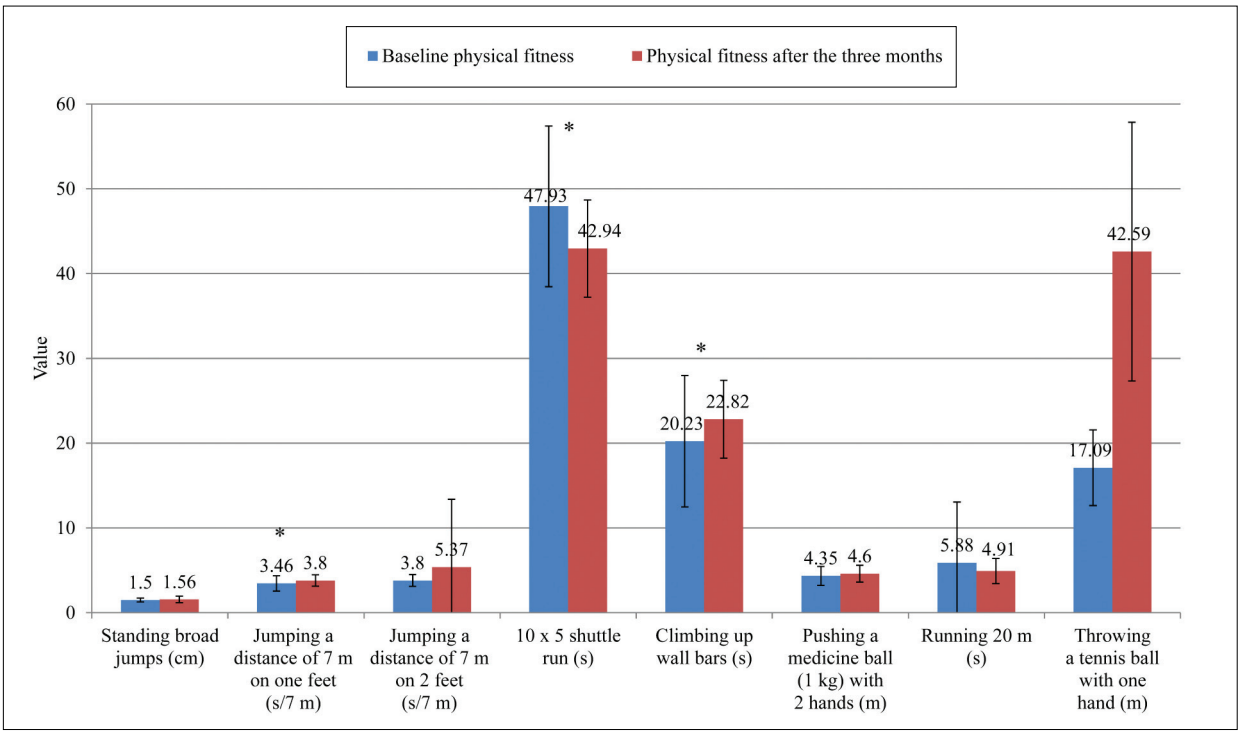
Further changes in three months in sedentary behaviour were examined and presented in Figure 5. Results in the figure indicate that the control group significantly ($p < .05$) increased watching TV time by 14 minutes on work days (Figure 5).

Meanwhile, the experimental group significantly reduced ($p < .05$) all the sedentary behaviour forms:



Note. * – $p < .05$.

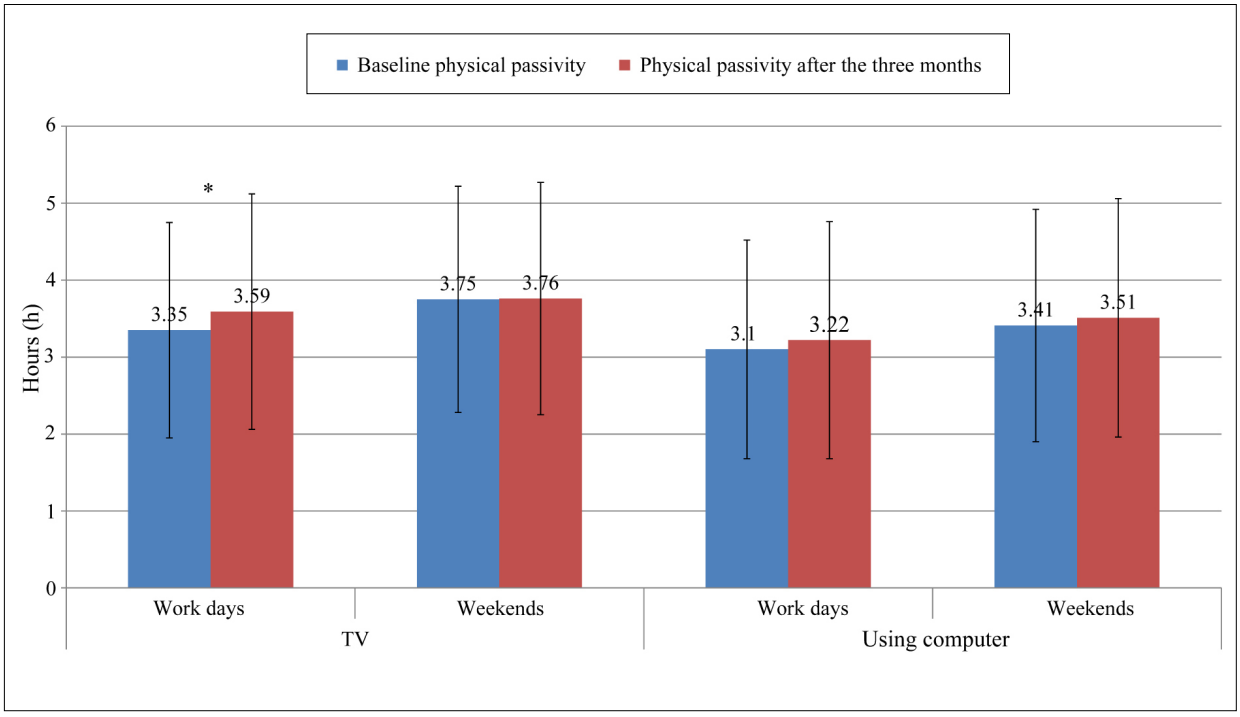
Figure 3. **Changes of physical fitness in three months in the experimental group of girls**



Note. * – $p < .05$.

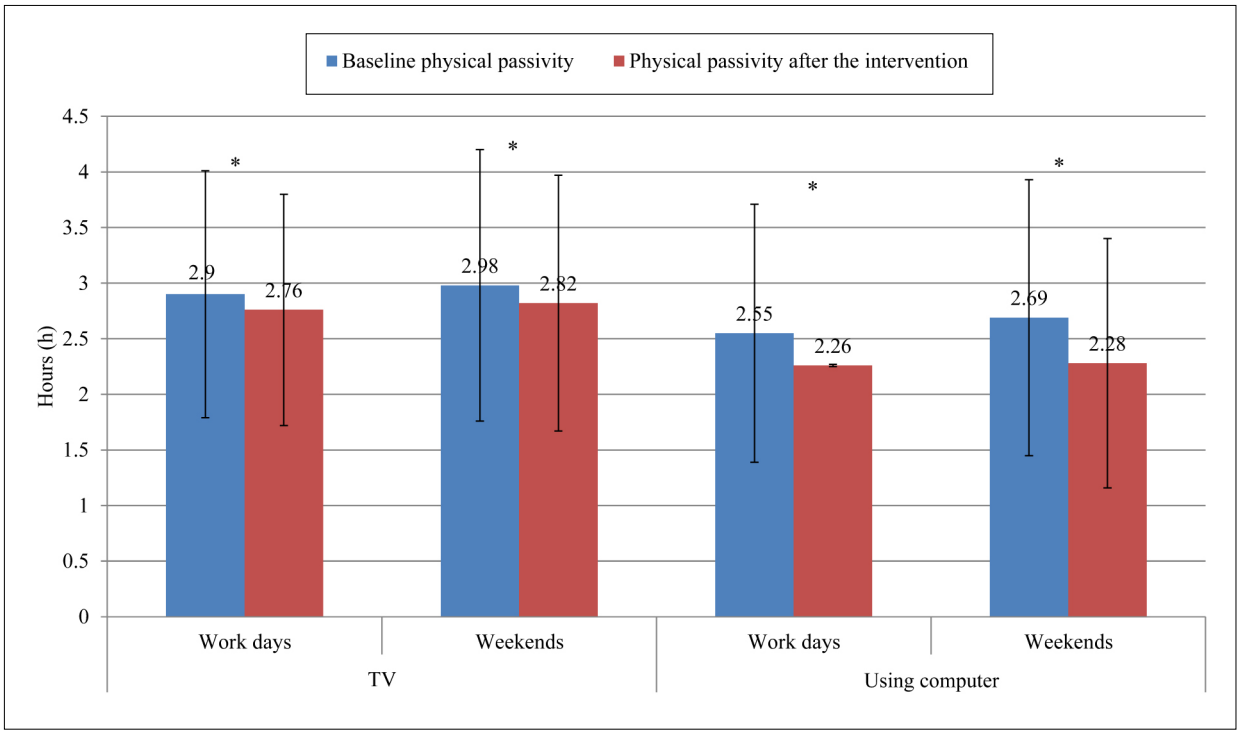
Figure 4. **Changes of physical fitness in three months in the experimental group of boys**

watching TV and using computer during the work days and at weekends. Watching TV during the work days decreased by 8 minutes, during the weekend – by 10 minutes, using computer during the work days decreased by 17 minutes, during the weekends – by 24 minutes (Figure 6).



Note. * – $p < .05$.

Figure 5. **Changes in the sedentary behaviour of the control group in three months' time**



Note. * – $p < .05$.

Figure 6. **Changes in the sedentary behaviour of the experimental group in three months' intervention period**

DISCUSSION

The general primary physical education programs maintain that physical activity is the key factor promoting the body to grow and develop. Each form of movement optimizes not only motor, but also mental and social maturity evolution of a human being. Primary schoolchildren are very receptive, agile, willing to know the world and themselves, therefore, at this age it is important to allow the children to experience the joy of movement, to encourage them to be physically active.

Following the research-based claims, Brazilian scientists argue that low physical fitness is determined by several factors (Hiraga et al., 2014): low physical activity, inaccurate perception of a person about his/her potential physical activity and its benefits, extremely high body mass index (BMI) indicators. HOPSport BB helps to develop certain movement habits with the help of the games. "HOPSport Brain Breaks" intervention program is a simple but effective way to solve the above mentioned problems. In case of extending the daily physical activity time, physical activity level would be significantly increased. There is a trend that the prolongation of time of daily physical activity and performance period is likely to result in the achievement of positive changes in physical fitness during the intervention period.

This research demonstrates that intervention of "HOPSport Brain Breaks" during the school breaks can successfully reduce sedentary behaviours among children (Steeves, Thompson, Bassett, Fitzhugh, & Raynor, 2012).

Most of the previously applied programs promoting students' physical activity used to fail. The reasons for this include inappropriate structure, lack of financial resources or simply unattractiveness for children (Bundy et al., 2011). "HOPSport Brain Breaks" program is acceptable by its novelty, it is safe. There is no need for financial resources, and, what is particularly attractive to children, is presented by using information technologies. An increasingly growing interest of children in information technologies, which promote sedentary lifestyle, leads children to a wide range of diseases (cardiovascular, obesity, etc.). Frequent use of computers and watching TV can reduce certain physical skills, which are closely related to physical activity and are particularly necessary for normal development of motor skills (Straker et al., 2011). Therefore, this program has met the children's need of computer games and information technologies, at the same time encouraging the primary schoolchildren to move actively.

Skurvydas, Stonkus, and Volbekienė (2006) showed that certain skills start developing during the first year of child's learning, which needs well-coordinated and quick movements. Endurance of 7–11-year-old child is not well developed; boys and girls' endurance increases significantly only in twelfth year; 7–8-year-old children are unable to regulate their actions adequately. They are unable to maintain the required rate of motions, feel the subtle changes of rhythm, distinguish and dose the muscle tension. However, all these important features are trained extensively. Most of the children in the experimental group are from the first and the second grades, i. e. 7–9 years old. Research conclusions demonstrate that children at this age do not regulate their movements effectively.

Certain recommendations for improving health through physical activity state that a child must be active for about 60 minutes a day (United States Department of Health and Human Services, 2008). Children are receptive to innovations, therefore, they very quickly get used to a sedentary lifestyle, especially to computer, DVD games or TV. A lot of research indicates that physical activity and fitness are closely related, however, children's daily activity fails to comply with the international recommendations (Strong et al., 2005). While analysing the results of completed research it was noted that that 10 minutes of physical activity a day, within the period of three months, is not enough to improve physical fitness of primary schoolchildren. The main recommendation, based on the international guidelines, is to extend the time of physical activity a day. Physical activity for 10 minutes a day, and doing so every day for more than 3 months, can introduce useful changes in physical activity and.

This research can be compared with previously carried out research on motivation of children which revealed that just spending the time, while being engaged in a favourite activity, without seeking to achieve the results, is an effective motivational aspect for children, which is closely related with higher physical activity level and gradually decreasing inactivity (Mackintosh, Knowles, Ridgers, & Fairclough, 2011).

This research is unique in that it is based on not only the definition of physical activity, but also

on other factors that are closely related to physical activity (motivation, knowledge about the benefits of physical activity and self-motivation to exercise). Videos not only improve certain motor skills, but also personal understanding about the benefits for children's health.

CONCLUSIONS

Three months' period of "HOPSport Brain Breaks" is not related to physical fitness of the primary schoolchildren. The results of physical fitness did not improve. The sedentary behaviour of primary schoolchildren reduced.

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