

Relationship between Primary School Children's Physical Fitness, Physical Activity and their Parents' Physical Activity

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ABSTRACT

Background. Healthy lifestyle skills instilled in childhood remain into adulthood. Parental physical activity skills are directly related to their children's physical activity which strengthens their children's physical fitness. The aim of the study was to determine and evaluate the relationship between parents' and children's physical activity and to evaluate the links between children's physical activity and physical fitness.

Methods. The study involved 486 primary school children aged 7 to 10 years (240 boys and 241 girls) and their parents from Kaunas district. The study was conducted in 2018 in Kaunas district schools. Parental physical activity was assessed using Godin Leisure-Time Exercise Questionnaire-GLTEQ (Godin & Shephard, 1985). Physical activity of primary school children was assessed by submitting a questionnaire to parents developed by researchers Bacardi-Gascón, Reveles-Roy, Woodward-Lopez, Crawford, and Jiménez-Cruz (2012). Schoolchildren's physical fitness was assessed by 9 physical fitness tests (Fjørtoft, Pedersen, Sigmundsson, & Vereijken, 2011).

Results. Having assessed the physical activity of children according to WHO (2010) recommendations, we found that the vast majority of the surveyed children (93.6% of boys and 86.3 of girls) were physically active, i.e. they engaged in physical activity for more than 1 hour during the day. Comparing the schoolchildren's physical fitness by gender we found that boys were more physically fit than girls when performing long jumps, two-legged jumps, throwing a tennis ball, and running for six minutes ($p < .05$). Comparing the results of schoolchildren's physical fitness by grades (Table 3), we observed that the older children were, the more physically fit they were. Correlation analysis of the research results showed a statistically significant direct relationship between father's and mother's physical activity ($r = .487, p = .0001$). A significant relationship was found between the results of children's physical activity and tennis ball throwing ($r = .170, p = .018$) and the results of 10 x 5 m running tests ($r = -.150, p = .019$). Higher physical activity was directly associated with better scores on these tests.

Conclusion. Schoolchildren's and their parents' physical activity has no relation with schoolchildren's physical fitness.

Keywords: healthy, lifestyle, physical activity, physical fitness.

INTRODUCTION

Physical fitness is a hallmark of children's physical health (Mora-Gonzalez, 2019), which is one of the most important features in the child's growth and development processes (Emeljanovas, Miežienė, Česnaitienė, Fjørtoft, & Kjønnsen, 2020). Decreasing physical fitness is associated with poorer capacity of children's respiratory systems (Langer et al., 2020), muscular system (Fraser et al., 2020), flexibility (Arán

Filippetti & Krumm, 2020), and cardiovascular capacity (Söğüt et al., 2019). Physical activity plays an important role in the healthy lifestyle of children (Jerina, Pišot, & Volmut, 2018). Child's behaviour is influenced by social and environmental factors (Gans-Segrera, Molina-García, & Martínez-Bello, 2018), and healthy lifestyle skills instilled in childhood remain into adulthood (Maher et al., 2019), therefore, the promotion of physical

activity in children and adolescents is crucial for strengthening health in the society as a whole (Abe et al., 2019). Physical activity is closely related to the physical activity of parents and other family members and peers, and having a dog is associated with increased physical activity as well (Jerina, Pišot, & Volmut, 2018). Childhood is a very favourable time to develop motor skills and physical fitness, but most recent studies show that motor skills and physical fitness are declining in many countries (Luz et al., 2019). Poor physical fitness and physical inactivity are responsible for poorer motor system coordination as such children are physically weaker and less active (Cairney et al., 2019). Recent research results show that physical fitness has a positive effect on children's academic achievements in math, arts, science and social sciences. Meanwhile, the capacity of the cardiovascular and respiratory systems has a positive effect in many fields of science, improving neurocognitive processes such as attention retention or semantic and syntactic information processing. High BMI is associated with poor attention maintenance and poor concentration (Chu, Chen, Pontifex, Sun, & Chang, 2019). Physical fitness is receiving a lot of research attention around the world because it has positive benefits for the child's health. Habits formed in childhood have a long-lasting effect on health, and higher physical fitness is positively associated with the health of the society as a whole (Saeedi, Shavandi, & Skidmore, 2019). Lower physical activity is also associated with psychological stress, which can potentially lead to overweight and obesity, especially in children aged 5–6 years (Gerber et al., 2017). Children who are less physically fit and less physically active are more likely to experience depression and anxiety (Bruggink et al., 2019). Canadian researchers claim that children's physical fitness is associated with an active lifestyle (Longmuir et al., 2018). In addition, physical fitness is closely related to physical activity (Sögüt et al., 2019). Researchers point out that parents' physical activity skills are directly related to their children's physical activity, and the most effective interventions to increase physical activity are in the family environment (Lakes et al., 2019).

By engaging parents in physical activity with their children, social skills are better developed, overall family health and learning opportunities are improved. However, barriers such as different interests in physical activity, different perceptions

of generations, intensity of physical activity, skill levels and different approaches towards when to engage in physical activity also intervene (Rhodes, Quinlan, Naylor, Warburton, & Blanchard, 2019).

Physical activity was also found to be higher in those parents and children who are of the same gender. The involvement of mothers in physical activity has had a positive effect on girls' after-school sports, which plays a particularly important role in promoting a healthy and active lifestyle. Parental involvement in physical activity is an effective way to increase their children's level of physical activity, which provides health benefits for the whole family (Rodrigues, Padez, & Machado-Rodrigues, 2018). Children with both physically active parents are 5.8 times more prone to physical activity than children with both physically inactive parents (Xu, Quan, Zhang, Zhou, & Chen, 2018).

The aim of this study was to evaluate the relationships between physical activity of children and their parents and between the physical activity and physical fitness of children. The evaluation of these relationships would complement the knowledge by developing strategies to promote physical activity, paying attention to the processes of education and the formation of healthy lifestyle habits in the family.

METHODS

Subjects. The study involved 486 primary school children aged 7 to 10 years (240 boys and 241 girls) and their parents from Kaunas district.

Research organization. The study was conducted in 2018 in Kaunas district schools. The study was conducted in accordance with the principles of bioethics. Information related to the study, its aim, course, benefits, etc. was given to the parents who agreed to allow their children to be tested and surveyed, to answer the questions themselves, and to confirm the results of the study for scientific purposes in writing. Permission No. BE-2-42. of the Kaunas Regional Bioethics Commission was received for the research.

Data collection methods. Parental physical activity was assessed using Godin Leisure-Time Exercise Questionnaire-GLTEQ, in which activity scores are calculated as follows: (9 * intense workouts) + (5 * moderate intensity physical activity) + (3 * number of light exercises). Subjects with a physical activity score lower than 24 points

are classified as physically inactive (Godin & Shephard, 1985). Physical activity of primary school children was assessed by submitting a questionnaire to parents developed by researchers Bacardi-Gascón, Reveles-Roy, Woodward-Lopez, Crawford, and Jiménez-Cruz (2012). Parents had to answer seven questions about how much time their children spent on various activities (watching TV, going to school, time in the yard, park, playing games, etc.). Parents were also given several phrases and they had to choose which one best described their child's activities at home. According to the parents' beliefs, the children were divided into physically active and physically inactive according to WHO recommendations (WHO, 2010). Children who were less physically active than 60 min per day were assigned to the group of physically inactive children.

Schoolchildren's physical fitness was assessed using 9 physical fitness tests (Fjørtoft et al., 2011):

1. Standing long jump test, measuring explosive strength.
2. Long jump with one leg (7-meter distance), measuring leg muscle strength and coordination.
3. Two-legged jumping (7-meter distance), measuring leg muscle strength and coordination.
4. Throwing a tennis ball with one hand, measuring the muscle strength of the arm.
5. Pushing a medical ball (weight 1 kg) with two hands, measuring upper body force.
6. Shuttle 10 x 5 m running, measuring coordination.
7. 20 m running, measuring speed.
8. Six minutes of running, measuring endurance
9. Wall climbing, measuring skeletal muscle strength, agility, and coordination.

Statistical analysis was performed using SPSS Statistics 24.0 for Mac software package for data collection and analysis. Chi-square (χ^2) criterion, Fisher's criterion, and Spearman's correlation coefficient were used to compare the results. Statistical significance was set at $p < .05$.

RESULTS

Having assessed the physical activity of students according to the WHO (2010) recommendations, we found that the vast majority of the surveyed students (93.6% boys and 86.3 girls) were physically active, i.e. they were engaged in physical activity for more than 1 hour a day. We did not find differences in physical activity between genders ($\chi^2 = 3.25$, $p = .081$). Comparing the physical activity of the first–fourth grade schoolchildren, we did not find significant differences ($\chi^2 = 5.83$, $df = 3$, $p = .12$).

After estimating the percentage distribution of schoolchildren's physical activity according to their parents' physical activity (Table 1) we observed that the majority of the surveyed children had both parents who were physically active. Few surveyed studied children had one of physically active parents, and even fewer – both physically inactive parents ($p > .05$).

Comparing physical fitness of schoolchildren by gender (Table 2) we found that boys were more physically fit than girls in long jump, two-legged jump, throwing a tennis ball, and running for six minutes ($p < .05$).

Comparing the results of schoolchildren's physical fitness by grade (Table 3) we observed that the older the children were, the more physically fit they were in such physical fitness tests as long jump, two-legged jump, tennis ball throw, 10 x 5 m run, six-minute run ($p < .05$).

Correlation analysis of research results showed a statistically significant direct relationship between father's and mother's physical activity ($r = .487$, $p = .0001$), however, no association was found between parents' and their children's physical activity ($r = .074$, $p = .281$; Table 4). A significant relationship was found between children's physical activity and tennis ball throw ($r = .170$, $p = .018$) and the results of 10 x 5 m running tests ($r = -.150$, $p = .019$). Higher physical activity was directly associated with better results in these tests (Table 4).

Table 1. Percentage distribution of schoolchildren's physical activity according to their parents' physical activity

Both parents are physically active <i>n</i> = 270	One parent is physically active <i>n</i> = 107	Both parents are physically inactive <i>n</i> = 79
84.8%	87.7%	86.6%
$\chi^2 = 2.261$, $df = 2$, $p = .323$		

Table 2. Distribution of schoolchildren's physical fitness assessment mean results by gender

Physical fitness test	Gender	<i>n</i>	<i>M ± SD</i>	<i>p</i>
Long jump	Boy	202	138.07 ± 28.16	.0001
	Girl	191	125.82 ± 23.64	
Jumps on one foot	Boy	201	3.13 ± 0.59	.302
	Girl	193	19.044 ± 218.29	
Two legged jumps	Boy	201	3.39 ± 0.68	.0001
	Girl	193	3.70 ± 0.84	
Throwing a tennis ball	Boy	162	15.76 ± 4.43	.0001
	Girl	160	12.12 ± 3.52	
Throwing a 1 kg ball	Boy	203	3.86 ± 0.80	.398
	Girl	192	5.22 ± 22.91	
10 x 5 run	Boy	197	22.26 ± 3.56	.321
	Girl	184	22.64 ± 3.99	
20 m run	Boy	164	4.45 ± 0.60	.095
	Girl	166	4.89 ± 3.32	
Six-minute run	Boy	43	1018.87 ± 306.63	.006
	Girl	49	861.24 ± 223.00	
Climbing the wall	Boy	14	13.32 ± 4.26	.03448
	Girl	22	16.57 ± 4.33	

Table 3. Distribution of schoolchildren's physical fitness assessment mean results by grade

Grades	Grade 1	Grade 2	Grade 3	Grade 4	<i>p</i>
Physical fitness tests	<i>M ± SD</i>	<i>M ± SD</i>	<i>M ± SD</i>	<i>M ± SD</i>	
Long jump	106.12 ± 28.63	119.31 ± 23.65	123.27 ± 23.99	139.25 ± 26.49	.0001
Jumps on one foot	3.77 ± 0.80	5.72 ± 31.87	20.13 ± 224.78	3.58 ± 7.66	.365
Two legged jumps	4.02 ± 0.87	3.64 ± 0.68	3.79 ± 0.95	3.36 ± 0.63	.0001
Throwing a tennis ball	10.17 ± 10.92	10.34 ± 3.55	12.89 ± 4.32	14.80 ± 4.47	.0001
Throwing a 1 kg ball	2.76 ± 1.81	2.91 ± 0.70	3.56 ± 1.93	5.18 ± 20.63	.083
10 x 5 run	24.48 ± 3.01	22.63 ± 3.65	22.82 ± 4.42	22.04 ± 3.26	.0001
20 m run	5.71 ± 5.00	5.30 ± 7.13	4.73 ± 0.62	4.63 ± 3.15	.118
Six-minute run	54.70 ± 15.27	642.68 ± 434.16	863.74 ± 248.90	1036.30 ± 271.27	.0001
Climbing the wall	10.31 ± 4.12	12.42 ± 3.54	13.15 ± 2.84	15.30 ± 5.22	.156

Table 4. Relationship between parents' and children's physical activity and children's physical fitness testing results

Physical fitness tests	Father's PA score	Mother's PA score	Family PA score	Children's sedentary time	Children's PA	
Throwing a tennis ball	<i>r</i>	-.025	-.031	.052	.127	.174*
	<i>p</i>	.656	.577	.351	.080	.018
	<i>n</i>	311	321	322	191	184
10 x 5 run	<i>r</i>	.009	-.031	-.011	.037	-.150*
	<i>p</i>	.846	.516	.815	.559	.019
	<i>n</i>	430	442	444	252	245
Father's PA score	<i>r</i>		.487**	.668**	-.089	.074
	<i>p</i>		.000	.000	.192	.281
	<i>n</i>		440	442	218	213
Mother's PA score	<i>r</i>			.639**	.009	.089
	<i>p</i>			.000	.898	.188
	<i>n</i>			454	226	221

Notes. R – Spearman's correlation coefficient, **p* < .05, ***p* < .001.

DISCUSSION

Assessing the parents' beliefs about the physical activity of their children, it was found that physical activity of the vast majority of children complied with the WHO recommendations – 93.6% of boys and 86.3% of girls were physically active enough. Physical activity did not differ between boys and girls. The results of a study conducted in Kaunas secondary schools showed that almost half of the boys surveyed were physically active every day, and a third of girls were physically active 2–3 times a week (Rutkauskaitė & Bukauskė, 2016). Such differences in students' physical activity results are possible due to different methodologies for assessing students' physical activity.

Children's physical activity is affected by their age. Physical activity in children was found to decrease with age. Long-term studies have found that changes in physical activity coincide with critical moments in a child's development at the age of 7, when they start school, and at the age of 12, when they move from primary to secondary school. Particularly significant negative changes in physical activity are observed during adolescence (Žaltauskė, 2017). The study found that it was in the primary school age (grades 1–4) that children's physical activity did not change, which was confirmed by the results of our study.

The results of the study show that primary school-age boys are more physically fit to perform many physical fitness tests (e.g. long jump, two-legged jump, tennis ball throw, six-minute run) than girls of the same age. Other authors' research results show that boys are 19% more physically active than girls. Low levels of physical activity among girls are associated with low involvement in family and school sports activities. Among girls, 18% have poorer cardiovascular capacity, 44% have poorer eye-hand coordination and 9% have less involvement in physical education lessons. Girls aged 8–12 are less involved in after-school physical activity classes than boys (Telford, R. M., Telford, R. D., Olive, Cochrane, & Davey, 2016).

Analysis of the results of physical fitness tests of 8-year-old primary school children (both boys and girls) revealed that their physical fitness improves with age and that boys are more physically fit than girls (Rutkauskaitė & Bukauskė, 2016). Many of the studies analysed found that physical activity was influenced by the child's gender – boys were more physically active than girls. Girls have a negative

view of physical education lessons in schools because physical activity is not an interesting area for girls.

A study by Slovenian authors shows that older students have higher rates of physical fitness (60 m running, jumping, hanging on the crossbar, flexibility, squatting, etc.). Boys were also found to have greater physical endurance (hanging on the bar with their arms bent) of muscles (Pikel et al., 2017). Bi (2019) notes that boys are more physically fit than girls and they can show greater strength. At the age of 5, they can jump further, run faster, or drop the ball five feet further. As they continue to grow, these differences increase.

The results of the study show that the older children are, the more physically fit they are. Lithuanian researchers have found that explosive strength and flexibility of limb muscles increase as children grow. Also, both boys' and girls' physical fitness differs statistically significantly up to the third grade, while in the older grades there are significant differences in explosive strength and agility (Rutkauskaitė & Bukauskė, 2016). A study by Dutch authors shows that third-graders demonstrate better results in physical fitness (long jump, squats, hand grip test, 10 x 5 m shuttle run, 20 m run) than second-graders (de Greeff et al., 2016).

The results of this study show that children's physical activity was not statistically significantly dependent on parents' physical activity. The study, conducted in two schools of Kaunas district in 2015, analysed the impact of families, parents on children's physical activity and fitness and identified what encourages primary school children to choose one sport or another. The results of the study showed that in 71.0% of cases, it was the child's own choice, and in 41.5% of cases the choice was determined also by the opinions of the parents (Ragelienė, 2016). In another study, subjective assessment of parental physical activity scores (1 to 10) was associated with positive weak correlations with subjective assessment of children's physical activity scores.

Subjective assessment of parents' physical fitness in points (from 1 to 10) was related to children's physical fitness with positive weak correlations. Subjectively assessed children's physical activity and fitness were positively strongly correlated as well (Rutkauskaitė & Bukauskė, 2016). The results of this study showed the relationship between children's physical activity and the results of tennis

ball throw and 10 x 5 m running tests. We believe that the abovementioned tests more strongly reflect the motor characteristics of children of the studied age, therefore, physical activity can help develop them more effectively.

Foreign researchers note that parents have a significant influence on physical activity in primary school children. Children who have physically active parents tend to be 5.8 times more physically active than those whose parents are physically inactive (Xu et al., 2018). It has been observed that physical activity of girls was more influenced by their mothers' physical activity, and that of boys – by their fathers' physical activity. In addition, parents or other important people encouraging to exercise also have a positive effect on children's physical activity (Aguonytė & Beržanskytė, 2015). However, our study did not find a relationship between parental physical activity and children's physical activity. We believe that the results of this study do not show a relationship between parents' and children's physical activity due to subjective

assessment methodology. Instrumental methods of physical activity assessment of both parents and their children are likely to yield other results.

CONCLUSIONS

1. The majority of children of primary school age are physically active, i.e. their physical activity is in line with WHO recommendations. Physical activity of boys and girls does not differ and remains similar in all grades from first to fourth.
2. The results of physical fitness of the studied schoolchildren showed that boys' leg and arm muscle strength, aerobic endurance and coordination were better than those of girls of the same age. The tested indicators improved significantly with the increasing age of children.
3. Parental physical activity had no connection with their children's physical activity. The distribution of physically active children according to the parents' physical activity does not differ.

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