Family Medicine & Primary Care Review 2019; 21(3): 237–242 https://doi.org/10.5114/fmpcr.2019.88382

ORIGINAL PAPERS

ISSN 1734-3402, eISSN 2449-8580

Survey of regular physical activity and socioeconomic status in Hungarian preschool children

ANETTA MÜLLER[1, A–G], ELENA BENDÍKOVÁ[2, A–G], JUDIT HERPAINÉ LAKÓ[3, A–G], ÉVA BÁCSNÉ BÁBA[1, A–G], WIOLETTA ŁUBKOWSKA[4, D–F], BOŻENA MROCZEK[5, E–F]
ORCID ID: 0000-0003-1409-4872

[1] Faculty of Economics and Business, Institute of Rural Development, Tourism and Sports Management, University of Debrecen, Hungary
[2] Faculty of Arts, Matej Bel University, Banská Bystrica, Slovakia
[3] Physical Education and Sports Science Institute, Eszterházy Károly University, Eger, Hungary
[4] Faculty of Physical Education and Health, University of Szczecin, Poland
[5] Department of Human Sciences in Medicine, Pomeranian Medical University in Szczecin, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** The sporting habits of parents have a very strong effect on the involvement of preschoolers in sports.
Objectives. The aim of the study was to evaluate the physical activity (PA) of preschool children depending on their socioeconomic status and to determine the relationship between body mass and sporting habits.
Material and methods. The research sample consisted of 252 Hungarian children (134 boys and 118 girls) of preschool age and their parents. A questionnaire was developed based on EU guidelines and it was used to evaluate PA and sporting habits.
Results. A correlation was found between sporting habits and the percentile values of Body Mass Index by age. The survey showed that 86.5% of the children falling into the underweight category and 81.3% of those with normal weight were regularly involved in sports with their parents; these values were significantly higher than those of their overweight counterparts, of whom only 66.2% did sports with their parents ($chi^2 = 9.8$, $p = 0.028$). Furthermore, 59.5% of underweight children and 63.3% of those with normal weight reported that their parents were involved in sports, while in the case of overweight children, this was observed in only 43.1% of parents ($chi^2 = 7.68$, $p < 0.05$). Most of the children who were underweight or had normal weight did sports with their parents 2 to 3 times a week or more than 3 times a week ($chi^2 = 28.7$, $p = 0.000$).
Conclusions. The physical activity of preschool children was low. Obesity was more likely to occur in families with lower incomes. The development of educational programs for children, their families, preschool teachers, family doctors and pediatricians is needed to promote healthy diets and encourage more frequent physical activity.
Key words: exercise, Body Mass Index, obesity, habits, child.

Müller A, Bendíková E, Herpainé Lakó J, Bácsné Bába É, Łubkowska W, Mroczek B. Survey of regular physical activity and socioeconomic status in Hungarian preschool children. *Fam Med Prim Care Rev* 2019; 21(3): 237–242, doi: https://doi.org/10.5114/fmpcr.2019.88382.

Background

In recent years, the number of overweight and obese people in the world, including children, has increased significantly [1]. According to the WHO, obesity in children in the 21st century represents one of the most serious public health concerns in most countries of the world, reaching epidemic proportions [2]. In the United States, obesity affects about 17% of children and young people [3]. Currently, there are over twelve million obese or overweight children in the European Union. The number of overweight children increases by 400,000 per year, while the number of obese children rises by 85,000 annually. In 2016, the number of overweight or obese children under 5 years of age worldwide was estimated at over 41 million [2]. A study conducted in Hungary ($n = 3,302$) showed that 19.1% of school-aged children are overweight or obese, and among 7-year-olds these problems occurred in 1 in 4 girls and 1 in 5 boys [4]. The number of children with excessive body weight under the age of 7 is constantly increasing [5, 6]. Starting from birth, rapid Body Mass Index (BMI) growth – especially in the time period of 9 months to 6 years – is significantly related to later metabolic risk in children [7]. This early increase in obesity is a significant risk factor in obesity in later stages of life [7, 8]. The latest trends in obesity in children and young people indicate an increase in the prevalence of obesity among children with low socioeconomic position (SEP) compared to children with high SEP [9]. Hungarian studies have also demonstrated differences between the growth patterns and nutritional status of children growing up in families with different socioeconomic backgrounds. The children from families with a poor socioeconomic background are smaller, and the prevalence of obesity and malnutrition is higher among them [10].

The development of a healthy lifestyle and turning regular exercise into an element of lifestyle plays a critical role in the prevention of obesity. Increasing the physical activity of different generations is of key importance, which can only be achieved using coordinated impact systems. As shown in Figure 1, the socioeconomic status and the sporting behaviors of parents are important and have an effect on children. If physical activity is incorporated into their way of life during childhood and becomes an integral part of their lifestyles, it is more likely that they will become more physically active adults.

The negative effects of physical inactivity and sedentary behavior on children's health have been widely supported by scientific evidence. However, evidence on how these behaviors are manifested in preschool children is limited.

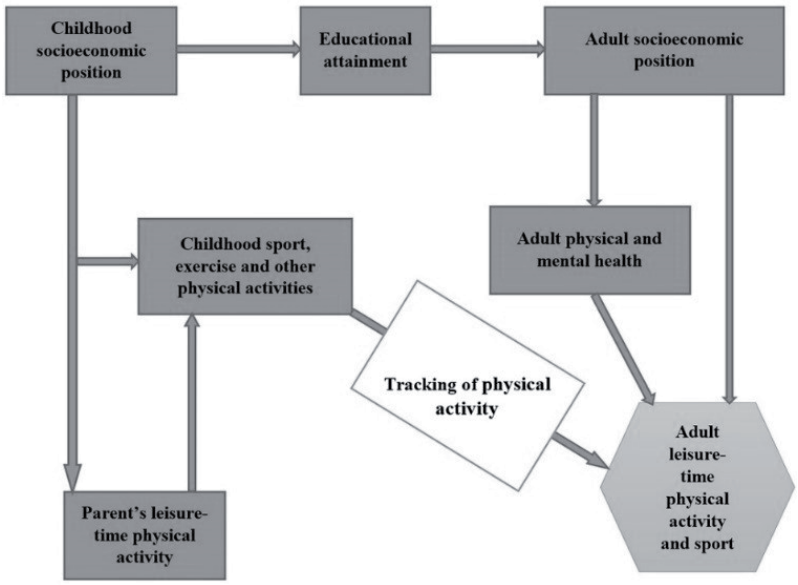

Figure 1. Hypothesized pathways explaining the associations found between childhood socioeconomic position and adult free-time physical activity (author's own elaboration based on [11])

Objectives

The aim of the study was to evaluate the regular physical activity (PA) and body mass of children of preschool age depending on their socioeconomic status and to establish the relationships between body mass and sporting habits of preschool children.

Material and methods

Data on the level of physical activity, sporting habits and socioeconomic status of children were obtained from 252 preschoolers aged 3–6 years and their parents. The collection of data took place in October 2016 in five preschools – Gyermeklánc, Farkasvölgyi, Zöld Liget, Gyermekkert and Ney Ferenc Preschools – in Eger, Hungary with the assistance of the preschool teachers working there, and with the involvement of the children's parents. Every other child was included in the sample, thus ensuring equal chances of being included in the sample (simple random sampling). The age, weight and height of the children were recorded and used to calculate BMI. Three groups of children were formed based on the percentile values of BMI by age [12] (underweight, normal and overweight/obese).

The study of PA and daily habits related to PA in terms of its type, intensity and duration was conducted using a questionnaire in accordance with the guidelines for monitoring and evaluating PA developed by the WHO [13]. The questionnaire contained open and closed questions and was completed with the help of parents and preschool teachers. As the respondents were children of preschool age, the definition of involvement in sports had to be clarified, taking into consideration their age characteristics. In light of this, all physical activities involving exercise performed outside of preschool hours and resulting in the movement of the child with a duration of at least 30 minutes were considered to be involvement in sports. This could include activities such as cycling with parents, playing football with a sibling or exercise performed within an organized framework, in the form of regular training. A similar method of evaluating physical activity has been used in international studies of the WHO's CINDI program (Countrywide Integrated Non-communicable Disease Intervention), among others [14].

The experiment was approved by the Bioethics Committee at the Regional Medical Chamber (Resolution DEOEC RKEB/IKEB Prot. No. 4841-2017).

The data were processed using statistical software (SPSS 21.0). The basic statistics were mean, standard deviation, median and mode. The chi² test was used to establish correlations.

Description of the research sample

Of the 252 children of preschool age responding, 53.2% were boys and 46.8% were girls. The age distribution of the children studied is presented in Table 1. Decimal age was calculated from chronological age and the children were then categorized based on the recommendations of the International Biological Program [15].

Table 1. The age distribution of the research sample

Age	*n* = 252	%
6	104	41
5	89	35
4	45	18
3	14	6

Results

Physical activity in free time (recreational activity)

Nearly 21% of the children studied did not perform any physical exercise with a duration of at least 30 minutes a day in their free time, apart from physical activity during the time spent at preschool. Almost 35% of the respondents performed physical activity once a week, 29% reported doing so 2–3 times a week and 15.1% more than 3 times a week (Table 2).

Table 2. Physical activity in free time: frequency of uninterrupted exercise lasting at least 30 minutes

	n = 252	%
Once a month or less frequently	1	0.4
Never	52	20.6
Once a week	88	34.9
2–3 times a week	73	29.0
More than 3 times a week	38	15.1

Of the respondents, 78.2% were involved in sports with their parents regularly, while 21.4% did not perform any activity with them. Of the parents, 57.5% did sports, while 42.5% of mothers/fathers did not perform any regular physical activity (Table 3).

Table 3. Regular physical activity of the parents in the research sample in their free time lasting at least 30 minutes

	n = 252	%
Yes	145	57.5
No	107	42.5

With regard to involvement in sports together with parents, the respondents were asked which sports the parents did together with the children. Football was the most popular sport, with 24.6% of responses, followed by cycling, shown to also be a very popular family sport and practiced by 23% of the families surveyed. Furthermore, 11.5% of respondents listed handball, whereas gymnastics, running and playing with a ball were each indicated by 7.14% of the respondents. Walking, hiking and swimming were each reported by 6.74% of the respondents. Furthermore, various physical exercises (squats, leg kicks, sit-ups, push-ups, etc.) and several other activities were also practiced 2 to 3 times a week according to the respondents (e.g., skiing, ice skating, dancing, wrestling, archery, yoga and orienteering).

The preschool children were also asked which sports they had heard about, and how they were informed about different sports. It can be concluded that as age progresses, the children can name more and more sports. Football was mentioned most frequently (45.63%), followed by swimming (36.9%), running (33.33%), cycling (16.66%), handball (13.88%) and gymnastics (9.52%), whereas boxing, karate and wrestling were mentioned by only 7.93% of respondents.

The respondents were also asked about the sources from which they had heard about these sports. Most of them (75%) had learned about the various sports from their parents (from a father/mother); 67.5% of the children learned about them from television, 13.9% from a friend, 2.8% from the radio and 2.2% from the Internet.

After BMI was calculated, age percentile values were determined [12] and the children were divided into 3 categories (Table 4). The children with a value below the 5th percentile were assigned to the underweight category. The children between the 5th and 85th percentiles were classified as being in the healthy/normal range, and those with values above the 85th percentile were included in the overweight/obese group. Consequently, 59.5% of children were classified in the healthy/normal group, 25.8% in the overweight/obese group and 14.7% in the underweight category.

Table 4. The physical characteristics of the respondents (based on age percentiles calculated from BMI)

Categories based on age percentiles calculated from BMI	*n* = 252	%
Underweight	37	14.7
Normal body mass	150	59.5
Overweight	65	25.8

The data in Table 4 also demonstrate that 25.8% of children of preschool age are classified as overweight or obese.

Close correlations were found between the sporting habits and the percentile values of BMI by age. The survey showed that 86.5% of the children falling into the underweight category and 81.3% of those with normal weight were regularly involved in sports with their parents; those values were significantly higher than those of their overweight counterparts, of whom only 66.2% did sports with their parents ($chi^2 = 9.8$, $p = 0.028$). 59.5% of the underweight children and 63.3% of those with normal body weight reported that their parents did sports, while in the case of overweight children, only 43.1% of parents were involved in sports ($chi^2 = 7.68$, $p < 0.05$).

Very strong significant differences were found between the frequency of PA and body weight. Most of the children who were underweight or had normal weight did sports with their parents 2 to 3 times a week or more than 3 times a week. With regard to the frequency of PA, it can be observed that 43.2% of the children with a thin physique reported that they did sports together with their parents 2–3 times a week, while this percentage was 34.7% in those with a normal body weight. These are significantly higher values than those for overweight children, with only 7.7% doing sports at least 2–3 times a week. 13.5% of underweight children and 17.3% of those with a normal body weight reported doing sports together with their parents more than 3 times a week, while 10.8% of overweight children were involved in sports more than 3 times a week ($chi^2 = 28.7$, $p = 0.001$).

The examination of socioeconomic status

Based on the section of the Children's Protection Act which provides the right to free catering in preschools and nursery schools and came into force on September 1, 2016 in Hungary, families with chronically ill or disabled children or those with 3 or more children are entitled to free catering for their child while receiving nursery care or preschool education. This also includes families in which the level of monthly income per capita does not exceed 130% of the net minimum wage, i.e., 111,000 HUF (based on the minimum wage in 2016), and families whose children receive foster care.

The parents were asked which category they fell into, i.e., whether they received free catering or were not entitled to such services according to the provisions of the Act. The children of 66.7% of the respondents did not receive free catering. Of all respondents, 33.3% received such services. These were vulnerable families in which the living conditions were more difficult.

Free catering was received by 92.3% of overweight children, 12.7% of healthy/normal children and 13.5% from the underweight category ($chi^2 = 137.1$, $p = 0.001$). Our research indicates that obesity is more likely to occur in families with lower incomes.

The parents of preschoolers were asked about their monthly expenditures on the sports activity of their children. The study showed that 23.8% of the respondents did not spend money on this activity, 27.4% spent less than 3,000 HUF, 13.9% spent between 3,000–5,000 HUF, 17.5% spent between 5,000–8,000 HUF, 11.5% spent between 8,000–10,000 HUF, 5.2% spent between 10,000–15,000 HUF and 0.8% spent over 15,000 HUF a month on sports and physical activity for their children. The group of parents spending below 3,000 HUF was the largest in the research sample, and a large number of people did not spend any money on sports for their children at all (23.8%). However, the positive fact is that 76.2% of the parents were able to and/or wanted to devote some money to the physical activity of their children.

Among the parents of overweight children, 40% did not spend any money on the sports played by their children, while this value was 18.7% in the case of those with a normal body weight and 16.2% in the case of underweight children. In children who were underweight or had a normal body weight, parents were more willing to spend money on the physical activity of their children than were the parents of obese children. The parents of 35.1% of underweight children, 36.7% of those from the healthy/normal category and 7.7% of obese children stated that the amount of money they spent on sports per month was 5,000–10,000 HUF ($chi^2 = 44.8$, $p = 0.001$).

Discussion

Physical inactivity has a major effect on health worldwide. A decrease in or removal of this unhealthy behavior could substantially improve health [16]. The results of our own research showed that almost 21% of the Hungarian preschool children surveyed were not involved in physical activity in their free

time at all, whereas almost 35% of the preschoolers reported a low level of activity. PA in free time can be regarded as high, regular and lasting at least 30 minutes in only 15% of children, and as moderate in 29% of respondents. Current recommendations provide guidelines for the amount of physical activity that children should acquire and how many days a week activities should occur. However, the available guidelines need an improved approach to addressing the role of the parents and caregivers in targeting physical activity and weight management in youth [17]. Children and adolescents should participate in moderate-to-vigorous physical activity 1 or more hours per day and muscle and bone-strengthening activities 3 or more times per week. Physical activities should be age-appropriate, enjoyable and varied and should occur beyond what is required for typical activities of daily living. Adequate exercise in youth improves strength, cardiorespiratory fitness and body composition and, therefore, it decreases cardiovascular risk factors. Exercise habits established in childhood often continue into adulthood [18, 19].

It has been estimated that 9.4% of all 57 million deaths in the world in 2008 could be attributed to physical inactivity, which translates into more than 5 million deaths worldwide [16]. It has been repeatedly demonstrated that low levels of physical activity and fitness coincide with obesity, type 2 diabetes, hypertension, cardiovascular diseases, cancer, osteoporosis, lower back pain, carbohydrate and lipid metabolism disorders and various psychosocial problems [18, 20].

As a global issue, obesity imposes a really large burden on societies, and thus it is treated as a priority by health-economic studies, while much attention is paid to the importance of prevention [21]. Community weight reduction programs and different forms of nutrition counselling with a family doctor have proven to be a cost-effective solution [22]. Significant improvements in the unfavorable health status in the Hungarian population can be achieved by promoting healthy lifestyles, especially physical activity. It is essential to have a change of perspective – to prefer the principle of "exercise as medicine" [23]. The role of over-the-counter medical preparations, herbs and natural medical factors has become more appreciated [24].

Parents and children doing sports together has been examined because the physical activity of children may be instilled by their parents [25]. (Note: Although 78.2% of the children do sport with their parents, this finding is not a projection of the sporting habits of the adults, as it is possible that they do sport with only one of their parents and it is unclear whether the parent always participated actively in these activities. However, the available guidelines need an improved approach to addressing the role of the parents and caregivers in targeting physical activity and weight management in children. A study of Canadian preschool children demonstrated that the composition of movement behavior was significantly associated with BMI [26]. Efforts must be taken in order to make sure that the types of physical activity offered are both suitable and enjoyable. Introduction of the "fun" factor of movement emphasizes the importance of physical activity in giving the child the opportunity to develop an "enjoyable play" attitude as a source of fun [27]. Sports, games, free play and other age-appropriate activities are adequate ways to increase moderate to vigorous physical activity in children. Differentiating types of physical activities in accordance with developmental stage, level of enjoyment and family characteristics is needed to establish sustainable habits [17].

Children learn to ride a two-wheeled bicycle at preschool age and the presence of the parent providing safety is important both during the process of learning and of taking part in traffic, which is not only a great family program, but it also provides an opportunity to practice following the rules. The reason for the high popularity of such sports as football and handball from among ball sports is twofold. On the one hand, these are two team sports which have a well-developed base for children and youth training, and the professionals engaged in the promotion of the sport also reach preschools (preschool football and sponge handball). On the other hand, the effect of the media can be presumed, as football becomes even more dominant with the European Football Championships organized in summer. With regard to handball, it is one of the most successful sports in Eger, which was the location of our study. Running is also popular, as one of the most commonly used forms of natural exercises of children.

The role of parents in passing on values is essential for the development of lifestyle, since living in families represents the primary stage of socialization [11]. This role and the effect of parents on instilling health behaviors are indisputable. As the primary stage of socialization, families may have a determinant motivating role in shaping and consolidating active and health-conscious lifestyles. Future health promotion strategies should inform parents that frequently joining in physical activity, for example, in one's own yard, is beneficial for lowering children's sedentary time [28].

Hungarian studies [10, 29] have shown that there are correlations between the socioeconomic status of the family and child obesity, with a greater number of obese children found in families with low socioeconomic status.

Recommendation for family doctors

The process of preventing and treating obesity should involve not only children but also their families, preschools and the health care system, i.e., family doctors and pediatricians. They have to diagnose the problem of overweight in a child at an early stage by means of proper and frequent evaluation during routine health checks [30]. Family doctors must be aware of the importance of physical activity for the prevention of multiple diseases and should be prepared to give appropriate advice on physical activity. The "referral to physical exercise," which consists of recommending exercising as treatment for improving health or reducing the risk of illness, is becoming a popular way of suggesting specific forms of physical exercise in some European countries [13].

In addition to "referral to physical exercise" programs, family doctors in many countries recommend that patients increase their physical activity by walking or cycling. It is therefore important that advice on lifestyles and modification of behaviors related to physical activity make up a part of the initial medical training and further education of medical staff.

Reversing the trend of the decreasing physical activity among children and young people requires taking action to promote and create opportunities for involvement in various forms of physical activity for both children and adults at each level of education [31, 32].

Conclusions

1. The level of free-time physical activity in Hungarian preschool-aged children was low. Obesity was more likely to occur in families with lower incomes.
2. Physical activity needs to be promoted using intervention programs, mainly during the preschool programs.
3. Individual and social educational programs need to be developed for children, their families, preschool teachers, family doctors and pediatricians in order to promote joint efforts in establishing healthy dietary habits and to encourage more frequent physical activity.

Source of funding: This work is supported by the GINOP-2.3.2-15-2016-00005 project. The project is co-financed by the European Union under the European Regional Development Fund.
Conflicts of interest: The authors declare no conflicts of interest.

References

1. Allender S, Millar L, Hovmand P, et al. Whole of Systems trial of prevention strategies for childhood obesity: WHO STOPS Childhood Obesity. *Int J Environ Res Public Health* 2016; 13(11): 1143, doi: 10.3390/ijerph13111143.
2. World Health Organization. Childhood overweight and obesity [cited 21.01.2019]. Available from URL: http://www.who.int/dietphysicalactivity/childhood/en/.
3. Styne DM, Arslanian SA, Connor EL, et al. Pediatric obesity-assessment, treatment, and prevention: an endocrine society clinical practice guideline. *J Clin Endocrinol Metab* 2017; 102(3): 709–757, doi: 10.1210/jc.2016-2573.
4. Kovács VA, Gábor A, Fajcsák Z, et al. Physical activity and sedentary behaviours among urban Hungarian school children. *Orv Hetil* 2010; 16: 652–658, doi: 10.1556/OH.2010.28765.
5. Czerwonogrodzka-Senczyna A, Kryńska P, Majcher A, et al. Wpływ czynników środowiskowych na występowanie otyłości u dzieci do 7 roku życia. *Endokrynol Pediatr* 2014; 13, 2(47): 17–23 (in Polish).
6. Chmiel-Pierzyńska I, Derkacz M, Perzyński A. Nadmierna masa ciała i jej uwarunkowania u dzieci w wieku 4–8 lat. *Fam Med Prim Care Rev* 2013; 15(3): 301–302 (in Polish).
7. Börnhorst C, Tilling K, Russo P, et al. Associations between early body mass index trajectories and later metabolic risk factors in European children: the IDEFICS study. *Eur J Epidemiol* 2016; 31(5): 513–525, doi: 10.1007/s10654-015-0080-z.
8. Pirogowicz I, Ornat M, Pachołek K, et al. Evaluation of fat mass and its correlation with abnormal blood pressure in children and adolescents. *Fam Med Prim Care Rev* 2017; 19(3): 256–260, doi: 10.5114/fmpcr.2017.69288.
9. Chung A, Backholer K, Wong E, et al. Trends in child and adolescent obesity prevalence in economically advanced countries according to socioeconomic position: a systematic review. *Obes Rev* 2016; 17(3): 276–295, doi: 10.1111/obr.12360.
10. Bodzsar EB, Zsakai A, Utczas K. The biological status of children living in disadvantaged regions of Hungary. *J Biosoc Sci* 2016; 48(3): 306–321, doi: 10.1017/S0021932015000097.
11. Elhakeem A, Cooper R, Bann D, et al. Childhood socioeconomic position and adult leisure-time physical activity: a systematic review. *Int J Behav Nutr Phys Act* 2015; 12: 92–119, doi: 10.1186/s12966-015-0250-0.
12. Joubert K, Darvay S, Ágfalvi R. *A gyermek testmagasságának (testhosszúságának), testtömegének és testmagasságára vonatkoztatott testtömegének percentilisei kétévestől tízéves korig* (Fejlődési lapok), (fiúk: C 3341–46/c r. sz., leányok: C 3341–45/c r. sz.). Budapest 1996 (in Hungarian).
13. European Union, EU Physical Activity Guidelines. *Recommended policy actions in support of health-enhancing physical activity. Fourth Consolidated draft Approved by the EU Working Group "Sport and Health".* Brussels: EU; 2008.
14. World Health Organization Regional Office for Europe. *CINDI Health Monitor: a Study of feasibility of a health behaviour monitoring survey across CINDI countries.* Data book. Copenhagen: WHO Regional Office for Europe; 2003.
15. Szakály Zs. A naptári (kronológiai) életkor kiszámításának, a biológiai életkor (morfológiai kor) és a várható testmagasság meghatározásának módszere [cited 15.01.2019]. Available from URL: http://triatlon.hu/upload/file/dr.-szakaly-zsolt-humanbiologiai-gyakorlatok.pdf (in Hungarian).
16. Lee IM, Shiroma EJ, Lobelo F, et al. Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012; 380(9838): 219–229.
17. Foster C, Moore JB, Singletary CR, et al. Physical activity and family-based obesity treatment: a review of expert recommendations on physical activity in youth. *Clin Obes* 2018; 8(1): 68–79, doi: 10.1111/cob.12230.
18. Landry BW, Driscoll SW. Physical activity in children and adolescents. *PMR* 2012; 4(11): 826–232, doi: 10.1016/j.pmrj.2012.09.585.
19. Bendíková E, Dobay B. Physical and sport education as a tool for development of a positive attitude toward health and physical activity in adulthood. *Eur J Contemp Educ* 2017; 6(1): 14–21, doi: 10.13187/ejced.2017.1.144.
20. Bouchard C, Blair SN, Katzmarzyk PT. Less sitting, more physical activity, or higher fitness? *Mayo Clin Proc* 2015; 90(11): 1533–1540, doi: 10.1016/j.mayocp.2015.08.005.
21. International Obesity Task Force. EU platform on diet, physical activity and health–briefing paper. Prepared in collaboration with the European Association for the Study of Obesity. Brussels; 2005. Available from URL: http://ec.europa.eu/health/ph_determinants/life_style/nutrition/documents/iotf_en.pdf.
22. Bray G, Bouchard C, James WPT. *Handbook of obesity: Clinical applications*, 3nd ed. New York: Informa Healthcare; 2008.
23. Füredi M. Sportdiplomáciai siker Havannában. Sport, mozgás – receptre Baltimore-ban. Beszélgetés Tóth Miklóssal az MSTT elnökével. *Magyar Sporttudományi Szemle* 2010; 11(42): 33–34 (in Hungarian).
24. Müller A, Kerényi E. *Trendek és fogyasztói magatartás az egészségügyben*. In: Egészségügyi marketing és telekommunikáció című konferencia kiadványkötete (11–19). Kékesteto: Mátrai Gyógyintézet; 2009 (in Hungarian).
25. Trost SG, Sallis JF, Pate RR, et al. Evaluating a model of parental influence on youth physical activity. *Am J Prev Med* 2003; 25(4): 277–282.
26. Carson V, Tremblay MS, Chastin SFM. Cross-sectional associations between sleep duration, sedentary time, physical activity, and adiposity indicators among Canadian preschool-aged children using compositional analyses. *BMC Public Health* 2017; 17(Suppl. 5): 848, doi: 10.1186/s12889-017-4852-0.
27. Łubkowska W, Tarnowski M, Terczyński R. Time measurement of a 30-meter run, using the cinematographic method and photogrammetry as an example of applying modern technology in promoting physical activity. *AIP Conference Proceedings* 2018; 2040: 070008-1–070008-4, doi.org/10.1063/1.5079129.
28. Määttä S, Ray C, Vepsäläinen H. Parental education and pre-school children's objectively measured sedentary time: the role of co-participation in physical activity. *Int J Environ Res Public Health* 2018; 15(2). pii: E366. doi: 10.3390/ijerph15020366.
29. Bodzsar EB, Zsakai A, Mascie-Taylor N. Secular growth and maturation changes in Hungary in relation to socioeconomic and demographic changes. *J Biosoc Sci* 2016; 48(2): 158–173. doi: 10.1017/S0021932015000061.
30. Drabik-Danis E, Hans-Wytrychowska A. Bilanse zdrowia u dorosłych – skuteczne narzędzie profilaktyki? *Fam Med Prim Care Rev* 2015; 17(2): 143–146 (in Polish).
31. Biernat E, Krzepota J, Sadowska D. Martial arts as a form of undertaking physical activity in leisure time analysis of factors determining participation of Poles. *Int J Environ Res Public Health* 2018; 15(9): 1989, doi: 10.3390/ijerph15091989.
32. Biernat E, Buchholtz S, Krzepota J. Eye on the ball: table tennis as a pro-health form of leisure-time physical activity. *Int J Environ Res Public Health* 2018; 15(4): E738, doi: 10.3390/ijerph15040738.

Tables: 4
Figures: 1
References: 32

Received: 22.02.2019
Reviewed: 17.03.2019
Accepted: 25.03.2019

Address for correspondence:
Wioletta Łubkowska, PhD
Wydział Kultury Fizycznej i Zdrowia
Uniwersytet Szczeciński
Al. Piastów 40B, blok 6
70-067 Szczecin
Polska
Tel.: +48 91 444-27-49
E-mail: wioletta.lubkowska@usz.edu.pl