

Assessment of physical fitness of 8 and 9-year-old children from Szczecin, Poland, involved in the obesity prevention program – pilot study

Ocena wydolności fizycznej 8- i 9-letnich dzieci miasta Szczecin objętych programem przeciwdziałania nadwadze i otyłości – badanie pilotażowe

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Abstract

Introduction. Increasing incidence of excess weight and poor physical fitness of children validates the need for preventive actions. The Szczecin municipality (gmina Szczecin) runs the „Odważna ósemka” (“The Brave Eight”) program – Prevention of excess weight and obesity in 8 and 9-year-old children attending elementary school in Szczecin, Poland. **Aim.** The assessment of physical fitness as well as the prevalence and intensity of excess body weight and blood pressure rates among the 8 and 9-year-old children attending elementary school in Szczecin, Poland. **Material and methods.** Between 6th December 2016 and 3rd December 2017, 3407 8 and 9-year-old children were examined (1757 girls and 1650 boys). BMI (Body Mass Index) as well as WHR (Waist Hip Ratio) were calculated. All the children were assessed according to criteria established by the International Obesity Task Force (IOTF). The examination included basic anthropometric measurements, such as: body height and weight, waist and hip circumference, blood pressure, body constitution analysis, and physical fitness assessment. **Results.** Excess body weight was diagnosed in 822 patients, which is 24.1% of the examined population. 369 patients were diagnosed with elevated blood pressure (10.8%). Very poor physical fitness – test abandoned before the completion (HR>180/min), was diagnosed in 151 children (4.5%), very poor physical fitness was diagnosed in 234 children (7%), poor physical fitness was diagnosed in 827 children (24.9%), sufficient physical fitness was diagnosed in 961 children (29.2%), good physical fitness was diagnosed in 650 children (19.5%), very good physical fitness was diagnosed in 428 children (12.8%) and excellent in 70 children (2.1%). **Conclusion.** The fact of unsatisfactory physical fitness and excess body weight in children from Szczecin is unsettling. There is certainly a need for preventive measures in the broad sense.

Key words

children, excess body weight, overweight, obesity, physical activity

Streszczenie

Wprowadzenie. Wzrastająca częstość występowania nadmiernej masy ciała oraz słaba wydolność fizyczna u dzieci uzasadnia potrzebę prowadzenia działań profilaktycznych. Gmina Szczecin realizuje program „Odważna ósemka” – Przeciwdziałanie nadwadze i otyłości wśród dzieci w wieku 8-9 lat uczęszczających do szczecińskich szkół podstawowych. **Cel.** Ocena wydolności fizycznej oraz częstości występowania i stopnia nasilenia nadmiernej masy ciała, wartości ciśnienia tętniczego, wśród 8- i 9-letnich dzieci uczęszczających do szczecińskich szkół podstawowych. **Material i metody.** Od 6 grudnia 2016 do 3 grudnia 2017 zostało zbadanych 3407 dzieci (1757 dziewczynek i 1650 chłopców) 8- i 9-letnich. Obliczono wskaźnik masy ciała BMI (body mass index) oraz wskaźnik WHR (waist-hip ratio). Przyjęto kryteria opracowane przez International Obesity Task Force (IOTF). Badania obejmowały pomiary podstawowych wskaźników antropometrycznych, takich jak: wysokość i masa ciała, obwód talii i bioder, ciśnienie tętnicze, analiza składu ciała, wydolność fizyczna. **Wyniki.** Nadmierną masę ciała zdiagnozowano u 822 pacjentów, co stanowi 24,1% przebadanej populacji. Podwyższone ciśnienie tętnicze zdiagnozowano u 369 pacjentów (10,8%). Bardzo słaba wydolność fizyczna – test przerwany

(HR > 180/min) została zdiagnozowana u 151 pacjentów (4,5%), bardzo słaba u 234 (7%), słaba u 827 (24,9%), dostateczna u 961 (29,2%), dobra u 650 (19,5%), bardzo dobra u 428 (12,8%), doskonała u 70 (2,1%). **Wnioski.** Niepokojący jest fakt występowania tak wysokiego odsetka niezadowolającej wydolności fizycznej oraz nadmiernej masy ciała u szczecińskich dzieci. Obserwuje się potrzebę prowadzenia szeroko pojętych działań profilaktycznych.

Słowa kluczowe

dzieci, nadmierna masa ciała, nadwaga, otyłość, aktywność fizyczna

Introduction

In today's world, the high pace of life is accompanied by lower physical activity in all populations, including children and adolescents. It is one of the causes of growing incidence of excess weight and obesity [1]. As a result, the risk of diseases related to contemporary civilisation also grows. In the spirit of social responsibility, seeing the need of preventive programs allowing positive changes in the lifestyle of children the Szczecin municipality (gmina Szczecin) runs the program "Odważna ósemka" ("The Brave Eight") – Prevention of excess weight and obesity in 8 and 9-year-old children attending elementary school in Szczecin. In the first stage of the program Comprehensive Health Assessment was performed for all 8 and 9-year-old children in Szczecin. The examinations are performed at schools by qualified and additionally trained teams of school nurses, with ongoing collection of gathered data in computer systems. Children with excess body weight, defined as BMI \geq 90th percentile, were qualified for the next stage of the program. The second stage took place in an outpatient clinic. Its goal is a one-year long observation and interdisciplinary care provided by a medical doctor, nutritionist, psychologist and a physical activity specialist. The first three visits take place every two months, the last one after six months. Every visit consists of children and their parents being consulted by the four aforementioned specialists. Physical activities in different forms are also organized for children (swimming pool, forest hike, football training with local football team players, bike trip), whereas parents can take part in educational workshops led by a medical doctor, nutritionist, psychologist and physical activity specialist. The project has been planned for 3 consecutive years (2016-2018). The total number of children to be examined is estimated at 11,494. The program is licensed by the Polish Society for Health Programs.

Aim

The main goal of the study is to assess the physical fitness of 8 and 9-year-old children attending elementary schools in Szczecin, as well as assessing the prevalence and intensity of excess body weight and blood pressure in this group. Besides that, the aim of the „Odważna ósemka” program to prevent excess body weight and obesity in children is to gather epidemiologic data concerning the occurrence of excess body weight and obesity in the city of Szczecin as well as cooperate with educational institutions in a systemic model of cooperation.

One of our specific objectives is also to identify children who are at risk of excess body weight complications (dyslipidemia, prediabetes). Undoubtedly, the priority is to reduce excess body weight and improve the levels of physical activity as well as promoting a healthy lifestyle.

Material and methods

From December 6, 2016 to December 3 2017, 3,407 children at the age of 8 and 9 from Szczecin (1,757 girls and 1,650 boys) were examined. The tests included measurements of basic anthropometric indicators, such as: body height (measured with the stadiometer in a standing position, upright, without footwear with an accuracy of ± 0.1 cm), body weight (measured in underwear using a medical weight to the nearest ± 100 g), waist and hips circumference (measured with a sewing tape measure), arterial pressure (measured using an electronic pressure gauge with a cuff fitted to the child's arm circumference) – values are referenced to percentile networks according to the OLAF and OLA study in 2007-2012 [2], body composition analysis (using the electrical bioimpedance method). The following parameters were determined: percentage of adipose tissue (% PBF), body fat (kg), lean body mass (kg, LBM), weight of water (kg, TBW) and muscle mass (kg, SLM). Physical capacity was also assessed using the Kasch Pulse Recovery Test step test to determine the mean post-exercise heart rate which was used to assess cardiovascular fitness. The test consisted of rhythmical climbing on a 30.5 cm high platform for 3 minutes. The pace was 24 ascents and descents determined by the metronome (Kasch 1961, Kuntzleman 1990). The heart rate was recorded using the "Polar" electronic analyzer and was monitored throughout the duration of the study, i.e. for 3 minutes of effort load (step-test) and for 1 minute and 5 seconds during rest (sitting position). Only those post-exercise heart rate values were analyzed, which were recorded for one minute, just after the end of the test (but no later than 5 seconds after the discontinuation of the exercise). All the indications of the heart rate monitor were recorded in the examined child while he or she was resting in the sitting position. The arithmetic mean calculated on their basis was the basic variable of the analyzes carried out in the study. Before the start of the step-test, ascent and descent at an appropriate pace were demonstrated by the nurse who conducted the study. The stopwatch was turned on only after 3-4 trial patient inputs. This study made it possible to estimate the level of physical fitness based on the frequency of HR, and

thus to estimate the level of physical activity of an aerobic nature, which is the basic element of a healthy lifestyle. 3,321 children participated in the performance test. The remaining patients were excluded from the test mainly due to a recent illness or discomfort on the day of the examination, or because those children were excused from PE classes on medical grounds. Based on the measured anthropometric parameters, the body mass index (BMI) (a coefficient created by dividing the body mass in kilograms by the square in meters) and WHR – waist-hip ratio (a factor created by dividing the waist circumference by the hip circumference) were calculated. WHR is an indicator of fat distribution in the human body and is a determinant of the type of body silhouette (pear – or apple-shaped) and type of obesity (abdominal or buttock-femoral obesity). The criteria developed by the International Obesity Task Force (IOTF) were used [3].

Results

Excess body weight was diagnosed in 822 patients (429 girls and 393 boys), i.e. 24.1% of the examined population; of those patients, 614 were overweight (18%) and 208 were obese (6.1%). Elevated blood pressure was diagnosed in 369 patients (184 girls and 185 boys), i.e. in 10.8% of the examined population. Very poor physical fitness – test abandoned before the completion (HR>180/min) was diagnosed in 151 children (4.5%), very poor physical fitness was diagnosed in 234 children (7%), poor fitness was diagnosed in 827 children (24.9%), sufficient fitness was diagnosed in 961 children (29.2%), good fitness was diagnosed in 650 children (19.5%), very good fitness was diagnosed in 428 children (12.8%) and excellent fitness was diagnosed in 70 children (2.1%). To sum up, 1,212 children, which is 36.4% of the examined population (668 girls and 544 boys) had their physical fitness assessed as insufficient (below the lower threshold of the norm). The most numerous groups of children have sufficient and poor physical fitness level. 544 children with BMI \geq 90th percentile (16% of

the examined population) were qualified for the second stage of the program. Of those qualified, 350 actually attended their visit (the other children either did not show up despite the date being arranged and a reminder being sent, or the researchers were unable to contact the parents despite multiple attempts). In this group of 350 children the mean body weight was 42.3 kg (min. 25.6 kg, max. 65.2 kg), mean BMI was 22.3 (min. 18.2, max. 33.0). Upon collecting the medical history, anthropometric measurements of the parents were gathered as well. The mean body weight of the mothers was 73.38 kg (min. 47 kg, max. 130 kg), mean BMI was 26.5 (min. 17.3, max. 42.46). The mean body weight of the fathers was 95.29 kg (min. 50 kg, max. 150 kg), mean BMI was 29.46 (min. 18.59, max. 48.98). In the mothers' and the fathers' groups the mean BMIs indicate excess body weight.

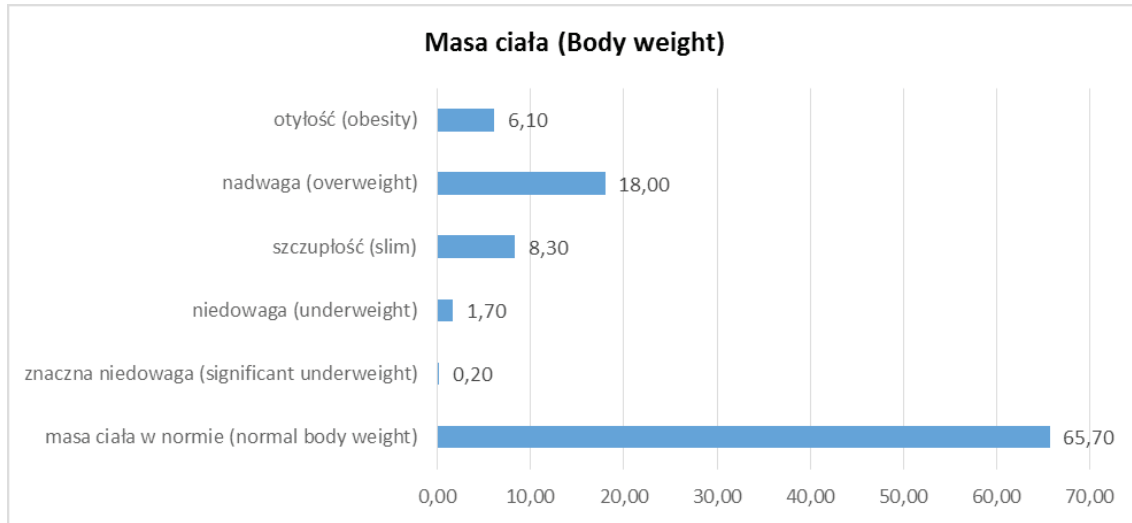
Discussion

Because of the rapid increase of obesity incidence in children, the fight against excess body weight is one of the greatest global challenges of the 21st century. The subject of children's obesity is one of the leading problems of modern paediatrics because of unsettling epidemiologic data. It is estimated that about 1/3 of the paediatric population is overweight or obese [4]. Unfortunately, constant progression of this phenomenon is observed. Children's obesity is a global problem, being a classic example of a multifactorial disease accompanied by behavioural tendencies impacting individual response for dietary treatment and physical activity [5]. Physical activity is one of the most important factors influencing proper physical and psychological development of children and adolescents. In adults it affects the general condition and quality of life. Low level of physical activity is one of the factors proven to be involved in many metabolic diseases (e.g. obesity, cardiovascular diseases, type 2 diabetes, numerous neoplasms, osteoporosis) [6]. It causes motoric functions to weaken, as well as overstraining the bone-joint-ligament

Table I. Statistical characteristics of body weight assessment in the examined population

Tabela I. Tabela zawiera statystyczne dane dotyczące wyników oceny masy ciała w przebadanej populacji

Masa ciała (Body weight)	liczba (number)	%
masa ciała w normie (normal body weight)	2230	65.70
znaczna niedowaga (significant underweight)	9	0.20
niedowaga (underweight)	61	1.70
szczupłość (slimness)	285	8.30
nadwaga (overweight)	614	18.00
otyłość (obesity)	208	6.10
Razem (sum)	3407	100



system, which contributes to body stature problems [7]. Therefore, it is especially important to promote an active lifestyle among children and adolescents in order to solidify positive habits associated with pro-health activities. Unfortunately, the fast pace of civilizational progress causes steady decrease in the amounts of physical activity. More and more frequently physical activity competes with activities based on immobility: watching TV or using the Internet. Physical activity levels in the Polish society are unsatisfactory, and the increase in passivity is observed in even such early stages of life as childhood and adolescence [6,8]. Therefore, especially in this age groups, systematic, organized activities with different types of sports are necessary, with proper frequency, duration and intensity, so that they are effective from the physiological point of view. This allows to achieve high physical fitness level, which decreases the risk of e.g. cardiovascular diseases later in adult life [9]. In many countries special measures are taken to prepare recommendations concerning physical activity, e.g. in the UK a team consisting of 57 representatives of academic centres and social organizations prepared recommendations for children and adolescents aged 5 to 18-years: recommended physical activity level is 60 minutes a day (at least 30 minutes) and exercise of at least moderate intensity, as well as exercises increasing muscle strength and suppleness twice a week [10]. Unfortunately, physical activity levels of Polish children amount only to a fraction of the above-mentioned values. The fault lies both in the education system and in parents as they do not offer encouragement to children and do not act as role models for them when it comes to active lifestyle. Physical fitness level in children and adolescents should be a catalyst for their somatic, psychological, intellectual and social development [11]. It is undeniable that children with excess body weight are less physically fit than their peers that are not overweight or obese [12]. Obese children present poor

physical fitness in qualities such as suppleness, speed, and functional strength. Additionally, hand strength, measured with a dynamometer shows a positive correlation with body weight [7]. Kubusiak-Stonina et al. [12] found a correlation between physical activity and ways of spending free time. An analysis of the results shows that the higher the physical fitness level, the more often respondents (children 11-12-years-old) declare active ways of spending free time. This result is not surprising, because less physically fit and less physically active people tend to show a dislike for physical activities, which is based on fear of not being accepted by the peers, but, in consequence, it only makes the problem worse. Epidemiologic data show that, during adolescence, the physical activity levels decrease (with the biggest decrease occurring between the age of 13 and 18). During that period, children show less spontaneous will for physical activity, which derives from the inner need for movement characterizing younger children. Animal tests show that this phenomenon is most probably connected with the dopaminergic system, which regulates the motivation to move [13]. The most popular ways of spending free time in children and adolescents are: watching TV, playing video games, and using the Internet. Other studies show that one in three adolescents watches at least 4 hours of TV every day [14]. There is a visible disproportion between time spent by adolescents on physical activity and on sedentary ways of spending free time. Sedentary activities took on average 4.5 hours, including 2-3 hours of watching TV and 1 hour of using the computer for boys and 0.5 hours for girls. One in three adolescents spent 4 hours or more watching TV, and 31.7% used the computer for 2 hours or more [14]. An additional factor adding to excess body weight is the fact that many people consume products high in calories while watching TV – sweets, soda, and crisps; meanwhile, the consumption of fruit and vegetables decreases [16]. What might give us hope is a fact that in the

Table II. Statistical characteristics of blood pressure assessment in the examined population

Tabela II. Tabela zawiera statystyczne dane dotyczące wyników oceny ciśnienia tętniczego w przebadanej populacji

Ciśnienie tętnicze (blood pressure)	liczba (number)	%
w normie (normal)	3036	89,20
podwyższone (elevated)	369	10,80
Razem (sum)	3405	100

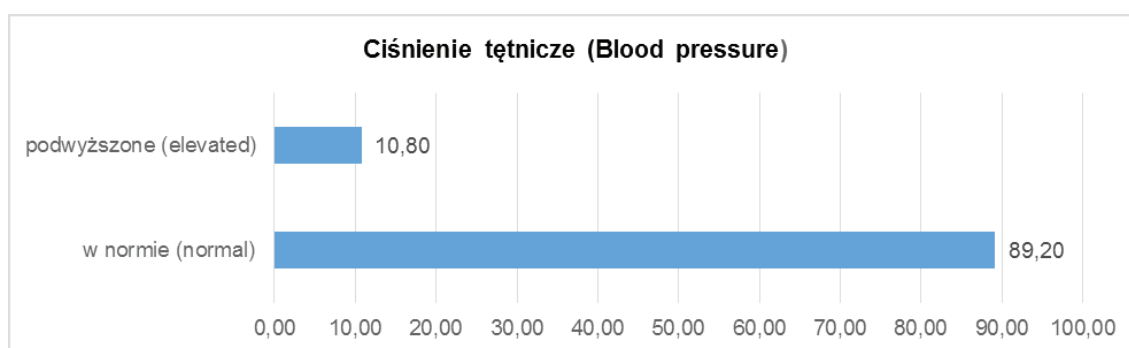
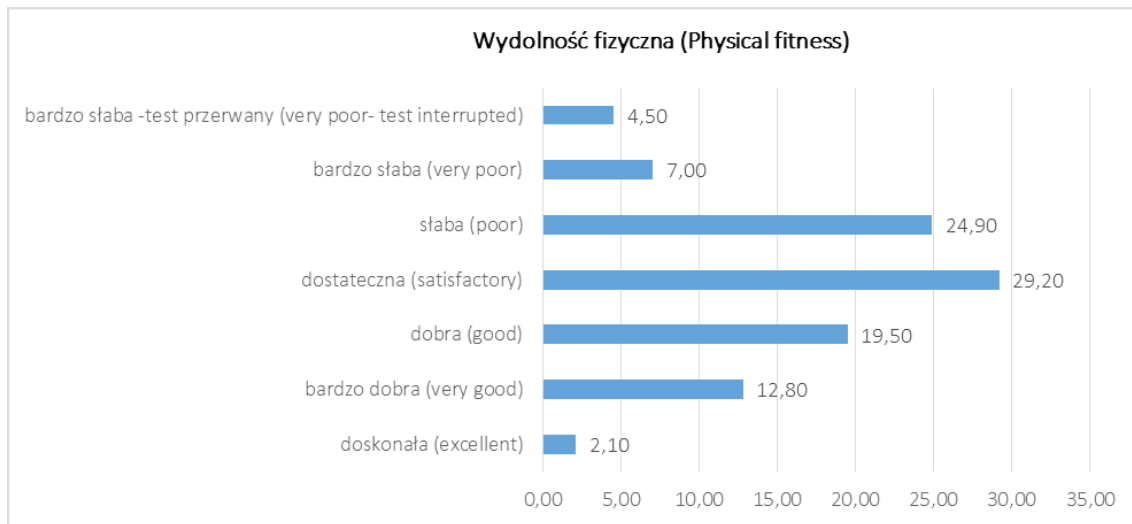


Table III. Statistical characteristics of physical fitness assessment in the examined population

Tabela III. Tabela zawiera statystyczne dane dotyczące wyników oceny wydolności fizycznej w przebadanej populacji

Wydolność fizyczna (Physical fitness)	liczba (number)	%
doskonała (excellent)	70	2.10
bardzo dobra (very good)	428	12.80
dobra (good)	650	19.50
dostateczna (satisfactory)	961	29.20
słaba (poor)	827	24.90
bardzo słaba (very poor)	234	7.00
bardzo słaba – test przerwany (very poor – test interrupted)	151	4.50
Razem (sum)	3321	100



years 2002-2010 the number of children and adolescents watching TV longer than recommended (2 hours and more) decreased in all age groups, both on weekdays and weekends. This tendency holds both for boys and girls [1]. Analysing health conscious behaviours, one has to take into account not only the increase of physical activity, but also the decrease of sedentary behaviours, i.e. the ones related to immobility, mostly in front of the TV-set or computer screen. In 2010 it was pointed out that the percentage of children spending many hours playing video games in Poland was higher than in other countries. On the global scale, this percentage steadily increases, but in Poland it has actually become lower. The percentage of 11-year-olds spending 2 or more hours in front of the screen every day on weekdays decreased from 46% to 33%, which made Poland move from 4th to 24th place in international rankings [15].

Earlier school age (6-12-year-olds) is characterized by willingness to move, the need to “blow steam off” in motion and spontaneous physical activity. It is the so-called golden age of motility, which gradually creates the sense of purpose and economy in movements, as well as the control of the body. The child easily masters basic motion abilities (such as swimming, riding a bicycle, skiing, ice skating), finds pleasure and fun in achievements and competition [9]. Therefore, this is the age that we should use to instill proper physical activity patterns in

children, and promote healthy lifestyle choices, which will have an impact on later stages of childrens’s development, and in consequence, their adult life.

Conclusion

The fact that unsatisfactory physical fitness level in children reaches 36.4% is unsettling. They had their physical fitness assessed as insufficient (below the lower threshold of the norm).The largest groups of children have sufficient and poor physical fitness level.

The percentage of children with excess body weight reaching 24.1% of the examined population is also surprisingly high, as is the percentage of children with elevated blood pressure (10.8%).

The results of the study incontrovertibly show that there is a need of radical, multidisciplinary and motivational activities for schools and parents in order to support the prevention of excess body weight and to improve the quality of physical education classes in elementary schools as well as of activities in the free time.

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