Rocz Panstw Zakl Hig 2020;71(4):383-391

http://wydawnictwa.pzh.gov.pl/roczniki_pzh/ https://doi.org/10.32394/rpzh.2020.0138

ORIGINAL ARTICLE

INTERVENTION FOR IMPROVEMENT THE DIET AND PHYSICAL ACTIVITY OF CHILDREN AND ADOLESCENTS IN POLAND

Katarzyna Wolnicka[1], Jadwiga Charzewska[2], Anna Taraszewska[1], Renata Czarniecka[3], Joanna Jaczewska-Schuetz[1], Natalia Bieńko[2], Elżbieta Olszewska[3], Bożena Wajszczyk[2], Mirosław Jarosz[4]

[1]National Institute of Public Health - National Institute of Hygiene, Department of Nutrition Education, Warsaw, Poland

[2]National Institute of Public Health - National Institute of Hygiene, Department of Nutrition and Nutritive Value of Food, Warsaw, Poland

[3]Józef Piłsudski University of Physical Education in Warsaw, Poland

[4]Food and Nutrition Institute, Department of Dietetics and Hospital Nutrition, Warsaw, Poland

ABSTRACT

Background. The effects of a two-year educational Programme "Keep Balance" addressed to children and adolescents have been evaluated. Its purpose has been to implement the rules of proper nutrition and increasing the level of physical activity on the population level.

Objective. The main objective of the evaluation was an indication if, after two years of programme activities, outcome indicators have been achieved.

Material and methods. Approximately 400,000 pupils/students from 1600 educational units from the territory of the whole country have been included in the education programme. The efficiency evaluation has been carried out in a sample of n = 1506 pupils/students in the interventional group and n = 1589 in the control group. Education has been addressed to the entire school environment, pupils, students, parents, teachers, headmasters, and the local community. The survey methodology, body weight and height measurements, the BMI index, and EUROFIT physical fitness tests have been used to assess the effects of the education programme in the scope of knowledge and nutritional behaviour regarding physical activity. There were assumed outcome indicators. The certification of schools/kindergartens with "The Certificate of a School/Kindergarten Friendly to Nutrition and Physical Activity" has been used to evaluate the activation of school environments.

Results. There was an improvement achieved over the assumed target points in the level of knowledge of pupils/students in the scope of nutrition and the role of physical activity, in the changes of nutritional habits, and in the results of physical fitness tests. There were achieved 20% increase in knowledge in the scope of nutrition and 5% increase in physical activity. There have been changes in the frequency in the consumption of the first breakfast before going to school (by 25% among the younger ones and by 17% among the older ones), an increase in the consumption of bottled water by 49% and reduction of sweet drinks by 19%. The percentage of the pupils/students consuming the recommended 5 meals increased by 33%. Physical fitness indicators were achieved over assumed 5% increase in the individual exercise tests. The Certificate was obtained after meeting the criteria and documenting the durability of the changes by 65% of 1600 educational units included in the Programme. A decrease in the frequency of overweight and obesity occurrence in the whole intervention sample by 1% was obtained; it was greater (but statistically insignificant) among younger students by 3.3% in comparison to the older ones where there was an increase of 1%.

Conclusions. Summing up all achieved results the educational programme "Keep Balance" implemented on the population level aimed at children and adolescents has turned out to be effective and deserves to be continued after minor adjustments. Many positive changes have been identified as well as those that ought to be improved. Comprehensively included education and sometimes small changes in much of nutritional and physical behaviour have influenced the reduction of the percentage of pupils/students with excessive body weight, despite the fact that the average BMI has basically remained on the same level.

Key words: *intervention, children, adolescents, nutrition, physical activity, obesity prevention*

Corresponding author: Katarzyna Wolnicka, Narodowy Instytut Zdrowia Publicznego - Państwowy Zakład Higieny, Zakład Edukacji Żywieniowej, ul. Chocimska 24, 00–791 Warszawa tel. +48 22 5509638, e-mail: kwolnicka@pzh.gov.pl

STRESZCZENIE

Wprowadzenie. Oceniono efekty dwuletniego programu edukacyjnego „Zachowaj równowagę" skierowanego do dzieci i młodzieży. Jego celem było wdrożenie zasad prawidłowego żywienia i podniesienie poziomu aktywności fizycznej na poziomie populacji.

Cel badań. Głównym celem ewaluacji było wskazanie, czy po dwóch latach działań realizowanych w ramach programu osiągnięto założone rezultaty i wskaźniki.

Materiał i metody. Około 400 000 uczniów z 1600 placówek oświatowych z terenu całego kraju zostało objętych programem edukacyjnym. Ocenę efektywności przeprowadzono na próbie 1506 uczniów w grupie interwencyjnej i 1589 uczniów w grupie kontrolnej. Działania edukacyjne były kierowane do całego środowiska szkolnego - uczniów, rodziców, nauczycieli, dyrektorów oraz społeczności lokalnej. Do oceny efektów programu edukacyjnego w zakresie wiedzy i zachowań żywieniowych, w zakresie aktywności fizycznej wykorzystano metodologię obejmującą ankietę, pomiary masy ciała i wzrostu, wskaźnik BMI oraz testy sprawności fizycznej EUROFIT. Określono wskaźniki do osiągnięcia. Do oceny aktywizacji środowisk szkolnych została wykorzystana certyfikacja szkół/przedszkoli za pomocą „Certyfikatu Szkoły /Przedszkola Przyjaznego Żywieniu i Aktywności fizycznej".

Wyniki. W stosunku do założonych punktów docelowych nastąpiła poprawa poziomu wiedzy uczniów z zakresu żywienia i roli aktywności fizycznej, zmiany nawyków żywieniowych oraz wyników sprawdzianów sprawności fizycznej. Osiągnięto 20% wzrost wiedzy z zakresu żywienia i 5% wzrost aktywności fizycznej. Zaobserwowano zmiany w częstotliwości spożywania pierwszego śniadania przed pójściem do szkoły (wzrost o 25% wśród młodszych i o 17% wśród starszych uczniów), wzrost spożycia wody butelkowanej o 49% oraz zmniejszenie spożycia słodkich napojów o 19%. Odsetek uczniów spożywających zalecane 5 posiłków dziennie wzrósł o 33%. Wskaźnik sprawności fizycznej osiągnięto powyżej zakładanego 5% wzrostu w poszczególnych próbach wysiłkowych. Certyfikat Szkoły/ Przedszkola Przyjaznego Żywieniu, po spełnieniu kryteriów i udokumentowaniu trwałości zmian, uzyskało 65% z 1600 uczestniczących w Programie placówek. Zaobserwowano nieistotne statystycznie zmniejszenie częstości występowania nadwagi i otyłości w całej próbie interwencyjnej o 1% - większe o 3,3% wśród uczniów młodszych w porównaniu ze starszymi, gdzie nastąpił wzrost o 1%.

Wnioski. Po podsumowaniu wyników stwierdzono, że program edukacyjny „Zachowaj Równowagę" realizowany na poziomie populacji, skierowany do dzieci i młodzieży, okazał się skuteczny i w pełni zasługuje na jego kontynuację po drobnych jego korektach. Zaobserwowano wiele pozytywnych zmian. Wszechstronna edukacja i czasami niewielkie zmiany w większości zachowań żywieniowych i fizycznych wpłynęły na zmniejszenie odsetka uczniów z nadmierną masą ciała, mimo, że średni wskaźnik BMI w zasadzie pozostał na tym samym poziomie.

Słowa kluczowe: *interwencja, dzieci, młodzież, żywienie, aktywność fizyczna, prewencja otyłości*

INTRODUCTION

Excessive body weight (obesity and overweight) at the developmental age has become now one of the most serious public health problems in all the regions of the world. The intensity of obesity in children and adolescents differs among countries, as there are countries with a low incidence of obesity below 10%, as well as those with a particularly high incidence approaching 40% [10]. However, regardless of the percentage, there is an increasing trend of overweight and obesity in all the regions of Europe, particularly intense in Eastern European countries [15]. Summarizing the most important issues of public health from the perspective of the population, the European Public Health Association (EUPHA) with the Section: Child and Adolescent Public Health (CAPH) indicated obesity as one of five priorities of children and adolescents' public health [5, 11].

The risk factors for the development of obesity in children and adolescents are mostly and comprehensively described with an indication to the dominating role of a lifestyle including unhealthy nutrition habits and a shortage of physical activity that would be optimal for health [7, 14, 15]. This knowledge causes the fact that intervention programmes are conducted in larger or smaller groups of children or adolescents in almost every country, as for which there is little information about their effectiveness and consequently, about durability in terms of a population [8, 9, 12]. A high variability in the intervention programmes applied, combating many factors often correlated with one another, the lack of a description of intervention tools used and the assessment of their effectiveness result in that practically little is known about the risk profile or protection factors operating in various countries [2]. The knowledge on the factors determining the effectiveness of specified methods of preventing the development of obesity in children and adolescents in various countries requires urgent supplementation.

Following the motivation above, an intervention programme addressed to the population of children and adolescents in Poland was initiated. Its main goal was to implement the principles of proper nutrition and physical activity in children and adolescents by shaping pro-health attitudes and, consequently, preventing the development of overweight and obesity as well as other chronic diseases with the help of educational tools.

The detailed goals were formulated in the form of assumed indicators to be achieved during two years of

its duration. They concerned the increase of changes in the scope of knowledge on healthy nutrition (outcome indicator: increase by 20%) and physical activity (by 5%), positive changes in behaviour in relation to nutrition and physical activity (outcome indicator: increase by 20%), the improvement of physical fitness results (outcome indicator: increase by 5%) and achieving good certification results of educational units by the assumed percentage (outcome indicator: 50% of certified institutions). The implementation of the objectives was directed at the entire population of pupils/students included in the programme and the entire school environment.

MATERIAL AND METHODS

The description of the programme

The educational program for children and adolescents was a part of a larger and comprehensive Project of Swiss and Polish Cooperation (KIK/34 grant) called "Keep Balance", which included educational tasks addressed also to other demographic groups apart from adolescents, to pregnant and lactating women, obese and overweight adults, and the whole society. One of the tasks supported all the Project's goals in the form of a nationwide media campaign.

The educational program meant for children and adolescents was implemented within the years of 2013–2015 in kindergartens and schools. Joining the program was a voluntary, spontaneous initiative of a school or kindergarten, which provided the opportunity to act together in the structure built by the authors. The programme covered 1,600 municipal and rural education establishments from all the education levels, 100 in each of 16 administrative units in the country (provinces), which allowed the programme implementers to take into account existing regional inequities in the intensity of obesity [6]. Approximately 400,000 pupils attended the schools and kindergartens included in the programme in 2013.

In order to achieve the planned goals, a communications structure between the programme management centre and the programme implementers in the field was built. For this purpose, the Programme implementers from the institutions managing the Project from the National Food and Nutrition Institute (NFNI) and the University of Physical Education (UPE) trained 16 coordinators of the programme in each province twice.

Subsequently, a leader was selected, a teacher who was responsible for the implementation of the programme and educational materials in a facility in each of 1,600 schools/kindergartens included in the programme. The leaders were trained by way of e-learning, using 9 films sent on CD-ROMs, and then placed on the Internet website of the Project. The leaders' training was finished with an examination checking their knowledge, assessed by the project management team (from the NFNI and the UPE).

The educational programme was launched on 1 September 2013, and finished on 30 June 2015. It is worth noting that the educational programme and final examination after the end of the programme were completed in June 2015 before the Regulation on the sale and administration of food products at schools issued by the Minister of Health came out (15 August 2015).

The achievement of the planned objectives of the programme was assessed on the basis of a sample survey of students from the last grades of primary schools (13 years old) and from the last grades of junior high schools (16 years old). Sixty four classes (4 classes: 2 urban and 2 rural ones from each province) constituted a sample for evaluating the effects of the programme. The school classes were selected for the control and intervention group according to the principle of cluster sampling. The classes from the intervention group were subjected to a two-year education programme; the classes from the control group did not participate in the educational program. The students from the intervention group did not differ in their age from the students from the control group (Table 2). The information about the school's activities, the teachers' information on the knowledge and behaviour of pupils/students, the measurements of height and weight, and fitness tests were conducted by trained Leaders - School Teachers both in the intervention and control groups. The leaders received a detailed research instruction, necessary equipment, and documentation to complete.

The following methods were used to assess the effects of the activity of the educational programme:

1. surveys containing test questions including the 5-point *Likert* scale, as well as open questions were used in the assessment of the level of knowledge of pupils/students in the scope of nutrition and physical activity,
2. in the assessment of the certification process by a school or kindergarten, a description of the criteria in the scope of nutrition and physical activity fulfilled by a school or kindergarten with the attached documentation in the form of photographs, CD recordings etc., attendance at physical education classes, or talks with parents, etc. were taken into account.

The certificate was granted in the presence of a committee on the basis of the documentation: (1) the results of a test in the form of four EUROFIT tests were taken into account in the assessment of changes in physical fitness, (2) the anthropometric measurements of body height and body mass of pupils/students were

Table 1. The types of educational and intervention activities used in the two-year Educational Project "Keep Balance"

Addressed to teachers
• e-learning for teachers with the help of 9 educational and instructional videos on the issues of physical activity and nutrition in educational institutions, and the rules for certifying kindergartens and schools, completed with a knowledge exam, • a guidebook for teachers 'A school and kindergarten friendly to healthy nutrition and physical activity' with an attached CD-ROM containing scenarios for classes on the subject of proper nutrition on various educational levels, • sending the criteria to be fulfilled so that a school/kindergarten can receive 'the Certificate of a School/ Kindergarten Friendly to Nutrition and Physical Activity' in the paper and electronic versions, • the development of original scenarios and recording educational videos based on them with training programmes for children and school adolescents, for the youngest ones from kindergartens and the grades of 1-3 of primary schools, for junior high schools, and for the oldest students from secondary schools with the total length of 6 hours, 52 minutes, and 26 seconds of film material: – 16 videos with the presentations of exercises, games, and plays for kindergarten children and the pupils of 1-3 grades with the total length of 1 hour, 0 min., 11 s. – 15 videos with the presentations of mid-lesson exercises for younger children with the total length of 36 min., 50 s. – 15 videos with the presentations of exercises, games, and plays for the pupils of 4-6 grades with the total length of 1 hour, 10 min., 45 s. – 3 videos with dance animations for adolescents with the total length of 2 hours, 3 min., 4 s. – 7 videos with fitness exercises for adolescents with the total length of 2 hours, 1 min., 36 s. • the production and distribution of 9 videos with the character of 'mad' Professor FunFit, along with the scenarios of plays and physical games and exercises for younger students with elements of nutrition, • 36 articles in the scope of physical activity and fitness on the Internet website of the project, • a bookmark for School and Kindergarten Headmasters and for teachers on the project website www.zachowajrownowagę.pl with articles and current information,
Addressed to pupils/students
• the competition 'The Good Shape Contest' for the pupils from the 5-6 grades of primary schools and the students from the 1-3 grades of junior high school with four tasks to be performed by pupils/students: designing and conducting an educational campaign on the subject of healthy nutrition and physical activity addressed to the family/parents and siblings, and 3 other tasks to choose from. The competition provided for prizes and the announcement of results on the project Internet website, • "The Good Shape" competition announced in the subsequent year for all the institutions participating in the project with prizes and the announcement of results on the project Internet website, • an interactive booklet for kindergarten children entitled "Be active and eat healthily", • an educational film for children about healthy nutrition and physical activity "Keep Balance" with animated elements with the participation of well-known chef Pascal Brodnicki for primary and junior high schools, • 7 posters including 2 posters with the Healthy Eating Pyramid and the rules for healthy nutrition (for the age of kindergarten children and the children of younger 1-3 grades, and for adolescents separately); 2 posters with the Healthy Eating Pyramid and the rules for activity (for the age of kindergarten children and the children of younger 1-3 grades, and for adolescents separately), and 3 informative posters on the programme (for kindergartens, for the primary school 1-3 grades, for adolescents), • the project website www.zachowajrownowagę.pl with a bookmark for pupils/students with articles and current information (3,791,279 visits to the website by 2016 stated), • Facebook: zachowajrownowage.pl for pupils/students with everyday answers to questions from pupils/students or parents (41,000 users by 2016), • YouTube with videos for the project (7000 hits a year).
Addressed to parents
• a brochure for parents entitled "The rules of healthy nutrition and physical activity of children and adolescents at the school age" in the paper and electronic version, • leaflets - fridge magnets with healthy eating pyramids and physical activity for parents, • a video with a celebrity, Pascal Brodnicki, 'Keep Balance – Elevenses' about the role of elevenses in pupil/student nutrition with recipes of dishes, • leaflets in the paper and electronic version (a leaflet about the role of elevenses, 2 leaflets with the recipes presented by Pascal in the video), • educational articles in the parents' bookmark on the project Internet website: zachowajrownowage.pl, • a page on Facebook: zachowajrownowage.pl.

Addressed to the society
• articles for the press, • press conferences, • national and local radio and television interviews, • after the completion of the Project, the creation of the National Centre for Nutritional Education and Lifestyle at the Food and Nutrition Institute (National Institute of Public Health - National Institute of Hygiene at present): www.ncez.pl (since 1 January 2017).
Addressed to the school/ kindergarten
• the development of requirements to be fulfilled by the school/kindergarten to obtain "The Certificate of a School/ Kindergarten Friendly to Nutrition and Physical Activity", • the development of criteria for certification in the scope of nutrition (from 6 to 10 criteria depending on the education level), • the development of criteria for certification in the scope of physical activity (from 3 to 4 criteria depending on the education level).

made according to the applicable methodology and after training teachers in the assessment of changes in body mass. The classification of overweight and obesity was made on the basis of the BMI index according to *Cole* et al. [3].

Intervention

The educational tools developed and applied during the two-year programme were directed to the entire school/kindergarten environment, to pupils/students, to their parents, to teachers and school headmasters, and to the local community. The culmination of the whole education process was the development of criteria to be met in the scope of nutrition and physical activity at school or kindergarten in order to receive the prestigious "Certificate of a School/Kindergarten Friendly to Nutrition and Physical Activity" to be hung outside and inside the building. The certificate was awarded after the initial evaluation after the first year of the programme; and it was granted after two years permanently after confirming the sustainability of pro-health changes in a school or kindergarten.

The educational materials used in the programme had a mixed character, i.e. taking into account new Internet technologies (digital ones), websites, social networking sites such as Facebook, YouTube, as well as traditional paper materials in the form of brochures, books or posters. The list and description of all the materials in a synthetic form used in the Programme are presented in the Table 1.

RESULTS

As it has been mentioned earlier, the sample of pupils leaving the primary school (the average age of 13 years old) and students leaving the junior high school (the average age of 16 years) was selected to evaluate the efficiency of the education programme. The students from the intervention group participated in the school education program for two years of study. The intervention group did not differ in their age from the students in the control group (Table 2). The two-year education programme did not affect the changes of the average BMI index, which was practically the same, except for the larger average of 0.3 kg/m^2 in the case of boys aged 16 in comparison to 16-year-olds of the control group. Changes in the incidence of excessive body weight i.e. high BMI values, occurred despite the lack of significant differences between BMI averages.

There were fewer pupils/students with excessive body weight (overweight and obesity) in the groups of 13-year-old boys by 13%, by 3.4% among girls as well, and by 0.6% among 16-year-old girls in the intervention group after two years of the programme. 16-year-old boys among whom there was an increase in the percentage of excessive body mass in the intervention group by 2.6% were an exception.

The data provided in table 3 show that the programme's effects connected with the occurrence of excessive body weight were connected with the age of the pupils/students. The reduction of excessive body weight was greater (but statistically insignificant) in the group of younger 13-year-old pupils, while there was an increase among the 16-year olds (Table 3). The younger the pupils/students were, the greater the effects of the programme.

The effects of the educational programme set at the beginning of the programme as target points to be achieved are presented in Table 4. These effects were determined following the most frequent disorders in the nutrition manner and physical activity constituting the risk of developing obesity and other diet-related diseases in the population of the Polish children and adolescents.

In the case of an assumed 20% increase in knowledge in the scope of nutrition and 5% increase in physical activity, the objectives of the programme have been achieved regardless of the age (in the group in total). However, what is worth emphasizing, the effects achieved were greater in the younger age group

Table 2. Baseline frequency of excessive body weight in 13 and 16 years old students in the intervention and control groups

	Intervention group n = 1506				Control group n = 1589			
Sex	boys		girls		boys		girls	
Age group	13 years old n=377	16 years old n=393	13 years old n=354	16 years old n=382	13 years old n=401	16 years old n=393	13 years old n=408	16 years old n=387
Age average in group	12.9	15.9	12.8	15.9	13.0	16.1	13.0	16.0
Height (cm)	160.0	176.0	159.0	165.0	160.4	176.5	160.0	165.4
Body weight (kg)	51.9	68.4	50.5	57.8	52.2	67.9	51.1	58.4
BMI (kg/m^2)	20.1	22.0	19.9	21.2	20.1	21.7	19.9	21.3
Excessive body weight (overweight and obesity) (in %)	25.9	24.2	18.8	14.7	29.3	21.6	22.2	15.3
Excessive body weight boys along with girls (%)	731 (22.4)	775 (19.5)	-	-	809 (25.7)	780 (18.4)	-	-

Statistical differences between the intervention and control groups statistically insignificant ($p>0.05$).
excessive body weight (overweight and obesity) BMI classification compliant with age and sex, according to *Cole* et al. 2000.

Table 3. Effects of intervention on excessive body weight occurrence (overweight and obesity) in intervention group in comparison with control group

Age	Basic frequency before start with intervention (2013)	Intervention group (assessed in 2015)	Control group (assessed in 2015)	Reduction or increase in the intervention group in comparison to control group
13 + 16 years old	22.3 % n = 3266	20.9% n = 1506	21.9% n = 1589	Reduction by 1 %
13 years old	25.3 % n = 1627	22.4% n = 731	25.7% n = 809	Reduction by 3.3 %
16 years old	19.3 % n = 1639	19.5% n =775	18.4% n = 780	Reduction by 1.1 %

excessive body weight (overweight and obesity) BMI classification compliant with age and sex, according to *Cole* et al. [3]

Table 4. Positive changes (in %) in knowledge on healthy nutrition behaviour in intervention group after two years of education in comparison with the control group (considered as 100 %)

Target points:	Increase achieved in intervention group in relation to control group	Assumed indicator to be achieved (increase or reduction by %)
Changes in the scope of knowledge		
Knowledge in the scope of healthy nutrition rules – Evaluation on the basis of 12 questions (one error allowed): – total – 13 years old – 16 years old	 by 23% by 28% by 18.6%	by 20%
Knowledge in the scope of physical activity – total – 13 years old – 16 years old	 by 7.2% by 8.6% by 5.8 %	by 5%

Changes in selected pupils'/students' nutrition behaviour		
1. Increase in the consumption of 1st breakfast – total – 13 years old – 16 years old	 by 19% by 25% by 17%	by 20%
2. Increase in the consumption of 2nd breakfast at school – total – 13 years old – 16 years old	 by 51% by 70% by 34%	
3. Increase in the number of meals a day (up to 5 or more)	by 33%	
4. Reduction in a small number of meals (1 to 2)	by 30%	
Change in the frequency of buying three products preferred by adolescents at a school shop 1. Increase in buying bottled water 2. Reduction in buying sweetened drinks 3. Reduction in buying chocolate bars – total – 13 years old – 16 years old (increase)	 by 49% by 19% by 5% by 18% by 12%	
Changes in selected behaviour connected with physical activity		
– flexibility increase (test: a trunk bend in the sitting position) – 13 years old – 16 years old – increase in abdominal muscles' strength (test: sit-ups) – 13 years old – 16 years old – increase in back muscles' strength (test: a chin-up) – 13 years old – 16 years old – increase in circulation-respiration stamina (test: a shuttle run x 20 m) – 13 years old – 16 years old	 by 50% by 60% by 7% by 6% by 44% by 20% by 22% by 13%	by 5%
Certification of Schools/Kindergartens		
Granting "The Certificates of a School/Kindergarten Friendly to Nutrition and Physical Activity"	by 15% (increase up to 65%)	50%

of 13-year-olds in comparison to older 16-year-old students.

Optimistic data concern the changes in the scope of nutritional behaviour. There have been important changes taking place in preventing the development of obesity in the frequency and regularity of consuming meals during the day including the increase in the consumption of the first breakfast before going to school (by 25% among the younger ones and by 17% among the older ones). There was an increase in the consumption of elevenses after 2-3 hours of staying at school as much as by 70% among the younger pupils and 34% among the older ones. Such a large increase in the frequency of consuming meals at school was associated with the school certification process, in which one of the important criteria was the organization of a sufficiently long break between classes and ensuring friendly conditions for pupils/students to consume a meal. The percentage of the pupils/students consuming the recommended 5 meals increased by 33%, and the percentage of the pupils/students eating too few meals during the day decreased by 30% complementarily. An important element of nutritional education was combating excessive sugar consumption by students, as a result of which there was a reduction in the purchase of sweetened drinks at school shops by 19%, chocolate bars by 5%, and an increase in the consumption of bottled water by 49%. The effects of changes were greater among the younger ones compared to the older students. The subsequent effects of the programme included the tests of the pupils'/students' physical fitness allowing to assess aerobic stamina, postural muscle strength, and flexibility of the lower spine section. The test of

sit-ups allowing for the evaluation of the abdominal muscles' strength in which the effects of change were the smallest, 6.8% among the 13-year-olds comparing to 6.1% among 16-year-olds. The progress was bigger in the test of chin-ups evaluating the muscle strength of the back and shoulder girdle (by 44% in 13-year-olds and by 19.6% among 16-year-olds). Both these tests referred to the evaluation of the muscle strength of the so-called postural muscles responsible for maintaining the correct posture. Strong back and abdominal muscles are, in turn, responsible for the safety and hygiene of the spine. The biggest changes were made in the subsequent test, a trunk bend in the sitting position, testifying to the fitness of the lower spine section (by 50.4% in 13-year-olds and by 60.5% in the group of 16-year-olds).

The changes presented in table 4 below and many others not discussed in this report were accompanied by the certification process of schools and kindergartens, in which educational units tried to fulfil quite demanding criteria in the scope of changes concerning nutrition and physical activity, adjusted to the education level and the infrastructure at a school or kindergarten on a different level (schools from the town/city and the country were included in the programme).

1027 units out of 1600 kindergartens and schools fulfilled the criteria of "The Certificate of a Kindergarten/School Friendly to Nutrition and Physical Activity" and confirmed the continuation of the changes after two years, which constituted 65% of the total; and it was 15% more than the assumed target point equal to 50%.

DISCUSSION

In this programme, "Keep Balance" it was assumed that the whole school/kindergarten community, including pupils/students, their parents, and the employees of educational facilities, and even local communities would take mutual actions under the influence of the education conducted for the improvement of nutritional behaviour and the one connected with physical activity of children and adolescents. The effects of the two-year programme confirmed these expectations, and demonstrated the efficiency of the activities carried out, as the intensity of the main risk factors for the development of excessive body mass in children and adolescents was reduced by pro-health changes in nutrition and in physical activity and fitness. Certainly, the inclusion of the school environment with the parents of the pupils/students in the programme contributed to the desired changes in nutrition and physical activity in our programme. The large role in promoting healthy eating behaviour and physical activity was assigned to parents and the home environment [4, 16] in programmes conducted in other countries as well.

The certification of schools in the Polish "Keep Balance" programme launched the activity of the school environment, because it influenced the change in the attitude of schools' management and teachers towards the needs of students in the scope of nutrition and physical activity, the organization of places for consuming meals at school, the change of assortment at school shops, or an increase in the participation of pupils/students in obligatory classes and in extracurricular forms of physical activity.

Moreover, the schools and kindergartens received specially designed educational materials in the scope of nutrition and physical activity (intended for pupils/students, teachers, parents, personnel dealing with nutrition or physical activity), both in the printed form as well as CD-ROMs and contacts with social media portals (Facebook, YouTube) or the project Internet websites for permanent use. The mixed and multi-sectoral forms of education proved to be efficient, because they satisfied the expectations of people with various preferences regarding educational materials, as well as they ensured the variety of information provided in the project. The intervention changing the health behaviour of adolescents through online communications proved effective, as documented in a review of 27 studies with the use of such methods [12].

One of the measures of efficiency of educational programmes is change in the BMI. In literature, reports are not consistent; there were both no changes under the influence of a 3-year intervention in children [1] as well as a reduction in the average BMI and the incidence of overweight and obesity in the intervention group in comparison to the control group during a four-year follow-up observation [8] or lowering of the z-score of the BMI together with the accompanying beneficial changes in nutritional habits associated with the development of obesity [13]. In the "Keep Balance" programme, the incidence of obesity in the intervention group was reduced by 1% regardless of age and by 3% among younger students. The achievement of such effects during activities addressed to the population, and not to individual children or families, suggests that the impact on a larger scale may affect many small changes in behaviour conducive to the development of obesity simultaneously, which results in the inhibition of its development.

CONCLUSION

Pro-health changes under the influence of the intervention applied in the programme "Keep Balance" have taken place in a relatively large number of pupils/students included in the programme. The results are a promising perspective in the aspect of public health

and the struggle against obesity in children and adolescents. The programme deserves to be continued after minor adjustments.

Acknowledgement

The study was a part of a larger and comprehensive Project of Swiss and Polish Cooperation (the KIK/34 grant) "Preventing overweight and obesity as well as chronic diseases by education on nutrition and physical activity of the society (2011-2016)" called "Keep Balance". Nationwide project providing for a long-term campaign to promote healthy lifestyles, addressed to the general public, in particular to obese and over-weight people, pregnant women and breastfeeding mothers, healthcare professionals, children and youth, parents, teachers, school directors, school nutritionists, consumers and food producers. Swiss-Polish Cooperation Programme (KIK-34) was a non-refundable foreign aid granted by Switzerland to Poland as one of the new EU member states and co-financed by the Polish Ministry of Health.

REFERENCES

1. *Barkin S.L., Heerman W.J., Sommer E.C., Martin N.C., Buchowski M.S., Schlund D., Pole E.K., Burgess L.E., Escarfuller J., Pratt Ch., Truesdale K.P., Stevens J.*: Effect of a behavioral intervention for underserved preschool-age children on change in Body Mass Index. A Randomized Clinical Trial. JAMA 2018;320(5):450-460.
2. *Blundell J.E., Baker J.L., Boyland E., Blaak E., Charzewska J., de Henauw S., Frühbeck G., Gonzalez-Gross M., Hebebrand J., Holm L., Kriaucioniene V., Lissner L.,Oppert J.M., Schindler K., Silva A.M., Woodward E.*: Variations in the prevalence of obesity among European Countries, and a consideration of possible causes. Obesity Facts 2017;10(2):25-37. https://doi.org/10.1159/000455952
3. *Cole T.J., Bellizzi M.C., Flegal K.M., Dietz W.H.*: Establishing a standard definition for child overweight and obesity worldwide: international survey. Br Med J. 2000, 320, 1240-1243.
4. *Haddad J., Ullach S., Bell L., Leslie E., Magarey A.*: The influence of home and school environments on children's diet and physical activity, and body mass index: a structural equation modelling approach. Maternal Child Health J. 2017, doi: 10.1007/s10995-017-2386-9.
5. *Jansen D., Saxena S., Azzopardi-Muscat N.*: Public Health Practice and Policy to Improve Child and Adolescent Health in Europe. European Pediatric Association. J Pediatrics 2017 doi:10.1016/j.peds.2017.07.043.
6. *Jarosz M., Charzewska J., Wolnicka K., Wajszczyk B., Chwojnowska Z., Taraszewska, A., Jaczewska-Schuetz J.*: Stan odżywienia dzieci i młodzieży szkolnej w Polsce - badania w ramach Projektu KIK/34 "Zachowaj równowagę " realizowanego w Szwajcarsko-Polskim Programie Współpracy. [The nutrition condition of school adolescents in Poland – research within the Project KIK/34 "Keep Balance" implemented in the Swiss-Polish Co-operation Programme]. Żywienie Człowieka i Metabolizm 2016;43(4): 231-238
7. The European Commission: A Strategy on Nutrition, Overweight, and Obesity - related health issues, 2007. Available: https://ec.europa.eu/health/archive/ph_determinants/life_style/nutrition/documents/nutrition_wp_en.pdf
8. *Llargues E., Recasens M.A., Manresa J.M., Bruun Jensen B..Franco R., Nadal A., Vila M., Recasens I., Perez M.J., Castell C.*: Four-year outcomes of an educational intervention in health habits in schoolchildren: the Wall 3 Trial. European J Public Health 2016;27(1):42-47.
9. *Mantziki K., Renders C.M., Westerman M.J., Mayer J., Borys J.M., Seidell J.*: Tools for a systematic appraisal of integrated community based approaches to prevent childhood obesity. BMC Public Health 2018;18:189-201. https://doi.org/10.1186/s12889-018-5042-4
10. *Ng, M., Fleming T., Robinson M., Thomson B., Graetz N.* and others: Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013 - a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;384(9945):766-81. doi: 10.1016/S0140-6736(14)60460-8.
11. Paediatric Health Reports. Journal of Pediatrics, Vol. 2. March 2018.
12. *Rose T., Barker M., Jacob Ch.M., Morrison L., Lawrence W., Stromer S., Vogel Ch., Wood-Townsend K., Farell D., Inscip H., Baird J.:* A systematic Review of Digital Interventions for Improving the Diet and Physical Activity Behaviours of Adolescents. J Adolescent Health 2017;61:669-677.
13. *Van Nassau F., Rose L., Singh A.S., Cerin E., Salmon J., van Mechelen W., Brug J., Chinapaw M.J.M.:* The Duch obesity intervention in teenagers (DDiT) cluster controlled implementation trial: intervention effects and moderators of adiposity and energy balance-related behaviours. Int J Behav Nutr Phys Act 2014;11:158-169. doi: 10.1186/s12966-014-0158-0
14. WHO. Global Strategy on Diet, Physical Activity and Health, 2004.
15. World Health Organization. Adolescent obesity and related behaviours: trends and inequalities in the WHO European Region 2002-2014. WHO 2017. ISBN 978 92 890 5240 5. http://cdn.basw.co.uk/upload/basw_85049-8.pdf (Accessed 04.07.2020).
16. *Wylie A., Pierson S., Goto K., Giampaoli J.*: Evaluation of a mindful heating intervention curriculum among elementary school children and their parents. J Nutr Educ Behav 2018;50(2):206-208. doi: 10.1016/j.jneb.2017.09.017

Received: 24.09.2020
Accepted: 26.10.2020