

# A Follow-Up Health Education Project's Effect on Elementary School Students' Health Status

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## Abstract

Our research topic was about the basic options of health education, divided for several parts and related questions. Research has been done in elementary schools.

**Objectives:** The main aim of the research is to present a health strategy in the elementary education institution system, which quality is crucial regarding the fact that it is also a secondary social field, in which students commence standards.

A. We presume physical activity of children decreases as the age of children increases.

B. We assume we would find significant coherence between sex and health awareness and regular exercise.

C. We hypothesize a deliberately formed elementary school health education program has a positive effect on health behavior.

D. We presume with the help of a proper strategic plan alongside dedicated participants; we would manage to achieve positive results in health education.

**Subject and methods:** We used the same questionnaire every year. Questions are alternately connected to health and sport subjects. The nutrition habits and trends of the students were explored, even personal opinions and feedback were welcomed. Through the process we applied descriptive statistics and multivariate analyzing ( $p < 0.05$ ). Students were aged from 11 to 14 years.

**Results:** Based on the BMI more than 13 % of the students were morbidly obese or under-nourished. Almost 10% of the students were overweight or obese. More than 65 % of students indulge sports on a regular basis at the lowest estimate 2 or 3 times a week. However, this trend seems to change with age, as the eighth grade students' ratio at the same terms are considerably lower. Nearly 10% of children never participate in sports.

**Conclusion:** The schools' infrastructure and selection of sport activities need to be improved.

A. Starting from eighth grade, it would be important to add informative lectures about proper training to the syllabus.

B. Furthermore it is relevant to promote a healthy lifestyle for both parents and children.

C. Establishing opportunities to open a healthy school canteen based on the requirements and needs of the children. Operational conditions would be ideal to be set up by the institution, not by the service provider.

**Keywords:** Health education; Physical activity; School health education program; BMI; Body fat

## Introduction

### Background

The main theme of our research was elementary school health development, which is still crucial, due to the still rising childhood obesity, which can be seen in even younger children year by year. Our research has been filled out in several elementary schools every three

years since 2012. Our aim was to gather information regularly and also to prove that a reasonable and relevant short and long term strategy may reach positive outcomes rapidly in public education institutions with health development. Our research took place in Hungary, Pécs, where we had collected data from elementary school children, due to our belief that a complex health promotion program cannot be started too early. In Pécs, in 2007 a long term health development program was initiated with the contribution of seven institutions and their health educator teachers, and also with the help of dietitians, physiotherapists and health development specialists of the University of Pécs, Faculty of Health Sciences. In 2009, we had the opportunity to join the work and begin the first measurements and collect data every three years. In this publication we would like to interpret our results. The cooperation between the seven schools had ceased before the last two data collections, thus every school was responsible for themselves in the last two measurements (2018,2021). Primarily we were interested in the kind of changes that had been developed in each elementary school due to the integration and the new health development task group. We were also looking for the enquiries of the latest data, in which it was revealed how each school continued the program without the task group.

### Aims and hypotheses

The primary aim of the research is to present a health strategy in the elementary education institutions, whose quality is crucial regarding they are also a secondary social field, in which students inaugurate standards. In view of the above we find it important to compare our tests and methods with standards from the literature to determine our position in this particular field of research.

- a) We presume physical activity of children decreases as the age of children increases.
- b) We assume we would find significant coherence between gender, health awareness and regular exercise.
- c) We hypothesize a deliberately formed elementary school health education program has the positive effect on mixed nurture and physical activity and would also depict a decreased number of overweight children.
- d) We presume with the help of a proper strategic plan alongside dedicated participants; we would manage to achieve positive results in elementary school health education.

### Theoretical framework

The first International Conference on Health Promotion meeting in Ottawa in 1986 presented a charter for action to achieve Health for All by the year 2000 and beyond, which is still valid now a days, too. The conference was primarily a response to growing expectations for a new public health movement around the world. Discussions focused on the needs in industrialized countries but took into account similar concerns in all other regions. Health development is the process of enabling people to increase control over decisions regarding their body to improve their health. To reach a state of complete physical, mental and social well-being, an

individual or group must be able to identify and realize aspirations, to satisfy needs and to change or cope with the environment. Health is therefore seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Therefore, health development is not just the responsibility of the health sector, rather it goes beyond healthy life-styles to well-being [1]. The evaluation of the international survey (HBSC) was published in Hungary in 2011 with a sample of 8,096 people entitled "Health Behavior of School-Aged Children" in cooperation with the World Health Organization. Since 1985, Hungary has been participating in this ever-expanding international research, the aim of which is to monitor the health-affecting behavior and self-rated state of health and well-being of 11-17-year-old school-aged children, as well as the broad exploration of factors, which show a connection with well-being and lifestyle.

In terms of physical activity, it was established that the regularity and length of time spent are significantly influenced by gender and age. Only 17.3% of the surveyed students exercise enough in a week. Almost a third of them had little (30.7%), and roughly a third (34.5%) had very little weekly physical activity. In terms of gender, girls exercised in a significantly lower proportion than boys [2,3]. In their 2014 research, Szmodis and his colleagues examined 3402 Hungarian children. In their study, in addition to filling out a questionnaire related to exercise and nutritional habits, anthropometric data of the children were assessed, and field tests were also performed. In terms of eating habits, the students between grades fifth to eight obtained the following results:

- A. Students mostly consume fruit/vegetables, meat and dairy products.
- B. In terms of nutrition, 27.5% of students consume dairy products daily or more than once a day.
- C. Almost half of the students eat at least some fruit/vegetables on a daily basis.
- D. Daily meat consumption is over 30%.
- E. However, it is a warning sign that the daily consumption of sweets affects 29.4% of the students, which may be cause for concern, although we have seen that in most cases this is also accompanied by daily exercise. A mixed and varied diet clearly emerges among the students surveyed [4].

The European headquarters of the World Health Organization (WHO) created an initiative to monitor and control childhood obesity. COSI (Childhood Obesity Surveillance Initiative) is an international initiative under the auspices of WHO Europe, which aims to reduce the growth in childhood obesity, especially among primary school-aged children. Consequently, a five-year plan was formulated for the participating countries, and recommendations were made to the relevant educational institutions on how schools could be reformed in terms of exercise and nutrition. In order to ensure the success of the COSI program, the European headquarters of the WHO have carried out measurements in the participating countries. In 2019, an estimated 38.2 million children under the

age of 5 years were overweight or obese. Once considered a high-income country problem, overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings, too. Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016. Obesity worldwide has nearly tripled since 1975. The prevalence of overweight and obesity among children and adolescents aged 5-19 have risen dramatically from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among both boys and girls: in 2016 18% of girls and 19% of boys were overweight [5].

## Methodology

### Study design and sample

We conducted a longitudinal research between 2012 and 2021, with follow-up measurements every three years among elementary school students in Pécs regarding their knowledge of a healthy lifestyle and examined the changes in their body mass index, their willingness to play sports, and their basic eating habits among young people between the ages of 10 and 14. The research was based on an anonymous self-completed questionnaire (survey method) in each measurement year. The measuring sheets (the contents of which are partially identical to the validated questionnaire used in the Hungarian research of the international "Shape-up" program, the "Get in shape Hungary" program) contained both multiple-choice and open-ended questions. In terms of their topic, questions were included regarding the students' health behavior and habits. Additionally, the extent of their physical activity besides physical education lessons were examined and also their basic eating habits broken down into individual food types were recorded. The students' individual opinions were also collected. For comparability, the questions used on the measuring sheet are the same as the questions of the previous examination. At the request of the institution's management, we partially changed the structure of the questionnaire compared to the previous measurement years to monitor the students' needs with the help of the results of the measuring sheets.

### Testing and data collection

Our first test was carried out in 2012, where we determined 688 students' weight, height and we calculated from these data the BMI. For further comparability, the measurements were performed by age group, forming 4 groups (group of 11-year-olds, 12-year-olds, 13-year-olds, and 14-year-olds). In parallel with the measurements, we also conducted a questionnaire survey among the same age groups, in which we tested their attitude towards a healthy lifestyle. A questionnaire survey was also carried out in 2015 amongst primary school students in Pécs, involving 691 young people, also aged between 10-14 years. We investigated whether their knowledge of a healthy lifestyle has changed in the age groups over the course of three years. In 2018, our research group managed to reach the 10-14-year-old elementary school target group in Pécs again in the same institutions as in previous years, and as in the previous years, we were able to repeat each of our studies in the current age groups, 937 individuals were involved in the research. We carried out our last measurement among the same age group in

2021, in which 901 elementary school students from the age group of 10-14 in Pécs were included (Table 1).

**Table 1:** Number of participants in the different measurement years.

**Source:** self-editing

Year	Age	N=
2012	Oct-14	688
2015	Oct-14	691
2018	Oct-14	937
2021	Oct-14	901
2012-2021	Oct-14	3217

### Analysis

To measure body weight composition, we measured the height of the students and determined the BMI with an OMRON BF511-B instrument. With regard to the measurements and the databases formed from the questionnaire, we examined whether there is a discrepancy with regard to the examined variables. ANOVA test and Kruskal-Wallis tests were performed for statistical analyses. Sports habits were graphically illustrated with the help of correspondence analysis, in which we analyzed the students' attitude to exercise in terms of multiple dimensions in relation to the three surveys.

### Ethical issues

The participants took part in the research anonymously in each measurement year. Anonymity was ensured based on unique coding. The presentation of the research, as well as the content of the consent forms, was carried out in advance for the legal representative of each participating child during the different measurement periods. The children participating in the study received verbal information about the purpose and course of the study according to their age and condition. The condition for starting the research meant the participating child's legal representative gave their consent on behalf of the child. The declarations of consent were handed over and collected by the students' class teachers. It was emphasized in the declaration of consent, that participation in the study is voluntary and anonymous, in addition to that data and personal information of the completed questionnaires are strictly confidential.

## Result

### Physical activity

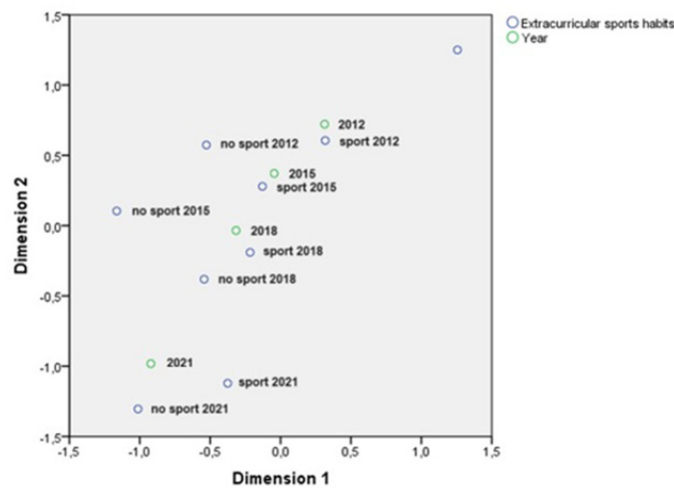
Physical activity is one of the most important components of a healthy life. The beneficial physiological effects of regular exercise are unquestionable: It increases the performance of the heart and circulatory system and the lungs, reduces the oxygen demand of the heart muscle, which is of great importance in the prevention of coronary artery diseases. As a result of regular exercise, serum lipid levels and blood pressure decrease, muscle work lowers blood glucose levels, reduces the risk of developing type 2 diabetes mellitus and malignancy, and helps to maintain body weight. In childhood and adolescence, it is essential for healthy growth and proper bone, muscle and nervous system development. It also

positively affects mental health, mental performance and social relationships. Low physical activity is associated with the risk of various risk behaviors. Research shows that smoking, marijuana (drug) and alcohol consumption are higher among physically inactive young people. Exercise is also related to nutrition. Students who do not exercise regularly consume less vegetables and fruits than their physically active peers. From the point of view of the research, one of the most important issues is related to children’s physical activity. There were four questions related to the topic on the measuring sheet. We inquired whether the students:

- a) How regularly exercise besides physical education class,
- b) Where do their leisure activities take place,
- c) What kind of sports they play and prefer,
- d) Would they appreciate additional sports opportunities at school?

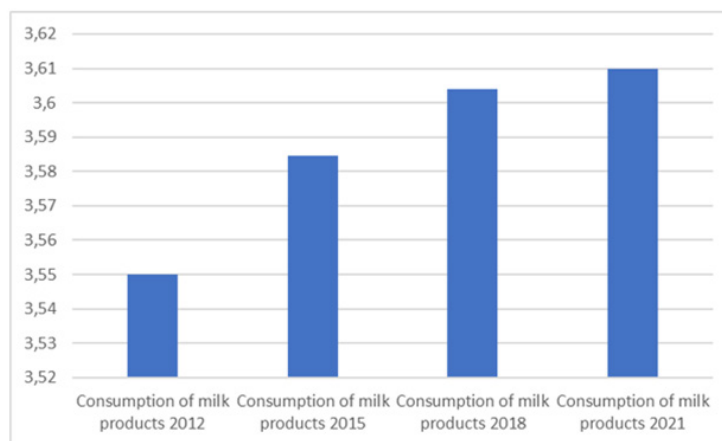
The physical activity was analyzed by a multivariate method. In Hungary, from 2011, it is mandatory to organize 5 physical

education classes per week in public education from the first to the twelfth grade. In our survey all students participated in the compulsory sessions. Although, it is apparent from the survey many students do not participate in physical education classes due to medical advice. Furthermore, a portion of students lack the access to attend physical education classes. As a result, the students were included in the activity survey, based on their responses two categories were defined regarding their sports activity: Members of Group 1 play sports besides the mandatory physical education class. Group 2 represents the ones who do not even attend the mandatory physical education class, meaning, they do not play sports at all. Deriving out of the three variables and the period of the survey, we conceived variables from which we constructed our graph using correspondence analysis (Figure 1). Correspondence analysis was used to analyze physical activity in the examined years. The results are shown in Figure 2. In the second dimension of the analysis it can be seen as the number of years increases, physical activity decreases in the examined age groups. Although, it should be noted, in the first half of the year 2021, pandemic restrictions were still in effect.



Source: self-editing

Figure 1: Multivariate analysis of physical activity.



Source: self-editing

Figure 2: Dairy product consumption habits among children aged 10-14.

WHO declared COVID-19 as a global pandemic on 11 March 2020, turning the world upside down. The pandemic affected enormously areas of social life including education on many levels. COVID-19 pandemic led to school closures worldwide. The Hungarian Universities were ordered to be closed by the Hungarian Government on 11 March 2020, whereas elementary and high-schools continued to operate through digital channels until September 2020 based on a regulation made on 13 March 2020. The aforementioned measures affected approximately 2 million students (40% of them attended elementary schools) [5]. School closures might slow down the spreading of pandemics and may contribute to the decrease in morbidity and mortality, however they could elicit certain healthcare threats mainly through sedentary lifestyle. Vulnerable members of the society could be even more severely affected by the potential socio-economic challenges and casualties caused by school closures.

UNESCO (6) emphasizes the following statements:

- A. Inter- and disruption of education
- B. Students lacking the access of free, school-based nutrition opportunities
- C. Parents being unprepared to support and facilitate home learning
- D. Lack of proper internet and electrical goods access
- E. Certain child's being increasingly exposed to risk factors and inactivity.

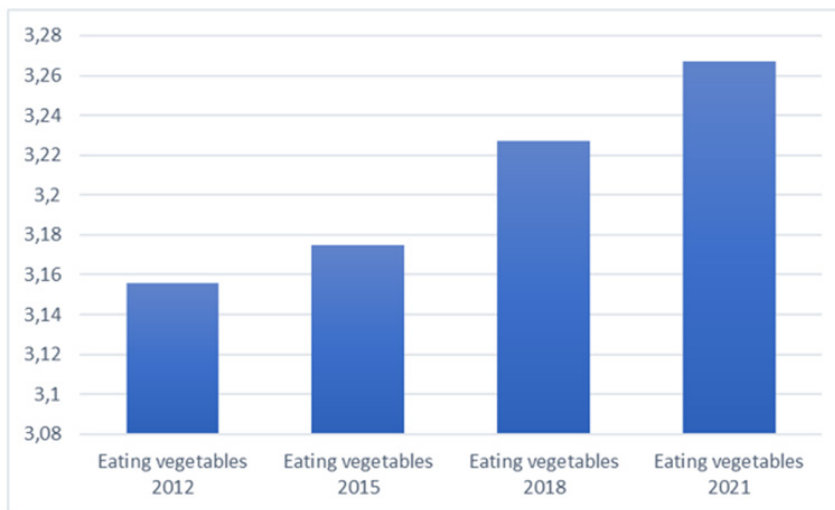
Although the majority of schools possess the necessary equipment for digital education, many principals complained that the lack of/inadequate digital technologies hindered quality education. Furthermore, a change of mindset in pedagogy is essential. Most of these theoretical suggestions have yet to be manifested, making a negative impact on the students' health-preserving habits. The first dimension of the analysis characterizes sport/exercise habits. The daily obligatory physical education introduced in 2011 influenced the physical activity of the students over the past decade. Before the mandatory daily exercise program was initiated, a larger number of students exercised individually, yet the number of those who did not exercise was also high. After following the process for over a decade, both the number of private athletes and the number of non-athletes notably decreased after the introduction of obligatory daily physical education classes, even though the body composition indicators (BMI) indicate an overall insufficient level of physical activity because the change in students' body composition unfortunately depicts a significant change towards the

overweight and obese categories. The most important of the issues related to the topic is how regularly the students engage in sports besides physical education class. In relation to sports, the Kruskal-Wallis test displayed a significant difference ( $p=0.00$ ), although, after examining the mean of descriptive statistics, we noticed the sports activity of young people diminished. In the case of the above, roughly after the age of 13, a break in the frequency of physical activity can be observed. At least 14-year-olds indulge in regular physical activity besides physical education class. Notwithstanding, they are the ones who are the least likely to exercise besides class, therefore it is worth paying special attention to them in connection with emphasizing the importance of physical activity.

### Dietary habits

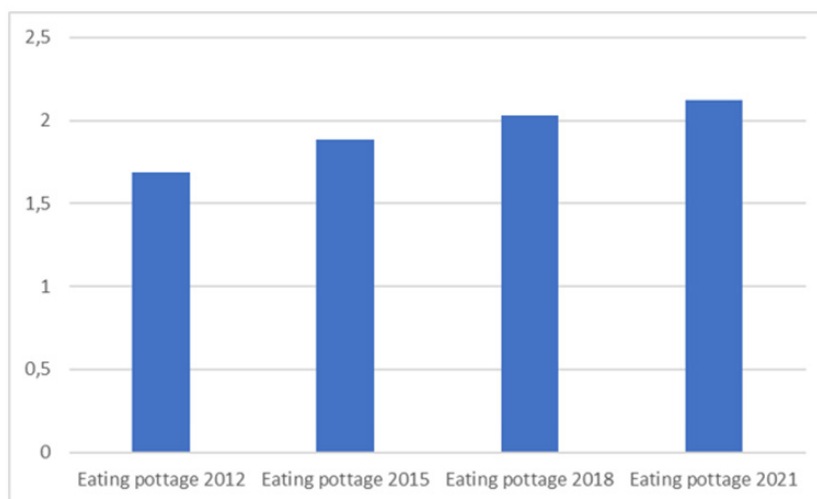
A healthy, correct diet serves to preserve health and prevent diseases even at a young age. If the child's nutrition is one-sided or incomplete, it can lead to various deficiency diseases. Furthermore, overconsumption of food types may accelerate the progression of obesity (which is becoming more common in youth), as well as increase the risk of the development of diseases associated with obesity (diabetes mellitus, cardiovascular diseases). Nowadays, cardiovascular diseases are one of the leading causes of death in Hungary, which could be mitigated by making nutrition more conscious and integrating regular physical activity in the daily routine. Regularity and awareness are crucial, since healthy nutrition is nothing more than consciously choosing foods of the right quality and quantity, as well as eating foods with the right composition providing the body everything it needs for its daily functioning. After the data analysis of the lifestyle questionnaire, we focused on the nutrition and exercise of the young people, and based on their eating habits, we obtained the following results.

Their vegetable consumption habits at the three measured times showed a significant difference ( $p=0.04$ ), which displays an increasing trend after the graphic representation (Figure 3). During our research, a positive change in the consumption of vegetable dishes was also noted (cooked vegetables), as the Kruskal-Wallis test showed a significant difference as well ( $p=0.007$ ). Figure 4 shows the average differences. Regarding meat consumption, a significant difference could not be detected in the three tests ( $p=0.8$ ). The average differences show no change either; the standard deviation is also low at 0.2 ( $3.2 \pm 0.2$ ). A significant difference ( $p=0.04$ ) was measured in relation to pasta consumption habits, with the variance analysis study/test. Based on the answers given in the indicated 3 years, the descriptive statistical representation depicted a decrease in averages (Figure 5).



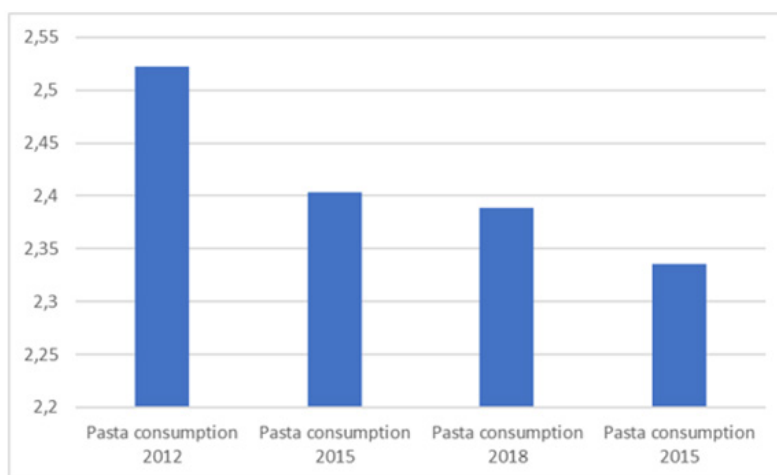
Source: self-editing

Figure 3: Vegetable consumption habits among children aged 10-14.



Source: self-editing

Figure 4: Consumption of pottage among children aged 10-14.

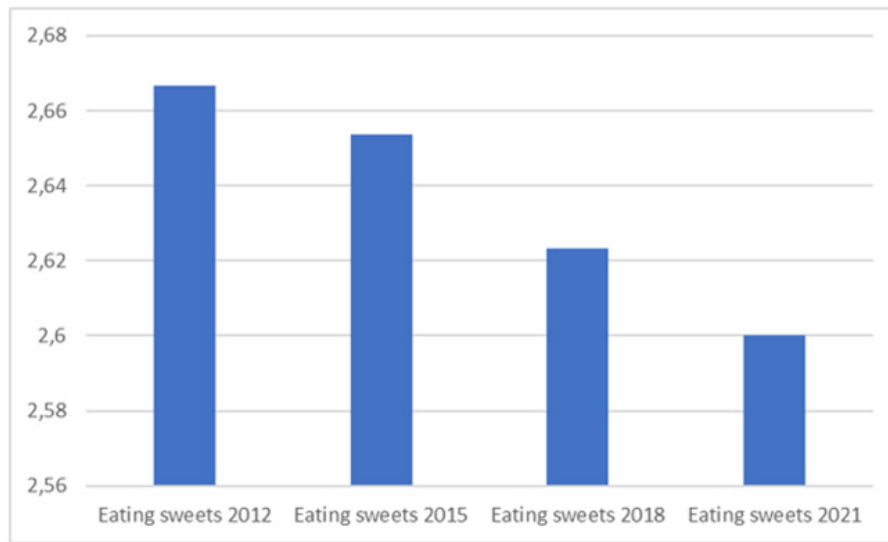


Source: self-editing

Figure 5: Pasta consumption among children aged 10-14.

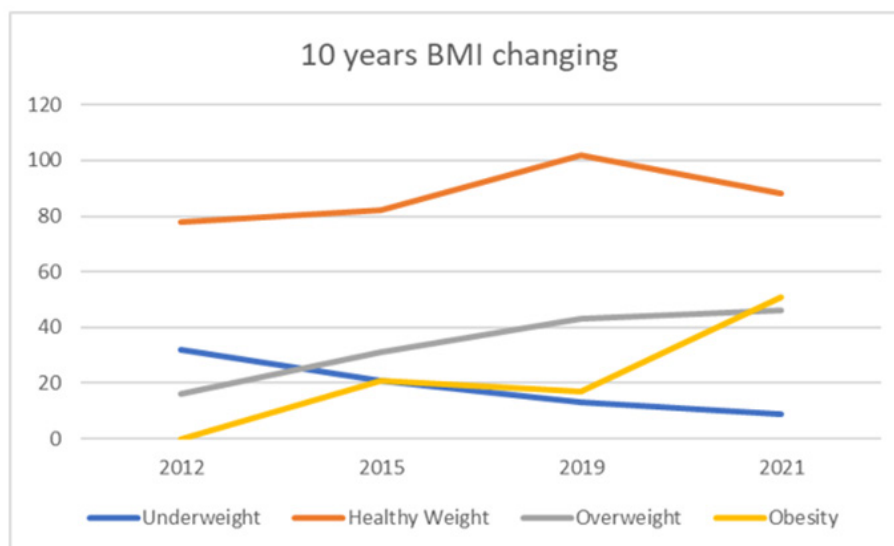
We did not measure any significant differences in fruit consumption between the three years ( $p=0.7$ ), and we also found no average difference during the analysis ( $x=3.5$ ). The sweets consumption habits did not show any difference during the analysis ( $p=0.88$ ), yet the average differences show a minimal decrease (Figure 6). We also did not measure a significant difference in the consumption of dairy products( $p=0.77$ ). However,

when analyzing the average differences, the descriptive statistics showed the consumption of dairy products among young people has increased (Figure 7). Examining additional variables based on the questionnaire, we also measured a significant difference in the application of a healthy lifestyle ( $p=0.00$ ), based on which it can be noticed, following a healthy lifestyle is increasingly important for young people [6].



Source: self-editing

Figure 6: Sweets consumption habits among children aged 10-14.



Source: self-editing

Figure 7: Changes in the body mass index of the 10-year-old age group.

### Body composition, image of health

Regarding body mass index, the ANOVA performed among the individual age groups showed no significant differences, among 10-year-olds  $p=0.9$ , among 11-year-olds  $p=0.99$ , among 12-year-olds  $p=0.83$ , among 13-year-olds  $p=0.82$  and among 14-year-olds, we obtained a value of  $p=0.76$ . With the help of the analysis of variance, we were able to prove quantitatively in our own sample,

in terms of gender; the percentage of body fat in the case of girls increased parallel to age, and in the case of boys, the neighboring age group averages did not differ from each other. The gender-specific relative (and absolute) fat loss could also be verified in this sample, no significant differences were found ( $p>0.05$ ). Similar results in connection with the recorded body fat percentage data can be disclosed. The measurements of each age group were also analyzed with descriptive statistics, which were represented in the

diagrams. The results of the analysis carried out among 10-year-olds are presented in Figure 1, which shows the number of health-risk overweight and obese children is on a rise (Figure 7). A similar trend can be observed among the 11-year-old age group and the number of students belonging to the aforementioned category shows an increase here as well (Figure 8). For each measurement year, in terms of age, this is the age where the situation is most unfavorable in terms of body composition among students. In relation to the above results, based on the subjective, own assessment of the questionnaire survey, it is mainly the 10-11 year

old age group for whom it is important to have a healthy lifestyle and to live healthily. It is clear from the BMI results that there are no gender differences between the students at any age. The decrease in the degree of overweight and obesity with expanding age is clearly apparent, contradicting which is described in the domestic and international literature. Until now, it has been a general trend that the BMI percentile values in the 10-14 years old age group deteriorate with age [7]. After the seventh grade, the values of both the appropriate body composition and the frequency of willingness to play sports begin to diminish (Figure 9).

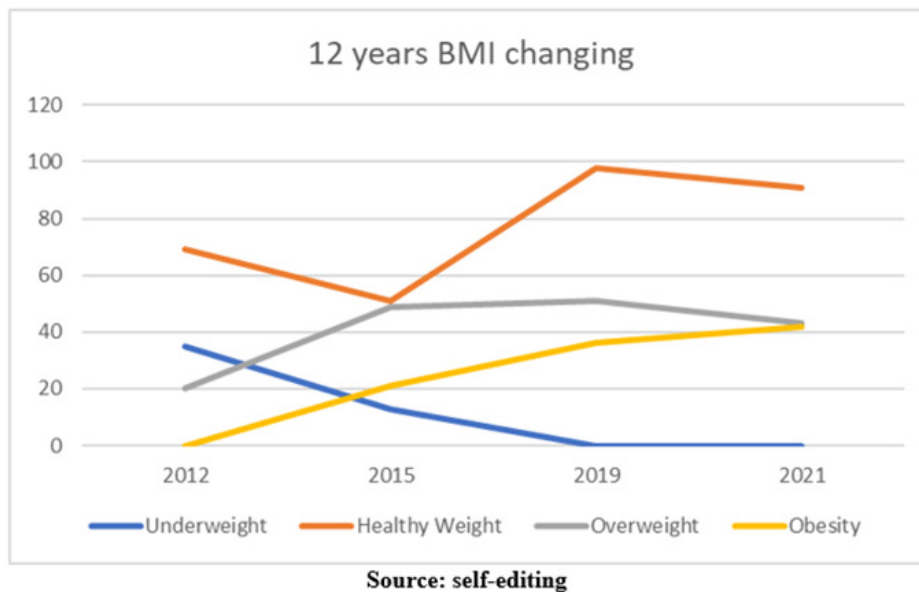


Figure 8: Changes in the body mass index of the 12-year-old age group.

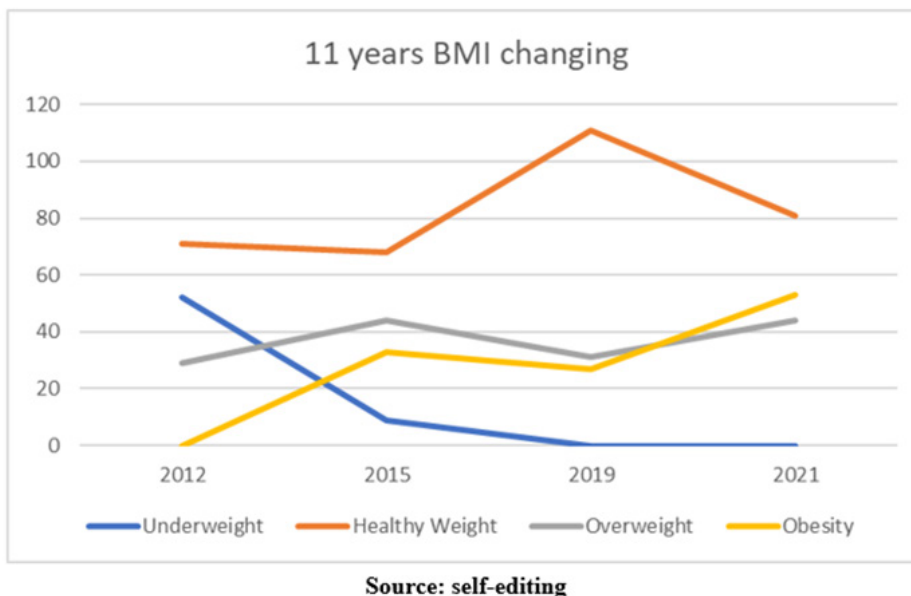


Figure 9: Changes in the body mass index of the 11-year-old age group.

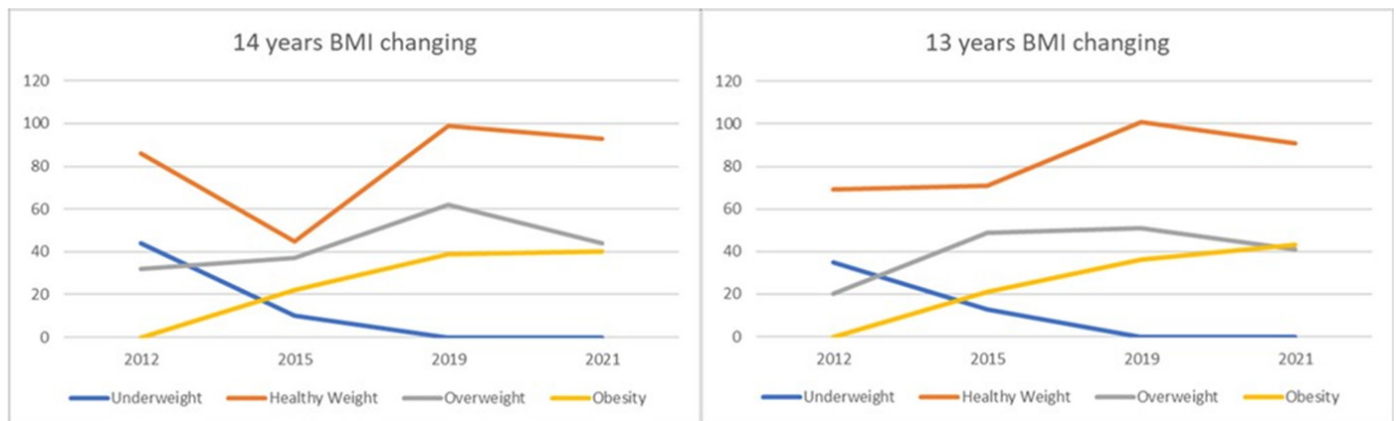
Among 12-year-olds, the number of children belonging to the appropriate body mass index category also shows a decreasing trend. Additionally, the process characterizing the previous age groups can also be detected here, in addition to the number of

overweight children has already exceeded the number of over nourished ones (Figure 9). The data measured among 13-year-old students also show an increase in the overfed and overweight categories, similar to those of the previous age groups, among



the children included in the study, we did not even find young people belonging to the thin category at the last measurement. However, in this age group, among the students included in our sample, the number of overweight pupils exceeded the number of over nourished, which means an increased risk in terms of health among children (Figure 10). The body mass index of 14-year-old children also shows the same trend that characterized the younger age groups, the proportion of overweight children in the age group is rising dangerously (Figure 10). All things considered, the results have shifted more and more towards extremities as the years progressed. A noticeable decrease is evident during the COVID period, especially regarding the proportion of obese children. Physical education classes are mandatory in Hungary five times a week in elementary and secondary schools as well, although

their quality is controversial, chiefly by virtue of lack of proper infrastructure. Nevertheless, it is obvious, online education failed to provide students adequate quality and amount of physical exercise during the pandemic. Analyzing the results by age, shrinkage appears in the proportion of obese children in a few age categories (Figure 9&10), nonetheless, it does not lead to increased rates of normal body weight children, rather the increased number of obese children. Essentially, a gap seems to be appearing, as a child leaves the normal values, he/she finds him/herself soon on the edges. For now, there is not any pediatrician service available to treat those children in a school setting. The school doctor or school nurse can promote the further investigation of the child by sending him/her to a specialist.



**Figure 10:** Changes in the body mass index of the 13- and 14-year-old age group.

Based on the literature there is an increase in BMI amongst children during the COVID-19 lockdown. Therefore, the issue is not only local (nationwide), rather regional, continental or even worldwide, backed by the systematic review and meta-analysis of Chang et al consisting of 12 studies [8]. Various research depict, obesity negatively influences the progress of COVID-19 in children, resulting in increased risk for hospitalization, intensive care admission, mechanical ventilation requirement, and death [8]. The aforementioned findings indicate the need for effective actions by healthcare professionals to increase awareness of the risks of obesity during a global pandemic [9]. The physical activity of the Hungarian adult population during the pandemic displays an upsurge trend, particularly amongst 18-29 year old. Every fourth individual in that age group exhibited increased physical activity [10]. Notwithstanding, 24.1% of the entire population (including school-aged children) demonstrated weight gain during the pandemic, in addition to that, in 10% of the population the weight gain exceeded 4kgs. In conclusion, during the pandemic the trend of energy imbalance of the population emerged, meaning the decrease in physical activity was accompanied by the increase in calorie intake. Similarly, regarding health awareness and changes of body weight, significant differences can be observed. Besides, in 2019 the "Healthy Child Health-Preserving Program" was developed by the Hungarian National Institute of Pharmacy and Nutrition [11], which targets the primary and secondary socialization environment of overweight and obese children between the ages of 0-18 years in

the selected cities. Additionally, educational materials were made for parents and teachers.

The main goal of the program is to improve the knowledge of children about nutrition between the period of 2019-2025. Healthy Cities Association in the Carpathian basin (as a part of the WHO Healthy Cities project) initiated its program called "Get in shape, Hungary" in 2008, with a focus of battling against childhood obesity, relying on the activity of students and the cooperation of schools and families [12] Most Hungarian cities has joined the program, including Hungarian speaking cities across the border. The Association has been an accredited member of the European National Healthy Cities Networks as well. An individual's health condition is essentially determined by the individual's genetic background and lifestyle. The aforementioned factors are also affected by various external factors, for instance by the physical and social environment. Naturally, health is also influenced by a number of factors, such as the health policy of a given society, equitable access to health care, and the quality of healthcare. By raising these questions, we were primarily interested in how the students judge their own state of health and their subjective assessment of their state of health. In the above questions, there is no significant correlation between gender and age. Based on the descriptive statistics, girls show more awareness in the related issues. What's more, it can also be perceived that the students' knowledge of topics related to health and a healthy lifestyle visibly expands with age.

## Discussion

Based on our complex, interdisciplinary follow-up study with the participation of school-aged children from Pécs, the following findings and recommendations can be made regarding the study areas.

### Discussion of the main results and comparison with studies

#### Physical activity

Physical activity is significantly influenced by age and gender, our results were similar to those in the Hungarian National Institute of Pharmacy and Nutrition (OGYEI)-HBSC research [13] and our hypothesis was confirmed, according to which regular exercise decreases with age and is insufficient. In terms of gender, it is mainly characteristic for girls, yet we could not support it with significant data, therefore we could not verify our hypothesis. Moreover, it is important to emphasize the regular physical activity of the students in the examined sample mainly takes place within the framework of physical education classes. Based on the above, comparing the results with the BMI data (Figure 8-10), it can be perceived even if the frequency of movement is optimal in terms of quantity, it is apparently inadequate in terms of quality, since the eating habits depict a suitable mixed diet. Unfortunately, school physical education alone is insufficient to provide students adequate physical activity and help them to reach a suitable physique. Furthermore, it is worth placing more emphasis on school sports projects, if due to the lack of equipment and/or suitable facilities, an optimal amount of physical education lessons cannot be solved, or it is better to put more emphasis on the child's sports activities besides school, which is not necessarily the task of the school (as a secondary socialization environment), it is rather the duty of the family (as the primary socialization environment).

During the examined measurement periods, several initiatives emphasizing the importance of regular physical activity took place in the institutions:

- a) Introducing new forms of movement to students within the framework of physical education lessons.
- b) Closer cooperation with local sports organizations.
- c) Holding regularly, professional presentations for the relevant age group regarding the importance of physical activity within the academic year.
- d) Holding project days on the topic of reforming school sports clubs with the involvement of parents.

In this area, it was not possible to obtain such positive results as a result of strategic thinking as in relation to eating habits. Seemingly it is a more complex issue for the affected group and it is not enough to involve only the secondary socialization environment from a health promotion point of view, if the current infrastructure conditions will determine the institutions and physical education classes in the near future. The explanation of the deterioration is also to be found in the management's loss of motivation in connection with the health promotion program, along with the

interim termination of the common health promotion working group covering all units operating in the institutions.

#### Nutrition

According to the annual survey of the Hungarian Sports Science Society (MSTT) [14] more than 30% of children consume daily fruit and nearly 30% consume daily vegetables. Regarding the consumption of dairy products, approximately half of the children consume some dairy product daily, mainly milk. In terms of gender differences, the quality of nutrition deteriorated slightly by expanding age, yet older individuals generally had less favorable nutrition. On the other hand, in our own research, the consumption of vegetables and fruits is constantly increasing. Students consume more than 40% of vegetables and nearly 60% of fruit on a daily basis. This exceeds the test results of Szmodis et al. [4]. We also obtained more favorable results in terms of dairy product consumption, this type of food is consumed by 61.65% of students on a daily basis. Furthermore, the reduction in the consumption of sweets can be seen continuously. The above definitely reflects and results in the strategic thinking of the examined institutions. During the examined measurement periods, numerous changes were made in the institutions advocating for more conscious nutrition education:

- A. They reformed the offer of the buffets.
- B. Vending machines containing sugary drinks have been removed, replaced by "healthy" products.
- C. Implementing apple vending machines in institutions.
- D. Installation of water dispensers.
- E. Management possessing the ability to influence the canteen offer.
- F. Holding regularly professional lectures on healthy and conscious nutrition for the affected age group (within the academic year).

In relation to eating habits, we can therefore justify our hypothesis that strategic health promotion initiatives may have positive long-term results for an institution.

#### Body composition, image of health

In our complex follow-up study, we analyzed variables directly related to health and sports in children aged 10-14 years old. Based on the BMI, the frequency of children classified as overweight or obese in our sample shows an increasing trend from measurement to measurement. In the European region, the incidence of childhood overweight and obesity is most accurately measured by the WHO Children's Nutritional Status Examination [15-16]. The study, which collects measured data every two years, has been taking place since 2007. Based on current data, the combined prevalence of overweight and obesity is highest in Cyprus (43%) and lowest in Tajikistan (7%). In the list, Hungary (28%) is in the middle, but the domestic value still exceeds the average of the countries participating in the study (27.4%). Hungary ranks twelfth in terms of obesity frequency (12.5%), thus exceeding the average of the countries participating in the study (10.6%) [17]. Our own data

match the national averages if we look at the results of the last two measurement periods. During the first two periods, the results obtained were outstanding in national terms. The deterioration (probably not only in this area of measurement) is probably due to the loss of management motivation in connection with the health promotion program, as well as the temporary termination of the health promotion work group operating in the institutions, covering all units.

Seemingly, a strategically thought-out health education program can quickly have a positive return for the institutions, yet at the same time, the lack of adequate follow-up care, or the possible loss of motivation in connection with such a project, rapidly leads to a deterioration of the results. In the questions aimed at measuring the level of physical activity, despite the number of hours of compulsory physical education per week, we found a significant difference between 10-11-year-olds with no sports on a daily basis, and 13-year-olds with daily physical activity. Based on the above, we confirm our hypothesis, the level of physical activity decreases with advancing age. On the other hand, no significant correlation was found between gender and the degree of willingness to play sports. There is no significant correlation between gender and age regarding the perception of health. Based on the descriptive statistics, girls demonstrate more awareness in the related issues, and it can also be observed that the students' knowledge of topics related to health and a healthy lifestyle visibly expands with age.

### Strengths and limitations

The main limitations of the research appeared mainly in connection with the data collection, unfortunately we could not provide the similar element of numbers to an adequate extent in the individual measurement periods. The main reason for this is that reorganizations took place in the investigated settlement in connection with the maintenance and administration of public education institutions, therefore there were periods when we were able to include four or five institutions in the investigation. Thanks to the above-mentioned reorganizations, there were also shortcomings in the implementation of the health promotion strategic programs, and the health promotion working groups of the individual institutions, which were responsible for sustainability, were partially abolished. These are clearly visible in all measurement areas (with the exception of nutrition). The initial positive results began to deteriorate continuously and became worse and worse in each period.

In relation to physical activity, the COVID-19 epidemic might also have influenced the attitude of the examined group. Domestic research also supports this regarding the adult population [18], which certainly had an impact on the 10-14-years-old age group, since during the pandemic period they mainly relied on primary socialization to achieve a healthy lifestyle. Overall, a well-thought-out health promotion strategy at the institutional level is not enough in order to achieve positive results in the field of health education. Adequate quantity and quality of human resources must be available to improve and maintain results. Because of the above, it is also important to integrate health promotion specialists into

educational institutions, as well as to build and maintain continuous relationships in similar fields at the management level [19].

### Conclusion

From the point of view of health promotion work, we can draw the following conclusions in connection with the research:

Primarily, when determining overweight or in questionable cases, the continuous estimation of children's body composition is justified, even by measuring relative body fat percentage, since BMI alone is not necessarily sufficient to screen children at risk. Regular screening of children is important, especially regarding the relative body fat content. Therefore it is necessary to strengthen and develop relations between educational institutions and school doctors and nurses. Emphasis on exercise and nutrition-related prevention programs is crucial, too. It would be worthwhile to provide special sports opportunities for overweight and obese children, even within the framework of a school sports circle, with a special recreational and health-preserving program. Paying special attention to students following 7<sup>th</sup> grade during health screening. Improving the selection of school sports clubs, the infrastructure and equipment of schools. Provision of special sports for students according to their needs. In the 8<sup>th</sup> grade, most individuals indulge in sports independently at home or in fitness rooms outside of class. It would be important to include informative sessions (even with the help of experts) in the local school curricula from the age of 8, in which students can learn to put together basic exercise programs for themselves, to provide them with information to be able to deal with issues independently (possible injuries, contraindicated exercises, later development to avoid problems). It is still important to promote a healthy lifestyle, both for parents and children. To create the possibility of healthy buffets in all member schools, indeed based on the needs of the children (of course in line with healthy nutrition). It would also be ideal if the operating conditions of the school cafeteria would not be established by the tenants. It is important to continuously maintain the level of motivation in order to preserve and possibly improve positive results. Continuous care and follow-up are necessary from a health promotion point of view. It is necessary to have a continuously and regularly functioning health promotion team within the institution, which takes care of such projects.

It has been proven time and time again that for the sake of the health of the rising generation, it is necessary to start educating them about a healthy lifestyle at school (or even kindergarten) age, consequently, health-conscious behavior becomes a habit and a skill in adulthood, which is very important to keep on a constant level. Our plans include sharing the results with other institutional units for further processing. The results of our research hide many possibilities, for example the examination of further trends per grade, differences or similarities between genders in the light of the results, the comparison of parental background and social situation with the obtained results. It would be beneficial to present the measurements and their results to the other primary and secondary educational institutions of the settlement participating in the measurement-promoting their health education work. Last

but not least, we could get an urban picture of the areas we are investigating.

### Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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### Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships, which could be construed as a potential conflict of interest.

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