



# Changes in eating behaviours and physical activity among primary schoolchildren aged 7–12 during the pandemic in the light of qualitative and quantitative research – Junior-Edu-Żywienie (JEŻ) Project

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## Abstract

**Introduction and Objective.** The COVID-19 pandemic had many direct and indirect effects, including lifestyle changes in all subpopulations, including children and adolescents. The aim of the study was to identify: 1) attitudes of students aged 7–12 years and their parents towards food, nutrition, and physical activity; 2) changes in the consumption of basic food products during the COVID-19 pandemic.

**Materials and method.** A qualitative survey was conducted among students and their parents using the Focus Group Interview method, as well as quantitative research among parents and schoolchildren aged 10–12 years.

**Results.** During the pandemic, changes were demonstrated in the eating habits of primary schoolchildren which were both positive and negative. Positive changes include a greater number of meals and their regularity, especially in relation to meals prepared at home, and a greater consumption of mainly fruit, and to a lesser extent vegetables and whole grain products. Among the negative changes observed were an increased consumption of salty snacks and sweets, including those prepared at home. Moreover, limiting physical activity during isolation may have resulted, as a long-term effect, in excessive body weight and obesity-related non-communicable diseases in children and adolescence, and later in adulthood.

**Conclusions.** There is a need to develop post-pandemic support strategies addressed to both schoolchildren and their parents regarding adequate eating behaviours and physical activity.

## Key words

physical activity, primary school, pupils, eating habits, COVID-19 pandemic, parents of pupils, Focus Group Interview (FGI)

## INTRODUCTION

The COVID-19 pandemic had many direct and indirect effects, including lifestyle changes in all subpopulations in various countries, as well as in children and adolescents. This concerned inadequate nutrition, increased screen time, with a simultaneous reduction in physical activity, as well as social isolation which, in turn, had a negative impact on health, specifically mental health, including sleep and mood disorders [1–6]. Changes in eating habits are especially important during childhood and adolescence, as nutrition plays a key role in functioning, physical and mental development, affecting the health of the population in the short- and long-term. Considering the time since the lockdown, the long-term effects of the pandemic are not yet known, but it can be assumed that in the future it may result in an increased incidence of diet-related diseases, including obesity and other metabolic diseases, as well as

reduced immunity which may be particularly critical in the youngest population.

In order to meet the extraordinary situation, a group of Polish scientific experts developed two lists of recommendations, one addressed to the general population, and the second to children, which provided a detailed overview of practical guidance for Poles in order to counteract the negative effects of the pandemic [7].

Modifications in eating habits observed among children and adolescents during the COVID-19 pandemic have been both positive and negative. Among the positive, researchers mention an increase in the consumption of home-cooked meals [8, 9], the frequency of breakfast consumption [10], the number of meals consumed daily [11], as well as the increase in vegetable and fruit consumption [9, 10], and the decrease in fast food consumption [9, 11, 12]. However, the negative changes included a rise in the consumption of snacks, sweets, and sweet drinks, and of the amounts of food in general [9, 11–17], which may result in weight gain [18].

In numerous studies conducted around the world, the United Kingdom [19], Argentina [20, 21], Austria [22], China [23], France [24, 25], Greece [26, 27], Spain [28], The

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Netherlands [29], Jordan [18], Canada [30, 31], Germany [32, 33], Poland [6, 17, 34–36], Portugal [37], Singapore [38], South Korea [39], Hungary [16], and Italy [14], a decline in physical activity and an increase in screen time among children and adolescents during the COVID-19 pandemic were reported, caused by the closure of schools and the introduction of online teaching.

## OBJECTIVE

The aim of the study was to identify: 1) the attitudes of schoolchildren aged 7–12 and their parents towards food, nutrition, and physical activity, and 2) changes in the consumption of basic food products during the COVID-19 pandemic.

To the best knowledge of the authors, this is the first article using qualitative and quantitative research to assess the changes in eating habits and in physical activity during the COVID-19 among children and adolescents, including their opinions.

## MATERIALS AND METHOD

**Ethical Approval.** This study was approved by the Bioethics Committee of the Ethics Committee of the Institute of Human Nutrition Sciences at the Warsaw University of Life Sciences (No. 18/2022), and was conducted in compliance with the Declaration of Helsinki. All participants, in the case of the schoolchildren, also their parents or legal guardians, provided informed consent to participate in the study. Data obtained during the interviews were confidential and restricted only to the researchers.

**Qualitative study – Focus Group Interview.** Qualitative research was carried out with the Focus Group Interview technique (FGI) in 10 locations throughout Poland. The following cities and towns of various sizes were included: Warsaw, Białystok, Lublin, Kielce, Ostrowiec Świętokrzyski, Nowy Sącz and Brańszczyk, and the villages: Rosko, Czachówek and Poręba. Data were collected in the period October – November, 2022.

Each focus group involved 6–10 students in 2 age groups: 7–9 and 10–12, and 6–8 parents of schoolchildren from these age groups. The number of persons participating in FGI depended on the number of consents obtained in each location, and the parents' willingness to participate in the study. The exclusion criteria for a schoolchild and his/her parent participation concerned health problems connected with following special diets, including elimination diets. A total of 158 schoolchildren aged 7–12 and 101 parents took part in the study.

Focus Group Interview (FGI) is a qualitative research technique involving an in-depth group discussion with people selected according to the purpose of the study, and taking into consideration the principles of their selection. Each focus group consists of 6–8 people who are encouraged by the moderator to speak freely and discuss specific topics [40–43].

FGI moderation scenarios were developed by the authors and tested in pilot studies among both target groups. The study was conducted by moderators, with one person

recording the interviews and taking notes. The principal moderator initiated the group discussion by presenting the idea of the discussion, and explaining the rules governing the behaviour of the group – confidentiality, respecting each other's opinions, not interrupting in while expressing thoughts. FGI participants could resign from participation in the FGI at any time, without giving reasons, although no such situation occurred during the study. The duration of each group discussion was approximately 90 minutes.

FGIs among both, students and their parents were conducted on school premises, in an environment familiar to students, without the need to travel to an external research site. The qualitative research was conducted by a professional company – Umbrella Agency Marketing Group.

The issues raised during the study concerned identifying the attitudes of the schoolchildren and their parents towards food, nutrition, and physical activity, including the problems and challenges in maternal/parental feeding practices. The issues referred to items on the questionnaire used in quantitative research by the same team of researchers among the parents of schoolchildren aged 7–12 on a nationwide research sample.

The group discussions were audio-recorded with the participants' consent, which allowed for subsequent analysis of the study participants' verbatim statements. Transcripts of interviews and notes made during the moderation were coded and analyzed by the team implementing the Junior-Edu-Żywnienie (JEŻ) project.

The material obtained from in-depth group discussions was analyzed using the principles of grounded theory, a flexible theory applied primarily in qualitative research, with an emphasis on discovering recurring themes that emerged as a result of group interactions. Data analysis was conducted in a seven-step approach: familiarization with the data, thematic coding, identification of sub-themes within the main framework, review and revision of sub-themes, definition and naming of sub-themes, analysis and interpretation of patterns throughout the data area, and combination of sub-themes into dominant contextual domains.

This study was conducted within 'Junior-Edu-Żywnienie' (JEŻ) Project.

The article discusses only the topics associated with nutrition during/in relation to the COVID-19 pandemic in the opinion of schoolchildren and their parents or guardians.

**Quantitative study – Questionnaire.** To confirm the results obtained in the qualitative study, in accordance with the analytical and explanatory approach [44], quantitative surveys were conducted on a nationwide sample of the parents of schoolchildren aged 7–12 (n=16,621) and students aged 10–12 (n=12,694). Younger children were not included in this quantitative study due to the fact that during the pandemic they attended the kindergartens or first grades of primary school, and answering questions about that period would have posed problems.

The questionnaires used in the study were developed on the basis of validated questionnaires [45–48] additionally verified in pilot studies.

The survey was of an auditory nature and questionnaires were distributed to the schoolchildren in classrooms. Firstly, the questions were explained briefly to avoid any misunderstanding, after which the questionnaires were

independently completed in the presence of teachers and researchers, who then checked the questionnaires for completeness. If necessary, detailed explanations were provided, avoiding any formulation that could be suggestive for the answers.

The study assessed the impact of the pandemic on children's nutrition compared to the pre-pandemic period, using the following responses: 'It had a positive impact', 'It had a negative impact', 'It did not influence my diet/it did not influence my child's diet', and 'It is difficult to say'. The assessment also determined how the consumption of food groups, important for children's development and health, had changed between the pandemic and pre-pandemic periods. The chosen food groups included: vegetables, fruit, whole grain products, fish, salty snacks, sweets, fast food and sugar-sweetened beverages.

The data were presented as the number and/or the percentage of responses.

## RESULTS

**Pandemic, eating habits and physical activity among schoolchildren aged 7–9 years.** Students aged 7–9, perceived the time of pandemic mainly as 'boring and full of free time'. This was especially stated by those who lost the possibility to spend their free time with peers. For most respondents, that period was associated with the lack of social meetings, as well as plenty of time spent in front of the computer due to obligatory remote learning. This fact caused the feeling of 'screens' over-abundance in many schoolchildren, although in the pre-pandemic period they were only too eager to spend their spare time with a laptop or smartphone. During the pandemic, however, they longed for a different way of spending their free time.

In terms of eating behaviours, some schoolchildren reported that their diets became noticeably healthier. At home, the constant presence of parents led to an increase in the consumption of fruit and healthy snacks, such as nuts, while sweets were consumed in smaller quantities as parents discouraged excessive consumption. However, the dietary habits of the schoolchildren did not change significantly during the pandemic. Some ate more meals because, in addition to their main meals, they often snacked between lessons. Moreover, during the pandemic, parents occasionally ordered fast food, such as pizza, for home delivery, a trend more common among participants from larger and medium-sized cities. The schoolchildren also associate the pandemic period with preparing meals together with their parents, which was an interesting and satisfying experience for them and can be clearly assessed positively.

The majority of schoolchildren admitted that they missed the opportunity to engage in sports. Before the pandemic, they participated in various sports activities, which they longed for during lockdown. The lack of physical activity led some of them to feel that they had gained weight during the pandemic. Schoolchildren in grades 1–3 living in rural areas, however, had different experiences. They were still able to spend time outdoors and engage in sports in their yards, sometimes even with their playmates.

## Examples of schoolchildren's statements

*'Pizza was often ordered, but I eventually got bored of it'* (schoolchild, Kielce).

*'I missed my friends the most, and I couldn't play football with them'* (schoolchild, Warsaw).

**Statements by parents.** Most parents declared that eating behaviours did not particularly differ from those before or after the lockdown. In some cases, both fathers and mothers indicated that in general household members ate more types of foods. One of the main reasons was the constant availability of food products, including salty and sweet snacks, specifically caused by anxiety about restrictions due to pandemic and the tendency to stockpile food. Several participants, especially women, admitted that they had tried to limit their meals because they feared shopping outdoors, which incurred the risk of infection with the SARS-COV-2 virus.

One may get the impression that parents who had the habit of cooking before the pandemic did not change their practices during the lockdown. Only a few people retained bad memories of having to spend a lot of time in the kitchen, which they were not used to before the pandemic. On the other hand, some respondents admitted that during the pandemic they developed previously unused cooking skills, and even learned to cook via the Internet and social media, and less frequently, from cookbooks and recipes from parents/family.

A large group of parents noticed that household members ate more systematically than before, and some indicated that they ate more meals together as a family. However, these behaviours did not necessarily remain for long after returning to work and school.

In large and medium-sized cities, some parents declared that they more often ordered home delivery meals, on one hand, to relieve those responsible for cooking from this obligation, but on the other hand, to diversify the meals and make them more attractive.

Residents from small towns and villages reported practically no changes in their diets. In their households, it was customary to cook meals both before and during the pandemic, which additionally resulted from the limited possibilities of ordering takeaway foods. Some parents admitted that due to the large number of responsibilities, they cooked more quick dishes, such as pasta with sauce and one-pot dishes.

Some adults, regardless of the type of location, indicated that the strict lockdown inspired them to be creative in the kitchen. They reached for recipes that always seemed complicated and time-consuming, e.g., dumplings, bread, yeast dough, etc. They began practicing because of the general trend for homemade cooking and comfort food, as well as for their own satisfaction, self-creation and self-esteem as an efficient 'home cook'. This type of behaviour also proved that food and its preparation provide the opportunity to satisfy various non-physiological needs, i.e., recognition, a sense of belonging or self-fulfillment.

For some respondents, cooking together was also a way of spending time with their children, which resulted not only in a tasty salad or a delicious cake, but also in strengthening family bonds and meeting the needs of belonging and loving. Parents also noticed that their children, who had used to avoid household chores, eagerly became involved in 'adult' duties, and while assisting in the preparation of meals they felt appreciated and important.

In particular cases, parents indicated that they prepared meals at home from different countries, including, among others, ramen, pizza, and oriental dishes. These possibilities occurred mainly among the parents of schoolchildren in grades 1–3 in primary schools living in larger cities, where they had almost unlimited access to stores with a great variety of products from different cuisines.

During lockdown, when outdoor mobility was severely restricted, discovering new tastes developed considerably, aided by the innovative solutions proposed by known gastronomes. They posted recipes online exquisite meals by famous chefs, who also utilised the opportunity as a solution for their own businesses during lockdown. On the one hand, parents wanted to experience new flavors and aromas through food and beverages, while on the other hand, various cuisines were a substitute for vacation, free time, and discovering new places and culinary customs.

#### Examples of statements by parents of schoolchildren aged 7–9 years

*'We were cooking together more often because we had time'* (parent, Czachówek).

*'Our son used to go to school without breakfast, but during the pandemic he ate it. Normally he skipped breakfast as he didn't have time, or he said he was not hungry, but when he was home during lockdown – he ate it'* (parent, Nowy Sącz).

*'Dad I'm hungry, I want to eat something (...) And I heard that over and over again. Kids were eating more; they were hungry more often or (...) we used to not see that'* (parent, Warsaw).

The majority of parents stated that during the pandemic, and specifically during lockdown, their physical activity as well as that of their children was minimal. Only the respondents living in rural areas with their own yards had the possibility for some outdoor activities, because they were not so affected by the imposed changes and restrictions.

It is worth noting that men more often declared mobilizing their families to walk more and take part together in home workouts. Moreover, simple forms of activities, like family walks in the parks or forests gained in importance, and were very much appreciated.

**Pandemic and eating habits and physical activity among schoolchildren aged 10–12 years.** Due to some retrospection during the pandemic, the schoolchildren primarily recalled remotely conducted lessons, which they tended not to view favourably, mentioning loss of concentration or engagement in several other activities during lessons. The negative effects of the pandemic manifested in spending more time at the computer, without being able to participate in physical education lessons, and therefore lacking physical activity. Several students reported that they had gained weight during the pandemic. In addition, they missed the opportunities to spend time with peers and the decreased ability to conduct face-to-face interactions and communication.

According to the schoolchildren's opinions, their eating habits did not change significantly during the pandemic, although they mentioned that they had eaten more processed, ready-to-eat and semi-finished dishes during that time. This especially concerned those from larger cities. In addition, students generally ate more often because they snacked during breaks between classes. Moreover, during the

pandemic, parents were more likely to order fast food like pizza, Asian or Turkish cuisine (kebab), as indicated more often by schoolchildren from larger and medium-sized cities. On the other hand, the pandemic gave parents more time to cook. Sometimes they prepared their own products (e.g., bread, yeast dough, various types of baked goods). One positive aspect of the pandemic was that the vast majority of schoolchildren ate breakfast, as there was no rush to get to school on time.

Due to the intensive remote schooling schedule, the schoolchildren also ate more healthy snacks, mainly fruits, reached for them themselves, or fruits were served by parents and grandparents while staying at home. Thus, the amount of fruit in their diets increased, which was also perceived as a way of promoting immunity to the Coronavirus. Unfortunately, this phenomenon was not observed for vegetables.

#### Examples of statements by schoolchildren aged 10–12 years

*'I ate healthier because I had to sit for almost every lesson, and always had some fruit next to me'* (schoolchild, Ostrowiec Swietokrzyski).

*'I prepared fruit cocktails and salads with my mother more often. I always liked doing it but there was still no time'* (schoolchild, Branszczyk).

*'My dad prepared breakfasts and suppers, which I enjoyed very much. I didn't know he could do that'* (schoolchild, Kielce).

It is interesting to note that most of the schoolchildren admitted that they felt the lack of practicing sports. Before the pandemic, they attended various sports activities which they clearly missed during the lockdown, and could only do some exercise at home on their own initiative. The feeling was different for those living in rural areas. They could still spend their free time outdoors and play sports in the backyard. A similar tendency was observed in small towns where the lockdown rules were not so rigorously followed as in the cities.

Comparing the statements made by parents of the younger and older schoolchildren about changes in their eating behaviours during the pandemic, leads to the conclusion that, in general, their opinions were quite similar. In both groups, the majority of parents declared that their children's diets did not differ from those before, during and after the lockdown. However, there were individual statements indicating that household members ate increasingly more often, which, as previously noted, could be caused by the constant food availability at the home.

At the same time, some parents of older schoolchildren declared that the household members ate less, mainly due to lack of time and endless remote work, which meant constant lessons and short breaks that were too short to eat complete meals. In such cases, parents tried to prepare a plate for the child, consisting mainly of favourite fruits and favorite snacks.

Parents who previously had cooked dinner every day, did not change this habit during the pandemic, with a large proportion of them noting that the household members ate more regularly than before. Similar to parents of younger children, some respondents also expressed the opinion that they ate more meals together because everyone was at home. The end of the pandemic and the return to previous work standards resulted in a return to pre-pandemic habits, and

quite frequent eating alone, e.g., while watching a movie or browsing the Internet.

A clear difference can also be noted among parents' statements depending on their place of residence. In large and medium-sized cities, parents more often declared ordering home delivery meals, which they treated as a variety and an opportunity to experience new flavours and dishes, as well as the result of their lack of culinary skills. Previously, they had usually prepared a few dishes at weekends.

Residents of small towns and villages reported virtually no differences in their diets. They had always cooked home-made meals, both before and after the pandemic, which was even strengthened during the lockdown because of limited access to ordering home delivery food. Some parents admitted that due to the large number of responsibilities, they prepared soups or pasta with sauce more often, and more complex dishes less often.

Some parents of schoolchildren aged 10–12 believed that their children had become more independent during the pandemic and were more willing to help with culinary work, treating it as a way of spending time with their family. As they constantly had to stay at home, they prepared simple meals, e.g., toasts and salads when they were hungry. A few parents admitted that children killed boredom and occupied their time by baking or cooking. Some teenagers browsed the Internet for recipes and experimented in the kitchen. They eagerly tried new recipes and discovered that many products or meals can be made easily at home and there was no need to buy them, e.g., bread. However, according to parents' opinions, these behaviours were temporary, because after the end of the COVID-19 pandemic, children returned to their previous habits, and again avoided activities in the kitchen.

A habit that remained with both the parents and their children even after the pandemic ended, is greater attention to hygiene, i.e., washing hands more often, avoiding sharing dishes like glasses, cutlery, and meals, among others.

#### Examples of statements by parents of schoolchildren aged 10–12 years

*'There was more time to prepare home-made meals, and children were included to help. Normally we come home very late'* (parent, Ostrowiec Świętokrzyski).

*'Sometimes, out of boredom, we prepared something together. I baked bread at home for the first time'* (parent, Kielce).

The vast majority of parents admitted that their physical activity during the pandemic was minimal. On the one hand, it was forbidden to stay in public space, and on the other hand, the respondents had no mood, desire or need to exercise more. Most often, they just went for walks. Individual people exercised on stationary equipment, e.g., a bicycle, but this concerned more respondents from larger cities.

Changes and restrictions were not felt so acutely by respondents from rural areas, who live mainly in houses with their own yard, hence such restrictions did not apply to them. Some parents admitted that their children led a more sedentary lifestyle than before the pandemic. Instead of physical exercises, they chose to spend time online, despite the excess of virtual activity caused by remote learning.

#### Statement by parents of a schoolchild in the 10–12 year age group

*'I think it's easier in the countryside. Because we had a place to go, a place to move, a place to run. Even if you couldn't go out anywhere, only around your property. In the city it is much worse. These children were tied up in their rooms in blocks of flats. And they got sucked into the virtual world. Because not only lessons were online, but they also wanted to play afterwards. And they stayed all days in front of this monitor. And I think it also had some impact on their health'* (parent, Poręba).

#### Impact of pandemic on child's eating behaviour – results of the quantitative survey.

According to the quantitative data, 28% of parents and 23% of schoolchildren aged 10–12 years indicated that the children's eating behaviours changed during the pandemic, compared to the pre-pandemic period (Tab. 1). At the same time, parents and children perceived the changes differently, as the positive and negative changes were noted by similar percentages of schoolchildren, while among parents the negative consequences were marked twice as often as positive consequences. Moreover, approximately 1/3 of students and 1/4 of parents could not univocally assess whether the pandemic had any impact on a child's eating behaviour in the general evaluation.

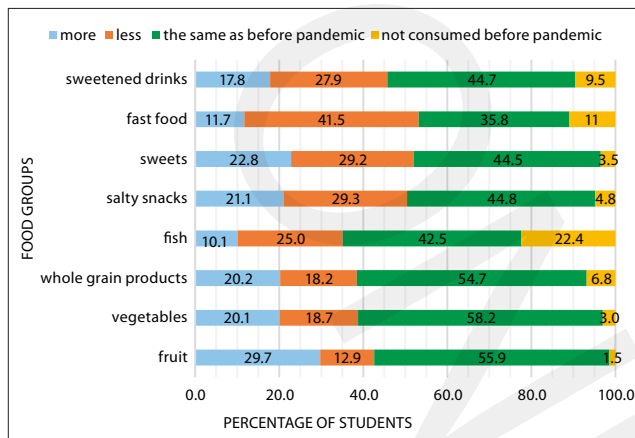
Schoolchildren aged 10–12 years declared that during the pandemic their consumption decreased for fast food (42% of responses), sugar-sweetened beverages (28%), sweets (29%) and salty snacks (29%) as well as fish (25%), compared to the pre-pandemic period. They also indicated that they ate more fruit (30%), vegetables (20%) and whole grain products (20%) (Fig. 1).

Parents of schoolchildren in both age groups noted to a lesser extent the changes in their children's consumption of food groups, especially the unhealthy ones, during the pandemic (Fig. 2). Such discrepancies between the opinions of children and parents can be explained by the fact that the schoolchildren could report reduced consumption of foods with low health benefits, but with high hedonistic value due to their perceived consumption limitations resulting from the constant presence of parents at home, and thereby their greater control of consumption.

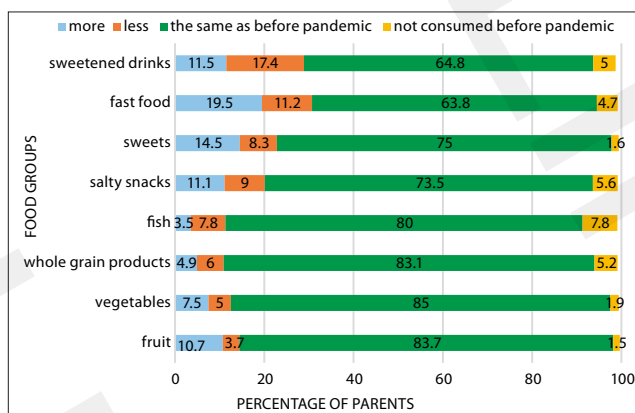
Therefore, according to parents, the reduction in the consumption of those unhealthy foods was smaller than

**Table 1.** Impact of the pandemic on the eating behaviour in the opinion of schoolchildren and their parents

Impact of the pandemic on the eating behaviour of schoolchildren	Parents' opinion		Children's opinion		
	Number, n=16,621	Percentage	Number, n=12,694	Percentage	
Did the pandemic impact on the eating behaviour of the child?	No	8,411	50.6	5,390	42.5
	It's hard to say	3,492	21.0	4,401	34.7
	Yes	4,718	28.4	2,903	22.9
Impact was:	Negative	3,123	18.8	1,624	12.8
	Positive	1,595	9.6	1,279	10.1



**Figure 1.** Food groups consumption during the pandemic among students aged 10–12 in students' opinion (n=12,694)



**Figure 2.** Food groups consumption during the pandemic among students aged 7–12 in parents' opinion (n=16,621)

that indicated by children, and accounted 17% for sweetened beverages, 11% for fast food, 9% for salty snacks and 8% for sweets. Similarly, parents when compared to their children, declared a smaller increase in the consumption of fruit (11% of responses), vegetables (8%), and whole grain products (5%), and a slightly smaller increase in fish consumption (4%) (Fig. 2). An additional explanation for these differences may be the fact that the schoolchildren referred in their answers to their eating behaviors, which their parents were not aware of, because they usually made these purchases secretly from their parents in school shops, vending machines, or on their way to or from school.

## DISCUSSION

The pandemic generally had a positive impact on the eating behaviour of both the younger and older groups of schoolchildren due to a few reasons. Parents stayed at home and had time to prepare meals for the family. They also controlled their children to a greater extent, not only in the consumption of meals, but also of other food products, as indicated during in-depth group discussions.

From the results of this quantitative research, it is difficult to make unequivocal conclusions about the positive or negative nature of the changes during the pandemic. Nevertheless, combining the emotional context of the freely provided statements by both parents and schoolchildren during the

in-depth group discussions, the authors of this article assess these changes as unequivocally positive, although mostly of a temporary nature. Particular emphasis should be placed on spending more time with the family due to preparing and eating meals together [8,35,49], which was not standard behaviour during the pre-pandemic, and probably also in the post-pandemic period, as can be concluded from other own research [50–51].

More frequent preparation of certain products at home, e.g., bread or cakes, as indicated in the qualitative survey, occurred due to limited shopping during the pandemic to lower the risk of illness. It was also the result of other factors related to lockdowns and quarantines: the large amount of free time and spending it at home which resulted in searching for new solutions to fill the free time, and finding purpose in taking up new activities. At the same time, as noted earlier, during this period many activities focused on supplying food products, hence, naturally, spending free time related to food was obvious for many people. This was also connected with emotional eating, i.e., eating certain food products under the influence of emotions, mainly negative ones, which was observed more often during the pandemic than in the pre-pandemic period. Moreover, the rising prices of food products, caused on the one hand by problems with the supply of raw materials and, on the other hand, by increase in demand, also had an impact.

The last factor that should be mentioned was the need to consume pro-healthy foods which are very often associated with natural and low-processed foods, and such could be produced at home under known and supervised conditions. All these factors contributed to the fact that people were looking for traditional or new recipes, and opportunities to prepare them with home produced food that they had previously been purchased in stores [52].

Eating breakfast was mentioned as a positive impact of the pandemic on diet. Respondents argued that it was often skipped before the pandemic due to the morning rush, the need to travel to school, and the accompanying morning emotions. Other authors have also noted an increase in breakfast consumption in families during the COVID-19 pandemic [10, 12, 16, 53]. Some research, however, did not show changes in breakfast consumption [54], and others even indicated a decrease, compared to the pre-pandemic period [55, 56], which may indicate a different reference point of the respondents.

In the present study, schoolchildren aged 10–12 indicated greater fruit consumption during the isolation period than before the pandemic. The observed increase differed between the opinions of students and parents, and equaled 30% and 11%, respectively. A similar relationship was determined in the case of vegetables. The opinions of schoolchildren and parents in quantitative studies also differed regarding the increase in vegetable consumption. Among the schoolchildren, 20% indicated an increase in vegetable consumption during the pandemic, while only 8% of parents indicated such change which, again, can be explained by the different emotional attitude displayed by parents and children to these products – especially vegetables. The increase in fruit and vegetable consumption among the younger and older age groups of schoolchildren has also been confirmed by other authors [14, 35, 57].

The current survey shows an increase in the number and the frequency of meals consumed. This could be related to

the greater pressure exerted by parents staying at home with their children, specifically in the case of younger children [14]. Similar results were found by other researchers [9, 11, 12, 16], who also indicating that snacks were more often eaten as evening or nighttime meals.

The pandemic also caused a negative increase in the consumption of salty snacks and sweets, which belong to the comfort food group. One of the reasons might be that such foods are treated as giving some comfort and support in stressful situations, which had a place during the pandemic [14, 58]. Comfort food is not only so-called 'unhealthy' food. The comfort food trend has gained popularity worldwide, and is used to describe dishes associated with carefree times, family meetings, and traditions that span generations. It can be traditional food that has been eaten in Polish homes 'for always' or completely modern, but prepared in such a way that its taste resembles the original. Comfort food most often refers to high-calorie, baked or sweet meals, e.g. pizza, burgers, casseroles, fries, chocolate and ice cream. During the pandemic, the comfort food trend received a new definition, i.e., food that arouses positive emotions, and was expanded to include deeper experiences – sentimental connotations. The smell or taste of traditional home-made meals could trigger nostalgic memories that made people want to return to the 'old days'. Hence, nostalgic foods are nothing more than a renaissance of recipes from the earlier generations of mothers and grandmothers. It was a return to the roots, the cultivation of simple forms of food and recipes without unnecessary 'decorations'.

When preparing meals, it was (and still is) important to save money, use products grown in own gardens, or use leftovers in the kitchen. Traditional cuisine meant favour, e.g., sauerkraut and pickled cucumbers, homemade dumplings, krupnik, cabbage rolls, and other dishes typical of Polish cuisine. In the home-made dishes resembling those from the past, parents looked for solace and peace, despite the difficult times of the pandemic, as indicated by respondents in qualitative survey.

The current state of knowledge differs from that in the initial period of the COVID-19 pandemic, but already at that time consumers were looking for potentially health-promoting products, implying the possible beneficial effects of many ingredients, including those whose positive benefits have yet to be confirmed. Moreover, during the pandemic, a change was observed in the nature of the functional food products bought by consumers, starting with those perceived as improving immunity, and ending with products reducing the risk of depression and affecting mental health [59].

The diet of many families, especially from medium and large cities, included takeaway meals more often, because parents also worked remotely and still had limited time to prepare meals. This trend was not noted in smaller towns due to the lower availability of restaurants offering food delivery. Here, the opinions of students and their parents again differed regarding the limitation in fast food consumption. Nearly 42% of students indicated a decrease in the consumption of such foods, while this trend was noticed by only 11% of parents. Such discrepancies can again be explained by diverse emotional attitudes to this type of food among teenagers and parents, clearly indicating that younger respondents experienced greater intensity of negative feelings, while parents, especially from medium and large cities, might not have noticed such changes due to the previously-noted

tendency during the pandemic to order fast food, especially pizza, which not everyone classifies as 'fast food'.

The fact of ordering takeaway meals during isolation is also indicated by Czarniecka-Skubina et al. [60], who emphasize that during the pandemic, respondents most often used pizzerias and fast food restaurants, which was also pointed out in the qualitative survey by schoolchildren, especially from medium-sized and large cities. These types of catering establishments already offered home delivery before the pandemic, which also influenced their choice by the respondents. However, many studies show a reduction in fast food consumption in favour of home-made meals [8, 49].

The schoolchildren from both age groups who participated in the qualitative study, had a negative opinion about the lack of contact with their peers. This was specifically underlined by young urban residents who were also more likely to lack physical activity during that period, as they had previously regularly taken part in sport classes after school.

That the combination of reduced physical activity, along with unhealthy dietary patterns, resulted in weight gain was indicated in the present study, as well as in others [18, 61]. Analysis of various physical activity areas among Polish children clearly manifested that the physical activity in children and adolescents is low, and that the pandemic period had additionally contributed to a deepening of this problem [62]. Low physical activity may contribute to poorer functioning and limited development of both younger and older schoolchildren, increase the risk of motor disorders and posture defects, and may inhibit the development of awareness and motor activity in subsequent stages of life. Other consequences of low physical activity include body weight gain that may lead to overweight and obesity which, in turn, cause the occurrence of other diet-related diseases, such as hypertension, type 2 diabetes, and osteoporosis.

The problem with reduced physical activity and elevated screen time became particularly escalated during the pandemic, which is underlined by the schoolchildren in the present study, and indicated by other authors [3, 27, 35, 36, 62].

## CONCLUSION

To summarize, from the observations presented in this study it can be concluded that the COVID-19 pandemic had an impact on the eating patterns and physical activity among primary school children aged 7–12 years, proving the existence of certain differences due to their age and place of residence. The current priority is to promote healthy eating strategies and increase physical activity among children and adolescents which, to some extent, could alleviate the problems that occurred during the pandemic, and prevent diet-related diseases. These actions should also apply to parents who are authority figures, especially for younger children. Besides, parents create the behaviours related to diet and physical activity among other family members. In turn, educational activities showing the simplicity of the preparation of meals at home, using seasonal and local products, may contribute to the improvement of the health of the entire family, and facilitate the dissemination of at least some aspects of a sustainable diet.

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