

# THE RESULTS OF THE "MY CHALLENGE" CAMP IN ADDRESSING CHILDHOOD OBESITY

## REZULTATI TABORA »MOJ IZZIV« PRI OBRAVNAVI PREKOMERNO HRANJENIH OTROK

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### ABSTRACT

#### Keywords:

Diets  
Food  
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**Introduction:** This article presents the development, implementation and results of the project "An interdisciplinary approach to the treatment of overweight children" under the name "My Challenge" camp. It is a 2-week multidisciplinary programme involving a physician, a dietitian, a psychologist, an occupational therapist or physiotherapist and a kinesiologist. The children stay in camp for 2 weeks and are actively involved in the daily preparation of healthy meals, participate in cooking workshops and interactive nutrition lessons, and are active outdoors throughout the programme.

**Methods:** The study included 117 overweight or obese children, aged 7-18 years, 66 girls and 51 boys from ten camps between 2017 and 2023. Completed dietary questionnaires and anthropometric measurements were compared at baseline, after 2 weeks, and after 1 month.

**Results:** Changes in children's diets include an increase in meal frequency, in higher vegetables, fish, and seafood consumption, lower consumption of fried food and reduced consumption of sugary drinks. Boys more frequently consume fried food than girls and less frequently consume milk and dairy products. After one month, there was a decrease in body fat percentage, waist circumference and waist-to-height ratio in both genders.

**Conclusions:** The "My Challenge" camp demonstrates promising outcomes in combating childhood obesity. Through a two-week multidisciplinary programme, significant improvements in dietary habits and anthropometric measures were observed. The findings underscore the importance of preventive education programmes for children in addressing the long-term health consequences of obesity. Further research and continued implementation of such initiatives are warranted to effectively tackle this public health issue.

### IZVLEČEK

#### Ključne besede:

diete  
hrana  
prehrana  
spodbujanje zdravja  
debelost v otroštvu  
prekomerna telesna  
masa

**Uvod:** Debelost v otroštvu ima številne negativne fiziološke in psihološke posledice za zdravje, ki se lahko prenašajo tudi v odraslo dobo. Preventivni izobraževalni programi in programi osveščanja za otroke lahko pomagajo omiliti te negativne posledice. Ta članek predstavlja razvoj, izvajanje in rezultate projekta »Interdisciplinarni pristopi pri obravnavi prekomerno hranjenih otrok in mladostnikov« pod imenom tabor »Moj izziv«. Gre za 2-tedenski multidisciplinarni program, ki vključuje zdravnika, dietetika, psihologa, delovnega terapevta ali fizioterapevta ter kineziologa. Otroci so v taboru dva tedna in so aktivno vključeni v vsakodnevno pripravo zdravih obrokov, sodelujejo v kuharskih delavnicah in interaktivnih izobraževanjih o prehrani ter so aktivni na prostem ves čas programa. Program vključuje tudi aktivno prisotnost staršev ali skrbnikov med vikendom. Vsi udeleženci imajo dostop do e-materialov o prehrani, receptih in jedilnikih, tudi ko se vrnejo v domače okolje.

**Metode:** V študijo je bilo vključenih 117 otrok s prekomerno telesno maso ali debelostjo, starih od 7 do 18 let, 66 deklic in 51 dečkov iz desetih taborov med leti 2017 in 2023. Izpolnjene vprašalnike o prehrani in antropometrične meritve smo primerjali na začetku, po dveh tednih in po enem mesecu. Poleg tega smo ugotavljali razlike v prehranjevalnih vzorcih med deklicami in dečki.

**Rezultati:** Opazne spremembe v prehrani otrok vključujejo povečanje pogostosti uživanja obrokov na več kot dva na dan, večjo pogostost uživanja zelenjave, rib in morskih sadežev, manjšo pogostost uživanja ocvrte hrane ter manjšo pogostost uživanja sladkih pijač. Dečki bolj pogosto kot deklice uživajo ocvrto hrano in manj pogosto uživajo mleko in mlečne izdelke. Po enem mesecu se je zmanjšal odstotek telesnega maščevja, obseg pasu in razmerje med obsegom pasu in višino pri obeh spolih.

**Zaključki:** Interdisciplinarni pristop, ki je bil izveden v taboru »Moj izziv«, kaže obetavne rezultate pri boju proti otroški debelosti. S pomočjo dvo-tedenskega multidisciplinarnega programa, ki vključuje strokovnjake s področja zdravstva, smo opazili pomembne izboljšave v prehranjevalnih navadah in antropometričnih meritvah. Ugotovitve poudarjajo pomen preventivnih izobraževalnih programov za otroke pri zmanjševanju dolgoročnih zdravstvenih posledic debelosti. Nadaljnje raziskave in nadaljnja izvajanja takšnih izobraževanj je potrebnih, da se učinkovito spopademo s tem javnozdravstvenim problemom.

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## 1 INTRODUCTION

Childhood obesity is the most important public health issue of the 21st century. It signals a higher risk of developing various chronic non-communicable diseases such as diabetes, cardiovascular disease, certain types of cancer and osteoporosis (1). It is a complex condition with multiple factors, defined as non-modifiable factors such as genetics, ethnic differences, gestational weight and intrauterine conditions, as well as modifiable factors such as socioeconomic status, diet, physical activity, sleep and parental factors (2, 3). Obesity can affect children's psychological health, social and emotional well-being, and self-esteem (4). Nutrition education can play an important preventive role here, as a healthy and balanced diet is not only important for each individual, but also influences the physical health of future generations (5). Overall, any nutritional education equips children with the knowledge and skills necessary to make informed decisions about their dietary choices, leading to better health outcomes both in childhood and throughout their lives (6-10). Research indicates that Slovenian children have unhealthy eating habits. An international study on health-related behaviours during the school years revealed that only 39.8% of children consume fruit daily, and even worse, only 35.9% consume vegetables every day. The consumption of sugary drinks has decreased over the years, but is still too frequent. Their consumption is more widespread among boys and increases with the age of children (11,12). Worrying data have directed public health efforts in Slovenia to the development of programmes that address these problems (13).

This article presents the development, implementation and results of the "My Challenge" camp project initiated by the RCS health resort at Debeli Rtič, co-financed by the Ministry of Health of the Republic of Slovenia (13). The project included nutrition and cooking education focusing on content characteristic of changing poor eating habits. The objective of this study was to investigate the effects of an intervention on changes in weight, body mass index (BMI), body fat percentage, waist circumference and waist-to-height ratio (WHtR) in boys and girls over a period of 1 month. In addition, changes in eating habits and gender-specific differences were analysed.

## 2 METHODS

### 2.1 Study design

A one-group pretest-posttest design was used to assess anthropometric changes and changes in eating patterns after 2 weeks and 1 month. In addition, gender differences in these changes were analysed. The project was developed in collaboration with various experts, including a physician, a dietitian, a psychologist, an occupational therapist or physiotherapist and a kinesiologist. It is part of

the measures provided for in the Slovenian Government's national plan to combat childhood obesity (13). It took place under the name "My Challenge" camp in the health resort of RCS Debeli Rtič. The recruited children stay at the camp for two weeks and are actively involved in the preparation and portioning of their meals. They have a cooking workshop twice a day where they prepare and eat two meals. They also have interactive nutrition lessons twice a day, where the dietitian combines nutrition education with didactic games. All activities were supervised by an experienced dietitian. During the main meal (lunch), dietitians and dietetics students supervised the children (individually) as they selected meals at the resort's self-service restaurant and helped them determine portion sizes, choose more appropriate foods and balance the ratio of vegetables to starchy foods. They had no access to other foods during their two weeks at the camp. The two-week camp is followed by a measurement after one month.

### 2.2 Participants

Based on the criteria of professional Slovenian guidelines (14), personal paediatricians referred children to the camp. The programme includes overweight or obese children aged 7-18 with: a) obesity; b) overweight, where a 6-month intervention at the primary level has not been successful; c) overweight, with complications. A total of 10 camps were held from 2017 to 2023 and 148 children were recruited for the camp. However, 31 children were missing at the third measurement (after 1 month) due to Covid-19, other diseases and unknown reasons. We excluded them from this study due to incomplete data. A total of 117 children completed all measurements.

### 2.3 Cooking workshops

The cooking workshops are divided into theoretical and practical parts. In the theoretical part of workshop, participants learn how to prepare healthy meals, how to handle kitchen utensils, how to use kitchen scales, measuring cylinders and adhering to hand hygiene rules. In the practical part, they receive a booklet with recipes for all the dishes they have prepared, focusing on the inclusion of vegetables, fruit, and grains. Under the guidance of a dietitian, they cut, cooked and decorated various dishes. They then prepared the dining room and ate the prepared meals together.

### 2.4 Nutrition lessons and didactic games

The nutrition lessons cover the following topics: food groups, nutrient and energy values of selected foods, healthy plate, eating fruits and vegetables, health benefits of eating fruits and vegetables, reading food labels, planning breakfast, determining portion sizes, fluid intake, salt in the diet and composition of foods. As part

of nutritional education, six didactic games were utilized. Simple games contents were prepared and conducted by a dietitian.

## 2.5 Screening questionnaire

The screening questionnaire included 11 items on eating habits, which can be categorized as unhealthy depending on the answer and are defined as risk factors in Slovenia (15). The statements were: I eat two or fewer meals a day; I never eat breakfast; I consume milk and dairy products less than once a day; I eat fruit less than once a day; I eat vegetable less than once a day; I eat red meat 3 times a week or more; I eat fish and seafood 3 times a month or less; I eat whole grain products/meals (cereals or porridge) 3 times a month or less; I eat fried food 1 time per week or more often; I consume soft drinks and beverages with added sugar (carbonated sweet beverages, flavoured water, fruit syrup) 1-3 times a week or more often; I eat margarine, butter, cream or lard every day. The answer “yes” means an unhealthy eating habit and is scored as zero, the answer “no” means a healthy eating habit and is scored as one point. The higher the total value, the better the eating habits. The highest healthy eating score is 11 points.

## 2.6 Anthropometric measurements

Height, waist circumference and body composition were measured in all children on arrival at the camp, after 2 weeks and after 1 month. All measurements were taken between 7:00 and 9:00 a.m. under standardized conditions by the same dietitian after the children had fasted overnight. The height of the children was measured to the nearest 0.1 cm while standing, without shoes, using the Leicester height meter (Invicta Plastics Limited, Oadby, England). The children's body weight (kg) was measured with an accuracy of 0.1 kg. BMI was calculated using the following formula: Weight (kg)/Height (m)<sup>2</sup>. The BMI z-score was calculated according to the WHO reference for growth standards for children aged 5-19 years (16). Waist circumference (WC) was measured with a tape measure in a standing position. WHtR was calculated: WC (cm)/Height (cm) (17). Body composition, total body fat mass and fat-free mass were determined using the Tanita BC 418MA bioelectrical impedance analysis (BIA) (Tanita Corporation, Arlington Heights, IL) and the data were analysed using GMON Pro 3.2.1 software from the same manufacturer.

## 2.7 Statistical analyses

To describe the basic characteristics of the participants, we used descriptive statistics, including mean and standard deviation (SD). Independent-Samples T Test was used to compare the children's characteristics by gender. To determine statistically significant differences between baseline, after 2 weeks and 1 month, we paired descriptive statistics with the results of inferential

statistics. Given that some of the data groups were not normally distributed, we used the Wilcoxon signed-rank test and Mann-Whitney U test and the paired samples t-test for normally distributed groups of data.

All statistical analyses were conducted using the IBM SPSS 29 (Statistical package for the Social Sciences). The study protocol was approved by the National Medical Ethics Committee of Slovenia (No. 0120-631/2017/2).

## 3 RESULTS

### 3.1 Anthropometric measurements and healthy eating score

A total of 117 children participated in the study, with 66 (56%) girls and 51 (44%) boys. The anthropometric measurements and healthy eating score at baseline, after 2 weeks and after 1 month are shown in Table 2 for girls and Table 3 for boys. Boys weighed 79.0 kg initially, reducing to 75.9 kg after 2 weeks ( $p < 0.001$ ), and girls started at 71.1 kg, reaching 68.4 kg after 2 weeks ( $p < 0.001$ ). After 1 month, boys weighed 75.2 kg ( $p < 0.001$ ), and girls 67.7 kg ( $p < 0.001$ ). In boys, initial BMI decreased from 31.0 kg/m<sup>2</sup> to 29.6 kg/m<sup>2</sup> ( $p < 0.001$ ) after 2 weeks and reached 29.0 kg/m<sup>2</sup> after 1 month ( $p < 0.001$ ). The girls' average BMI started at 28.9 and decreased to 27.7 kg/m<sup>2</sup> after 2 weeks ( $p < 0.001$ ), reaching its lowest value after 1 month at 27.3 kg/m<sup>2</sup> ( $p < 0.001$ ). Initial WHO BMI-for-age z-score for boys decreased from 3.24 to 2.99 after 2 weeks and reached 2.90 after 1 month. Initial WHO BMI-for-age z-score for girls decreased from 2.69 to 2.49 after 2 weeks, reaching its lowest value after 1 month at 2.39. Fat percentage in boys decreased from an average of 38.3% at the beginning to 36.5% after 2 weeks ( $p < 0.001$ ), and further to 35.1% after 1 month ( $p < 0.001$ ). In girls, the percentage of body fat started at 37.4%, decreased to 36.8% after two weeks ( $p < 0.001$ ), and reached its lowest value after 1 month at 35.7% ( $p < 0.001$ ). Lean body mass was 45.9 kg at the beginning, reducing to 44.9 kg after 2 weeks ( $p < 0.001$ ), and reaching 45.3 kg after 1 month ( $p = 0.001$ ). In boys, lean body mass decreased from 48.5 kg to 47.9 kg after 2 weeks ( $p = 0.002$ ) and remained at 48.5 kg after 1 month ( $p = 0.292$ ). Girls started at 43.9 kg, decreased to 42.5 kg after 2 weeks ( $p < 0.001$ ), and reached 42.8 kg at the end of follow-up ( $p < 0.001$ ). The mean waist circumference decreased from 95.9 cm at the beginning to 91.9 cm after 2 weeks ( $p < 0.001$ ) and further to 86.9 cm after 1 month of follow-up ( $p < 0.001$ ). In boys, the initial waist circumference of 99.8 cm decreased to 95.6 cm after 2 weeks ( $p < 0.001$ ) and further to 89.7 cm after 1 month ( $p < 0.001$ ). Girls' waist circumference decreased from an initial 92.9 cm to 88.9 cm after 2 weeks ( $p < 0.001$ ), with the mean value reaching its lowest at 84.6 cm after 1 month ( $p < 0.001$ ). In girls, the initial WHtR was 0.60, decreasing to 0.57 after 2 weeks ( $p < 0.001$ ) and reaching 0.54 at the end of the one-month

follow-up ( $p < 0.001$ ). In boys, the baseline WHtR was 0.63, decreasing to 0.60 after 2 weeks ( $p < 0.001$ ) and further to 0.56 after 1 month ( $p < 0.001$ ). The score for healthy eating was 6.6 at the beginning of the study, increasing to 8.9 after 2 weeks ( $p < 0.001$ ) and reaching 7.3 points after 1 month ( $p < 0.001$ ). Boys started at 6.3 points, increasing to 8.8 after 2 weeks ( $p < 0.001$ ) and remaining at 6.9 points after 1 month ( $p < 0.001$ ). Girls scored 6.8 points initially, reaching 8.9 points after 2 weeks ( $p < 0.001$ ) and 7.6 points after 1 month ( $p < 0.001$ ). The only significant difference between genders was observed in the healthy eating score after one-month ( $U = 1289.5$ ,  $p < 0.028$ ).

### 3.2 Gender differences in eating patterns

Table 3 shows gender differences in eating patterns. A higher percentage of boys compared to girls, 37% versus 20% ( $p = 0.035$ ), never eat breakfast. After one month, the percentage of boys who never eat breakfast was still higher, but not statistically significant. However, we found statistically significant differences in milk and dairy products consumption. More boys than girls, 47% versus 24% ( $p = 0.010$ ), consumed milk and dairy products less than once a day. Similarly, more boys than girls, 51% vs. 30% ( $p = 0.024$ ), consumed fried foods once a week or more often.

Table 1. Anthropometric measurement and healthy eating score at baseline, after 2 weeks and after 1 month for girls.

Girls 66 (56.4%)	Baseline	After 2 weeks			After 1 month		
	Mean±SD	Mean±SD	t	p	Mean±SD	t	p
Body mass (kg)	71.1±20.7	71.1±20.7	-17,573	<0.001	67.7±19.72	-12,435	<0.001
Body height (cm)	155.1±12.87	155.1±12.87			155.8±12.44	4,384	<0.001
WC (cm)	92.9±12.60	92.9±12.60	-8,898	<0.001	84.6±12.15	-6,951	<0.001
Fat mass (kg)	27.3±10.88	27.3±10.88	-9,224	<0.001	27.3±10.88	-9,972	<0.001
Fat percentage (%)	37.4±5.21	37.4±5.21	-3,351	<0.001	35.7±5.74	-6,62	<0.001
Fat free mass (kg)	43.9±10.88	43.9±10.88	-6,038	<0.001	42.8±10.43	-4,719	<0.001
BMI (kg/m <sup>2</sup> )	28.9±4.74	28.9±4.74	-20,021	<0.001	27.3±4.71	-12,768	<0.001
WHtR	0.60±0.06	0.60±0.06	-8,718	<0.001	0.54±0.06	-7,030	<0.001
Healthy eating score	6.8±1.90	6.8±1.90	13,460	<0.001	7.6±1.81	4,293	<0.001

Legend: WC, waist circumference; BMI, body mass index; WHtR, waist to height ratio; Healthy eating score was calculated from answers yes or no; Yes, means an unhealthy eating habit and is scored as zero, the answer no means a healthy eating habit and is scored as one point. The higher the total value, the better the eating habits. Statistical significance:  $p < 0.05$ .

Table 2. Anthropometric measurement and healthy eating score at baseline, after 2 weeks and after 1 month for boys.

Boys 51 (43.6%)	Baseline	After 2 weeks			After 1 month		
	Mean±SD	Mean±SD	t	p	Mean±SD	t	p
Body mass (kg)	79.0±21.52	75.9±21.06	-22,470	<0.001	75.2±20.72	-15,092	<0.001
Body height (cm)	158.8±11.48	158.8±11.48			159.7±11.52	6,885	<0.001
WC (cm)	99.8±11.82	95.6±12.09	-8,713	<0.001	89.7±15.45	-6,100	<0.001
Fat mass (kg)	30.5±10.86	28.0±10.19	-22,470	<0.001	26.7±9.59	-9,819	<0.001
Fat percentage (%)	38.3±6.75	36.5±5.90	-4,618	<0.001	35.1±6.07	-7,659	<0.001
Fat free mass (kg)	48.5±13.43	47.9±12.74	-3,573	<0.001	48.5±13.36	-1,053	0.292
BMI (kg/m <sup>2</sup> )	31.0±4.92	29.6±4.89	-10,337	<0.001	29.0±4.76	-11,115	<0.001
WHtR	0.63±0.06	0.60±0.06	-8,745	<0.001	0.56±0.09	-6,093	<0.001
Healthy eating score	6.3±1.93	8.8±1.27	15,286	<0.001	6.9±1.69	3,521	<0.001

Legend: WC, waist circumference; BMI, body mass index; WHtR, waist to height ratio; Healthy eating score was calculated from answers yes or no; Yes, means an unhealthy eating habit and is scored as zero, the answer no means a healthy eating habit and is scored as one point. The higher the total value, the better the eating habits. Statistical significance:  $p < 0.05$ .

**Table 3.** Gender differences from a screening questionnaire, percentage of answers “Yes”.

Statements	Boys baseline 51 (43.6%)		Girls baseline 66 (56.4%)		Boys baseline 51 (43.6%)		Girls baseline 66 (56.4%)	
	%	%	U	p	%	%	U	p
I eat two or fewer meals a day	12	11	1663.5	0.844	12	5	1561.5	0.148
I never eat breakfast	37	20	1387.5	0.035	31	17	1435.5	0.062
I consume milk and dairy products less than once a day	45	33	1485.0	0.197	47	24	1299.0	0.010
I eat fruit less than once a day	45	33	1485.0	0.197	25	29	1627.5	0.693
I eat vegetable less than once a day	43	48	1593.0	1.000	35	30	1599.0	0.569
I eat red meat 3 times a week or more	47	42	1605.0	0.618	47	39	1554.0	0.408
I eat fish and seafood 3 times a month or less	69	74	1588.5	0.505	63	62	1672.5	0.945
I eat whole grain products/meals (cereals or porridge) 3 times a month or less	39	23	1405.5	0.054	35	24	1497.0	0.194
I eat fried food once a week or more often	59	42	1407.0	0.080	51	30	1335.0	0.024
I consume soft drinks and beverages with added sugar 1-3 times a week or more often	45	41	1612.5	0.651	25	26	1678.5	0.974
I eat margarine, butter, cream or lard every day	43	55	1491.0	0.223	41	55	1458.0	0.153

Legend: Statistical significance:  $p < 0.05$ .

#### 4 DISCUSSION

Our study examined the results of the “My Challenge” camp by determining changes in measuring anthropometric parameters and eating patterns at baseline, after 2 weeks and after 1 month. The participants were 117 children, 66 girls and 51 boys. A total of 10 camps were held from 2017 to 2023. Key findings of this study were: (a) reduction in weight and BMI; (b) reduction in body fat percentage; (c) decrease in waist circumference and WHtR; (d) improvement in healthy eating score; (e) gender differences in eating habits. The camp aimed to provide theoretical and practical knowledge to the children through cooking workshops and interactive nutrition lessons. The impact of nutrition education on the nutritional knowledge and habits of children and adolescents has been studied by many researchers. Kostanjevec (18) conducted an extensive study among ninth grade primary school students. The aim of the study was to analyse students’ eating habits and assess their knowledge, attitudes and intentions regarding healthy eating before and after the implementation of nutrition education. The research results showed that formal nutrition education is effective, as students’ nutrition knowledge improved after the training, but it has no effect on changing dietary habits. Contrary to these results, some research (19, 20) confirms the effectiveness of nutrition education and shows that those who participate in nutrition education are more likely to consume the recommended amounts of fruit and vegetables. As nutrition education plays a

crucial role in establishing appropriate dietary habits, children should be equipped with appropriate nutritional knowledge (21, 22). In our study, however, the participants acquired appropriate nutritional knowledge during the culinary workshops in the morning and afternoon, which were led by a dietitian. Nutritional knowledge and skills were acquired also with the help of computer programmes and desktop learning games. The use of educational games to teach nutritional content stimulate attention more than traditional methods and allowed for repetition and reinforcement of data, facts and acquiring more knowledge while having fun (23).

Although we did not test knowledge, we noted differences in food intake. We found that children after 2 weeks acquired more appropriate eating patterns. Of course, the results were to be expected, as the children had reduced their access to junk food, fried food and sweet drinks during this 14-day period. They therefore had time to get to know new types of vegetables and to focus intensively on healthy eating. Children and young people cite the relatively easy access and good taste of disappointing foods as the main barrier to eating healthy foods (24). Because of these obstacles, children and young people need to discover new and different flavours of the recommended foods, especially by actively participating in their preparation. At camp, the children prepared healthy and appealing snacks as part of the practical training and discovered different foods and new, unfamiliar flavours. For example, we prepared various spreads from

cooked fish, which the children liked better due to their consistency and they therefore ate more fish. Perhaps this was also a result of the children's education, similar to what Mahmudiono et al. report (25). However, we wanted to know whether the effect would still be visible after a month. We found that even after one month, a greater proportion of children were eating more than two meals a day, eating more fish and seafood dishes, eating less fried food and drinking fewer sugary drinks. Interestingly, we did not see a higher proportion of vegetables in the daily diet after 14 days, but the results showed up later. After one month, 68% of the children included at least one portion of vegetables per day. This is much better than other Slovenian children who in a much lower percentage (35.9%) consume vegetables every day (11). It is interesting to note that even at the beginning of the camp a high proportion of children ate breakfast every day (73%). This has improved to 77%, which we are pleased about as breakfast is a very important meal to prevent obesity (26). The healthy eating scores after 1 month (Table 1 for girls and Table 2 for boys) also show improvements. However, girls were more successful, as they had a better healthy eating score than boys. Our results are consistent with the HBSC survey (11), which shows that a higher percentage of girls consume fruit and vegetables more often and sweet drinks less often, but according to the HBSC survey, a higher percentage of boys regularly consume breakfast, which was shown to be the opposite in our survey. Nevertheless, we only found statistically significant differences in the consumption of milk and dairy products. More boys than girls, 47% compared to 24%, consume milk and dairy products too rarely, and more boys than girls, 51% compared to 30%, consume fried food too frequently. We also observed a decrease in body weight, although the children increased in height in both sexes. There were statistically significant changes - decrease in fat mass, increase in fat-free mass and improvement in WHtR. Of course, the encouraging results are not only due to the change in dietary intake, but also to the physical activity that the children did every day at the camp, and perhaps they were also more active at home.

The study by Howard et al. (27) indicates that children are more receptive to new tastes when they experience them together with high-energy foods. The preparation of meals for the children in the camp was also based on this fact, i.e., the combination of different types of vegetables with energy-rich foods such as cream, parmesan, peanut butter and similar foods. Parents were also partly involved in nutritional education and have a considerable influence on establishing appropriate eating habits in childhood (28). Therefore, the effectiveness of programmes and approaches to change dietary habits can be further improved by involving parents. Other similar interventions have also shown that nutrition interventions can improve dietary intake, however evidence of the long-term

sustainability of these impacts is limited (29). Interventions that modify the environment may be effective in improving children's dietary patterns, both in the short and long term (30). There are interesting results in the research of Strączek et al. (31) and Ranucci et al. (32), who found, similar to our research, significant improvements in body weight, waist and hip circumference, WHtR and positive effects also on changing eating habits in children. When developing the "My Challenge" programme, we reviewed and took into account the British recommendations for dealing with childhood obesity (33) as well as programmes that are already being implemented in Slovenia (34), but there is still a gap in the area of intensive cooking education. Research shows that such programmes have a positive impact on children's eating habits (35, 36).

Nevertheless, it is important to recognise the limitations associated with this study. The data we used in our study covers a short period of time for the children and the study was a one-group pretest-posttest design. Another limitation is that the children were individually supported in their food choices by a dietitian, which could have an overly suggestive influence on the children's dietary choices. A limitation of our study is also the screening method for (un)healthy eating, which is based on dichotomous responses and a limited number of dietary factors. However, the results of this study are important for the conclusions and further design of similar public health projects in this area, as childhood obesity is a major public health problem. It is crucial to note that our research group consisted only of children who completed all measurements, leading to a possible bias as their continued participation could indicate greater motivation.

## 5 CONCLUSION

**The described study provides insight into a public health intervention implemented in Slovenia as part of the national plan of the Republic of Slovenia to combat childhood obesity (13). In the study, we have highlighted short-term results that are very encouraging, as well as the challenges that experts working with children see in the funding and approval of programmes. The 2-week intervention had an impact on children's anthropometric measurements and eating habits after one month, with clear gender differences observed for certain eating habits. Further research and continued implementation of such initiatives are warranted to effectively tackle this public health issue.**

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## CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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## ETHICAL APPROVAL

The study protocol was approved by the Slovenian National Medical Ethics Committee (No. 0120-631/2017/2). Written informed consent was obtained from all subjects who participated in the study. The questionnaire was anonymous and the data collected was used only for the purposes of the research. Informed Consent Statement: All participants included in “My Challenge” camp project consented to publication. No additional individual person’s data in any form (details, images or videos) were used.

## AVAILABILITY OF DATA AND MATERIALS

All data and materials used in this study are available upon reasonable request.

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