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Effects of eating outside the home on adolescent diet quality

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Abstract

Location of meal consumption can affect the quality of adolescents' diet. The main goal of this study was to observe if eating outside the home affects diet quality of 607 adolescents from the CRO-PALS longitudinal study. 24-hour recall was used as a dietary assessment method and meal location was also recorded during the interview. Two measurements were taken: one in the first and one in the final year of high school, so the goal was also to determine the differences between the groups and between the two measurements. As expected, considering previous studies, adolescents who had a higher energy intake consumed outside the home showed lower diet quality, more so in the case of girls and during the first year.

Keywords: diet quality, adolescents, eating outside the home, social influence

Sažetak

Mjesto konzumiranja obroka može utjecati na kvalitetu prehrane adolescenata. Glavni cilj ovog istraživanja bio je promatrati utječe li prehrana izvan kuće na kvalitetu prehrane 607 adolescenata uključenih u CRO-PALS longitudinalnu studiju. Provedena su dva mjerenja: jedno u prvom i jedno u završnom razredu srednje škole, pa je cilj bio i utvrditi razlike između skupina i između ta dva mjerenja. 24-satno prisjećanje korišteno je kao metoda procjene prehrane, a mjesto obroka također je zabilježeno tijekom intervjua. Očekivano, s obzirom na prethodna istraživanja, adolescenti koji su imali veći energetski unos izvan kuće pokazali su nižu kvalitetu prehrane, više u slučaju djevojčica i tijekom prve godine.

Ključne riječi: kvaliteta prehrane, adolescenti, prehrana izvan kuće, društveni utjecaj

Introduction

In the last 40 years, the prevalence of overweight and obese children and adolescents has risen greatly (World Health Organization, 2021). This trend was also noticed among the Croatian adolescent population. According to Eurostat (2019) data, 19.7% of Croatian adolescents aged 15-19 years has a body mass index (BMI) greater than 25 kg/m2. It is known that being overweight or obese increases the risk of many chronic illnesses, such as cardiovascular diseases, metabolic syndrome, diabetes and some types of cancers (Safaei et al., 2021). It is crucial to recognize the factors that lead to obesity early on and take actions that will prevent the development of obesity. Some of the most important factors in etiology of obesity are dietary factors.

There is evidence that meal location is a factor that influences adolescent diet quality. Eating outside the home is often associated with lower diet quality in the adolescent population (Taher et al., 2019; Bezerra et al., 2021; Golper et al, 2021). To this date, there is only few papers that are focused on the link between meal location and diet quality in European children and adolescents.

The main goal of this study was to determine if there is a link between eating meals outside the home and diet quality on a sample of Croatian adolescent population from the CRO-PALS longitudinal study.

Materials and methods

Participants

The data used in the present study was collected from CRO-PALS (Croatian physical activity in adolescence longitudinal study). The participants of this study were high school students from Zagreb, Croatia. They were selected using stratified two-stage random cluster sampling. The selection process was described in detail elsewhere (Sila et al., 2019; Rešetar et al., 2020). After the selection process, the study counted 903 participants (average age: 15.6 years). The first measurement was performed in spring of 2014, when the participants were in the first grade of high school. The second measurement was performed when the participants were in the final year of their high school education, in spring of 2016 or spring of 2017 (average age: 18.6 years), depending on the duration of their high school program. After completing the two measurements, some participants were excluded from the study due to incomplete data, so the final number of participants was 607 (50.25% females, 49.75% males). The study was performed according to the Declaration of Helsinki and all the procedures were approved by the Ethics Committee of the Faculty of Kinesiology, University of Zagreb (No. 1009-2014).

Diet assessment

The dietary assessment method used in this study was single multi-pass 24-h recall in the form of an interview that consisted of 5 standardized steps (Moshfegh et al., 2008). The interviews were carried out by Nutrition graduate students from the Faculty of Food Technology and Biotechnology of the University of Zagreb. Food-intake data was recorded on weekdays, excluding Friday and the weekend. To assist the participants in estimation of their portion sizes, the national food portion booklet, containing photographs showing three serving sizes (small, medium and large), was provided (Senta et al., 1990). The chemical composition of consumed food was estimated using a combination of national, Danish and US chemical food composition tables (Kaić-Rak and Antolić, 1990; Møller et al., 2005; USDA, 2019). The chemical composition of complex dishes was determined by calculating the chemical composition of individual ingredients from traditional recipes (Vučetić, 2013).

Reference values

The results were evaluated by nutrient density (intake of nutrient per 1000 kcal) for macronutrients, vitamins and minerals, using cut-offs issued by the U.S. Department of Agriculture (USDA) defined by the National Institutes of Health (NIH, 2023). Furthermore, micronutrient intake was evaluated by comparison to the average requirement (AR) recommendation issued by The European Food Safety Authority (EFSA), considering differences regarding gender and age (EFSA, 2017). In the absence of AR values, Adequate Intake (AI) values were used.

Classification according the location of meal consumption

The location of meal consumption was recorded during interviews. For the purpose of this study, consumption of food outside the home included all locations where students do not have a permanent home residence. Some of these locations were: school, street, restaurants, fast-food restaurants, pastry shops, coffee shops, a friend's or grandparents' house, car, bus and other places outside the home. Therefore, it did not matter where the food was prepared, but rather where it was consumed.

In addition, participants were divided into two groups. One group consisted of those who consumed a significant portion of their energy intake (≥25% kcal) by eating food outside the home (SOH). The other group included those whose energy intake of meals consumed outside their homes was less than 25% kcal per day (NSOH). It is assumed that the students who were classified in the SOH group, on the days when 24-hour recall was collected, usually have a significant energy intake from food consumed outside the home (Orfanos et al., 2007; Myhre et al., 2014).

Classification of fruit and vegetables, fast food, sweetened non-carbonated and carbonated drinks

To assess the diet quality, data for fruits and vegetables, fast food and sweetened drinks non-carbonated and carbonated drinks was obtained. Total fruit and vegetable intake included fresh, cooked or canned fruit, dried fruit, nuts and fruit juices, all types of fresh, canned or cooked vegetables (except potatoes). Complex dishes such as stews or smoothies were not included in the total, unless the ingredients were listed individually with quantities (in grams). This definition of fruit and vegetables has already been used (Prynne et al., 2006). The total intake of fast food included products prepared at home or in fast food restaurants or bakeries (various types of pizza, sandwiches, hamburgers, salty pies and other bakery products). Carbonated sweetened drinks included non-diet carbonated drinks that contained sugar, while non-carbonated sweetened beverages included industrial fruit juices, excluding milk and hot drinks. The definitions used for fast food, non-carbonated and carbonated sweetened drinks have already been introduced (Lioret et al., 2009). The intake of fruit and vegetables is expressed as a total intake in grams and percentage of energy intake (g/1000 kcal; % kcal). The fast food and sweetened beverages intake are expressed as a percentage of energy intake (% kcal).

Statistical analysis

The tools used for statistical data processing were Microsoft Excel 2019 and XLSTAT 2022. Data set was analyzed using descriptive statistics in order to calculate frequencies, mean values, standard deviations, median, minimum and maximum values. Student's t-test, ANOVA test and Fisher's (LSD) test were used to determine the significance of changes of certain variables between the first and second measurement of the students. The selected level of statistical significance was $\alpha = 0.05$.

Results and discussion

According to the results, during both measurements, girls and boys showed larger share of those who consumed less than 25% energy intake outside the home. During the first year, 54% of girls and 58% of boys consumed less than 25% energy intake outside the home. However, during the final years both genders showed a significantly higher percentage of those that consumed less than 25% energy intake outside the home (66% versus 34% for girls and 67% versus 37% for boys). This result is quite unexpected, because we could assume that stepping into adulthood and greater independence of older adolescents would push them to eat more outside the home compared to earlier adolescent years.

The average nutrient density of macronutrients and fiber during measurements is presented in table 1. All groups had the average nutrient density for carbohydrate intake lower than the recommendation (150 g/1000 kcal) during both measurements. On the other hand, all groups had the average fat and protein density higher than recommended (33 g/1000 kcal for fats and 35 g/1000 kcal for protein intake) during both measurements. During the measurement and interviews in the first secondary school year, the girls from the NSOH and SOH groups had a significantly higher nutritional density of carbohydrates and a significantly lower protein density in comparison to the final year of their schooling. The differences between the girls from the NSOH and SOH group in nutrient density of macronutrients were mostly nonsignificant (α=0.05), except for the protein density during the first year, which was significantly higher for the girls from the NSOH group. During the first year, there were no statistically significant differences in nutrient densities of macronutrients between the boys from the NSOH and SOH group. However, there were significant differences established for all macronutrients during their final schooling years. Furthermore, the

Table 1. Average nutrient density of macronutrients and dietary fiber during the first year and final years for students divided into groups depending on the percentage of energy intake consumed outside the home (n=607)

		F (NSOH) (n (first year) = 200; n (final year)= 166)	F (SOH) (n (first year) =105; n (final year) = 139)	M (NSOH) (n (first year) =199; n (final year) = 176)	M (SOH) (n (first year) =103; n (final year) = 126)
Carbohydrates (g/1000 kcal)	First year Final year	128.37±24.93 122.39±27.99	131.89±24.56 123.46±27.42	126.1±22.81 106.75±23.85*	131.27±19.97 115.08±24.75*
Fat (g/1000 kcal)	First year Final year	35.63±8.83* 36.24±8.68	37.95±9.48* 35.98±8.22	36.29±8.16 40.28±9.28*	35.31±7.19 37.64±7.86*
Protein (g/1000 kcal)	First year Final year	43.98±15.87* 47.64±19.09	36.16±11.95* 46.22±16.71	44.36±14.54 53.48±18.34*	41.71±11.08 49.28±15.68*
Protein (g/kg BM)	First year Final year	1.28±0.8* 1.3±0.73	1.02±0.53* 1.22±0.64	1.7±0.88 1.93±0.96	1.60±0.88 1.77±0.96
Dietary fiber (g/1000 kcal)	First year Final year	9.2±4.35 9.33±4.53	8.67±2.99 9.41±4.11	8.28±2.95 7.52±3.24	8.29±3.11 8.14±3.93

Values are presented as mean ± standard deviation.
NSOH - non-substantial out-of-home eaters - individuals having less than 25% of their daily energy intake through eating out;
SOH - substantial out-of-home eaters - individuals having at least 25% of their daily energy intake through eating out
F-female; M-male; BM - body mass
Differences between NSOH and SOH groups were tested using T-test. Statistically significant changes (α = 0.05) are marked with an asterisk (*).

Table 2. Average nutrient density of vitamins and minerals during the first year for students divided into groups depending on the percentage of energy intake consumed outside the home (n=607)

	F (NSOH) (n=200)	F (SOH) (n=105)	M (NSOH) (n=199)	M (SOH) (n=103)
Thiamine (mg/1000 kcal)	0.75±0.4	0.67±0.31	0.78±0.37	0.76±0.31
Riboflavin (mg/1000 kcal)	0.93±0.5	0.84±0.44	0.96±0.41*	0.85±0.37*
Niacin (mg/1000 kcal)	11.79±7.13*	8.68±5.91*	11.04±6.27	10.64±5.87
Folate (μg/1000 kcal)	147.66±100.76	138.46±88.56	144.02±73.03	132.01±65.44
Pantothenic acid (mg/1000 kcal)	2.75±1.78	2.5±1.74	2.92±1.22	2.65±1.34
Vitamin B6 (mg/1000 kcal)	1.07±0.63*	0.75±0.42*	1.04±0.47	0.95±0.42
Vitamin B12 (μg/1000 kcal)	2.47±2.09	2.03±1.85	2.37±1.47	2.09±1.33
Vitamin D (μg/1000 kcal)	0.96±1.11*	0.67±0.58*	1.04±0.81	0.88±0.9
Vitamin E (mg/1000 kcal)	5.67±4.69	6.21±4.53	5.72±3.67	5.7±3.74
Vitamin C (mg/1000 kcal)	64.62±81.9	58.92±49.62	51.02±46.4	41.88±43.71
Vitamin K (μg/1000 kcal)	32.11±42.56	27.74±37.65	32.11±75.23	23.36±22.48
Vitamin A (mg/1000 kcal)	222.09±286.6	262.06±449.24	262.79±332.91	247.89±352.93
Calcium (mg/1000 kcal)	479.76 ± 283.96	483.75 ± 210.23	422.9 ± 169.21	410.82 ± 171.24
Iron (mg/1000 kcal)	5.94 ± 4	5.29 ± 3.14	5.93 ± 4.02	5.51 ± 3.33
Magnesium (mg/1000 kcal)	143.56 ± 50.68*	130.66 ± 35.46*	130.59 ± 31.84	124.97 ± 30.66
Phosphorus (mg/1000 kcal)	658.13 ± 194.34*	569 ± 185.89*	656.71 ± 156.88*	618.62 ± 143.07*
Potassium (mg/1000 kcal)	1282.93 ± 477.22*	1082.22 ± 331.34*	1206.55 ± 344.5*	1105.75 ± 307.63*
Selenium (mg/1000 kcal)	37.77 ± 21.31*	28.88 ± 17.7*	38.27 ± 18.58	34.37 ± 17.53
Zinc (mg/1000 kcal)	5.14 ± 2.56*	4.4 ± 2.26*	4.9 ± 1.79	4.9 ± 1.95
Sodium (mg/1000 kcal)	1339.8 ± 534.34	1380.58 ± 519.07	1499.53 ± 613.85	1439.5 ± 479.98

Values are presented as mean ± standard deviation.
NSOH - non-substantial out-of-home eaters - individuals having less than 25% of their daily energy intake through eating out;
SOH - substantial out-of-home eaters - individuals having at least 25% of their daily energy intake through eating out
F-female; M-male; BM - body mass
Differences between NSOH and SOH groups were tested using T-test. Statistically significant changes (α = 0.05) are marked with an asterisk (*).

average density of fiber was much lower than recommended (13 g/1000 kcal), in all groups (57.9-72.4% of recommended values) during both measurements, however, without significant differences between the NSOH and SOH groups. The consumption of food prepared outside the home (more than twice a day) is associated with a higher proportion of energy originating from fat and protein with a lower intake of carbohydrates and fiber than in Korean young people (20-29 years old) (Lee et al., 2016). This research doesn't show similar results. Moreover, the proportion of energy originating from protein is lower in the SOH group compared to the NSOH groups during both measurements and for both sexes. A study investigating the topic "Social environment and food and drink intake in European adolescents: the Helena study" (Santaliestra-Pasías et al., 2022) pointed out that the family environment greatly influences the eating habits of adolescents, and the results pointed to the fact that adolescents who ate their main meals at home (within the family) have a significantly lower intake of foods with low nutritional density (chocolate, salty snacks, sugar, etc.) compared to those who ate alone, with friends or other people ($p < 0.05$). According to the data from Table 1, the trend is in line with similar studies including food quality for adolescents eating alone or with others (Fidler et al., 2012; Chae et al., 2018; Santaliestra-Pasías et al., 2022;) and how the meals of students who eat outside of home have more carbohydrates and fat, which is why unhealthy food abounds (Biltoft-Jensen et al., 2017). Unfortunately, a study which included Croatian students of the same age, but accommodated in boarding schools, showed that the consumption of food classified as healthier (milk, fruit and vegetables) is under the recommended values (Gajdoš Kljusurić and Colić, 2004). This has also been affirmed among Brazilian adolescents (Bezerra et al., 2021), which turned out to be a common choice of this age group when they themselves choose what to eat (Bragg et al., 2019). After the analysis of the dietary intake quality at the level of macronutrients and the proportion of fiber in the diet (Table 1), the analysis of micronutrients was carried out, which follows in Tables 2-4. For a clearer presentation of the chemical composition of meals consumed outside the home, the results are divided depending on the (i) percentage of energy intake for the first round of data collection (1st year of schooling, Table 2) and the second one (last year of schooling, Table 3) and (ii) percentage of students with intake under average requirement (AR), presented in Table 4.

Table 3. Average nutrient density of vitamins and minerals during the final years for students divided into groups depending on the percentage of energy intake consumed outside the home (n=607)

	F (NSOH) (n=166)	F (SOH) (n=139)	M (NSOH) (n=176)	M (SOH) (n=126)
Thiamine (mg/1000 kcal)	0.8±0.46	0.75±0.29	0.76±0.35	0.83±0.37
Riboflavin (mg/1000 kcal)	0.91±0.41*	0.83±0.3*	0.91±0.4	0.92±0.38
Niacin (mg/1000 kcal)	13.22±8.66*	11.28±6.68*	13.49±8.58	12.34±6.59
Folate (µg/1000 kcal)	148.12±91.64	137.44±78.95	131.36±92.9	131.21±75.13
Pantothenic acid (mg/1000 kcal)	2.85±1.26	2.81±1.15	3.02±1.46	2.88±1.13
Vitamin B6 (mg/1000 kcal)	1.13±0.57*	1±0.52*	1.07±0.53	1.03±0.45
Vitamin B12 (µg/1000 kcal)	2.45±1.86	2.23±1.69	2.56±2.68	2.46±1.53
Vitamin D (µg/1000 kcal)	0.9±0.9	0.91±0.86	1.08±0.88	1.14±0.95
Vitamin E (mg/1000 kcal)	5.86±3.43	5.79±3.8	5.15±3.1	5.18±3.36
Vitamin C (mg/1000 kcal)	57.47±59.37	51.25±58	35.89±34.57	37.7±38.39
Vitamin K (µg/1000 kcal)	50.57±151.28*	24.81±27.64*	31.1±81.36	40.58±115.63
Vitamin A (mg/1000 kcal)	227.6±447.97	185.25±328.35	232.21±601.67	249.02±477.43
Calcium (mg/1000 kcal)	446.24 ± 176.38	450.61 ± 193.24	438.61 ± 197.11	423.2 ± 198.48
Iron (mg/1000 kcal)	6.06 ± 3.41*	5.37 ± 2.38*	5.41 ± 2.72	5.91 ± 2.7
Magnesium (mg/1000 kcal)	145.3 ± 45	143.03 ± 50.12	135.4 ± 38.07	133.64 ± 45.38
Phosphorus (mg/1000 kcal)	674.29 ± 203.66	656.99 ± 191.75	724.19 ± 187.85*	680.16 ± 184.02*
Potassium (mg/1000 kcal)	1336.26 ± 471.9	1257.67 ± 456.84	1215.04 ± 362.07	1182.29 ± 388.03
Selenium (mg/1000 kcal)	41.12 ± 23.26	39.45 ± 23.38	47.43 ± 26.8	46.63 ± 23.96
Zinc (mg/1000 kcal)	5.22 ± 2.42	5.41 ± 2.52	5.59 ± 2.59	5.55 ± 1.92
Sodium (mg/1000 kcal)	1504.6 ± 683.2	1582.51 ± 743.12	1623.29 ± 691.59	1646.86 ± 615.21

Values are presented as mean ± standard deviation.
NSOH - non-substantial out-of-home eaters - individuals having less than 25% of their daily energy intake through eating out;
SOH - substantial out-of-home eaters - individuals having at least 25% of their daily energy intake through eating out
F-female; M-male; BM - body mass
Differences between NSOH and SOH groups were tested using T-test. Statistically significant changes ($\alpha = 0.05$) are marked with an asterisk (*).

The parameters regarding vitamin and mineral intake can be found in Tables 2 to 4. Considering nutrient densities of vitamins and minerals, it is noticeable that the girls from the NSOH group had higher densities for most vitamins and minerals during both measurements. However, most of the differences were not significant (α=0.05). During the first year, the girls from the NSOH group had a significantly higher average nutrient densities of niacin, magnesium, potassium, selenium and zinc. During the final schooling years, it can be noticed that the girls from the SOH group had a much lower vitamin K density than the girls from the NSOH group. Also, their average nutrient density is much lower than recommended (45 mg/1000 kcal). Vitamin K plays a major role in many important biological functions, such as bone and joint health, brain development and cardiovascular health (Kozioł-Kozakowska and Maresz, 2022). Most of vitamin K in our diet comes from green leafy vegetables, so this result could be an indicator of the SOH group girls not eating enough of them. Furthermore, potassium plays a vital role in cellular functions, and there is evidence of negative correlation between potassium intake and blood pressure, cardiovascular diseases and kidney diseases (McLean and Wang, 2021). Also, zinc deficiency could slow down adolescent growth, appetite, gonad development and skeletal maturation. This can be reversed with Zn treatment (Olmedilla and Granado, 2000). However, these results should not be taken lightly. As far as the boys are concerned, the differences in average nutrient densities of vitamin and mineral intake weren't significant for most vitamins and minerals. Similar to girls, both groups of boys had lower nutrient densities of vitamin K and vitamin D than recommended during both measurements.

If we take a look at the percentage of the participants under EAR values for vitamin and mineral intake, we could see that during the first year the girls from the SOH group had about 20% more participants that had vitamin B6 and iron intake under EAR values. During the final years, there were no noticeable differences. Furthermore, the boys from the SOH group had significantly more participants under EAR for vitamin C during the first year and calcium during the final years. Besides that, the differences weren't quite as noticeable. Regardless of the groups the adolescents were assigned in, it can be noticed that a high percentage of participants scored below EAR values for many vitamins and minerals during both measurements, so this could be a sign of inadequate diet quality of the entire observed population. Those findings are in accordance with the findings published in previous studies where the consumption out of home is characterized with lower intake of protein, fiber, Fe and higher intake of added sugar and fats (Bezerra et al., 2021), as well as with lower values of the Index of Nutritional Quality (Gholamalizadeh et al., 2021).

Table 4. Percentage of students with intake under AR during the first year and final years for students divided into groups depending on the percentage of energy intake consumed outside the home (n=607)

	F (NSOH) (n (first year)=200; n (final year) = 166)		F (SOH) (n (first year) =105; n (final year) = 139)		M (NSOH) (n (first year) =199; n (final year) = 176)		M (SOH) (n (first year) =103; n (final year) = 126)	
	First year	Final year	First year	Final year	First year	Final year	First year	Final year
Thiamine	3	1.8	1.9	3.6	0.5	1.1	0	0.8
Riboflavin	57	49.4	57.1	61.2	22.1	21	31.1	22.2
Niacin	21	13.3	35.2	14.4	16.1	11.4	19.4	8.7
Folate	64	68.7	73.3	77	37.2	33	40.8	42.1
Pantothenic acid	68	68.1	72.4	69.1	28.1	23.3	38.8	31
Vitamin B6	39	35.5	59	44.6	24.1	19.9	33	25.4
Vitamin B12	65	63.9	70.5	70.5	40.7	35.2	46.6	34.9
Vitamin D	100	100	100	100	99.5	100	99	98.4
Vitamin E	69.5	65.1	67.6	66.9	54.3	58	56.3	57.1
Vitamin C	57	60.2	54.3	66.2	44.7	66.5	58.3	65.1
Vitamin K	77	77.1	82.9	84.9	69.8	73.9	69.9	70.6
Vitamin A	78.5	84.3	79	88.5	67.8	75	72.8	70.6
Calcium	77	73.5	78.1	75.5	47.7	35.2	51.5	50.8
Iron	28	39.8	51.4	45.3	22.1	9.7	31.1	4.8
Magnesium	63.5	78.3	80	83.5	45.7	53.4	57.3	66.7
Phosphorus	18	9.6	25.7	8.6	5	0.6	5.8	3.2
Potassium	86.5	92.8	98.1	88.5	68.3	60.8	79.6	69.8
Selenium	65.5	61.4	78.1	67.6	35.2	27.8	45.6	30.2
Zinc	68.5	62	83.8	64	52.8	37.5	58.3	40.5
Sodium	50	41.6	49.5	44.6	19.6	11.9	18.4	12.7

NSOH - non-substantial out-of-home eaters - individuals having less than 25% of their daily energy intake through eating out;
SOH - substantial out-of-home eaters - individuals having at least 25% of their daily energy intake through eating out
F-female; M-male; BM - body mass

Table 5. Average intake of fruit and vegetables and percentage of energy intake originating from fruit and vegetables, fast food, carbonated and non-carbonated sweetened drinks during the first and second measurement for students divided into groups depending on the percentage of energy intake consumed outside the home (n=607).

		F (NSOH) (n (first year) =200; n (final year) = 166)	F (SOH) (n (first year) = 105; n (final year) = 139)	M (NSOH) (n (first year) =199; n (final year) = 176)	M (SOH) (n (first year) =103; n (final year) = 126)
Fruit and vegetable (g)	First year	265.15 ± 312.04	207.47 ± 257.74	318.73 ± 354.65	287.91 ± 454.58
	Final year	224.11 ± 242.66	200.48 ± 248.03	215.08 ± 254.58	251.42 ± 315.59
Fruit and vegetable (% kcal)	First year	8.91 ± 11.39	7.39 ± 8.4	6.35 ± 6.66	5.81 ± 6.2
	Final year	8.27 ± 9.03	7.52 ± 9.63	5.13 ± 6.62	5.69 ± 7.16
Fast food (% kcal)	First year	18.19 ± 21.49*	23.54 ± 21.95*	17.68 ± 17.01*	29.8 ± 19.28*
	Final year	13.83 ± 17.03*	25.1 ± 22.59*	22.12 ± 18.66*	32.64 ± 22.64*
Non-carbonated sweetened drinks (% kcal)	First year	3.52 ± 8.48	3.56 ± 5.45	3.22 ± 4.63	3.91 ± 5.91
	Final year	1.98 ± 3.95	1.94 ± 4.37	1.51 ± 3.18*	2.48 ±5.18*
Carbonated sweetened drinks (% kcal)	First year	1.4 ± 5.05	1.56 ± 4.28	1.57 ± 3.56*	2.87 ± 5.23*
	Final year	0.99 ± 3.06	0.89 ± 2.74	1.46 ± 3.46	2.39 ±5.19

Values are presented as mean ± standard deviation.
NSOH - non-substantial out-of-home eaters - individuals having less than 25% of their daily energy intake through eating out;
SOH - substantial out-of-home eaters - individuals having at least 25% of their daily energy intake through eating out
F-female; M-male; BM - body mass
Differences between NSOH and SOH groups were tested using T-test. Statistically significant changes ($\alpha = 0.05$) are marked with an asterisk (*).

During both measurements and for both sexes, participants from the SOH group had a significantly higher percentage of energy intake from fast food. This is an indication that school children choose to eat meals from local bakeries and school cafeterias during their breaks. In the future, efforts should be made to ensure that all school cafeterias offer healthier food choices (Gasper de Matos et al., 2016). Schools that do not have cafeterias should at least provide vending machines with healthier food choices.

Conclusions

The adolescents who had a higher proportion of daily energy intake consumed outside the home had a lower diet quality. The distribution of macronutrients did not differ significantly; however, differences in the adequacy of micronutrient intake were present. Although these differences were not always significant, a trend of higher intake adequacy can be noticed for students with a lower proportion of energy intake consumed outside the home. In addition, it should be emphasized that those who showed a higher energy consumption outside the home had a significantly higher intake of fast food. Adolescents made unhealthier food choices when eating out, which implies that unhealthier food choices are more available and more tempting than healthier food choices. In the future, healthier food choices should be made more available for the adolescent population, through school system, local markets and restaurants. Adolescents should be educated about the importance of healthy food choices for their long-term health and learn what healthier choices they could make when eating outside the home.

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