

Gender differences in the projection of food preferences into food consumption in Czech adolescents

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Summary

Food preferences are considered an important factor contributing to “risky” dietary behaviour. The amount of data on the nutritional behaviour of the adolescent population is scarce. The aim of this study was to analyse food preferences and their projection into food consumption in a cohort of adolescents of Central-European origin. The sample included 1615 15-year-olds who were asked to indicate their like or dislike of 59 food and drink items, evaluating them on a scale of 1 = “I dislike” to 10 = “I love”. Food consumption was studied using a frequency questionnaire, which included the same items and a 5-grade frequency scale. Compliance with nutritional recommendations was assessed, as were gender differences, and the relationship between preferences and consumption was subsequently analysed. Preferences were found to differ significantly between the genders, with results indicating less healthy choices in the case of boys. However, the established preferences were not completely projected into actual consumption, which in fact appeared to be healthier than the preferences implied. Study results thus indicate that food preferences are not necessarily being projected into the actual consumption of the Central-European adolescent population.

Keywords

nutrition; food preferences; consumption; adolescents, gender differences

Food preferences are one of the key determinants affecting dietary and nutritional behaviour. In general, preferences for individual food items tend to develop on the basis of inherent taste preferences (e.g. sweet taste in mammals) in combination with cognitively received preferences. During the course of an individual's ontogenetic development, preferences for particular kinds of foods adapt to the cultural symbolism common in a given region or community as well as conforming to socially desired attitudes. In individual age intervals and in a gender-specific manner, socially desirable reactions are influenced by many factors to a varying extent, including e.g.: expectations regarding the health-related effects of selected foods, regulation of body weight or even a sense

of belonging to a social group associated with certain advertisements (e.g. for a specific type of drink), etc. Preferences that develop within the ontogenesis framework include gender-related differences, among other factors, due to the fact that boys and girls identify with different ideals in different developmental phases, particularly during adolescence, i.e. beauty versus bravery. This distinction may in turn lead to stronger preferences for foods that are perceived as “risky” in the case of boys and, on the other hand, foods that are considered healthy in the case of girls. While food is a significant source of pleasant experiences and a part of the sociocultural sphere, taste and food preferences also influence our dietary choices, thus shaping our diet in terms of its composition

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and content. Ongoing discussions focus on the genetically conditioned extent of these choices, examining the extent to which they are the result of modulation by external factors, tracing their development throughout childhood and adolescence, evaluating changes occurring with ageing and examining various gender differences [1–3]. It is widely accepted that preferences are only loosely consistent with nutritional recommendations, and that valuable and essential foods desirable for consumption are only rarely the most frequently preferred ones [1–8].

The number of available studies that monitor preferences in actual food consumption is relatively low [9–11]. Moreover, no studies focusing on the food preferences of adolescents are available for the Central-European region. This study was therefore designed to analyse i) the food preferences and ii) the rate of projection in actual consumption in an extended sample of Central-European adolescents, while also examining the associated iii) gender distinctions.

MATERIALS AND METHODS

Study design

The study was implemented within the framework of the ELSPAC (European Longitudinal Study of Pregnancy and Childhood) project. Although ELSPAC as such is a longitudinal prospective cohort study with a wide scope, this study focused specifically on selected nutritional characteristics of study subjects at the age of 15. Food preferences and actual consumption frequencies were monitored in the case of 59 food and drink items. The study was conducted in compliance with the Helsinki declaration for experiments on human subjects and a written informed consent was obtained from each individual.

Subjects

The study was conducted using a large sample of 15-year-old respondents ($n = 1615$) of Central-European Caucasian origin, born and living permanently in the area of the city of Brno (Czech Republic). Sampling was implemented by sending printed ELSPAC questionnaires to all eligible families, i.e. families who had been participating in ELSPAC since pregnancy. Among other areas, respondents were asked to specify their consumption and preferences for selected foods as part of the standard ELSPAC questionnaire package.

Food preferences

Respondents were asked to answer one ques-

tion: “How do you like the following food/drink item?” A list of food/drink items was included, each with its own numeric scale from 1 to 10. Respondents expressed their preferences for each item by ticking one number from 1 = “I dislike, I don’t like at all” to 10 = “I love it, I like it very much”. A total of 59 items in 9 food groups (one group included drinks) were evaluated in this manner.

Diet composition

Actual consumption was established using a food frequency questionnaire (FFQ), which included a list of items identical to those listed in the preference questionnaire. Respondents were asked to answer the question “How often do you consume the following food/drink item?” and indicate their choices on a 5-grade frequency scale: 1 = never or seldom, 2 = once a fortnight, 3 = 1–3 times a week, 4 = 4–7 times a week, 5 = more than once a day. For the purpose of this evaluation, the frequency data were processed, in addition to the utilization of the initial categories, in the form of a simplified semi-quantitative 1–5 scale describing the consumption rate (1 = lowest, 5 = highest).

Additional nutritional data

The questionnaires also contained additional questions regarding dieting, vitamin supplement consumption, eating locations and snacking behaviour. In addition, body mass index (*BMI*) was calculated using the supplied weight and height data.

Statistical analysis

Standard summary statistics were used to describe primary data, the mean was used for cardinal and ordinal data, and absolute and relative frequencies for nominal variables. For further analysis, both consumption and preferences were adjusted on a 0–100 scale. The statistical significance of differences between boys and girls was analysed using *t*-test for two independent samples (for *BMI*), Mann–Whitney U test (for cardinal and ordinal data) and ML chi-square test (for nominal variables). Results were considered statistically significant when $\alpha < 0.05$ in all applied analyses. Analyses were performed using IBM SPSS 22.0.0 (IBM, Armonk, New York, USA).

RESULTS

An overview of subject responses is provided in Tab. 1. While no significant gender-related dif-

ferences in *BMI* were established, girls displayed significantly more frequent dieting behaviour ($p < 0.001$) and were significantly more likely to take vitamin supplements ($p = 0.008$). On the other hand, boys were significantly more likely to consume main courses outside of the school ($p = 0.037$) and eat snacks brought from home ($p = 0.016$).

An overview of the preferences and consumption of foods and drinks included in the study is

provided in Tab. 2, including the statistical significance of differences between boys and girls. The results suggest that there were in fact significant gender-specific differences in both preferences and actual consumption of the studied items. Specifically, boys were more likely to indicate a preference for items belonging to the “junk food” cluster, e.g. burgers ($p < 0.001$) and hot dogs ($p < 0.001$), as well as items from the meat cluster, e.g. red meat ($p < 0.001$), smoked meat

Tab. 1. Overview of questionnaire responses.

		Total (<i>n</i> = 1615)	Boys (<i>n</i> = 792)	Girls (<i>n</i> = 823)	<i>p</i>
Body mass index ^a		20.3 (20.2; 20.5)	20.2 (20.0; 20.5)	20.4 (20.2; 20.6)	0.358
Question	Response				
Are you currently on a diet? ^b	Yes	69 (4.3%)	18 (2.3%)	51 (6.2%)	< 0.001*
	No	1 493 (92.4%)	743 (93.8%)	750 (91.1%)	
	I don't know/Not available	53 (3.3%)	31 (3.9%)	22 (2.7%)	
Do you take vitamin supplements? ^b	Regularly	253 (15.7%)	118 (14.9%)	135 (16.4%)	0.008*
	Occasionally	463 (28.7%)	203 (25.6%)	260 (31.6%)	
	No	787 (48.7%)	405 (51.1%)	382 (46.4%)	
	I don't know/Not available	112 (6.9%)	66 (8.3%)	46 (5.6%)	
How often do you consume: a main course in the school cafeteria? ^c	5 times per week	964 (59.7%)	488 (61.6%)	476 (57.8%)	0.156
	2–4 times per week	156 (9.7%)	78 (9.8%)	78 (9.5%)	
	Once per week	29 (1.8%)	12 (1.5%)	17 (2.1%)	
	Once per 2 weeks	20 (1.2%)	8 (1.0%)	12 (1.5%)	
	Never	400 (24.8%)	187 (23.6%)	213 (25.9%)	
	I don't know/Not available	46 (2.8%)	19 (2.4%)	27 (3.3%)	
How often do you consume: a main course outside of the school? ^c	5 times per week	519 (32.1%)	280 (35.4%)	239 (29.0%)	0.037*
	2–4 times per week	604 (37.4%)	283 (35.7%)	321 (39.0%)	
	Once per week	159 (9.8%)	69 (8.7%)	90 (10.9%)	
	Once per 2 weeks	88 (5.4%)	35 (4.4%)	53 (6.4%)	
	Never	180 (11.1%)	95 (12.0%)	85 (10.3%)	
	I don't know/Not available	65 (4.0%)	30 (3.8%)	35 (4.3%)	
How often do you consume at school: snack from home? ^c	5 times per week	991 (61.4%)	512 (64.6%)	479 (58.2%)	0.016*
	2–4 times per week	224 (13.9%)	102 (12.9%)	122 (14.8%)	
	Once per week	97 (6.0%)	40 (5.1%)	57 (6.9%)	
	Once per 2 weeks	84 (5.2%)	37 (4.7%)	47 (5.7%)	
	Never	175 (10.8%)	82 (10.4%)	93 (11.3%)	
	I don't know/Not available	44 (2.7%)	19 (2.4%)	25 (3.0%)	
How often do you consume at school: snack that you bought yourself? ^c	5 times per week	127 (7.9%)	60 (7.6%)	67 (8.1%)	0.729
	2–4 times per week	376 (23.3%)	180 (22.7%)	196 (23.8%)	
	Once per week	383 (23.7%)	199 (25.1%)	184 (22.4%)	
	Once per 2 weeks	333 (20.6%)	157 (19.8%)	176 (21.4%)	
	Never	344 (21.3%)	172 (21.7%)	172 (20.9%)	
	I don't know/Not available	52 (3.2%)	24 (3.0%)	28 (3.4%)	

n – number of respondents, *p* – significance (results significant on a level of $\alpha = 0.05$ are marked by asterisk).

a – variables are described by the mean and a 95 % confidence interval, differences between boys and girls were tested using *t*-test;

b – variables are described by absolute and relative count, differences between boys and girls were tested using a maximum likelihood chi-square test; c – variables are described by absolute and relative count, differences between boys and girls were

tested using the Mann–Whitney U test.

($p < 0.001$) and offal ($p < 0.001$), compared to girls. On the other hand, girls were more likely to prefer and consume raw vegetables ($p < 0.001$ both for preference and consumption) as well as cooked vegetables ($p < 0.001$ for preference, $p = 0.048$ for actual consumption).

As a graphic format may provide better insight into the order of individual items, the relationships between preferences and actual consumption are presented as figures. Fig. 1 and Fig. 2 display the relationship between preferences and consumption frequencies according to gender, whereas the division lines represent the median values. While the upper right quadrant includes foods with a high rate of preference and frequent consumption, the lower left quadrant includes

foods which are both unpopular and rarely consumed. Fig. 1 and Fig. 2 clearly indicate considerable gender-specific variations in the area of dietary preferences. While it can be said that many of the most frequently preferred items were actually consumed relatively rarely (upper left quadrant of Fig. 1 and Fig. 2), a not entirely negligible number of items with a considerably lower rate of preference indicates a higher consumption rate.

Fig. 3 summarizes the differences between boys and girls both in the area of preferences and with respect to the frequency of consumption. The upper right quadrant represents typical dietary tendencies for boys and the lower left quadrant includes foods typically chosen by girls. Among items with significant gender-specific dif-

Tab. 2. Preference versus consumption of selected foods.

Food	Preference/Consumption				
	Total ($n = 1615$)	Boys ($n = 792$)	Girls ($n = 823$)	p^a	p^b
Cereal products	64.1/42.9	59.0/41.7	69.1/44.2	$< 0.001^*$	0.092
Bread	64.3/74.6	63.0/75.6	65.5/73.7	0.033*	0.043*
Rolls, buns	71.9/79.3	72.2/83.3	71.6/75.3	0.280	$< 0.001^*$
Rice	66.6/47.7	64.3/47.7	68.9/47.6	$< 0.001^*$	0.991
Pasta	70.5/47.7	67.0/47.6	73.8/47.7	$< 0.001^*$	0.869
Dumplings (side dish)	61.2/37.7	62.8/41.3	59.7/34.2	0.012*	$< 0.001^*$
Fruit dumplings and other flour foods	62.7/28.6	65.2/32.1	60.4/25.2	0.001*	$< 0.001^*$
Fine pastries	69.5/47.8	70.5/51.3	68.5/44.4	0.123	$< 0.001^*$
Raw vegetables	69.7/63.6	62.5/61.3	76.6/65.8	$< 0.001^*$	$< 0.001^*$
Vegetables cooked	49.4/40.8	46.5/42.1	52.1/39.6	$< 0.001^*$	0.048*
Vegetable juice	36.5/19.4	38.0/22.7	35.0/16.3	0.030*	$< 0.001^*$
Potatoes cooked	65.4/60.2	64.8/60.3	65.9/60.1	0.506	0.925
Fresh fruit	79.1/74.4	74.9/72.4	83.2/76.4	$< 0.001^*$	$< 0.001^*$
Fruit juice 100% (as a fruit)	76.9/48.7	73.3/48.9	80.4/48.4	$< 0.001^*$	0.590
Fruit canned	65.8/34.9	64.6/37.7	67.0/32.3	0.043*	$< 0.001^*$
Milk or milk drink	69.7/63.1	69.9/67.4	69.5/59.0	0.821	$< 0.001^*$
Yoghurt	69.3/61.7	68.1/64.0	70.4/59.6	0.133	$< 0.001^*$
Curd cheese	59.6/36.4	59.7/40.2	59.5/32.7	0.966	$< 0.001^*$
Cream cheese	65.7/41.9	66.0/45.3	65.5/38.6	0.682	$< 0.001^*$
Puddings	65.0/36.6	65.7/40.0	64.3/33.3	0.345	$< 0.001^*$
Cheese	73.4/68.1	71.6/68.5	75.0/67.8	0.006*	0.419
Red meat	58.7/47.0	64.1/52.6	53.4/41.6	$< 0.001^*$	$< 0.001^*$
Smoked meats	61.6/52.1	67.3/57.1	56.2/47.4	$< 0.001^*$	$< 0.001^*$
Offal	33.3/15.4	37.9/19.6	28.9/11.4	$< 0.001^*$	$< 0.001^*$
Meat products – pies, preserves	47.4/28.5	52.4/35.4	42.6/22.0	$< 0.001^*$	$< 0.001^*$
Poultry, rabbit	73.2/53.0	72.9/53.9	73.5/52.2	0.521	0.336
Fish	58.5/30.7	59.0/31.6	58.0/29.8	0.836	0.175
Eggs	65.6/41.3	66.0/43.9	65.2/38.7	0.315	$< 0.001^*$
Legumes	56.6/35.2	57.5/38.0	55.7/32.5	0.276	$< 0.001^*$
Nuts	63.5/34.5	62.8/35.9	64.1/33.2	0.308	0.013*

Tab. 2. continued

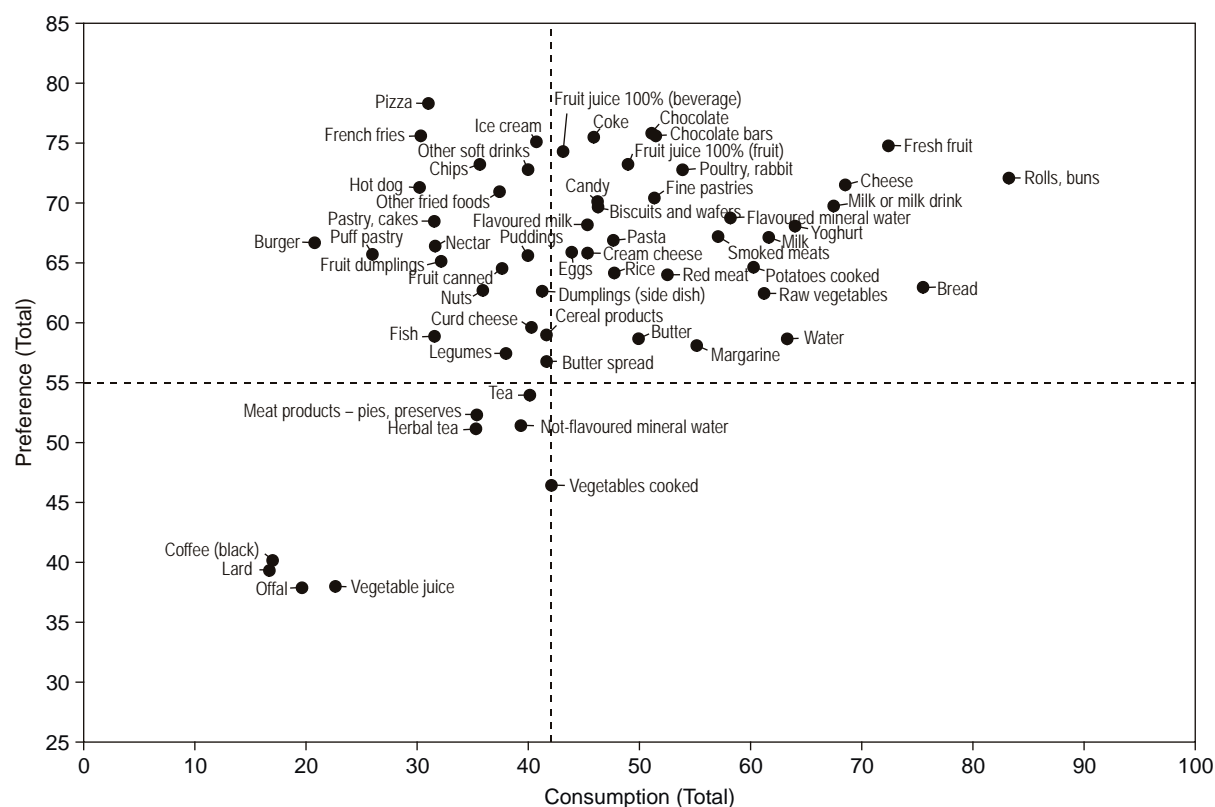
Food	Preference/Consumption				
	Total (<i>n</i> = 1615)	Boys (<i>n</i> = 792)	Girls (<i>n</i> = 823)	<i>p</i> ^a	<i>p</i> ^b
Pastry, cakes	68.1/28.0	68.6/31.5	67.6/24.7	0.313	< 0.001*
Chocolate	77.7/51.2	75.9/51.1	79.4/51.2	0.001*	0.900
Chocolate bars	75.5/48.6	75.7/51.5	75.2/45.9	0.270	< 0.001*
Candy	71.2/45.8	69.9/46.3	72.4/45.2	0.079	0.340
Ice cream	76.9/38.8	75.2/40.7	78.6/37.0	0.017*	0.002*
Butter	57.4/45.8	58.7/49.9	56.2/41.9	0.205	< 0.001*
Lard	33.7/12.3	39.3/16.7	28.3/8.1	< 0.001*	< 0.001*
Butter spread	58.4/40.3	56.8/41.6	59.8/39.1	0.038*	0.101
Margarine	58.9/54.3	58.2/55.1	59.5/53.5	0.350	0.430
Hot dog	69.3/25.7	71.3/30.3	67.4/21.3	0.001*	< 0.001*
Burger	61.1/17.2	66.8/20.8	55.7/13.7	< 0.001*	< 0.001*
Puff pastry	65.3/24.6	65.8/25.9	64.9/23.3	0.753	0.017*
Biscuits and wafers	69.3/44.2	70.2/46.3	68.4/42.3	0.131	0.001*
Pizza	79.1/28.4	78.4/31.0	79.7/25.9	0.753	< 0.001*
French fries	74.5/26.7	75.7/30.3	73.3/23.3	0.087	< 0.001*
Chips	71.2/31.9	73.3/35.6	69.1/28.2	0.023*	< 0.001*
Other fried foods	68.0/34.1	71.0/37.5	65.1/30.9	< 0.001*	< 0.001*
Water (water from a bottle or tap water)	62.3/66.0	58.8/63.2	65.7/68.6	< 0.001*	< 0.001*
Not-flavoured mineral water	55.0/43.2	51.5/39.3	58.2/46.9	< 0.001*	< 0.001*
Flavoured mineral water	69.7/58.1	68.8/58.2	70.5/57.9	0.074	0.993
Coke	73.1/41.4	75.6/45.9	70.8/37.2	0.001*	< 0.001*
Other soft drinks	69.4/35.2	72.9/40.0	66.0/30.7	< 0.001*	< 0.001*
Fruit juice 100% (as a beverage)	77.6/43.7	74.4/43.1	80.7/44.2	< 0.001*	0.666
Nectar	67.0/30.5	66.5/31.6	67.5/29.3	0.202	0.090
Milk	65.6/56.5	67.3/61.6	63.9/51.6	0.107	< 0.001*
Flavoured milk	66.8/41.8	68.3/45.3	65.4/38.4	0.046*	< 0.001*
Coffee (black)	40.5/18.9	40.2/17.0	40.9/20.8	0.819	0.012*
Tea	56.6/42.2	54.0/40.1	59.0/44.2	0.001*	0.023*
Herbal tea	53.4/35.8	51.2/35.3	55.5/36.2	0.008*	0.578

n – number of respondents, *p* – significance tested by Mann–Whitney U test (a – significance of preference differences between boys and girls, b – significance of consumption differences between boys and girls (results significant on a level of $\alpha = 0.05$ are marked by asterisk).

ferences, dissimilarities in terms of compliance with nutritional recommendations speak in favour of girls, who positively perceived items such as raw and cooked vegetables, cereal products and fresh fruits, while perceiving items such as lard, hamburgers, sausages, red meat, tripe and soft drinks in a markedly negative fashion.

However, the declared actual consumption differed considerably from the established food preferences. In fact, the most preferred foods were consumed least frequently, e.g. pizza, which, while being the most popular food item among boys, was also among the 10 items least frequently consumed. French fries are another good example:

3rd most popular, 8th least consumed. No such marked discrepancy was observed in girls, i.e. none of the 10 most frequently preferred items are found among the 10 least frequently consumed. The low rate of projection of preferences into consumption is well documented by the finding that, in the case of boys, only one item (fresh fruit) appeared in the 10 most frequently consumed. The rate of correspondence was likewise minimal in the case of girls, with a mere 3 items out of 10. In addition, gender-specific differences in the area of consumption were considerably smaller than those encountered in the case of preferences.



Gender differences in the projection of food preferences

DISCUSSION

Proceeding from the assumption that food preferences are one of the factors influencing dietary choices and consumption, an ideal scenario would likely feature preferences consistent with nutritional recommendations, i.e. our concept of a healthy diet. However, the rate of such consistency was found to be quite low in the Czech 15-year-old adolescent population, in particular among boys. Of items included in the "top ten" group, only one, i.e. fruit (and fruit juice), belongs to those recommended as healthy foods. On the other hand, the most popular items were of a "fast food" nature, exhibiting a high energy value. Raw vegetables ranked 40th out of a total of 59, with foods like cottage cheese (41st), cereal products (42nd), fish (43rd), legumes (47th), and cooked vegetables (55th) also found towards the end of the list. The situation was somewhat different among girls since, compared to boys, their preferences were more consistent with a healthy diet model, with fruits being listed as the most popular item. However, although raw vegetables achieved 6th place, the top 10 items included pizza, chocolate, ice cream and chocolate bars, while foods such as

fish (45th), legumes (48th) and cooked vegetables (54th) were found towards the end of the list. The low popularity of meat was an interesting finding, placing 53rd most popular among girls and 36th among adolescent boys.

Preferences in the Czech population correspond to results established by similar surveys performed in different countries. In fact, disparities between preferences and nutritional recommendations considered to constitute a dietary “gold standard” were mentioned as being quite common [4–7] and were often attributed to the genetic background of individuals. In humans, these disparities include a preference for sweet and salty tastes and an avoidance of bitter and sour tastes, present even in newborns. A predisposition for high-energy foods is another relevant observation [1, 2, 8]. However, it cannot be claimed that all of these associations are innate, as the preference for salty taste does not exist at birth and only develops at the age of approximately 4 months [8]. Sweet food facilitates a high-energy intake, historically crucial for survival. By contrast, bitter and sour tastes may signal the presence of harmful toxins and bacteria, and therefore such innate preferences may be considered adaptive since they

contributed to increasing the likelihood of survival, too. At present, however, high-energy intake commonly leads to weight-gain and obesity, which has become a significant issue. A non-preference for bitter and sour tastes constitutes grounds for the refusal of vegetables with such tastes and even applies to some fruits. The same causes lead to a refusal of black coffee in Czech population, as coffee was ranked 56th by both genders. To conclude, food preferences include both a “fixed” innate element and an acquired component, which facilitates the resulting adaptation to available food items later in life. As such, food preferences represent an extremely useful tool for the promotion of survival and the reduction of dietary risks.

Prior to comparing the results of this study with the outcomes of previous studies, it is necessary to take into consideration the selection and classification of food items. Some studies included extremely detailed inventories, listing e.g. various kinds of vegetables, while others included a smaller number of considerably wider food groups. Likewise, the form of questions asked with respect to establishing attitudes to food also varied. Last but not least, the very term “preference” may be interpreted in various ways [12] and it is not always entirely clear what the term “food preference” stands for.

Gender-specific differences in food preferences were examined by a relatively small number of studies [4, 7, 13]. NU et al. [7] considered the preferences of subjects aged 10 to 20 very important for food preference development, especially as they contributed considerably to actual dietary selection throughout adolescence. In that study, girls were found to be influenced by health, climate, and food fat content, while boys focused on nutritional value and ate more of what was offered or available. COOKE et al. [4] examined a population of 1291 schoolchildren aged 4 to 16, establishing, similar to our study, that children’s preferences were generally not consistent with healthy foods, and that boys tended to exhibit less healthy preferences than girls. However, the study also mentioned that children’s preferences determined consumption, i.e. that children ate what they liked. At the same time, the study indicated that foods most loved by children only seldom exhibited high nutritional value. CAINE-BISH et al. [13] in a study aimed at gender-specific differences in preferences examined the preferences of 1818 schoolchildren and adolescents. In order to provide a simplified comparison, multiple items were grouped into so-called factors, i.e. larger groups: fast and familiar foods, ethnic foods, pork and beef (in particular grilled), fish, starchy foods and sweets, cheese,

fruit, vegetables and sides. In terms of gender-specific differences, boys were found to prefer ethnic food, meat and fish, while girls expressed a preference for starchy and sweet foods, fruits and vegetables. Significant age-related differences were also established, e.g. a growing preference for food of animal origin increasing with age in boys.

Significant differences in food preferences were also established in this study, namely that girls’ preferences were found to comply with a healthy nutrition model to a greater extent than preferences expressed by boys. However, the observed differences in food preferences generally did not translate into the actual consumption, as demonstrated e.g. by the fact that the “top ten” most frequently consumed items exhibit almost no variation between the genders in comparison with preferences established on the basis of items included in the study. Study results suggest that boys were less discerning with respect to healthy food choices when compared to girls, and that their food intake was generally higher.

In the light of the results of this study, it may be speculated that the socioeconomic status of the 15-year-old population does not allow for its members to affect the availability of various foods. Moreover, the expected rate of projections of preferences in consumption has its limits, i.e. a high preference for ice cream will hardly boost this item to the highest rank in consumption in comparison with other foods. The results of this study also suggest that i) low preferences do not automatically mean low consumption, on the contrary, consumption may in fact be higher than in the case of highly rated preferences, and that ii) preferences need not be the main factor in determining consumption, in particular in children and adolescents, even though they are supposed to “eat mainly what they like”.

The increased consumption of items with low preferences may be due to a range of reasons. Certain foodstuffs, such as bread, are traditionally (i.e. due to habits, availability, price, etc.) consumed more frequently than others, e.g. sweets and candy, although preferences for bread may well be insignificant. An individual’s awareness of the health benefits and overall usefulness of a given food item may also preclude a projection of certain preferences into consumption.

One of the major limitations of this study is the presumption that food preferences as well as actual consumption as indicated in questionnaire responses are completely dependent on the decisions of the individual adolescent, and not on the food choices made by the family or other people. Additional limitations possibly include a limited

number of alternative opportunities, e.g. school canteens serving food that complies with nutritional recommendations rather than with adolescents' preferences [5, 12, 14, 15]. An explanation involving higher targeted consumption (with low preferences) may be accepted in the case of e.g. fresh vegetables. This study has nevertheless identified a range of common combinations of high preference and low consumption rates, as assessed above. Authors of previously published studies differed in their opinion on the influence of preferences on consumption: some mentioned preferences as the key factor in determining consumption [9, 11], while others did not reveal any correlation between preference and consumption whatsoever [10].

CONCLUSION

The results of this study indicate that: 1) preferences expressed by boys and girls in our sample differed considerably, 2) indicated preferences were contrary to recommendations for healthy nutrition, markedly more so in boys than in girls, 3) preferences were projected into consumption only in part.

In fact, consumption substantially differed from stated preferences and rather exhibited compliance with healthy nutrition standards. Actual consumption differences between boys and girls were not overly pronounced. The key outcome established by this study is the finding that preferences in adolescents are not the crucial factor in determining dietary composition and consumption. The results of this study indicate that food habits among adolescents may be significantly moulded by external influences, i.e. nutritional education and the regulation of foods on offer, namely by increasing the direct availability of high-quality healthy foods and, to some degree, by limiting the offer of unsuitable items. Focused preventive projects targeting healthier nutrition appear to have a great deal of potential with regard to adolescents, who are otherwise considered to be a relatively problematic population with respect to food consumption.

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REFERENCES

1. Benton, D.: Role of parents in the determination of the food preferences of children and the development of obesity. *International Journal of Obesity and Related Metabolic Disorders*, 28, 2004, pp. 858–869. DOI: 10.1038/sj.ijo.0802532.
2. Breen, F. – Plomin, R. – Wardle, J.: Heritability of food preferences in young children. *Physiology and Behavior*, 88, 2006, pp. 443–447. DOI: 10.1016/j.physbeh.2006.04.016.
3. Harris, G.: Development of taste and food preferences in children. *Current Opinion in Clinical Nutrition and Metabolic Care*, 11, 2008, pp. 315–319. DOI: 10.1016/j.cub.2013.02.037.
4. Cooke, L. J. – Wardle, J.: Age and gender differences in children's food preferences. *British Journal of Nutrition*, 93, 2005, pp. 741–746. DOI: 10.1079/BJN20051389
5. Noble, C. – Corney, M. – Eves, A. – Kipps, M. – Lumbers, M.: Food choice and secondary school meals: the nutritional implications of choices based on preferences rather than perceived healthiness. *International Journal of Hospitality Management*, 22, 2003, pp. 197–215. DOI: 10.1016/S0278-4319(03)00018-5.
6. Russell, C. G. – Worsley, A.: Do children's food preferences align with dietary recommendations? *Public Health Nutrition*, 10, 2007, pp. 1223–1233. DOI: 10.1017/S1368980007699546.
7. Nu, C. T. – MacLeod, P. – Barthelemy, J.: Effects of age and gender on adolescents' food habits and preferences. *Food Quality and Preference*, 7, 1996, pp. 251–262. DOI: 10.1016/S0950-3293(96)00023-7.
8. Wardle, J. – Cooke, L.: Genetic and environmental determinants of children's food preferences. *British Journal of Nutrition*, 99, 2008, pp. S15–S21. DOI: 10.1017/S000711450889246X.
9. Brug, J. – Tak, N. – Velde, S. – Bere, E. – De Bourdeauhuij, I.: Taste preferences, liking and other factors related to fruit and vegetable intakes among schoolchildren: results from observational studies. *British Journal of Nutrition*, 99, 2008, pp. S7–S14. DOI: 10.1017/S0007114508892458.
10. Iglesias-Gutiérrez, E. – García-Rovés, P. – García, A. – Patterson, A.: Food preferences do not influence adolescent high-level athletes' dietary intake. *Appetite*, 50, 2008, pp. 536–543. DOI: 10.1590/S0101-32892014000100003.
11. Pérez-Rodrigo, C. – Ribas, L. – Serra-Majem, L. – Aranceta, J.: Food preferences of Spanish children and young people: the enKid study. *European Journal of Clinical Nutrition*, 57, 2003, pp. S45–S48. DOI: 10.1038/sj.ejcn.1601814.

12. Guidetti, M. – Cavazza, N.: Structure of the relationship between parents' and children's food preferences and avoidances: an explorative study. *Appetite*, 50, 2008, pp. 83–90. DOI: 10.1016/j.appet.2007.06.001.
13. Caine-Bish, N. L. – Scheule, B.: Gender differences in food preferences of school-aged children and adolescents. *Journal of School Health*, 79, 2009, pp. 532–540. DOI: 10.1111/j.1746-1561.2009.00445.x.
14. Pearson, N. – Biddle, S. J. – Gorely, T.: Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. *Public Health Nutrition*, 12, 2009, pp. 267–283. DOI: 10.1017/S1368980008002589.
15. Wąjołowska, L. – Babicz-Zielińska, E. – Czarnocińska, J.: Food choice models and their relation with food preferences and eating frequency in the Polish population: POFPRES study. *Food Policy*, 33, 2008, pp. 122–134. DOI: 10.1016/j.foodpol.2007.08.001.

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