

FOOD AVERSIONS AND DIETARY PREFERENCES IN PRE-SCHOOL CHILDREN FROM OLSZTYN

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ABSTRACT

Background. The nutrition of pre-school children often does not follow the recommendations, and qualitatively and quantitatively limited selection of products in the diet shapes an attitude of aversion towards new products and dishes. The risk of deficiencies in many important nutrients emerges, particularly in vitamins and mineral components, which can affect the psychophysical development of the child and have an impact on nutritional status and health disorders in adulthood.

Objective. Study of dietary preferences in pre-school children and identify possible food aversions.

Material and methods. Nutritional preferences of pre-school children in Olsztyn were examined using a questionnaire prepared in a graphic form, presenting images of 40 food products classified into 5 groups, and the acceptance level and knowledge of the product was established.

Results. The values of *Cole's* index proving the proper nutritional status of pre-school children were obtained for about 87% of the examined group, excessive nutrition was observed in more than 4% of the examined group, about 2% of the group demonstrated obesity and mild malnutrition was observed in about 7% of the examined children. A high acceptance rate of sweets and fast-food products by children was observed. A high degree of preference for milk was recorded, as well as traditional and cognitive aversion for kefir. In the group of fruit and vegetables, both a high degree of preference and aversions to all indicated vegetables and fruit were observed. Taste determined the results, with high acceptance for the sweet taste and rejection or a neutral attitude towards sour and bitter products

Conclusions. Food aversions, by reducing the intake of food products, can result in nutritional deficiencies, affecting the psychosomatic development and cognitive abilities of the child. Traditional and cognitive food aversions was observed towards kefir, cheeses and most of vegetables. A high level of preference was observed in relation towards sweet and fast food products and a low acceptance level for selected vegetables, fruits and dairy products.

Key words: dietary preferences, pre-school children, food aversions

STRESZCZENIE

Wprowadzenie. Żywnienie dzieci przedszkolnych często nie odpowiada zaleceniom, ograniczony ilościowo i jakościowo dobór produktów w diecie kształtuje postawę niechęci wobec nowych produktów i potraw. Pojawia się ryzyko niedoborów wielu ważnych substancji odżywczych, głównie witamin i składników mineralnych, które rzutować mogą na rozwój psychofizyczny dziecka i wpływać na stan odżywienia i zaburzenia zdrowia w dorosłości.

Cel. Badanie preferencji żywieniowych dzieci przedszkolnych i określenie możliwych awersji pokarmowych.

Material i metody. Preferencje żywieniowe dzieci przedszkolnych badano z zastosowaniem kwestionariusza opracowanego w formie graficznej, przedstawiającego obrazy 40. produktów spożywczych podzielonych na 5 grup i określano stopień akceptacji oraz znajomość produktu.

Wyniki. Wartości wskaźnika *Cole'a*, świadczące o prawidłowym stanie odżywienia dzieci przedszkolnych, uzyskano dla blisko 87% badanej grupy, nadmierne odżywienie wykazano u ponad 4% badanych, około 2% grupy charakteryzowała otyłość a u około 7% badanych dzieci zaobserwowano nieznaczne niedożywienie. Zaobserwowano wysoką akceptację słodczy i produktów typu fast-food wśród badanych dzieci. Zanotowano wysoki stopień preferencji dla mleka i awersję tradycyjną i poznawczą do kefiru. W grupie owoców i warzyw zaobserwowano zarówno wysoki stopień preferencji jak i awersje do wszystkich wskazanych warzyw i owoców. O wyniku decydował smak, charakterystyczna była wysoka akceptacja dla smaku słodkiego i odrzucanie lub obojętny stosunek do produktów kwaśnych i gorzkich.

Wnioski. Awersje pokarmowe poprzez ograniczenie spożycia produktów spożywczych mogą skutkować niedoborami pokarmowymi, wpływając na rozwój psychosomatyczny i możliwości poznawcze dziecka. Awersje tradycyjne i poznawcze zaobserwowano względem kefiru, serów oraz większości warzyw. Wysoki poziom preferencji zaobserwowano w relacji do produktów słodkich i żywności typu 'fast-food', a niski poziom akceptacji dla wybranych warzyw, owoców i produktów nabiałowych.

Słowa kluczowe: preferencje żywieniowe, dzieci przedszkolne, awersje pokarmowe

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INTRODUCTION

Human nutrition is an environmental factor which affects the development of health (defined in its somatic, social, psychical and emotional aspects) to a significant degree. Although the importance of developing proper dietary habits is commonly acknowledged, this relation is usually transposed to the food/nutrition – somatic health dependence. Multiple behaviours towards food and nutrition are developed in the emotional sphere, being the result of attitudes, customs and nutritional habits demonstrated by persons in the nearest circle. One of the important objectives in child development is to promote proper dietary habits, which will certainly constitute one of the pillars of health at each subsequent stage of his or her life.

Dietary attitudes and behaviours are clearly dependent on dietary preferences, which have been defined as “general predispositions towards specific food, regardless of the situation in which this food is consumed” [11] and are characterized in terms of food names using the degree of like or dislike, specified as a consumer’s acceptance to a given food sample. Many studies indicate that the diet of children aged 2-7 years quite frequently does not correspond to nutritional recommendations and can be monotonous – children consume the same products, selected from the food pyramid area, developing an attitude of aversion towards new products and dishes [5]. The risk of deficiency of several very important nutrients emerges, mainly as regards vitamins and mineral components which can affect the psychophysical development of the child and subsequently, the health of the adult [9, 10].

MATERIAL AND METHODS

The research was carried out with participation of pre-school, four-, five- and six-year-old children, from randomly selected kindergarten in the area of the city of Olsztyn, in Poland. The children’s parents were invited to take part in the study. The experiment was carried out in June 2011 and a total number of 45 children participated in the study, including 19 four-year-olds, 14 five-year-olds and 12 six-year-old children. The study of potential dietary preferences or aversions was based on two questionnaires [8]:

(1). A questionnaire in a graphic form, addressed to children, presenting images of 40 food products divided into five groups (Table 1): dairy products, vegetables, fruits, sweets, fast food products; the degree of product acceptance was expressed by showing an emoticon defining the acceptance degree and the familiarity with the product (Figure 1);

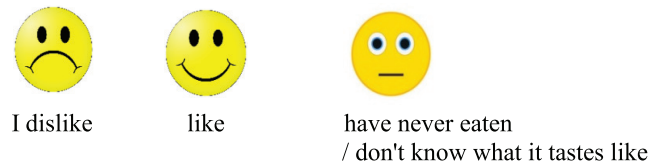


Figure 1. An emoticon defining the acceptance degree and the familiarity with the product

Table 1. Food products to which food preferences of children were examined

Group	Food products
Sweets	candies, chocolate bar, muesli bar, pastry (cakes, sweet rolls, donuts), ice-creams, jellies, sweet beverages (Fanta, Pepsi, Cola), chewing gum
Dairy products	milk, rennet cheeses, cottage cheeses, yoghurt, kefir;
Vegetables	cucumber, tomato, potato, parsnip, carrot broccoli, cauliflower, lettuce, pepper, radish, onion
Fruits	apple, pear, cherry, plum, grapes, banana, orange, lemon, kiwi;
Fast-food products	hamburger, hot-dog, grilled cheese baguette, chips, pizza, crisps, puff snacks;

(2). A survey questionnaire addressed to parents of the examined pre-school children; the questions concerned the same groups of products about the acceptance of which the children were asked, but the questionnaire made it possible to provide answers in a broader context, by introducing the scale, taking into account the following answers: likes (rank 1), dislikes (rank – 2), neutral (rank - 3), has never eaten (rank 4), does not eat following the doctor’s advice (rank 5).

Data concerning anthropometric parameters of children – their body weight and height – were obtained from the parents of the examined children. This information made it possible to specify selected indicators evaluating the nutritional status of children – the analysis of centile distributions according to WHO and determine *Cole’s* index for the percentage evaluation of BMI (Body Mass Index) in relation to the ideal BMI, corresponding to the 50th centile for the age and sex. *Cole’s* index specified in the 90%-110% range was assumed as the value proving the correct nutritional status [3].

BMI index was calculated according to the formula: $BMI = \text{body mass (kg)} / \text{height}^2 \text{ (m)}$

Formula for calculating *Cole’s* index = $(\text{patient’s BMI} / \text{standard BMI}) \times 100\%$ [3].

Classification of the nutritional status was achieved using *Cole’s* index as a criterion:

- < 75% - severe malnutrition (depletion), 75- 85% - malnutrition, 85-90% - mild malnutrition
- 90-110% - norm, 110 -119% - excessive nutrition, $\geq 120\%$ obesity [3].

Characteristics of the examined group

The research was carried out on a group of 45 children aged 4-6 years. 51% (23 persons) of the examined group were girls, 49% – boys (22 persons) (Table 2).

Table 2. The structure of the examined group

Child's age (years)	Girls		Boys		Total group	
	n	%	n	%	n	%
4	11	58	8	42	19	100
5	6	43	8	57	14	100
6	6	50	6	50	12	100
Total	23	51	22	49	45	100

Based on the data concerning the body weight and height of children (mean values for the examined group are presented in Table 3), BMI was calculated, *Cole's* index was established and nutritional status classification was performed.

Table 3. Body weight and height of the examined children (mean values)

Child's age (years)	Girls				Boys			
	body weight (kg)		body height (m)		body weight (kg)		body height (m)	
	X	SD	X	SD	X	SD	X	SD
4	16.1	1.86	1.0	0.030	16.5	0.61	1.0	0.008
5	17.6	0.81	1.1	0.007	17.5	0.93	1.05	0.009
6	20.0	0.95	1.2	0.004	20.0	1.15	1.1	0.020

RESULTS AND DISCUSSION

The nutritional status of the examined group of children, evaluated on the basis of *Cole's* index, was described as good. For a small percentage of children, overweight or obesity was found (about 4% and about 2%, respectively) and about 7% of children demonstrated mild malnutrition.

A high degree of food preference towards sweets was observed. Within each age group under study, products of this group are liked or very much liked. A high acceptance rate was also noted for fast-food products and the degree of preference towards products or dishes increased with the age of the children participating in the study. A high preference towards milk (accepted by approx. 80% of the group under study) and rennet cheeses as well as towards selected vegetables most typical of Polish cuisine (cucumber, tomato, carrot, and lettuce) was noted. Fruits were defined in the area of high food preferences. The accepted fruits are primarily those included in a child's menu already in the early stages of development as an element of juices, puree juices, snacks or desserts, mainly bananas, apples, pears, grapes and oranges.

Traditional and cognitive aversions were observed within all age groups of the children under study; 4-year olds exhibited aversions towards the greatest number of products. A tendency towards cognitive aversions is triggered by fermented dairy products, mainly kefir. Vegetables are another group of products associated with a wide range of aversions; cognitive and traditional aversions towards cruciferous and root vegetables as well as those with unique taste. Taste was also significant in defining food aversions towards fruits. The fruits most often indicated as not accepted were sour fruits (cherries, lemons, kiwifruits, and plums). Traditional aversions towards fruits being frequently included in children's diets, such as apples and pears, were noted. As regards the group of fast-food products, aversions towards products such as grilled cheese baguette, hot-dogs and hamburger were demonstrated, and for commonly accepted sweets, cognitive and traditional aversions towards chocolate bars and muesli bars were observed. Moreover, traditional aversions towards pastry products, and cognitive aversions towards sweet beverages were noted.

The acceptance of a product or dish and the decision to eat it depends on many factors. Particular importance is given to individual dietary preferences, resulting from previous nutritional experiences, taste preferences as well as from aesthetics, consistency and smell of the given food product [7]. Two types of aversion have been distinguished: traditional and cognitive aversion. Traditional aversion usually emerges as a result of negative experiences with a product or a dish, which can be connected to discomfort from the alimentary tract or a lack of acceptance of the appearance, consistency or smell. Cognitive aversion is a complex process, consisting in disliking and rejecting products and dishes without tasting them.

Sweets

In the group of the examined children, a high acceptance rate was observed for sweets (Table 4). The inclination to consume sweets results both from innate preferences for sweet taste as well as from dietary habits developed in later periods. A similar high position of sweets in the preference ranking was observed by *Kolarzyk et al.* [8], emphasizing that the highest level of acceptance for sweets was observed among underweight children and children with proper body weight, while overweight and obese children ranked sweets in third place in their preferences. In the studies, the highest preference rates were revealed by children in relation to jellies, candies and ice-cream. Five- and six-year-old children demonstrated a high acceptance of pastry and, in relation to this group of products, cognitive aversions were observed in the group of four-year-old children.

It should be noted that there were traditional aversions in the group of four- and six-year-old children for sweet Pepsi-, Fanta- and Cola-type beverages. For this group of products, the highest percentage of the examined children with cognitive aversions were the group of five-year-old children, and such a declaration was confirmed in the interview with parents, who chose the answer “has never eaten, does not know what it tastes like” for products such as: sweet beverages, but also chewing gums and pastry. The awareness of the effect of the glucose-fructose syrup used in the production of sweet beverages on lipid balance disorders, risk of obesity, atherosclerosis and ischemic heart disease, was not the subject of educational activities under the research [1]. Nevertheless, the dietary approaches of parents are satisfactory. The highest intake of candies, chocolate bars, pastry, ice-cream and sweet beverages was observed for children with proper body weight and for underweight children. A relatively low percentage of the examined children demonstrated a neutral attitude towards sweets. In the group of four-year old children, it was about 30% of those surveyed; among five-year-olds it was about 14%, and about 17% in the group of six-year-old children. No impact of the sex of children was observed on their choice and scale of preferences.

Dairy products

Milk is the product preferred by the majority of the examined children (Table 4). Four-year-olds ranked this product high in their preference scale (more than 84% of the group), as well as five-year-olds (100% of the group) and six-year-old children (about 84% of the group). As results from the study conducted by *Kozioł-Kozakowska et al.* [9] with a group of over 300 children aged 2 to 7, milk was consumed every day in the amount of 1-2 glasses a day; it was also observed that dairy products were often chosen for snacking. Other studies [2] also revealed a high consumption and acceptance rate for milk and milk-based products. In the author’s own research, yoghurts were recorded high in the preference

ranking. Aversions were observed towards other dairy products. The strongest traditional and cognitive aversion was observed in relation to kefir. The taste and smell characteristics of kefir were not accepted by 42% of four-year olds, almost 30% of five-year-olds and 25% of six-year-old children, but almost 67% of six-year-old children declared that they had never tried, and did not want to try, and “did not like” the product. An equally clear cognitive aversion towards kefir as well as towards cottage and rennet cheeses was observed in the group of five-year old children. According to the answers provided by the parents of the children, rennet cheeses, cottage cheeses and kefirs were products that children do not like or do not know/have never eaten. The sex of the surveyed children was not a differentiating factor. The research carried out by *Kolarzyk et al.* [8] demonstrated that a low level of dairy acceptance was typical for the groups of children with excessive body and too low body weight, which can indicate an important relation between the supply of milk and its products in a diet and maintaining proper body weight. The answers provided by children were similar to those chosen by their parents. None of the children had to reduce or eliminate dairy products from their diet following medical recommendations.

Vegetables

Multiple studies emphasize that preferences towards substances with sweet taste and aversions towards bitter and sour substances is the effect of adaptation of the human body to living conditions. These preferences start to take shape in the foetal development period and sensitivity to various tastes affects dietary preferences in later periods of life. Additionally, the significance of genetic conditions was emphasized, particularly with regard to sensitivity to the bitter taste, which can significantly affect the degree of acceptance of new tastes in products [9, 12]. The highest degree of acceptance for vegetables was observed in the group of six-year-old children. Dietary preferences start to develop intensively in the pre-school period and the dynamics of those

Table 4. Food preferences and dietary aversions, in relation to sweets and dairy products

Child's age (years)	Food preferences	Dietary aversions	
		traditional	cognitive
Group / food products			
4	<ul style="list-style-type: none"> sweets/jellies, candies, ice-creams dairy products/milk, yoghurt 	<ul style="list-style-type: none"> sweets/ sweet beverages (Fanta, Pepsi, Cola) dairy products /kefir, rennet cheeses 	<ul style="list-style-type: none"> sweets/ chocolate bar, sweet beverages (Fanta, Pepsi, Cola) dairy products /kefir, cottage cheeses
5	<ul style="list-style-type: none"> sweets/jellies, ice-creams, pastry dairy products/milk, yoghurt 	<ul style="list-style-type: none"> sweets/ chocolate bar, sweet beverages (Fanta, Pepsi, Cola) dairy products /kefir, cottage cheeses 	<ul style="list-style-type: none"> sweets/ sweet beverages (Fanta, Pepsi, Cola) chewing gum dairy products /kefir, cottage cheeses, rennet cheeses
6	<ul style="list-style-type: none"> sweets/jellies pastry, sweet beverages (Fanta, Pepsi, Cola) products/milk, yoghurt, rennet cheeses 	<ul style="list-style-type: none"> sweets/ sweet beverages (Fanta, Pepsi, Cola) dairy products /kefir 	<ul style="list-style-type: none"> sweets / muesli bar dairy products /kefir, cottage cheeses

changes was observed in the study. The younger children most often did not know, and had never eaten, broccoli or cauliflower, but the same was true for pepper, onion, parsnip, carrot, lettuce and radish (Table 5). The highest degree of acceptance was observed for such vegetables as cucumber, carrot, tomato, potato and, for a half of the four-year olds, also lettuce and radish. Traditional aversion was recorded with reference to such vegetables as parsnip and cauliflower (over 40% of the examined group) and pepper, onion and radish (37%-42% of the group). In the group of older children, the amount of accepted vegetables increases and, at the same time, aversions of the traditional type are observed with regard to all presented vegetables. Children also demonstrate cognitive aversion, rejecting such vegetables as tomato (about 36% of the five-year old), radish, pepper, onion (about 29% of five-year-old children), parsnip, onion and cauliflower (more than 14% of the examined five-year-olds), although they have never eaten those vegetables. Six-year-old children in the definitely high rate accepted all vegetables demonstrated. Traditional aversions were observed mainly with reference to cauliflower (25-42% of the examined group), while cognitive aversion was also related to the consumption of cauliflower and parsnip. Those products are definitely more often accepted by boys. Openness to taste in children decreases after the twelfth month of life, therefore the possible occurrence of cognitive aversions is typical, particularly for the period between the second and sixth years of life. It might be assumed that introduction of new tastes to the diet by the carers and the creation of new flavour combinations can make it possible to increase the taste preferences of children, which is particularly important for increasing the consumption of vegetables [5, 14]. The degree of product acceptance demonstrated by the children and

the degree of acceptance of those products indicated by parents differed. In the parents' opinion, the diet of their children included a great majority of the vegetables indicated, and those vegetables were accepted by the children, although six-year-olds declared traditional and cognitive aversion and a reduced preference towards the vegetables in question.

Fruits

The dietary patterns in early childhood are related to the introduction of fruits and juices made of easily digestible, non-allergic fruits to the child's diet. This unquestionably affects the dietary preferences of pre-schoolers and is particularly visible in the youngest children. Four-year-old children like fruit, indicating bananas, grapes, pears and apples as particularly liked (Table 5). Other fruits of preference included oranges, kiwis, lemons, cherries and plums, introduced to the child's diet in a later stage. Fruits of this last group are also most often indicated as unknown, not previously consumed. Five- and six-year-old children demonstrate a high and diversified degree of fruit acceptance. In those groups, aversions of the traditional type were observed in relation to almost every fruit indicated, while a determining aspect is generally the taste, the consistence and, sometimes, the smell of the fruit. Cognitive aversions were also recorded; such relations were observed towards seasonal fruits, mainly sour cherries and plums, neutral reactions of children were additionally observed towards well-known and accepted fruits - apples, pears, but also in relation to kiwi and lemons. Declarations of parents and children as regards fruit preferences were similar, with a negative relation demonstrated by children most often towards sour cherries, plums, kiwi as well as apples and pears.

Table 5. Food preferences and dietary aversions to vegetables, fruits and fast-food products

Child's age (years)	Food preferences	Dietary aversions	
		traditional Group / food products	cognitive
4	<ul style="list-style-type: none"> vegetables/cucumber carrot, tomato, potato fruits/ banana, grapes, pear, apple fast- food/chips, pizza 	<ul style="list-style-type: none"> vegetables/ parsnip, cauliflower, pepper, onion, radish fruits/ plum, cherry fast- food/grilled cheese baguette 	<ul style="list-style-type: none"> vegetables/broccoli cauliflower, onion, pepper fruits/ lemon, kiwi, plum, cherry fast- food/hot-dog, grilled cheese baguette, hamburger, crisps
5	<ul style="list-style-type: none"> vegetables / cucumber carrot, potato fruits/ orange, apple fast- food/ chips, crisps 	<ul style="list-style-type: none"> vegetables/parsnip, broccoli fruits/ lemon, plum fast- food/hot-dog, grilled cheese baguette 	<ul style="list-style-type: none"> vegetables / tomato, radish, pepper, onion fruits/ plum, cherry fast -food/ hamburger, grilled cheese baguette, puff snacks
6	<ul style="list-style-type: none"> vegetables/ carrot, pepper, cucumber, tomato, onion fruits/ banana, grapes fast- food/ chips, crisps, pizza 	<ul style="list-style-type: none"> vegetables/ broccoli, cauliflower, parsnip fruits/ lemon, kiwi, plum fast- food/ grilled cheese baguette, hamburger 	<ul style="list-style-type: none"> vegetables/ cauliflower, parsnip fruits/ cherry, plum, lemon fast food/hot-dog, hamburger, grilled cheese baguette

Fast food

Fast food includes food products commonly regarded as unhealthy. Therefore, they should not make up an element of the child's diet and such recommendations in educational programmes are addressed to parents and educators. However, a high preference level was found for this type of food (Table 5). It was observed that each product in this group was liked by more than 50% of the examined sample. If the salty or umami taste, typical for fast-food products, is known, the acceptance of products from this group also increases. The most-liked products included chips and pizza, and the highest dislike was declared by children towards puffy snacks. Among four-year olds, cognitive aversions were recorded towards hot-dogs, grilled cheese baguettes, hamburgers and crisps. Overweight children did not consume (or significantly reduced the intake of) products from this group and sex was not a factor determining the choice of the product. About 7% of the examined five-year olds demonstrated cognitive aversions towards hamburgers, grilled cheese baguettes, pizza and puffy snacks. Six-year-old children definitely showed the highest preference for chips and crisps. This group also included children who have never eaten and do not know the taste of hot-dogs (42% of the group), hamburgers (25%), grilled cheese baguettes (about 17%) and chips (over 8%). A small share (about 8%) of six-year-old children were neutral towards fast-food products. The youngest children had a negative relation most often towards crisps and grilled cheese baguettes, while in the older groups these products most often included puffy snacks and hot-dogs. The point of view of the parents on preferences concerning this product group did not differ from children's declarations. The observed emotional, behavioural or interventional selective consumption of products or dishes, without body weight loss, is generally perceived as a standard behaviour of children, while early detection of problems related to improper dietary habits and preferences can prevent the development of many health disorders in further stages of child development [4, 6, 7, 15].

It was observed that children at pre-school age chose a product they knew when confronted with the group of products differing in taste. Therefore, they often preferred products with a sweet taste, which is known and accepted. In the examined group of pre-school children, fast-food was preferred to a significant degree. The study did not demonstrate any differences in preferences depending on sex. The role of the dietary attitudes of parents and carers must be also emphasized. Introduction of new tastes to the diet by the carers and the creation of new flavour combinations can make it possible to increase the taste

preferences of children. Dietary education of parents, carers and children is a necessary element in building proper attitudes and dietary behaviours, because food aversions can contribute to reduced consumption of food products and result in nutritional deficiencies, having an impact on the psychosomatic development and cognitive abilities of the child.

CONCLUSIONS

1. A high level of preference was observed in relation towards sweet and fast food products and a low acceptance level for selected vegetables, fruits and dairy products.
2. Traditional and cognitive food aversions was observed towards kefir, cheeses and the most of vegetables.

Conflict of interest

The authors declare no conflict of interest.

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