

CONCEPTUAL MODEL OF CONSUMER'S WILLINGNESS TO EAT FUNCTIONAL FOODS

Ewa Babicz-Zielinska^{1*}, Maria Jezewska-Zychowicz²

¹Department of Trade and Services, Gdynia Maritime University, Gdynia, Poland

²Department of Organization and Consumption Economics, Warsaw University of Life Sciences, Warsaw, Poland

ABSTRACT

Background The functional foods constitute the important segment of the food market. Among factors that determine the intentions to eat functional foods, the psychological factors play very important roles. Motives, attitudes and personality are key factors. The relationships between socio-demographic characteristics, attitudes and willingness to purchase functional foods were not fully confirmed. Consumers' beliefs about health benefits from eaten foods seem to be a strong determinant of a choice of functional foods.

Objective The objective of this study was to determine relations between familiarity, attitudes, and beliefs in benefits and risks about functional foods and develop some conceptual models of willingness to eat.

Material and methods The sample of Polish consumers counted 1002 subjects at age 15+. The foods enriched with vitamins or minerals, and cholesterol-lowering margarine or drinks were considered. The questionnaire focused on familiarity with foods, attitudes, beliefs about benefits and risks of their consumption was constructed. The *Pearson's* correlations and linear regression equations were calculated.

Results The strongest relations appeared between attitudes, high health value and high benefits, ($r = 0.722$ and 0.712 for enriched foods, and 0.664 and 0.693 for cholesterol-lowering foods), and between high health value and high benefits (0.814 for enriched foods and 0.758 for cholesterol-lowering foods). The conceptual models based on linear regression of relations between attitudes and all other variables, considering or not the familiarity with the foods, were developed.

Conclusions The positive attitudes and declared consumption are more important for enriched foods. The beliefs on high health value and high benefits play the most important role in the purchase. The interrelations between different variables may be described by new linear regression models, with the beliefs in high benefits, positive attitudes and familiarity being most significant predictors. Health expectations and trust to functional foods are the key factors in their choice.

Key words: *functional food, attitudes, beliefs, psychological factors*

STRESZCZENIE

Wprowadzenie. Żywność funkcjonalna stanowi ważny segment rynku żywności. Wśród czynników determinujących intencje spożycia żywności funkcjonalnej, jednym z ważniejszych są czynniki psychologiczne, jak motyw, postawy i osobowość. W literaturze przedmiotu zależności między cechami społeczno-demograficznymi, postawami i chęcią zakupu żywności funkcjonalnej nie zostały w pełni potwierdzone. Wiara konsumentów względem korzyści zdrowotnych wynikających ze spożywania takiej żywności, wydają się silną determinantą wyboru żywności funkcjonalnej.

Cel. Celem badania było określenie zależności między znajomością, postawami i wiarą respondentów w korzyści lub ryzyko zdrowotne wynikające ze spożycia żywności funkcjonalnej oraz opracowanie modeli konceptualistycznych chęci jej zakupu.

Material i metody. Badania przeprowadzono na reprezentatywnej próbie polskich konsumentów w wieku 15 lat i więcej. Badania przeprowadzono w oparciu o ankietę zawierającą pytania dotyczące znajomości, postaw oraz wiarę w korzyści i ryzyko wynikające ze spożycia żywności wzbogaconej w witaminy i składniki mineralne oraz margaryn i napojów obniżających poziom cholesterolu. Obliczono współczynniki korelacji *Pearsona* i równania regresji liniowej.

Wyniki. Najsilniejsze korelacje wystąpiły między postawami, a poglądami w wysoką wartość odżywczą i korzyściami wynikającymi z wprowadzenia do jadłospisu żywności funkcjonalnej (odpowiednio $0,722$ i $0,712$ dla żywności wzbogaconej oraz $0,664$ i $0,693$ dla żywności o obniżonej zawartości cholesterolu), a także między poglądami w wysoką wartość odżywczą i korzyściami z wprowadzenia do jadłospisu ($0,814$ dla żywności wzbogaconej oraz $0,758$ dla żywności o obniżonej zawartości cholesterolu). Opracowano modele konceptualistyczne bazujące na liniowej regresji między postawami i wszystkimi innymi zmiennymi; pierwszy uwzględniający znajomość żywności funkcjonalnej, drugi nie biorący pod uwagę tego czynnika.

* **Corresponding author:** Ewa Babicz-Zielinska, Department of Trade and Services, Gdynia Maritime University, Morska 81/87, 81-225 Gdynia, Poland, phone +48 501329368, e-mail: e.babicz-zielinska@wpit.am.gdynia.pl

Wnioski. Pozytywne postawy i deklarowane spożycie były bardziej istotne dla żywności wzbogaconej. Wiara w wysoką wartość odżywczą tej żywności i korzyści wynikające z jej spożycia, odgrywały najważniejszą rolę w chęci zakupu. Zależności między zmiennymi mogą zostać opisane nowymi modelami regresji liniowej, w których najważniejszymi predyktorami są: wiara w korzyści wynikające ze spożycia żywności funkcjonalnej, pozytywne postawy i znajomość tej żywności. Oczekiwania zdrowotne i zaufanie do żywności funkcjonalnej są kluczowymi kryteriami w jej wyborze.

Słowa kluczowe: *żywność funkcjonalna, postawy, wierzenia, czynniki psychologiczne*

INTRODUCTION

The functional foods constitute the important segment of the food market. They include foods enriched with some supplements enhancing the vitamin content, fortified with hydrocarbonates or proteins for sportsmen, lowering the cholesterol level in the case of cardiac diseases and fibre contained food proposed to lose the weight [24]. Among factors that determine the quantity and sort of food consumed, the psychological factors, like attitudes and beliefs, can play an important role. Four concepts were identified for functional foods: the nature of food, health benefits, functions and regular consumption, and two dimensions, physiological effects and functional intensity, were developed to define the frontiers of the functional food universe [11]. The perceived benefits and barriers of health foods are critical antecedents of continued consumption intention [32].

The important role of attitudes was evaluated for some functional foods. The research made in Belgium, France, U.S.A. and Japan [23] showed the national differences possibly influencing the health condition, in worry about food, the degree of consumption of foods modified to be "healthier", the importance of food as a positive force in life, the tendency to associate foods with nutritional vs. culinary contexts, and satisfaction with the healthiness of one's diet. Purchase decisions were almost exclusively determined by attitudes towards purchasing the products. As the most important consequences motivating people to consume functional food the following were recognized: the health effects of proper nutrition resulting from consciousness-raising actions promoting health; and the joy of eating and improvement of the appearance. When it comes to the most important motivating factors, good health, long harmonious life and self-esteem were included [16]. In a study on attributes of probiotic functional foods, namely base product (yoghurt, orange juice and biscuits), health claim (generic, psychological and prevention), price (high, regular and low) and brand (familiar and unfamiliar), the consumers considered the base product as the most important attribute in selecting a probiotic functional food and assessed prevention claim as the most valuable [1].

Consumers' beliefs about health benefits from eaten foods seem to be a strong determinant of a choice of functional foods [20, 22, 34]. There is evidence that more consumers want to make dietary changes for the health-

oriented behaviours [7, 9, 13, 30]. Nevertheless, some unexpected factors may be substantial [8]; for example, people without regular access to a car were more likely to purchase white bread compared to that with health-promoted ingredients, and full-cream milk against to the milk more beneficial for health. The barriers to improving dietary quality included: (i) unhealthy foods marketed in low-income communities; (ii) high cost of healthy foods; and (iii) lifestyle challenges faced by low-income individuals [27]. The expressed need for functional food affected the willingness to use probiotic yoghurt low-fat mayonnaise [14].

The significant effect of conservative attitudes was observed [10]: deeper distrust in formal institutions among Russian consumers resulted in high levels of food neophobia as consumers perceived traditions as the most important guarantee of healthy food. On the other hand, German participants indicated some trustworthy formal institutions through which information concerning novel and healthy attributes in foods could be communicated. Also, the acceptance and willingness to pay were observed to be inversely related to the neophobia degree among older adults in Canadian population [25].

So far research revealed that the gender and age were important in an acceptance of functional foods [3]. Women were more interested than men in functional foods and their impacts on health, and they were more likely to include such foods in the daily diet [6, 29]. Women's interest in functional foods could be attributed to a variety of reasons; women are often responsible for family for food purchase [5], they especially take care of feeding the children [18] or family members suffering from different causes [29]. Young people, in particular, women, looked for food that could help to control their appetite and body weight, while older consumers demanded foods that would help to lower their cholesterol and blood pressure [17, 31]. The recent study [2] showed more specifically the existence of significant barriers to acceptance of functional foods and their use by older consumers, namely a price sensitivity, availability and general scepticism about the reliability of the information provided by food manufacturers. In other research [28], the specific socio-demographic variables (like gender, age, presence of kids in the household and the need to follow a specific diet) positively affected the willingness to pay for functional and organic yoghurts. *Niva* and *Makela* [21] surveying

the Finnish subjects showed that the differences in consumer views of functional foods were to some extent linked with but better explained by the differing roles of food and health in people's lives and the acceptability of modern food technologies. In a study of the propensity of male consumers to consume functional food and/or nutraceutical, the age and knowledge of health and/or nutrition were significant explanatory variables [12].

In Poland such studies have mainly focused on dietary supplements [26, 33] and effect of education on knowledge level about functional foods [19] rather than on psychological determinants. The purpose of this study was to describe quantitatively the relations between consumers' attitudes and beliefs about risks and benefits, familiarity with foods, and willingness to eat for two important and seldom considered functional food groups: foods enriched with vitamins or minerals, and cholesterol-lowering margarine or drinks. The found relations were expressed by linear regression equations. The results were used to develop a new conceptual model.

MATERIAL AND METHODS

The data for this study come from a survey conducted by a reputable Polish marketing research company TNS OBOP. A total sample of 1002 Polish consumers was recruited using a random selection route, i.e. the starting addresses were drawn and then the designated addresses were selected in their immediate vicinity, according to strictly defined rules, with no survey at the starting point. The data were collected from participants through a pen and paper questionnaire. The representative group of Polish citizens above 15 years of age (28.2% at age 15-29 yrs., 32.6% at age 30-50 yrs. and 39.2% at 50+) counted 47.8% of males and 52.2% females was recruited.

The questionnaire included questions concerning two types of functional foods: (i) foods enriched with vitamins or minerals, and (ii) cholesterol-lowering margarine or drinks. Participants were asked to declare their familiarity with each category of food. They could use two answers: "yes" or "no" to the question "Are you familiar with the foods enriched with vitamins or minerals, and cholesterol-lowering margarine or drinks?".

Participants were also asked to consider their opinions on "I have a positive attitude towards foods enriched with vitamins or minerals / cholesterol-lowering margarine or drinks". To answer this question, a 5-point scale from 1 (strongly disagree) to 5 (strongly agree) was used. To determine participant's beliefs about health value, benefits and risks from both functional foods, the participants were then asked to express their opinions related to the following statements: "I have positive attitude towards foods (enriched with vitamins or minerals / cholesterol-lowering margarine or drinks)", "These foods have positive health value", "There are positive benefits from implementation of food into the diet", and "There is a high risk of eating such foods". The 5-point scales were used: 1 - strongly disagree, 2 - disagree, 3 - neither disagree nor agree, 4 - agree, 5 - strongly agree. In the case of all statements the answer "no opinion" was possible. When the data were analyzed, the answers "no opinion" were excluded.

The willingness to eat both functional products was measured using following question: "How willing would you be to eat foods enriched with vitamins or minerals (cholesterol-lowering margarine or drinks) next year?". The response format was on a 5-point scale from 1 (not very willing) to 5 (very willing).

Statistical analyses used SPSS 14.0 software. The descriptive statistics for both groups of functional foods and bivariate correlation matrices for each variable were prepared. *Pearson's* correlation coefficients were computed to investigate the relationship between variables. Linear regression analyses were used to find significant predictors of the willingness to eat both groups of functional products. A *p*-value of <0.05 was taken as significant.

RESULTS

In Figure 1 the familiarity with both groups of functional foods in the examined sample is presented. Both in the whole sample, as well as in groups of women and men, more participants were familiar with foods enriched with vitamins or minerals than with cholesterol-lowering foods or drinks.

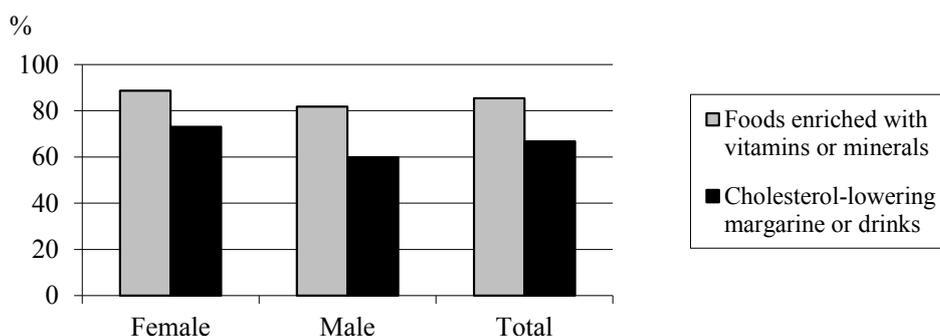


Figure 1. Familiarity with both type of functional foods according to participants' gender (%)

The participants were more willing to eat enriched foods than cholesterol-lowering foods (Figure 2). Mean values expressing willingness to eat both types of functional foods differed significantly ($F(4, 1999) = 136.574, p < 0.001$).

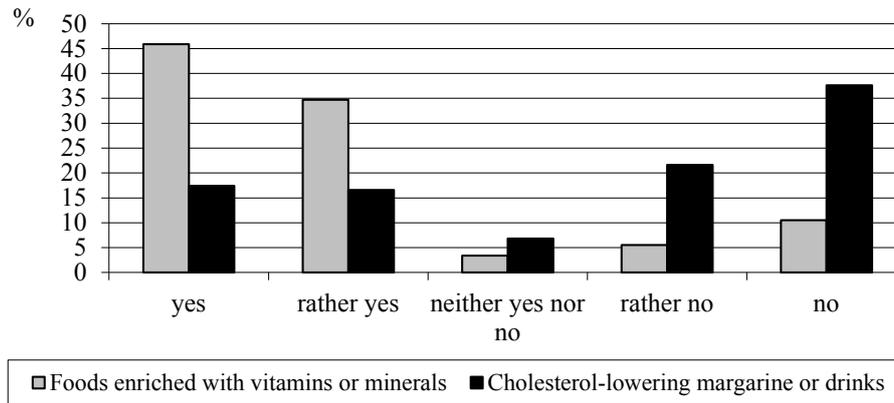
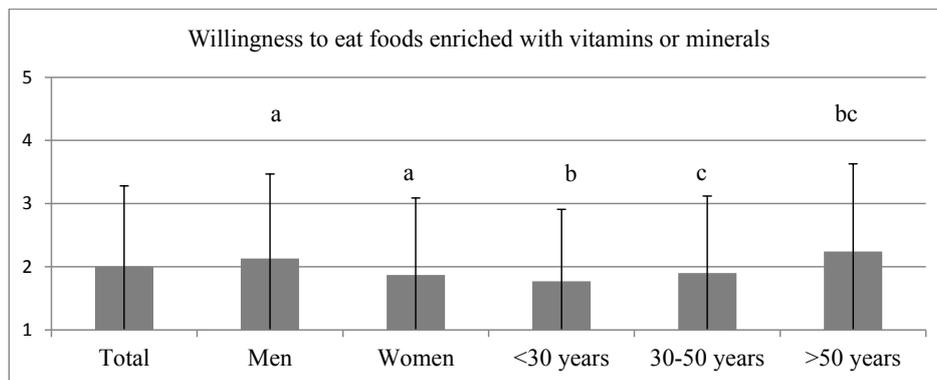


Figure 2. Declared willingness to eat both types of functional foods in the population (%)

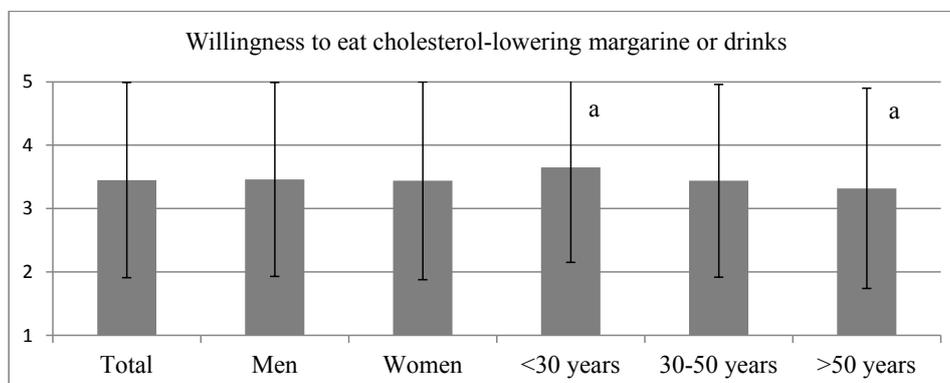
The declared willingness to eat foods enriched with vitamins or minerals, as shown in Figure 3, differed significantly regarding to gender ($F(1, 999) = 10.571, p = 0.001$) and age ($F(2, 998) = 12.796, p < 0.001$). Women and younger people were more willing to eat such food.



a,b,c Means with the same superscripts differ significantly (ANOVA, $P \leq 0.05$). Means from 1002 participants and based on a 5-point hedonic scale (1 = yes, I am willing; 5 = no, I am not willing).

Figure 3. Declared willingness to eat foods enriched with vitamins or minerals according to gender and age (mean value; standard deviation)

In the case of cholesterol-lowering foods, the differences were related to age ($F(2, 998) = 3.725, p = 0.024$). People at 50+ age were more willing to eat cholesterol-lowering margarine and drinks than those below 30 yrs. (Figure 4).



a,b,c Means with the same superscripts differ significantly (ANOVA, $P \leq 0.05$). Means from 1002 participants and based on a 5-point hedonic scale (1 = yes, I am willing; 5 = no, I am not willing).

Figure 4. Declared willingness to eat cholesterol-lowering margarine or drinks according to gender and age (mean value; standard deviation)

The descriptive statistics for both functional foods and bivariate correlation matrices for each variable are presented in Tables 1 and 2. All variables were

significantly correlated with the willingness to eat both groups of functional foods except for gender in the case of cholesterol-lowering margarine or drinks.

Table 1. Descriptive data for measures for foods enriched with vitamins or minerals

	M	SD	N	1.	2.	3.	4.	5.	6.	7.	8.
1. Age	43.8	18.8	1002	1.000							
2. Gender	1.52	0.50	1002	0.075 ^a	1.000						
3. Positive attitude	2.12	0.98	966	0.120 ^c	-0.069 ^a	1.000					
4. High health value	2.04	0.91	962	0.108 ^c	-0.021 ^{ns}	0.722 ^c	1.000				
5. High benefits	2.10	0.94	951	0.060 ^{ns}	-0.083 ^b	0.712 ^c	0.814 ^c	1.000			
6. High risk	3.61	1.12	952	-0.122 ^c	0.063 ^{ns}	-0.369 ^c	-0.348 ^c	-0.315 ^c	1.000		
7. Familiarity	1.14	0.35	1002	0.168 ^c	-0.097 ^b	0.335 ^c	0.287 ^c	0.273 ^c	-0.241 ^c	1.000	
8. Willingness to eat	1.99	1.28	1002	0.177 ^c	-0.102 ^b	0.568 ^c	0.522 ^c	0.552 ^c	-0.266 ^c	0.521 ^c	1.000

M = mean value; SD = standard deviation; N = numbers of respondents;

^{ns} not statistically significant, ^a statistically significant (p<0.05); ^b statistically significant (p<0.01); ^c statistically significant (p<0.001)

Table 2. Descriptive data for measures for cholesterol-lowering margarine or drinks

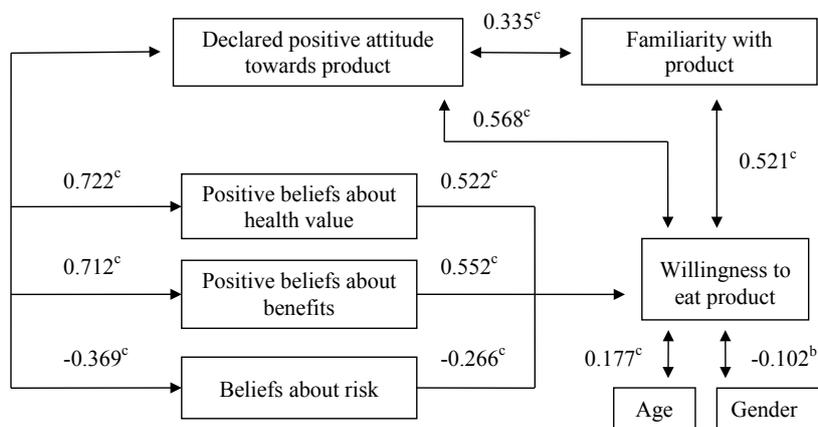
	M	SD	N	1.	2.	3.	4.	5.	6.	7.	8.
1. Age	43.8	18.8	1002	1.000							
2. Gender	1.52	0.50	1002	0.075 ^a	1.000						
3. Positive attitude	2.61	1.00	806	0.020 ^{ns}	-0.050 ^{ns}	1.000					
4. High health value	2.51	1.01	817	-0.023 ^{ns}	-0.066 ^{ns}	0.693 ^c	1.000				
5. High benefits	2.55	1.06	808	-0.047 ^{ns}	-0.037 ^{ns}	0.664 ^c	0.758 ^c	1.000			
6. High risk	3.46	1.06	797	-0.073 ^a	0.074 ^a	-0.182 ^c	-0.295 ^c	-0.245 ^c	1.000		
7. Familiarity	1.33	0.47	1002	0.049 ^a	-0.139 ^c	0.198 ^c	0.209 ^c	0.185 ^c	-0.204 ^c	1.000	
8. Willingness to eat	3.45	1.54	1002	-0.081 ^a	-0.006 ^{ns}	0.415 ^c	0.345 ^c	0.361 ^c	-0.089 ^a	0.222 ^c	1.000

M = mean value; SD = standard deviation; N = numbers of respondents;

^{ns} not statistically significant, ^a statistically significant (p<0.05); ^b statistically significant (p<0.01); ^c statistically significant (p<0.001)

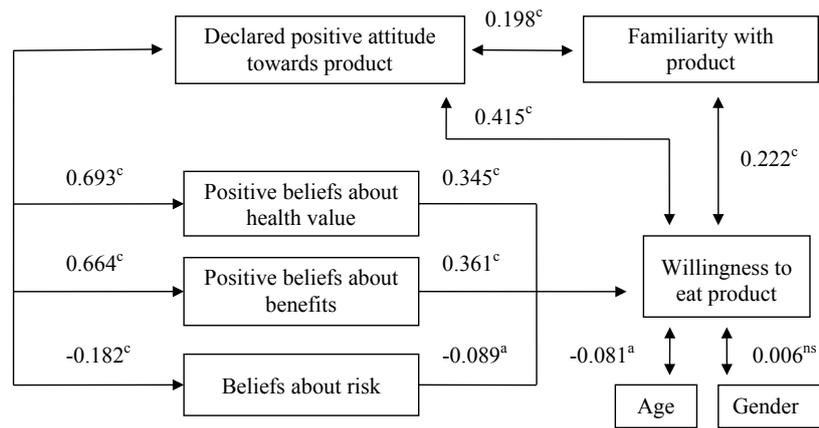
The strong correlations were observed for declared attitudes, beliefs on health value, benefits, familiarity and willingness to eat foods enriched with vitamins or minerals (Figure 5). Weaker correlations were observed in the case of cholesterol-lowering margarine or drinks

(Figure 6). Opinions on risks from consumption of both functional foods negatively correlated with declared willingness to eat food. Simultaneously, these correlations were weak, especially for cholesterol-lowering foods.



^a statistically significant (p<0.05); ^b statistically significant (p<0.01); ^c statistically significant (p<0.001)

Figure 5. Correlations between variables from the conceptual model for food enriched with vitamins and/or minerals



^{ns} not statistically significant ^a statistically significant ($p < 0.05$); ^b statistically significant ($p < 0.01$); ^c statistically significant ($p < 0.001$)

Figure 6. Correlations between variables from the conceptual model for cholesterol-lowering margarine and drinks

Three regressions were established to examine the effect of the impact of all variables included in the conceptual model of the willingness to eat. Because the inclusion of age and gender did not alter the final results of the regression, these variables were excluded from the analysis. Finally, two regressions were used for each functional food.

The effects of participants' beliefs and their familiarity with foods enriched with vitamins or minerals on declared willingness to eat these foods next year are shown in Table 3. Model 1 comprising opinions on high health value, high benefits, high risk and positive attitude was significant at $R^2=0.369$,

$F(4,929) = 518.394$, $p < 0.001$. Nevertheless, the Model 2 integrating, also, the familiarity with these foods, predicted better-declared willingness to consume enriched foods next year, $R^2=0.466$, $F(5,928) = 654.899$, $p < 0.001$. Also, the familiarity with these foods predicted better-declared willingness to consume foods enriched with vitamins or minerals next year, $R^2=0.466$, $F(5,928) = 654.899$, $p < 0.001$. The predictors of the willingness to eat these foods, in this case, were opinions on benefits, declared attitude towards these foods, and familiarity with them, but the strongest predictors were the beliefs on benefits from consumed foods with added vitamins or minerals.

Table 3. Linear regression analysis predicting willingness to eat food enriched with vitamins or minerals

Model	Variable	<i>B</i>	<i>SE</i>	β
1	High health value	0.117	0.065	0.087
	High benefits	0.336	0.061	0.257 ^c
	High risk	-0.054	0,031	-0.050
	Positive attitude	0.377	0.051	0.297 ^c
2	High health value	0.085	0.060	0.064
	High benefits	0.329	0.057	0.251 ^c
	High risk	-0.008	0.029	-0.007
	Positive attitude	0.285	0.048	0.225 ^c
	Familiarity	0.236	0.095	0.334 ^c

^c statistically significant ($p < 0.001$)

In the case of cholesterol-lowering margarine or drinks, the Model 1 was also significant: $R^2=0.190$, $F(4, 768) = 389.191$, $p < 0.001$. Model 2, including familiarity with these foods, predicted significantly better the willingness to consume cholesterol-lowering margarine or drinks, $R^2=0.209$, $F(5,767) = 415.760$, $p < 0.001$. The predictors of the willingness to eat these

foods were opinions on benefits, declared positive attitudes towards these foods, and familiarity with them. However, the declared positive attitude and the familiarity with cholesterol-lowering margarine or drinks were more strongly correlated with the willingness to eat them than beliefs on benefits (Table 4).

Table 4. Linear regression analysis predicting willingness to eat cholesterol-lowering margarine and/or drinks

Model	Variable	B	SE	β
1	High health value	0.081	0.087	0.051
	High benefits	0.203	0.078	0.135 ^b
	High risk	0.005	-0.051	0.004
	Positive attitude	0.472	0.076	0.293 ^c
2	High health value	0.063	0.086	0.040
	High benefits	0.200	0.077	0.132 ^b
	High risk	0.040	0.075	0.026
	Positive attitude	0.449	0.051	0.279 ^c
	Familiarity	0.508	0.118	0.143 ^c

^b statistically significant ($p < 0.01$); ^c statistically significant ($p < 0.001$)

DISCUSSION

The lower familiarity with cholesterol-lowering foods than with enriched foods can be a result both of a price impact, and real needs or trust. The prices of cholesterol-lowering margarine or drinks are usually much higher than prices of food enriched with vitamins or minerals. The familiarity with foods and the willingness to eat them positively correlate with the declared attitudes on these foods, as already observed [15]. In an earlier study carried out among people not taking functional foods, a lack of knowledge, and small perception of importance and interest in functional foods were observed, with a price as the main determinant when deciding buy or not such a food [20].

The perception of high risk from eating of enriched foods was not significantly correlated with the declared willingness to eat them. In previous research [22] the perceived risk was a negative predictor of the willingness to eat functional foods, but in another study [27] even if the consumers were aware of the risks associated with consumption of functional foods, this would not affect their intentions to take them. As concerns the possible risks in this study, more people who were not familiar with both groups of food, confirmed an existence of a large risk associated with their consumption.

It is surprising that a considerable percentage of people recognised as risky the eating of cholesterol-lowering foods. It can be assumed that knowledge about the role of such foods in the prevention of diseases in modern society is still insufficient.

The significant fraction of subjects agreed on the positive health value of foods enriched with vitamins or minerals (28.9%), and cholesterol-lowering margarine or drinks (16.2%). Other beliefs were presented by persons who were unfamiliar with these foods or by people aware of risks associated with an excessive intake of certain minerals and vitamins, resulting from e.g. uncontrolled switching fortified foods to the diet. Only small fraction of interviewed persons, who did

not know the enriched and cholesterol-lowering foods, pointed to the benefits and health value of these foods. It may be a consequence of the lack of knowledge about functional foods.

The positive attitudes and declared consumption towards the enriched foods are significantly more important than those for cholesterol-lowering foods. The enriched food is according to beliefs of subjects characterised by higher health value, greater benefits resulting from its implementation into the diet and lower risk as compared to the cholesterol-lowering foods. This tendency can be related to knowledge and importance of foods enriched with vitamins or minerals among both young and old people, due to the high promotion of these products, which may be even totally unimportant at well-balanced diets.

The use of *Pearson* coefficient for determination of the correlation between different nutritional measures was already proposed and justified for qualitative scales, which can be quantified [4]. Based on that, a strong significant correlation between beliefs of consumers and their attitudes for both food categories was found, but only a weak dependence on attitudes and declared eating frequency. This observation may support the argument that consumers take into account the perceived necessity of the product and its price when deciding on its purchase and consumption.

The correlations between declared eating frequency and beliefs on the health profits and benefits from eating were only moderate and weaker than relations between the declared attitudes and beliefs. This difference is not surprising because the beliefs constitute the cognitive component of attitude while the relationship between attitudes and behaviour may be strongly influenced by other factors such as a price, availability, etc. It seems that such statement is valid for the tested sample and likely for the whole population of Poland and other countries of the similar economy, in which the relationships between eating frequency and declared attitudes appear relatively weak. The more positive perception of health profits and the eating benefits for this food, the more positive attitude and declared

consumption frequency. The beliefs on the major risks associated with the consumption of functional foods were inversely correlated with the eating frequency. Thus, the perceived risk had a negligible effect on the expressed behaviour of consumers.

CONCLUSIONS

1. The familiarity of food is positively correlated with the positive attitudes towards this food demonstrating the adverse effect of neophobia on preferences. The lower familiarity with cholesterol-lowering foods about foods enriched with vitamins or minerals can be a result of the price impact.
2. The perception of high risk from eating of enriched foods is not significantly correlated with the declared willingness to purchase them. More people who were not familiar with both groups of food confirmed an existence of a large risk associated with their consumption.
3. The significant fraction of subjects agreed on the positive health value of foods enriched with vitamins or minerals and cholesterol-lowering margarine or drinks. Other beliefs were presented by persons who were unfamiliar with these foods or by people aware of risks associated with an excessive intake of certain minerals and vitamins. The positive health expectations for functional foods and trust to them are key factors in a desire to take them.
4. The familiarity perceived benefits and declared attitudes towards enriched foods are significant predictors of the willingness to eat them, but these factors are better predictors in the case of foods enriched with vitamins or minerals, more familiar to consumers.

Conflict of interest

The authors declare no conflict of interest.

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