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Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Willingness to eat bread with health benefits: habits, taste and health in bread choice

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ARTICLE INFO

Article history:
Received 20 March 2018
Received in revised form
12 October 2018
Accepted 29 October 2018
Available online 12 January 2019

Keywords:
Bread consumption
Purchasing behaviours
Health benefits
Taste

ABSTRACT

Objectives: The association between the perceived importance of taste and health benefits and bread-eating habits is still not well recognized referring to products with the improved health value, in particular when it comes to the character of the health modification applied in the food product. In many populations, the crucial issue is to decrease the intake of salt and to increase the intake of fibre in the diet; therefore, modifications in foods concern these components. Thus, the aim of the study was two-fold: (1) to determine the association between the actual consumption of bread and the willingness to eat the bread with the decreased level of salt and the bread with the increased level of fibre; and (2) to determine whether and in what way the perception of the importance of taste and health benefits of bread are linked with the willingness to eat bread with the improved health benefits.

Study design: The survey was conducted using computer-assisted personal interviews.

Methods: The survey was conducted in October 2014 among 1014 Polish consumers. To evaluate the consumption of bread, questions concerning (1) the frequency of eating white bread, white bread with added grains, bran and so on and wholemeal bread, and (2) the amount of consumed bread were asked. The logistic regression analysis was performed separately for bread with fibre addition and bread with reduced salt content. Only statistically significant variables were used in the models, using an automatic stepwise method.

Results: The results of the study showed that consumers who were more willing to eat bread with added fibre were those who paid more attention to health aspects, those who consumed more wholemeal bread and those who ate breads with grains more frequently. Participants declaring moderate and high importance towards health benefits were more willing to eat bread with increased fibre content than those declaring minor importance of health benefits when choosing bread. Among consumers who were more willing to eat bread with reduced salt content, they were mainly those who ate more wholemeal bread. Participants for whom the taste was important and moderately important were less willing to eat bread with reduced salt content compared with those who considered this attribute as unimportant. When it comes to people who were less willing to eat bread with added fibre, they ate white bread more frequently and consumed bigger amounts of it. Those who

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https://doi.org/10.1016/j.puhe.2018.10.018

were less interested in bread with reduced salt content declared consuming more white bread. Among them, there were also men and people for whom the taste of bread was crucial.

Conclusions: It is necessary to increase the consumers' awareness of the health benefits of a product change and to gain their acceptance for the changed taste. The strength of this study is the measure of the amount of bread consumed by consumers as a variable that can be associated with the willingness to eat bread with improved health benefits. Results of our study may be valuable for undertaking activities referring to the public health, including educational activities aimed at the consumers. Thus, a public health campaign is needed to encourage Polish consumers to use less salt and more dietary fibre, which seems to increase the importance of health reasons instead of taste in the selection of bread. The outcomes can also be used by the companies operating on the food market with a particular emphasis on the bread offer to develop communication strategies, including the proper and clear information about the level of salt and fibre content. Moreover, food companies and consumer organisations should exert pressure on the government for greater support for product reformulation, for example, in the form of regulation, enforcing companies to reformulate their products. In fact, a proper policy emphasis on mandatory reformulation to reduce salt in processed foods is likely to be an effective and inequality-reducing route to improve the population health.

Introduction

In recent years in Poland, a decrease in the consumption of bread has been observed accompanied by simultaneous slow changes in consumption patterns involving an increased consumption of wholemeal bread.[1] Nevertheless, in Poland, similarly to many Western countries, the intake of dietary fibre is below the recommended levels which are associated with too low consumption of whole grains, fruits and vegetables.[2–4] Changes in consumers' perception of bread quality, their preferences and the increase in gluten-free diet popularity cause the decline of bread consumption.[5–7]

The improvement of bread health benefits may be achieved by increasing the fibre content and decreasing the salt content in white bread. These changes to bread are aimed at people who are not eager to modify their eating habits and/or who prefer white bread compared with wholemeal bread.[8] On the other hand, these changes may be accompanied by the deterioration of sensory qualities[9] that significantly affects the consumer's product acceptance.[10,11] The choice of breads is directly associated with the product (e.g. baking process) but also with the profile of consumers and the way they view the bread health benefits.[10,12–14]

In the literature, the importance of fibre in preventing the development of non-communicable diseases is emphasized.[15–17] Thus, some consumers may seek products containing fibre because of its health benefits.[18–20] Research also indicates that increasing the amount of fibre by adding it to products that naturally contain fibre can increase the consumer's acceptance.[21] The preference for products rich in dietary fibre and the perception of the benefits of such enrichment as well as the experience with such products cause the greater acceptance of increased fibre content in white bread.[22]

Owing to the fact that the high sodium intake has raised concern all over the world, the reduction of salt consumption is recommended.[23,24] In the Western diet, bread and cereals contribute 30% of sodium (Na) to the daily intake.[25] The reduction of sodium in bread is, therefore, expected to lead to the significant health benefits.[26] On the one hand, the salt reduction in bread is difficult because of the important role of sodium chloride in bread making; however, the ingredient reformulation is being undertaken by food industry.[24,27] On the other hand, still relatively little known about consumers' acceptance of cereal products with the reduced amount of salt.[24,28,29] However, the amount of salt in bread had an impact on consumer preferences in some European countries.[27] Furthermore, reducing salt in products is often perceived as having an adverse effect on the taste, making it hard to encourage consumers to use these products without adding more salt back at the table.[30] It is suggested that the salt content in bread could be reduced, and after the adequate waiting time, consumers would adapt to sensory characteristics of the new product.[23]

Research results showed that consumers were unaware of how much salt they consumed. However, they were aware of the link between the high salt intake and certain negative health consequences, although they were unsure about the precise links. Consumption practices were largely driven by a habit and lifestyle choices rather than by health considerations.[31]

In the theoretical models of food choice, various factors were indicated as important. Shepherd[32] included those related to the food and the economic and social environment, whereas Grunert et al.[33] included the value perception (food-related lifestyle). The relationship between the importance of health attributes and the choice of food was confirmed in many studies.[34–36] Health and overall quality as motives for

food choice increased the tendency to consume fibre-fortified cereals.[37] Nevertheless, the perception of cereal products was also determined by other factors including, among other things, the type of product and the kind of applied modification[11,12] as well as sensory attributes and physicochemical properties of products.[11–13,38,39] In general, taste played a crucial role in directing consumers' food choices[40,41] including decisions regarding bread.[39,42]

Despite the observed decrease in the bread consumption, the modification to the composition of white bread is justified owing to its large share in the diet.[43] The low amount of fibre in bread made from white flour and the use of salt in its production result in bread being an insufficient source of fibre and an extensive source of salt in the diet.[7] Moreover, prohealthy modifications of food products are important not only for consumers but also for producers because they play the key role in food entrepreneurships' activities, e.g., participating in the policy debate or influencing the interpretation of evidence of nutrition.[44] Various aspects of products' modifications are also analysed by food companies to better understand the positive impact of ingredient's replacement on economic performance, from the perspective of both cost and revenue.[45] Therefore, the involvement of all stakeholders is required to successfully introduce new products with health-related attributes.[46] Because the introduction of new products to the market is a risky undertaking, it is important to know the willingness of consumers to buy such products.[7] Thus, the consumer's expectations should be taken into consideration when making decisions regarding the reformulation in the food market.[47–50]

Taking into account the existing food decision models,[32,33] the framework of our study included (1) the perception of values (e.g. health), (2) the importance of food attributes (taste) and (3) bread eating habits as the variables to be linked with the willingness to eat the bread with an improved health value. Therefore, the aim of the study was two-fold: (1) to determine the association between the actual consumption of bread and the willingness to eat the bread with the decreased level of salt and the bread with the increased level of fibre; and (2) to determine whether and in what way the perception of importance of taste and health benefits of bread are linked with the willingness to eat bread with the improved health benefits.

Methods

Study sample

The survey was conducted in October 2014, among a group of 1014 adult consumers using computer-assisted personal interviews. The selection of the sampling from the address survey of Central Statistical Office in Poland fulfilled the condition of representativeness of the general population for the Polish people older than 21 years in terms of age, gender and the size of the place of residence. The survey was conducted in each of the sixteen voivodeships in Poland. After drawing the starting addresses, the so-called method of random route was used in the selection of the sample.[51,52] Only the respondents who met two recruitment criteria, i.e. (a) being responsible for food purchases or making cooperative food purchases within the household (*Who does usually make food purchases in your household?; (1) Only me; (2) I make most of food purchases; (3) I sometimes make food purchases and sometimes somebody else does it; (4) Somebody else makes most of food purchases; (5) I never make food purchases*), and (b) eating at least two slices of bread a day (*How often do you eat bread?; (1) I eat 2 slices of bread or more several times during the day; (2) I eat bread one time during the day however at least 2 slices of bread; (3) I eat less than 2 slices of bread during the day*), participated in the study. Respondents who answered that they do not participate in the purchasing of food (*Somebody else makes most of food purchases* or *I never make food purchases*) and that they eat less than two slices of bread a day (*I eat less than 2 slices of bread during the day*) were excluded from the study. The detailed sociodemographic characteristics of respondents and all variables used in the analysis are presented in Table 1.

Consumption and willingness to eat bread

To evaluate the consumption of bread, questions concerning (1) the frequency of eating white bread, white bread with added grains, bran and so on and wholemeal bread (*How often do you eat the following types of bread?*) and (2) the amount of consumed bread (*How many portions of bread do you usually eat?*) were asked. The frequency of eating bread was measured on a 7-point scale, starting from 'I am not familiar with this product' (1), through 'I do not consume this product' (2), '1–2 times a month' (3), '1–2 times a week' (4), '3–5 times a week' (5), 'once a day' (6), to 'several times a day' (7). To assess the amount of bread consumed a day, the respondents were asked to indicate the number of eaten rolls and slices of bread, both made of refined/white and wholemeal flour. Four photographs of portions (one white roll, one wholemeal roll, one slice of white bread and one slice of wholemeal bread) were presented when a question: *How many portions of bread do you usually eat?* was asked. An amount of eaten bread in grams/person/day was calculated on the basis of the declared number of portions, the weight of the roll (50 g) and the weight of the slice (25 g).[53]

To assess the willingness to eat bread with added fibre and bread with reduced salt content, the following question was asked: *Would you like to buy the 'following product/s' if it was/were available in your corner shop?* The opinions were pointed on a 5-point scale, starting from 'no' (1), through 'rather not' (2), 'neither yes nor no' (3), 'rather yes' (4) to 'yes' (5).

Socio-economic variables were also collected and coded as numerical data as follows: gender—female (1) and male (2); education—lower than secondary (1), secondary (2) and higher (3); residence—village (1), town up to 100,000 inhabitants (2) and town with >100,000 inhabitants (3); declared economic situation—insufficient (1), sufficient for satisfying some needs (2) and sufficient for satisfying all needs (3).

Bread choice motives

To evaluate the role of some motives for bread choice, the respondents were asked to assess the importance of ten motives during the decision-making process while buying bread: taste,

Table 1 – The profile of the sample and the variables used in the analysis.

Variables		Number	%	Mean ± SD	Range
Gender					1–2
	Female	552	54.4		
	Male	462	45.6		
Place of residence					1–3
	Village	373	36.8		
	Town up to 100 thousand inhabitants)	314	31.0		
	Town with more than 100 thousand inhabitants	327	32.2		
Education					1–3
	Lower than secondary	294	29.0		
	Secondary	465	45.9		
	Higher	255	25.1		
Opinion about income					1–3
	Insufficient	202	19.9		
	Sufficient for satisfying some needs	578	57.0		
	Sufficient for satisfying all needs	234	23.1		
Age in years				42.6 ± 16.4	18–87
	25 years old or less	204	20.2		
	26–35 years old	208	20.5		
	36–45 years old	189	18.6		
	46–55 years old	146	14.4		
	More than 55 years old	267	26.3		
Importance of taste as choice motive				3.7 ± 2.7	1–10
Importance of health benefits as choice motive				5.4 ± 2.9	1–10
Frequency of consuming white bread				4.4 ± 1.6	1–6
Frequency of consuming white bread with addition of grains, bran and so on				3.1 ± 1.4	1–6
Consumption of white bread (bread and rolls) [g/day]				131.5 ± 112.9	0–700
Consumption of wholemeal bread (bread and rolls) [g/day]				104.0 ± 107.9	0–710
Willingness to eat bread with the fibre addition				3.6 ± 1.1	1–5
Willingness to eat bread with the reduced salt content				3.4 ± 1.1	1–5

SD, standard deviation.

health benefits, freshness, appearance, naturalness, addition of grains, fibre addition, consumer's familiarity with the product, price and shelf life. The respondents evaluated the importance of the motives by answering the question *What is the importance of the following attributes of bread during the decision-making process?* and setting them in order from the most important one (1) to the least important one (10).

Statistical analysis

Descriptive statistics including frequency distribution and cross tabulation were carried out. A simple logistic regression analysis was applied to verify the associations among the tertiles of motive importance, the frequency of eating bread, the amount of eaten bread, and the willingness to eat the bread with the decreased level of salt and with the increased level of fibre. The logistic regression analysis was performed separately for bread with fibre addition and bread with reduced salt content. Only statistically significant variables were used in the models, using an automatic stepwise method.

Results were reported as odds ratio (OR) with 95% confidence intervals (95% CI). The reference groups were divided according to the following: (1) the frequency of eating bread and the amount of eaten bread, the participants who did not consume bread at all; and (2) the importance of both motives, the participants representing the bottom tertile of motives' importance (OR = 1.00). The significance of ORs was assessed by Wald's statistics. For all tests, P-value <0.05 was considered as significant.

The models for predicting the willingness to eat the bread with the decreased level of salt and with the increased level of fibre based on a logistic regression analysis were successfully verified by assessment tools, such as information criteria, a classification table, an ROC (Receiver Operating Characteristics) curve and the HosmereLemeshow test.[54] It was found that the model allows important factors that may have an impact on the willingness to eat both products to be identified. The statistical analysis was carried out using IBM Statistics SPSS, version 24.0, and SAS 9.4.

Results

Freshness (mean value 3.3; standard deviation 2.1), taste (3.7; 2.7) and naturalness (4.8; 2.4) were indicated as the most important motives determining the choice of bread. Next up were the following: health benefits (5.4; 2.9), price (5.4; 2.9), shelf life (6.2; 2.6), familiarity with the product (6.4; 2.5), appearance (6.4; 2.4), addition of grains (6.4; 2.8) and finally, addition of fibre (7.0; 2.6).

The importance of taste and health benefits as crucial motives for choosing bread were used in a further analysis. Because of the skewed distribution of rankings in the case of perception of taste, the participants were divided into three groups based on tertile distribution (Table 2).

Table 2 – Sample distribution by categories of taste and health benefits as choice motives.

Categories	Taste as choice motive			Health benefits as choice motive		
	Range (points)	Sample size (n)	Sample percentage (%)	Range (points)	Sample size (n)	Sample percentage (%)
Tertile distribution						
Upper tertile	1	318	31.3	1–3	306	30.2
Middle tertile	2–4	350	34.6	4–7	412	40.6
Bottom tertile	5–10	346	34.1	8–10	296	29.2
A priori distribution[a]						
Important motive	1–3	583	57.5	1–3	306	30.2
Moderate motive	4–7	309	30.6	4–7	412	40.6
Unimportant motive	8–10	122	11.9	8–10	296	29.2

[a] The cut-offs were calculated as 1/3 and 2/3 of the minimumemaximum range. Taste and health motives were estimated on a 10-point scale starting from 'very important' (1) to 'unimportant' (10).

White bread was the most commonly consumed type of bread. More than a half of the respondents consumed it at least once a day. Only about one-fifth of the respondents declared their daily consumption of wholemeal bread (Table 3).

Individuals reported higher consumption of rolls in comparison with bread slices, regardless of the type of flour used for the production. A smaller percentage of people reported eating wholemeal bread in comparison to white one (Table 4).

Generally, the participants showed relatively moderate interest in the bread with added health values (Table 5). The participants who considered the taste as unimportant motive for choice (bottom tertile) were more willing to eat the bread with the fibre addition and with the salt reduction compared with the consumers who considered the taste as important or moderate motive (upper and middle tertile). The participants who perceived health benefits as unimportant (bottom tertile) were less willing to eat bread with the addition of fibre and with the reduced salt content than others. Significantly higher willingness to eat bread with the reduced salt content and with the added fibre was observed among the respondents for whom health benefits were important (upper tertile).

The participants who declared the consumption of white bread a few times a day were less willing to eat bread with increased fibre content (OR = 0.51, 95% CI 0.28–0.93) than those who declared not eating white bread. The participants who consumed white bread with added grains, bran and so on once a day (OR = 2.19, 95% CI 1.44–3.31) and those eating it a few times a day (OR = 2.41, 95% CI 1.01–5.77) were more willing to eat bread with increased fibre content than those who never ate such bread. The participants declaring moderate importance (middle tertile) of health benefits (OR = 1.33, 95% CI 1.03–1.85) and high importance (upper tertile) of health benefits (OR = 1.72, 95% CI 1.19–2.48) were more willing to eat bread with increased fibre content than those declaring small importance of health benefits when choosing bread (bottom tertile) (Table 6).

The increase in white bread consumption by about 1 g per day reduced the willingness to eat the bread with added fibre by about 0.3% (OR = 0.997, 95% CI 0.996–0.999). Thus, the consumption of one white roll (50 g) per day was linked with the decrease of the willingness to eat the bread with added dietary fibre by 15%, whereas the increase in wholemeal bread consumption by about 1 g per day increased the willingness to eat the bread with added fibre by about 0.4% (OR = 1.004, 95% CI 1.003–1.006). Thus, consuming two slices (50 g) of wholemeal bread per day increases the willingness to eat the bread with added fibre by about 20% (Table 6).

Table 4 – Consumption of bread and rolls in the study population (mean, SD and %).

Type of product	Total population		Participants consuming bread and rolls	
	Mean ± SD [g/day]	Percent of the sample	Mean ± SD [g/day]	Percent of the sample
White rolls	65.2 ± 78.0	100.0	105.5 ± 74.8	61.8
White bread	66.3 ± 63.8	100.0	89.3 ± 58.6	74.2
Wholemeal rolls	55.3 ± 69.8	100.0	102.4 ± 64.9	54.0
Wholemeal bread	48.7 ± 60.3	100.0	83.5 ± 57.8	58.4

SD, standard deviation.

Table 3 – Frequency of consuming bread in the study population (%).

Type of bread	Frequency of consumption					
	Never	1-2 times a month	1-2 times a week	3-5 times a week	Once a day	A few times a day
White bread	10.2	9.3	11.1	15.0	16.8	37.6
White bread with addition of grains, bran and so on	22.2	21.6	19.8	19.0	13.4	4.0
Wholemeal bread	20.5	20.8	16.6	19.6	11.3	11.2

Table 5 – Willingness to eat bread with the fibre addition and with the reduced salt content according to the perceived importance of taste and health benefits (mean and SD).

Variables	Willingness to eat bread and rolls	
	With addition of fibre	With the reduced salt content
Total	3.6 ± 1.1	3.4 ± 1.1
Importance attributed to taste[a]		
Upper tertile	3.4[b] ± 1.1	3.3[b] ± 1.2
Middle tertile	3.5[b] ± 1.0	3.4[b] ± 1.2
Bottom tertile	3.7[c] ± 1.0	3.7[c] ± 1.1
Importance attributed to health benefits[a]		
Upper tertile	3.9[b] ± 1.0	3.7[b] ± 1.1
Middle tertile	3.5[c] ± 1.0	3.4[c] ± 1.1
Bottom tertile	3.3[d] ± 1.2	3.2[d] ± 1.2

ANOVA, analysis of variation; SD, standard deviation.
[a] The values are represented as mean, 5-point scale, 1: no; 2: rather no; 3: neither yes nor no; 4: rather yes; 5: yes, ± standard deviation.
[b–d] Means within a column with different superscripts differ significantly for each variable separately (ANOVA, $P < 0.05$).

Table 6 – Odds ratios (ORs [95% CI]) of willingness to eat bread with the addition of fibre according to the frequency of eating bread, frequency of eating bread with grains and bran, the importance of health benefits and the consumption of bread.

Variables	Willingness to eat bread with the addition of fibre		
	Estimate (β)	OR	(95% CI)
Intercept	0.063		
Frequency of eating white bread			
Never		1	
1-2 times a week or seldom	−0.036	0.97	(0.47;1.97)
3-5 times a week	−0.199	0.82	(0.42;1.59)
Once a day	−0.301	0.74	(0.41;1.33)
A few times a day	−0.679	0.51*	(0.28;0.93)
Frequency of eating white bread with addition of grains, bran and so on			
Never		1	
1-2 times a week or seldom	0.348	1.42	(0.93;2.16)
3-5 times a week	0.173	1.19	(0.77;1.83)
Once a day	0.783	2.19***	(1.44;3.31)
A few times a day	0.880	2.41*	(1.01;5.77)
Importance of health benefits when choosing bread			
Bottom tertile		1	
Middle tertile	0.288	1.33*	(1.03;1.85)
Upper tertile	0.541	1.72**	(1.19;2.48)
Consumption of white bread (bread and rolls) [g/day]			
No		1	
Yes	−0.003	0.997***	(0.996;0.999)
Consumption of wholemeal bread (bread and rolls) [g/day]			
No		1	
Yes	0.004	1.004***	(1.003;1.006)

1, reference value; β, estimate; OR, point estimate (e^{β}); 95% CI, 95% Wald confidence interval.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Men were less willing to eat bread with reduced salt content than women (OR = 0.74, 95% CI 0.56–0.98). The participants for whom the taste was important (upper tertile) (OR = 0.64, 95% CI 0.46–0.89) and moderately important (middle tertile) (OR = 0.74, 95% CI 0.54–0.98) were less willing to eat bread with decreased salt content than those who considered this attribute to be unimportant (bottom tertile). The increase in white bread consumption by about 1 g daily decreased the willingness to eat the bread with reduced salt content by about 0.2% (OR = 0.998, 95% CI 0.996–0.999). Thus, the consumption of one roll made from white flour (50 g) per day reduced the willingness to eat the bread with lower salt content by about 10%. The increase in the consumption of wholemeal bread by about 1 g daily was linked with the increase of the willingness to eat the bread with reduced salt content by about 0.5% (OR = 1.005, 95% CI 1.004–1.006). Those who ate two slices (50 g) of wholemeal bread per day were more willing to eat bread with a reduced level of salt by about 25% (Table 7).

Discussion

It is expected that the health-related motives will play an increasingly important role when a food choice is made. In our study, the most important factors determining the choice of bread were its freshness and taste, which was also confirmed in the previous studies.[55,56] Nevertheless, our research showed that participants who perceived health benefits as important and those who consumed more frequently the bread with added grains as well as those who ate bigger amounts of wholemeal bread were more willing to eat the bread with added fibre. These results concerning the bread with added fibre confirm the previous research showing that interest in functional food products is revealed by people for whom the health motives are important factors in the food choice.[57,58] Some studies showed that the health concern was more important to the group of traditional consumers than to the hedonists[59] and was even more important than the nutrition concern in determining dietary behaviours.[60]

In our research, the people who consumed the wholemeal bread were more willing to eat both breads (1) with the added fibre and (2) with the reduced salt content. Results from the previous studies showed that the beliefs of consumers on the health benefits significantly differentiated the acceptance of innovative cereal products.[11,12] Consumers considered natural products *per se* as healthy, and it resulted in appreciating and preferring this group of products (e.g. whole grain products).[61,62] Moreover, it was shown that consumers from European countries were more positive towards barley in their daily bread consumption after receiving information about the possible health benefits, and they were moderately positive towards the salt reduction in breads.[27]

The study results of Newson et al.[63] showed that the salt reduction was seen by consumers as healthy and important; however, more than one-third of participants were not interested in salt reduction. Regarding the reduction of the salt level in other foods (e.g. meat products), in general, Polish consumers declared that the salt consumption should be

Table 7 – Odds ratios (ORs [95% CI]) of the willingness to eat bread with reduced salt content according to the gender, the importance of taste and the consumption of bread.

Variables	Willingness to eat bread with reduced salt content		
	Estimate (β)	OR	(95% CI)
Intercept	−0.064		
Gender			
Female		1	
Male	−0.301	0.74*	(0.56;0.98)
Importance of taste when choosing bread			
Bottom tertile		1	
Middle tertile	−0.296	0.74*	(0.54;0.98)
Upper tertile	−0.442	0.64**	(0.46;0.89)
Consumption of white bread (bread and rolls) [g/day]			
No		1	
Yes	−0.002	0.998***	(0.996;0.999)
Consumption of wholemeal bread (bread and rolls) [g/day]			
No		1	
Yes	0.005	1.005***	(1.004;1.006)

1, reference value; β, estimate; OR, point estimate (e^{β}); 95% CI, 95% Wald confidence interval.
*P < 0.05; **P < 0.01; ***P < 0.001.

reduced, and the majority of them declared that they would reduce their salt consumption, but only a tiny percentage (3.7%) declared always buying food with the lower level of salt.[64]

Most consumers being unaware of the salt intake recommendations and the availability of the products with the low level of salt are the crucial barriers to improve dietary habits.[30,63,65] Salt content in foods available on the market varied significantly, even between foods with a similar name and within the same product category. This can be an obstacle for consumers to choose products with the lower salt content, particularly when it comes to consumers with the low level of awareness.[66] The effective way to solve the problem may be to gradually reduce the salt content in all products available on the market. Results of studies showed that cumulative series of small salt reductions may be a feasible strategy for reducing the sodium content in bread without affecting the consumer hedonic perception.[29] According to the results of our research, this strategy seems to be a more effective way of introducing a change in the amount of salt supplied with food, especially in the group of consumers for whom the taste is an important motive for a bread choice.

Our research indicated that those who were less interested in the consumption of bread with the reduced salt content were the consumers eating more white bread, men and people for whom the taste was important. As stated previously, the taste is thought to be one of the most important decisive factors for food purchase.[42] When it comes to men, in general, they are less health oriented compared with women.[12] Furthermore, women are generally more aware of the health benefits of dietary fibre compared with men, while men are more well informed about fibre sources.[18] Studies also showed that women, compared with men, perceived more benefits of cereal products fortification, i.e. bread and pasta, in fibre.[11] Some other analyses showed that female respondents were associated with both greater knowledge about dietary fibre and its greater consumption.[67]

Our results indicated as well that the consumers who were less willing to eat bread enriched with fibre were the people who consumed bigger amounts of white bread and those who consumed this kind of bread more frequently. Limited willingness to eat white bread with added health values among the participants who consumed white bread frequently and in big amounts may be a major obstacle in modifying the assortment of consumed products. Simultaneously, the consumption of bread with added health values would improve the diet without the need for fundamental changes in behaviour, e.g. reducing the consumption of bread at all or switching from white to wholemeal bread. Arvola et al.[12] indicated that some consumers did not perceive significant differences between the white and the wholemeal bread products; therefore, this group of consumers was not motivated to change their eating behaviours. The results of another research showed that consumers liked refined bread more than wholemeal bread, indicating that sensory properties were a barrier to consumption of the latter.[68] However, other studies showed[69] that consumers can accept sensory attributes of rolls made from flour with added fibre. The perception of the healthiness and nutritional value of bread increases if the information on the content is provided.[20] Moreover, the nutrition information influences the perception of cereal products, and the information on the label about the fibre performance should be legible and sufficiently clear for the consumers to highlight the food benefits and encourage them to choose a product rich in fibre.[10] The importance of health benefits in increasing the willingness to eat bread with the added fibre confirms the position of labels informing about fibre content and its benefits for health. Information about salt content on the bread label is needed as well. However, reducing the salt content in bread requires the gradual accustoming of a consumer to the modified flavour of a product, as evidenced by other studies.[70]

Conclusions

The study revealed that consumers who were more willing to eat bread with the added fibre were those who paid higher importance to health aspects, those who consumed bigger amounts of wholemeal bread and the consumers who ate breads with grains more frequently. The study also showed that among the respondents who were willing to eat bread with the lower level of salt, there were those who ate more wholemeal bread. When it comes to the people who were less willing to eat bread with the added fibre, they ate white bread more frequently and they consumed bigger amounts of this product as well. In addition to this, those who were less willing to eat bread with the lower level of salt, there were people consuming more white bread, men and people for whom the taste was crucial. The strength of this study is the measure of the amount of bread consumed by consumers as a variable that can be associated with the willingness to eat bread with improved health benefits.

In fact, results of our study do not confirm the possibility of achieving the rapid growth in fibre intake and lowering the salt consumption in the group of people consuming the white bread using the bread reformulation. It is necessary not only to

increase the consumers' awareness of the health benefits of a product change but also to gain their acceptance for the changed taste. In general, in strategies aimed at eliminating unhealthy dietary habits, the individual approach is required not only to consumers but also towards food products and food components, as shown by the example of dietary fibre and salt.

The outcomes of our study can be used by the companies operating on the food market with a particular emphasis on the bread offer to develop communication strategies, including the proper and clear information about the level of salt and fibre content. Our results may be valuable for undertaking activities aimed at the consumers, particularly representing more vulnerable groups. Therefore, a public health campaign is needed to encourage Polish consumers to use less salt and more dietary fibre, which seems to increase the importance of health reasons instead of taste in the selection of bread. Moreover, food companies and consumer organisations should exert pressure on the government for greater support for product reformulation, for example, in the form of regulation, enforcing companies to reformulate their products. In fact, a proper policy emphasis on mandatory reformulation to reduce salt in processed foods is likely to be an effective and inequality-reducing route to improve the population health.

Author statements

Acknowledgements

The study was perfomed within the Project No POIG.01.03.01-14-041/12 'Bioproducts, innovative technologies of pro-health bakery products and pasta with reduced caloric value' co-financed by the European Regional Development Fund under the Innovative Economy Operational Programme 2007-2013.

Ethical approval

The Bioethics Committee of the Faculty of Medical Sciences, University of Warmia and Mazury in Olsztyn, approved the protocol of the study on the 17th of June 2010, Resolution No. 20/2010.

Funding

This study was cofinanced by the European Regional Development Fund under the Innovative Economy Operational Programme 2007–2013, Poland.

Competing interests

There is no conflict of interest.

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