H5: Consumers following a gluten-free diet pay more attention to health, nutrition and gluten-free claims, and those on a gluten-free diet have a higher level of gluten-free product purchase intention than those not following a gluten-free diet.

Our research was based on conceptual framework summarized in Figure 1.

Methodology

The experiment described in this paper is a part of a larger project concerning consumer behaviour in the gluten free food market. Our research team collected data from 67 individuals (aged 19…55 years; women: 71.6%; with residents of cities over 100 thousand citizens: 67.2%) recruited through the local Polish Coeliac Society website, gluten-free shops in Pozna , and emails among students and employees of university. Among the study group, 37 participants (55.2%) were nonGFD followers, while 30 participants declared following a GFD (44.8%) for health reasons due to celiac disease (53%), gluten intolerance (20%), thyroid disorders, including Hashimoto (10%) and other ailments (17%).

The ET study was prepared using the OpenSesame program. Eye movements were recorded using SMI Eye Tracking Glasses 2 Wireless with the sampling rate of 60 Hz. Before the stimulus display, a calibration of the eye-tracking glasses to the participants' individual eye characteristics (3-point) was conducted. Participants were randomly assigned to one of the three stimuli, for details on demographics (per condition), see Table 1.

Each participant saw one image of GF cookies' packaging for 7 seconds on a computer screen (Figure 2). Then, each participant's opinion about the product was examined: quality of product, labelling readability, labelling understanding, packaging attractiveness and trust towards the product, participant's purchase intention were measured with a 5-point scale (where 1 was the lowest rate, 5 was the highest rate).

In the second part of the study, participants were asked to fill out a questionnaire. First, they had to answer general questions about how important the information on cookie packaging about the impact of the ingredients on their health is to them. Then they were asked to assess the importance of different claims (NCs and HC) and statements concerning non-nutrient substances that could be placed on cookie packaging in the process of a potential purchase. These claims were defined as follows: high fibre, with no added sugar, source of vitamins (e.g. vitamin B_1), source of minerals (e.g. magnesium), contain beta glucan that has been shown to reduce blood cholesterol, gluten-free product, and without lactose. A 5-point scale was applied (where 1 was the lowest rate, 5 was the highest rate). The GFD compliance was used as a criterion in the statistical analysis. Several

Figure 1. Conceptual framework

Notes: GFD … consumers on gluten-free diet; nonGFD … consumers not following gluten-free diet.

Source: own elaboration.

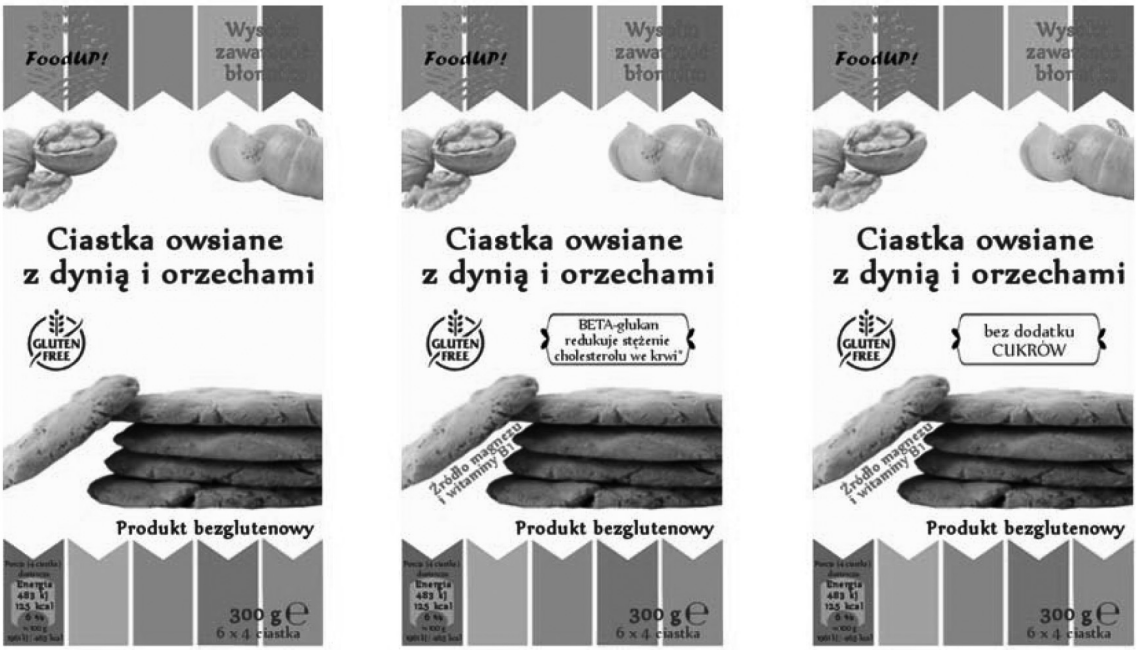
Table 1. Participant profile per stimuli

Participant		Control packaging [%]	Packaging A [%]	Packaging B [%]
GFD compliance	GFD	50.0	42.1	40.9
	nonGFD	50.0	57.9	59.1
Gender	Male	15.4	36.8	36.4
	Female	84.6	63.2	63.6

Notes: GFD … consumers on gluten-free diet; nonGFD … consumers not following gluten-free diet

Source: own elaboration.

Figure 2. Illustrations of cookies' packaging used in study



Control packaging Packaging A Packaging B

Notes: NCs … high fibre (in Polish … wysoka zawarto b›onnika); source of magnesium and vitamin B 1 (in Polish … ród›o magnezu i witaminy B1); with no suggar added (in Polish … bez dodatku cukrów); HC … beta glucan has been shown to reduce blood cholesterol (in Polish … beta glukan redukuje st enie cholesterolu we krwi); GF claim … gluten-free product (in Polish … produkt bezglutenowy).

Source: own elaboration.

socio-demographic questions and those concerning following a GFD were also asked.

The stimuli were three self-designed packaging labels for GF cookies (gluten-free oat cookies with pumpkin and nuts) (Figure 2). All information on the label was in the Polish language, as is required by Regulation (EU) No. 1169/2011. Control packaging had three claims … two GF claims (one verbal and one nonverbal) and one NC (high fibre). The packaging A contained five claims … two GF claims (one verbal and one nonverbal), one HC (beta glucan has been shown to reduce blood cholesterol) and two NCs (high fibre and source of magnesium and vitamin B 1). The packaging B had also five claims … two GF claims (one verbal and one nonverbal) and three NCs (high fibre, source of magnesium and vitamin B 1, and with no added sugar). The HC on packaging A was placed in the same location as NC (with no added sugar) on packaging B. The tested HC and NCs were chosen taking into consideration probable composition of cookies. Selected claims were authorized for use by the EFSA, according to Article 14 of Regulation (EC) No. 1924/2006 and the Annex to the Regulation. The gluten-free claims were in accordance with

Regulation (EU) No. 828/2014 and fulfilled additional requirements for food containing oats. Designed cookies' packages were typical for the selected food category.

ET data were analysed by defining the area of interest (AOI) that referred to the HC, NCs and GF claims and by calculating common metrics, i.e. dwell time, number of revisits, fixation count, average fixation duration for those AOIs (Tullis & Albert, 2013). Then, the aggregated dwell time, number of revisits, fixation count and average fixation duration on combined claims on each packaging were calculated to verify the hypothesis. The means and SD were calculated for declaratory questions. For data with normal distribution, the Student's t-test and ANOVA were conducted, whereas for data that did not have normal distribution, the Mann–Whitney U test and Kruskal–Wallis test were carried out. The LSD post-hoc test was performed where appropriate. The level of statistical significance was set at $p = 0.05$. To evaluate the strength of an effect (the strength of the difference between groups, or the influence of the independent variable), effect size statistics (r statistics) were calculated. The r statistics were reported using Cohen (1988) criteria of 0.1 = small effect, 0.3 = medium effect, 0.5 = large effect (Pallant, 2011). SPSS Statistics 23.0 was employed to verify all of the hypotheses.

Findings

The impact of the number of claims placed on packaging on consumer behaviour

The declaratory opinions about the packaging showed that cookies labels are moderately attractive, while the information presented is highly understandable and readable (Table 2). This allowed us to assume that stimuli were well designed and we proceeded with analysis.

The influence of the number of claims on consumer behaviour was assessed through comparison of ET parameters for three claims placed on control packaging and five claims on packaging A and B (control vs. A+B). The aggregated ET parameters for claims' AOIs on each packaging were calculated. Then, the mean values of those parameters for packaging A and B were obtained. The aggregated dwell time on three claims on control packaging ($m_{control} = 620$ milliseconds (ms)), was much shorter than aggregated dwell time on five claims on packaging A and B ($m_{A+B} = 1591$ ms, $U = 170.5$, $z = -3.124$, $p = 0.002$, with a medium effect $r = 0.42$). Significant difference in the fixation count across two groups ($m_{control} = 2.43$, $m_{A+B} = 5.76$, $U = 371.00$, $z = -3.693$, $p = 0.000$, with a medium effect $r = 0.45$) and average fixation duration ($m_{control} = 289$ ms, $m_{A+B} = 641$ ms, $U = 170.50$, $z = -3.328$, $p = 0.001$, with a medium effect $r = 0.45$) was found. The Mann–Whitney U tests showed that higher number of claims leads to higher visual attention that is given to them as calculated based on dwell time, fixation count and average fixation duration, which allowed us to accept H1a.

The impact of the number of claims on the cookies' packaging on consumer purchase intention was verified with use of the Mann–Whitney U test. The analysis showed that participants expressed equal interest in purchasing cookies with either three or five claims ($m_{control} = 3.52$, $m_{A+B} = 3.73$, $U = 400.5$, $z = 1.115$, $p = 0.265$), which did not allow us to accept H1b.

In order to verify H2, results for three packaging with different number of NCs were analysed. A Kruskal–Wallis test revealed a statistically significant difference in aggregated dwell time levels across three stimuli (χ^2 statistic is 8.83, $p = 0.012$, with a medium effect $r = 0.43$). The dwell time on high fibre claim on control packaging was lower ($m_{control} = 310$ ms) than on two AOIs combined (high fibre and source of magnesium and vitamin B_1) placed on packaging A ($m_A = 371$ ms) and three NCs combined placed on packaging B (high fibre, source of magnesium and vitamin B_1 and with no added sugar) ($m_B = 928$ ms). The number of revisits to the claims' AOIs showed statistically significant difference (χ^2 statistics is 9.373, $p = 0.009$, with a medium effect $r = 0.30$) with the highest result for packaging B ($m_B = 0.80$). The number of fixations was also the highest for packaging with three NCs ($m_B = 3.25$), which differed with number of fixations on two claims ($m_A = 1.31$) and one claim ($m_{control} = 1.24$) (χ^2 statistics is 8.915, $p = 0.012$, with a medium effect $r = 0.42$). The average fixation durations were significantly different ($m_{control} = 123$ ms, $m_A = 192$, $m_B = 439$ ms, χ^2 statistics = 12.856, $p = 0.002$, with a large effect $r = 0.55$). The Kruskal–Wallis tests showed that higher number of NCs on the cookie package leads to higher participant's visual attention to them, as calculated via the analysed parameters, which allowed us to accept hypothesis H2a.

The impact of the number of NCs on a consumer's purchase intention was examined by carrying out the Kruskal-Wallis test. Consumer's willingness to buy a particular product significantly differed (χ^2 statistic is 6.291, $p = 0.043$, with a medium effect $r = 0.27$) (Figure 3) with the most interest in packaging B with three NCs. The

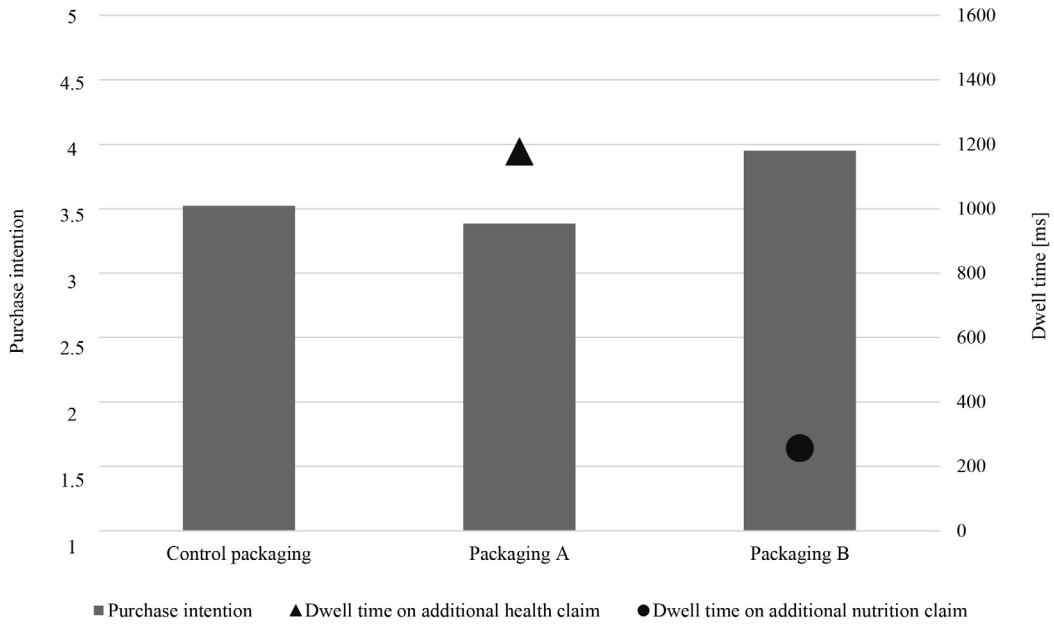
Table 2. Participants' declaratory opinions about the products and their packaging

Aspects	Control packaging		Packaging A		Packaging B		*p*
	Mean	SD	Mean	SD	Mean	SD	
Quality of product	3.19 [a]	0.57	3.68 [b]	0.67	3.73 [b]	0.55	0.004
Labelling readability	3.69 [a]	0.88	3.58 [a]	1.17	3.91 [a]	0.92	0.528
Labelling understanding	4.04 [a]	0.77	3.84 [a]	0.90	4.36 [a]	0.66	0.112
Packaging attractiveness	3.19 [a]	0.98	3.32 [a]	0.88	3.45 [a]	0.91	0.615
Trust towards the product	3.12 [a]	0.99	3.53 [ab]	0.70	3.82 [b]	0.85	0.050

Notes: a, b ... mean values followed by different lowercase letters are significantly different ($p < 0.05$). Scale: 1 ... very low, 2 ... low, 3 ... neither low nor high, 4 ... high, 5 ... very high.

Source: own elaboration.

Figure 3. Purchase intention and visual attention given to health and nutrition claims on cookies packaging



Notes: PI scale: 1 ... definitely no, 2 ... rather no, 3 ... difficult to say, 4 ... rather yes, 5 ... definitely yes; ms ... milliseconds.

Source: own elaboration.

average purchase intention level equalled to 3.95 on a 5-point scale, and it was higher than those for the control packaging ($m_{control}$ = 3.52) and packaging A (m_A= 3.38) (Figure 3). The obtained results allowed us to accept H2b, which proved that purchase intention is higher for cookies labelled with a higher number of NCs.

The declaratory opinions about products and their packaging partially correspond to the above results. Product B was assessed to have the highest quality (m_B = 3.73), as well as product A (m_A = 3.68), significantly higher than control ($m_{control}$ = 3.19) ($p < 0.05$). Similarly, the trust in product B was significantly higher (m_B = 3.82) than for the control ($m_{control}$ = 3.12), which is in line with results of buying intention. The evaluation of the packages' attractiveness, labelling readability and labelling understanding did not differ statistically between the stimuli ($p > 0.05$) (Table 2).

Influence of the type of claims on consumer behaviour

The Student's t-test was carried out in order to test whether there was a difference in visual attention paid to different types of claims placed in the same location on label (HC beta glucan has been shown to reduce blood cholesterol on packaging A vs. NC with no added sugar on packaging B) (H3a). The effect of claim type was significant for two ET parameters (dwell time and fixation count). Dwell time on HC (m_{HC} = 1177 ms) was nearly five times longer than on NC (m_{NC} = = 256 ms) (t(12.53) = 2.17, p = 0.014) (Figure 3). The number of fixations differed explicitly, i.e. m_{HC} = 4.08 and m_{NC} = 1.10 (t(12.99) = 2.27, p = 0.010). Conversely, the number of revisits (t(17.02) = 1.52, p = 0.098) and average fixation duration (t(31) = 0.586, p = 0.563) did not differ significantly. The results showed that H3a was rejected.

The Mann…Whitney U test revealed a statistically significant difference in purchase intention levels across two different stimuli (U = 181.00, z = …2.191, p = 0.028, with a medium effect r = 0.30). The participants declared that they preferred to buy products with additional NC (m_B = 3.95) than products with additional HC (m_A = 3.38) (Figure 3), which supports H3b.

The impact of GFD compliance on packaging perception

In the next step we assessed the impact of GFD compliance on the declarative importance of information regarding certain ingredient's health effect on cookie's packaging. The Mann…Whitney U test was carried out and it confirmed H4 (U = 393.50, z = …2.097, p = 0.036, with a medium effect r = 0.26). For participants who had declared following a GFD such information on the packaging was more important (m = 3.77 on a 5-point scale) than for those who were not following a GFD (m = 3.19).

Moreover, further analysis allowed us to examine which claims on the cookie packaging were crucial for participants who complied with a GFD. The mean values of the importance of claims on cookie packaging, such as source of minerals (e.g. magnesium), gluten-free product and without lactose, significantly differed for both groups (p < 0.05) (Table 3). NCs such as high fibre, with no added sugar, source of vitamins (e.g. vitamin B_1) and the HC contain beta glucan that has been shown to reduce blood cholesterol were equally significant for both GFD and nonGFD participants. The claim regarding beta glucans was the least important for both groups and was assessed at a level of 2.41 for nonGFD and at 2.80 for GFD participants, whereas the NC with no added sugar turned out to be of high importance for GFD participants (m = 3.77).

Two-way ANOVA was conducted to verify H5, which describes the impact of GFD compliance on visual attention given to health, nutrition and gluten-free claims and to the purchase intention of cookies. Our findings revealed that compliance with GFD does not simultaneously impact visual attention given to claims and consumer willingness to buy a product (p > 0.05), thus H5 was rejected (Table 4). The values of all the ET parameters analysed here were statistically similar for both groups of participants.

Discussion and implications

The findings presented here offer new insight into the way how claims on gluten-free product

Table 3. Importance of possible claims on cookies' packaging

Claim on cookies' packaging	GFD		nonGFD		*p*
	Mean	SD	Mean	SD	
High fibre	3.27	1.17	3.51	1.26	0.329
With no added sugar	3.77	1.36	3.35	1.23	0.112
Source of vitamins (e.g. vitamin B_1)	3.30	1.05	3.35	1.18	0.633
Source of minerals (e.g. magnesium)	3.13	1.17	3.59	1.28	0.038
Contain beta glucan that has been shown to reduce blood cholesterol	2.80	1.24	2.41	1.14	0.201
Gluten-free product	4.93	0.25	1.76	0.83	0.000
Without lactose	3.57	1.61	2.00	1.31	0.000

Notes: Scale: 1 … definitely unimportant, 2 … rather unimportant, 3 … difficult to say, 4 … rather important, 5 … definitely important.

Source: own elaboration.

Table 4. Impact of GFD compliance on visual attention given to claims and purchase intention of products

Parameter	Control packaging				Packaging A				Packaging B				*F**	*p**
	GFD		nonGFD		GFD		nonGFD		GFD		nonGFD			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Dwell time [ms]	605	585	637	402	1766	1802	2060	1771	1421	1096	1318	987	2.21	0.104
Revisits	0.64	0.81	0.50	0.71	1.00	1.23	0.88	0.84	1.13	1.25	1.00	1.21	1.99	0.134
Fixation count	2.82	2.44	2.00	1.25	6.40	5.32	7.13	5.08	5.13	3.04	5.00	3.44	2.28	0.097
Average fixation duration [ms]	262	237	319	196	563	280	631	321	707	516	637	494	0.81	0.496
Consumers' purchase intention	3.73	0.65	3.30	0.68	3.20	0.84	3.50	0.76	3.75	0.89	4.08	0.52	x	x

*based on two-way ANOVA calculations.

Source: own elaboration.

affect consumer behaviour. They constitute valuable contribution to the existing literature and can provide both producers and marketing departments with useful food labelling guidance.

The study shows that both the number and the type of claim on GF packaging impact the visual attention and purchase intention of consumers. Longer visual attention was observed in case of HC in comparison to NC presented in the same location on different cookies' packaging, however it did not result in higher purchase intention. Conversely, product with an additional NC had higher purchase likelihood than other product. The individual importance of a claim and familiarity with it could have impacted the visual attention that was given to it (Hieke et al ., 2016). The results of the declaratory research showed that the claim with no added sugar was much more important to consumers than the claim contain beta glucan that has been shown to reduce blood cholesterol, and we think that selected HC might not have been familiar to some of the participants, similarly, as it was proved in the study of Diaz et al . (2020). Because there are many factors that influence where a participant directs his/her eyesight, experience with the tested stimulus (the so-called task experience) is one of them. The more novel and visually complex a stimulus is, the more visual attention it attracts and the longer the subject's viewing time is on that stimulus (Morrison & Dainoff, 1972). The consumer's earlier experience with a specific stimulus accelerates its identification and shortens the interpretation time. Therefore, one practical implication is that in order to capture the attention of consumers, the introduction of products with claims that are not commonly applied or will be novel on packaging of foods from given category is advised. Simultaneously, the claims must be easily understandable and should not be written in complex scientific language (Diaz et al ., 2020), as additives and ingredients that are difficult to pronounce and are not widely known are perceived as more harmful (Maruyama et al ., 2021). In our research longer fixation duration on the HC could have been impacted by the length of the claim, which thus required more cognitive effort to become acquainted with.

Lower purchase intention of product with additional HC than additional NC confirms our assumption that HC on hedonic products, similarly to HC on unhealthy products, negatively impacts purchase intention as opposed to NC. Moreover, the number of appropriately chosen claims seems to be of great importance. In our study, the packaging with the highest number of NCs (packaging B) collected the highest likelihood of purchase and was evaluated as the most trusted. The relation observed could have been enhanced by participants' profile. In our study, mostly women, educated persons and rather young participants took part. This is in line with the findings of Cavaliere et al . (2015), who found that females and consumers with higher nutritional awareness, for whom the household well-being is important, dedicate particular attention to NCs, whereas HCs are of interest to older consumers with a limited income.

Consumers have different information needs towards food products that correspond to their attitudes and motivations regarding their health and well-being. Labelling plays crucial role in the

t. XXX, nr 12/2023 DOI 10.33226/1231-7853.2023.12.1

process of meeting these needs, as it is available at a key point when the consumer is faced with the product and makes a purchase decision. An analysis of the impact of GFD compliance on consumer behaviour has provided interesting results. Participants following GFD declared that the importance of information on the packaging about how ingredients impacted their health was higher than among those not following the diet. Yet these consumers' visual attention and purchase intention, measured in a real-time experiment, showed contradictory results. Likewise, in a study by Hoppert et al . (2014), consumers with a considerable type 2 diabetes risk rejected non-degreased yoghurt when the labels were presented, but in the sensory test the group showed a strong preference for a product with a higher fat content. In our research the results of the declarative studies indicated that participants who can be considered as having health-motivation due to medically guided diet, as opposed to nonGFD consumers, considered the information regarding health on the packaging more relevant, but the experiment showed that the evaluation of a product can be processed rapidly, even with no conscious awareness. This finding supplements our previous work (Sielicka-Ró y ska et al ., 2021). Such outcome could be due to evaluation of hedonic product, which is typically based on overall emotional impressions, as consumers seek for products providing the desired consumption experiences (Garrido-Morgado et al ., 2021).

NCs and HCs, as well as all-natural and organic labelling, are often argued to be used as marketing tools rather than to help consumers make more informed decisions about foods (Amos et al ., 2019; Pereira et al ., 2019). As a result, consumers still don't know which foods contribute to their health and well-being and which are unhealthy. It is even more important in case of GF products, as many consumers perceive them as more healthful, only due to bearing a GF claim and decide to adopt a GFD without any guidance by a health care provider or dietician. Moreover, many new companies are starting to produce GF products but they lack knowledge and expertise in understanding their consumers' perception. Then they face problems with designing appropriate labels. Even though the current legislation (Regulation (EU) No. 828/2014) provides requirements how to inform consumers on the absence or reduced presence of gluten in food, details of the label is broadly at the discretion of manufacturers, thus causing ambiguities. This research shows that more different claims induce more attention paid to them, but without translating into higher purchase intention. Use of combination of NCs and HCs with GF claims should be deliberate and always linked to the overall product characteristics. The findings of this work correspond with the EU strategy focused on improving consumers' understanding of front-of-pack nutrition labelling to ensure a high level of consumer protection.

Limitations and suggestions for further research

Although this study provides new insight into the influence of claims on consumer perception and purchase behaviour of GF product, it has some limitations that offer opportunities for future research. The participants of this study evaluated one GF product, thus future studies could introduce other products that are relevant to GFD consumers, both hedonic and utilitarian, e.g. snacks, breads, pastas or ready-to-eat meals, which would provide a more comparative context. As a significant difference in the importance of the Œwithout lactoseŽ statement was found between the study groups, and the researches confirm that GFD consumers often share comorbidities of autoimmune nature (Kim et al ., 2019), it could be interesting to expand the research group in order to evaluate the influence of intercurrent food allergies on the perception of claims. Moreover, the influence of other NCs and HCs could be assessed.

The cookies had a defined flavour (pumpkin and nuts), which might have impacted the participants' overall purchase intention. We realized that we should have explored the participants' individual preferences towards cookies to reduce the impact of product attributes other than claims on product perception. Our research took place in a laboratory conditions. The results might differ from consumer choices in a real store as the laboratory setting may bias the participants' choices and gazing behaviour.

Notes/Przypisy

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Dr in . Maria Sielicka-Ró y ska

Assistant Professor at Department of Food Quality and Safety, Pozna University of Economics and Business. Her research interests are in the areas of food quality and safety focusing mostly on food product design, sensory evaluations and product labelling in shaping consumers' awareness.

Dr Natalia Gluza

Assistant at Department of Marketing Strategies, Pozna University of Economics and Business, Member of Consumer Research Laboratory. Her fields of interest are: consumer attitude, customer engagement, marketing communications, neuromarketing, social media's impact on consumer behaviour.

Dr hab. Ewa Jerzyk, prof. UEP

Professor at Department of Marketing Strategies, Pozna University of Economics and Business, Manager of Consumer Research Laboratory. Her fields of interest are: consumer behaviour (attitudes and predicting behaviour), food market, marketing communications, neuro-marketing, packaging (labels, claims, multisensory packaging design), retromarketing.

Dr in . Maria Sielicka-Ró y ska

Adiunkt w Katedrze Jako ci i Bezpiecze stwa ywno ci Uniwersytetu Ekonomicznego w Poznaniu. Jej zainteresowania naukowe to jako i bezpiecze stwo ywno ci, a w szczególno ci projektowanie produktów ywno ciowych, sensoryczna ocena produktów oraz znakowanie produktów w kszta›towaniu wiadomo ci konsumentów.

Dr Natalia Gluza

Asystent w Katedrze Strategii Marketingowych Uniwersytetu Ekonomicznego w Poznaniu, cz›onek Laboratorium Bada Konsumenckich. Jej zainteresowania naukowe to: postawy konsumentów, zaanga owanie konsumenta, komunikacja marketingowa, neuromarketing, wp›yw mediów spo›eczno ciowych na zachowania konsumentów.

Dr hab. Ewa Jerzyk, prof. UEP

Profesor w Katedrze Strategii Marketingowych Uniwersytetu Ekonomicznego w Poznaniu, kierownik Laboratorium Bada Konsumenckich. Jej zainteresowania naukowe to: zachowania nabywców (postawy i przewidywanie zachowa), rynek ywno ci, komunikacja marketingowa, neuromarketing, opakowania (etykiety, o wiadczenia, multisensoryczne projektowanie opakowa), retromarketing.

Zapowiedzi

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