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NUTRITION VALUE LABELING ON FOOD PACKAGING – RESEARCH WITH USE OF INFORMATIVE TECHNOLOGY TOOLS

Placing nutrition value and food composition is obligatory on the packaging according to Regulation (EU) 1169/2011. In European Union countries this regulation applied on 13.12.2014, but nutrition value labeling is obligatory from 13.12.2016. Spreading information about energy value, nutrition facts and composition is important in view of obesity epidemic in high developed countries and also in consideration of strengthening consumer health preservation trend on food market. The majority of food producers places this type of information on the packaging, but the graphic form is elective.

Subjects of research were present on Polish market food packages and also designed packaging images in accordance with guidelines of Food and Drug Administration from United State of America. Using the computer program (Tobii Studio) the retrieval speed of information of nutritional value (time between displaying images and click on the area of the package containing the specified data) was investigated. On this basis A/B test was conducted, in order to elect better version of packaging, allowing faster information searching. User Experience tools were reviewed for utility to the testing of packaging. The study allowed to indicate form of graphical presentation of this type of information causing them fast retrieval on the packaging. Also range of required on packaging nutritional information was researched in questionnaire form. The study involved 52 persons of all ages.

Keywords: nutrition value, food packaging, packaging informativity, food labeling, provision information to consumers

1. INTRODUCTION

The main goal of labelling products is to inform consumers' about products kind, quality, compositions and other essential information from the point of consumers' safety, best interest and decision making. Moreover information should be delivered in appropriate form. That mean, it should be clear and understandable[2]. The nutrition declaration for a food concerns information on the presence of energy and certain nutrients in foods. These information are mandatory in accordance to Regulation (EU) No 1169/2011 of the Euro-

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pean Parliament and of the Council of 25 October 2011 on the provision of food information to consumers[3].

Nowadays information about nutritional value is required by consumers what was proven in Panfil-Kuncewicz et al 2010[4] studies. The mandatory provision of nutrition information on packaging should assist nutrition actions as part of public health policies which could involve the provision of scientific recommendations want to make better dietary choices, studies conducted by Talagala and Arambepola 2016[5] and Platkin et al. 2014[6] has confirmed that information about nutritional value is not sufficient. It is proven that easy legibility is an important element in maximizing the possibility for labelled information to influence its audience. Food marketing concerning nutritional value, as well as health problems in relation to food labelling are the subject of many research published by Wansink (2003)[7], Colby et. al (2010)[8], Nestle and Ludwig (2010)[9], Ollberding et. al (2010)[10], Rundel-Thiele et. al (2013)[11].

Moreover, illegible product information is one of the main causes of consumer dissatisfaction with food labels. Therefore, a comprehensive approach should be developed in order to take into account all aspects related to legibility, including font, color and contrast[12].

The main goal of the study was to verify computer aided methods in labeling study. Moreover, research on proper identifying information concerning nutrition value (on European nutrition labels and labels prepared based on FDA guidelines), taking into account

[3] Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004, O. J. L 304/18.

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[12] B. Kabaja, *Kryteria oceny znakowania opakowań jednostkowych suplementów diety*, Ph.D. thesis, UEK Kraków 2016; M. Lisińska-Kuśnierz, *Food Packaging as Non-satisfactory Communication Instrument in Opinion of Consumers*, [in:] *Commodity Science in Research and Practice – Innovations in product development and packaging*, ed. by A. Cholewa-Wójcik, A. Kawecka, Polish Society of Commodity Science, Cracow 2014.

respondents gender and age (especially interesting was comparison young consumers and seniors) was conducted. Consumers were also asked about preferred range of information concerning nutritional value.

2. METHODOLOGY

For investigating two versions of nutrition labels (prepared in accordance with European and USA legal requirements) informative technology tools were used. Informative technology has developed a new approach in designing websites, applications and services concentrated on user concerning on interaction between user and computer. Tools like A/B test, 5 second test and utility test might have application in packaging testing, especially in testing packaging images on-line. Moreover computer use techniques are getting more and more popular in packaging testing[13].

In the study consumers were asked to indicate specified nutrition information (calories, protein, carbohydrates, salt content). Correct answers and time needed to indicate answer were counted and measured. On this basis test A/B was contacted. The most important was the speed of searching information, not consumers preferences. For time measures and area of pointing out information Tobii Studio computer program was used.

In second part of consumer preferences with use of questionnaire were tested. Respondents group was 52 persons, in all group age. Detailed summary of respondents characteristics is presented in table 1. In research 27 women and 25 men took part, the biggest group were persons from 21 to 31 years old, age groups 31–40; 51–60 and above 60 were represented by 10 persons each.

Table 1. Characteristic of respondents

Age groups	Women	Men	SUM
to 20	2	2	4
21–30	6	8	14
31–40	4	6	10
41–50	2	2	4
51–60	7	3	10
above 60	6	4	10
SUM	27	25	**52**

Source: own work.

3. RESEARCH MATERIAL

Research materials were packaging of biscuits present in Polish market offer (version 1). The version 2 of each packaging were prepared according to guidelines of FDA (Food and Drug Administration). Basic guidelines for designing nutrition fact label are: white

[13] J. Chudley, J. Allen, *Projektowanie witryn internetowych User Experience*, Helion, Gliwice 2013; A. Cholewa-Wójcik, A. Kawecka, *The influence of effectiveness of packaging elements on the consumers' preferences with the use of marketing eye-tracking techniques*, "Modern Management Review" 22/1 (2015), p. 49–61.

background, black letters, Helvetica font and defined range of information[14]. Example label is presented on fig.1. On photo 1 are presented packaging images used in research.

Fig. 1. Nutrition facts label according to FDA

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container about 2

Amount Per Serving

Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Trans Fat 3g	
Cholesterol 30mg	**10%**
Sodium 470mg	**20%**
Total Carbohydrate 31g	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Proteins 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

For educational purposes only. This label does not meet the labeling requirements described in 21 CFR 101.9.

Source: http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm114155.htm

Photo 1. Researched biscuits packaging

Packaging no.1, ver.1

Packaging no.1, ver.2

[14] http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm20026097.htm

Packaging no.2, ver. 1

Packaging no.2, ver. 2

Packaging no. 3, ver. 1

Packaging no.3, ver. 2

Packaging no. 4, ver. 1

Packaging no. 4, ver. 2

Souce: own work.

4. RESULTS OF RESEARCH CONDUCTED WITH USE OF INFORMATIVE TECHNOLOGY TOOLS

Research started with a question about specific information concerning nutrition fact, after question image of packaging was displayed. On the image by clicking respondents indicated placement of this information. On table 2 below results are presented. Table includes number of correct answers and time to indicate that answer, the measures used was average time, minimum and maximum time needed by respondents to indicate information.

Table 2. Results of research on proper identifying information concerning nutrition value

Packaging		Number of correct answers	Average time to indicate the correct answer [s]	Minimum time to indicate correct answer [s]	Maximum time to indicate correct answer [s]
Packaging no. 1	Ver. 1	34	8,04	3,8	21,92
	Ver. 2	40	9,79	2,01	28,78
Packaging no. 2	Ver. 1	23	27,05	4,74	70,68
	Ver. 2	11	11,41	5,5	18,74
Packaging no. 3	Ver. 1	29	15,27	4,31	64,73
	Ver. 2	41	7,24	2,79	15,13
Packaging no. 4	Ver. 1	50	6,29	2,87	22,15
	Ver. 2	49	8,21	1,57	33,59

Source: own work.

The research has reveal that consumers has a problem to indicate correct answer (by clicking on it). From 52 respondents on original packaging the information was correctly indicate respectively by 34, 23, 29 and 50 respondents. On packaging with nutrition value presented according to FDA guidelines correct indications was pointed out by 40, 11, 41 and 49 respondents.

Measuring time to indication the correct answers revealed that respondents are very differential. The gap between time needed to indicate correct answers by the fastest and to slowest respondent was 65,94s (in case of packaging no. 2 version 1). The time by the different packaging and its version was very diversified too.

To investigate differences between respondents in analysis they were segmented on two age groups. Young consumers from age groups: to 20 years old, from 21 to 30, from 31 to 40 years old and Seniors from 51 to 60, and above 60 years old. The number of correct answers for both group with χ^2 test value and average time needed to indicate that answer is presented in table 3.

Table 3. Results of research on proper identifying information concerning the nutrition value regarding division on age groups

Packaging		Number of correct answers			Average time to indicate the correct answer [s]	
		Young	Seniors	χ^2 test value	Young	Seniors
Packaging no. 1	Ver. 1	18	12	0,7624	7,19	10,20
	Ver. 2	19	16	0,3507	9,64	11,07
Packaging no. 2	Ver. 1	12	8	0,8431	16,00	44,86

Packaging		Number of correct answers			Average time to indicate the correct answer [s]	
		Young	Seniors	χ^2 test value	Young	Seniors
	Ver. 2	2	8	**0,0057**	12,45	11,98
Packaging no. 3	Ver. 1	18	8	0,0959	8,93	30,99
	Ver. 2	24	14	0,1863	5,92	9,79
Packaging no. 4	Ver. 1	26	20	0,2221	4,31	9,33
	Ver. 2	24	20	0,0775	7,61	10,03

Source: own work.

The analysis showed that there is no relationship between age and correctness of answer. Only in one case it was possible to identify relation between age and correctness of answers, what is surprising the seniors pointed out more correct answers than young respondents. It might be noted that in almost all cases young respondents needed shorter time than the seniors. Most distinctive case was packaging no. 2 original version where that gap was almost 29 seconds. There is no obvious evident that form proposed by FDA is shortening the time to indicate information concerning nutrition facts. Only in case of packaging no. 3 is confirming that. It might be explained by the facts that consumers are used to traditional form of presenting this kinds of information. However it could be spotted that one of the packaging (no. 2) has caused longer time to find information than others. It might be noticed that low contrast between the font and background color caused illegible of information placed on packaging.

For further analysis of differences between respondents they were divided in two groups concerning gender. Results of this analysis is showed in table 4.which concerns the number of correct answers for both group with χ^2 test value and average time needed to indicate answer.

Table 4. Results of research on proper identifying information concerning the nutrition value regarding division on gender**Błąd! Nieprawidłowe łącze.** The source: own work.

The analysis showed that there is also no relationship between gender and correctness of answer. Only in one case it was possible to identify relation between gender and correctness of answers, what is noticeable men pointed out more correct answers than women in first case of studied packages, and that relation might be confirmed by the χ^2 test.

5. RESULTS OF RESEARCH ON THE RANGE AND FORM OF NUTRITIONAL INFORMATION ON PACKAGING

Research on the range of information and form of nutrition value on food product packaging were conducted while research which results presented above. Respondents were asked about the form of presenting nutritional facts. The answers and number of

indicated answers is showed in table 5 with value of χ^2 test to investigate relationship between gender of respondents and the indicated answer.

Table 5. Results of research on preferred form of nutritional value presentation

Answers	Women	% of indications	Men	% of indications	χ^2 test value
Per 100g	8	15,4%	20	38,5%	**0,00029**
Per portion	10	19,2%	0	0,0%	
Both	9	17,3%	1	1,9%	

The source: own work.

Most of respondents both men and women pointed out that they preferred nutrition value presented per 100g of food product. They motivated that this form is easy while compering different products. Almost 20% of respondent, only women indicated the form per portion. Also almost 20% of respondents pointed out both forms. Applicable legal requirements in European Union demands provision these kind of information in both forms, that form should be maintained.

In table 6 are presented research results of preferred range of nutrition information on food packaging.

Table 6. Results of research on preferred range of information on packaging concerning nutritional value **Błąd! Nieprawidłowe łącze.** The source: own work.

Preferred range of nutritional information desired by consumers is very wild. Most of the consumers requires information about content of cholesterol, salt, dietary fiber and sugar. Also information about reference of daily value of each components is required. Women are more interested in nutritional value, especially the content of dietary fiber. Men are also less interested in daily value %.

6. SUMMARY

Research has proven that consumers expect a wide range of nutritional information on packaging of food product, especially women. Both forms of presenting, per 100g and per portion, information is advisable.

Indicating correct answers about nutrition facts was not easy for respondents. There were no case in which 100% of respondents indicated right answer (by clicking on it). In case of one packaging only about 20% of respondents has pointed out correct answer. There were no identified relations between version of packaging or age or gender in indicating correct places of information placement. Conducted research has confirm result of European Project FLABEL which has been realized from 2008 to 2012[15]. However the

[15] http://www.flabel.org/en/ (last accessed: 28.09.2015).

researchers are not unanimous Foltran et. al (2010)[16], Roodenburg et. al (2011)[17], Vyth et. al (2012)[18] Hersey et. al (2013)[19].

Computer method of packaging testing by clicking on area with correct answer was verified. This method is not enough for testing the speed of searching information of packaging. It does not include searching of surface were this information is placed. Moreover using computer may cause problems for persons who do not have regular contact with computer. However, this kind of test makes possible on-line testing and extend the number of respondents, collecting and analyzing data is much easier.

In the range of above presented research were only considered nutrition labels acceptable by European Union law and by FDA (USA) regulations. Further research should concern nutrition labelling in form of "traffic lights" and nutrition facts in form proposed by FDA with use of colour.

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INFORMACJE O WARTOŚCI ODŻYWCZEJ NA OPAKOWANIACH PRODUKTÓW SPOŻYWCZYCH – BADANIA Z WYKORZYSTANIEM NARZĘDZI INFORMATYCZNYCH

Zamieszczanie informacji odżywczej oraz składu środków spożywczych jest obligatoryjne na ich opakowaniach zgodnie z Rozporządzeniem (WE) 1169/2011. W krajach Unii Europejskiej regulacja ta obowiązuje od 13 grudnia 2014 r., zamieszczanie wartości odżywczej na opakowania będzie obowiązkowe od 13 grudnia 2016 r. Rozpowszechnianie infor-

macji dotyczącej kaloryczności, wartości odżywczej, a także składu jest istotne w związku z panującą epidemią otyłości w krajach wysokorozwiniętych, a także wobec wzmacniającego się trendu na rynku spożywczym związanym z przywiązywaniem wagi do zachowań zdrowotnych przez konsumentów. Większość producentów żywności zamieszcza tego typu informacje na opakowaniach, jednak ich forma graficzna jest dowolna.

Przedmiotem badań były opakowania obecne w polskiej ofercie rynkowej, jak i projekty opakowań przygotowane w oparciu na wytycznych amerykańskiego organu nadzoru nad rynkiem żywności *Food and Drug Administration* (FDA). Za pomocą programu komputerowego (Tobii Studio) badano szybkość odszukiwania informacji (czas pomiędzy wyświetleniem zdjęcia a kliknięciem na obszar opakowania zawierający wskazane dane) dotyczącej wartości odżywczej produktów żywnościowych. Badaniom poddano 52 osoby w różnym wieku.

Badania nie umożliwiły wskazania formy graficznej prezentacji tego typu informacji powodującej najszybsze ich odszukiwanie na opakowaniu. Konsumenci deklarowali, że prezentacja wartości odżywczej produktu w przeliczeniu na 100 g oraz na porcje jest dla nich pomocna, między innymi w porównaniach między produktami. Ponadto w badaniu ankietowym zbadano preferencje konsumentów dotyczące sposobu prezentacji tego typu danych na opakowaniach produktów spożywczych. Należą do nich między innymi informacje dotyczące zawartości cholesterolu, błonnika pokarmowego, soli oraz cukru. Przeprowadzone badania pozwoliły pozytywnie zweryfikować przydatność narzędzi informatycznych w badaniach nad informacyjnością opakowań.

Słowa kluczowe: wartość odżywcza produktu, opakowania żywności, informacyjność opakowań, etykietowanie żywności, przekazywanie informacji konsumentowi

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