Appetite 71 (2013) 63–74

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Effects of nutrition label format and product assortment on the healthfulness of food choice ☆

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ARTICLE INFO

Article history:
Received 3 December 2012
Received in revised form 12 July 2013
Accepted 15 July 2013
Available online 23 July 2013

Keywords:
Nutrition label
Consumer research
Guideline daily amount
Traffic light colour coding
Health
Choice

ABSTRACT

This study aims to find out whether front-of-pack nutrition label formats influence the healthfulness of consumers' food choices and important predictors of healthful choices, depending on the size of the choice set that is made available to consumers. The predictors explored were health motivation and perceived capability of making healthful choices. One thousand German and Polish consumers participated in the study that manipulated the format of nutrition labels. All labels referred to the content of calories and four negative nutrients and were presented on savoury and sweet snacks. The different formats included the percentage of guideline daily amount, colour coding schemes, and text describing low, medium and high content of each nutrient. Participants first chose from a set of 10 products and then from a set of 20 products, which was, on average, more healthful than the first choice set. The results showed that food choices were more healthful in the extended 20-product (vs. 10-product) choice set and that this effect is stronger than a random choice would produce. The formats colour coding and texts, particularly colour coding in Germany, increased the healthfulness of product choices when consumers were asked to choose a healthful product, but not when they were asked to choose according to their preferences. The formats did not influence consumers' motivation to choose healthful foods. Colour coding, however, increased consumers' perceived capability of making healthful choices. While the results revealed no consistent differences in the effects between the formats, they indicate that manipulating choice sets by including healthier options is an effective strategy to increase the healthfulness of food choices.

Introduction

The past two decades have witnessed increased attention to nutrition labels in both research and public policy discussions (Baltas, 2001; Cowburn & Stockley, 2005; Drichoutis, Lazaridis, & Nayga, 2006; Grunert & Wills, 2007; Seiders & Petty, 2004). In light of rising obesity rates worldwide (World Health Organization, 2007) and the public health costs associated with this and other diet-related chronic conditions, many stakeholders are weighing their options for counteraction. Of the various instruments intended to improve citizens' diets, nutrition labels provide information as a basis for voluntary, informed and conscious consumer decision-making (Capacci et al., 2012).

Nutrition labels are already in use around the world (European Food Information Council, 2011; Storcksdieck genannt Bonsmann et al., 2010). They constitute a popular instrument among policy makers (Van Trijp, 2009), non-governmental organisations and food companies (Golan, Kuchler, Mitchell, Greene, & Amber, 2001). Consumers express their support for nutrition labelling initiatives (EATWELL, 2011) and have positive attitudes towards nutrition labels (Grunert & Wills, 2007; Wills, Schmidt, Pillo-Blocka, & Cairns, 2009), particularly when provided on the front

☆ *Acknowledgements:* The authors gratefully acknowledge the European Community financial contribution under the Seventh Framework Program for Research, Technological Development and Demonstration Activities, for the Small Collaborative Project FLABEL (Contract No. 211905). The content of the paper reflects only the views of the authors; the European Commission is not liable for any use that may be made of the information contained in this paper. We would also like to thank two anonymous reviewers for the comments and suggestions that helped to improve the paper.

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0195-6663/$ - see front matter
http://dx.doi.org/10.1016/j.appet.2013.07.004

of the package (e.g., delivering information about the calorie content of a food; Van Kleef, van Trijp, Paeps, & Fernández Celemín, 2008). Front-of-pack (FOP) nutrition labels are valued because many people are exposed to them (Campos, Doxey, & Hammond, 2011) and because they provide information at the point where the majority of food decisions is made (Nordfält, 2009). Nutrition labels might also be appealing because they do not restrict consumers' freedom to choose (Brehm, 1989).

In recent years, various FOP nutrition labelling schemes have been implemented across Europe as a means to inform consumers about the healthfulness of the foods that they can choose from, complementing information on the back of the package. FOP schemes range from the presence of a simple visual symbol (or *health logo*), displayed on the package when a product meets a set of nutrient content criteria for a particular category of foods, to a variety of more detailed FOP schemes. The latter often provide the levels of both energy and key nutrients (usually fat, saturated fat, sugar and salt). Also, for ease of both interpretation and comparison of figures, they often show additional elements, such as *traffic light colours* (TL), *text referring to content levels* (e.g., low, medium, high) and the *percentage of guideline daily amounts* (GDA).

Previous research has identified how consumers assess such FOP labels, showing, for example, that they prefer a simple tool and find the use of TL colours appealing (Hawley et al., 2013), and that they consider more advanced labels difficult to interpret. At the same time, however, consumers appreciate being provided with comprehensive information (Food Standards Agency, 2009; Hodgkins et al., 2012). At present, it remains unclear how much and which information on FOP nutrition labels is just right and which interpretative elements serve best to provide this information.

Furthermore, previous studies focused on the effects of different FOP nutrition labelling elements on consumers' attention, understanding and choice intentions in order to find out whether consumers' decision-making process can be influenced by the labels. As regards consumer attention, the studies do not provide conclusive evidence about attention-drawing properties of different elements, except that attention is higher and processing time shorter for health logos (Feunekes, Gortemaker, Willems, Lion, & van den Kommer, 2008; Van Herpen & van Trijp, 2011) or if the logo appears on a consistent location (Bialkova & van Trijp, 2010). The implementation of TL colour schemes on nutrition labels might be beneficial because the colour coding draws consumers' attention to risk-related nutrients (Jones & Richardson, 2007; for a review see Hawley et al., 2013). As regards consumer understanding, healthfulness comparison tasks of products belonging to one category did not reveal consistent evidence about the differences between various nutrition labelling formats (Grunert, Fernández Celemín, Storcksdieck genannt Bonsmann, & Wills, 2012; Grunert, Wills, & Fernández Celemín, 2010; Malam, Clegg, Kirwan, & McGinigal, 2009; Wasowicz-Kirylo & Stysko-Kunkowska, 2011).

Choice behaviour remained largely unconsidered in previous studies that focused on differences in the effects of nutrition labelling formats on the consumer decision-making process. The present study aims to partially fill this research gap. As part of the research project FLABEL (Food Labelling to Advance Better Education for Life), we developed a basic FOP label (see Fig. 1; top row) that was expected to potentially help consumers make healthful choices (Grunert et al., 2012; Hodgkins et al., 2012). It has the following characteristics: First, it is presented consistently in the same position on all food products; second, it provides information on energy expressed per 100 g and key nutrients which are of high

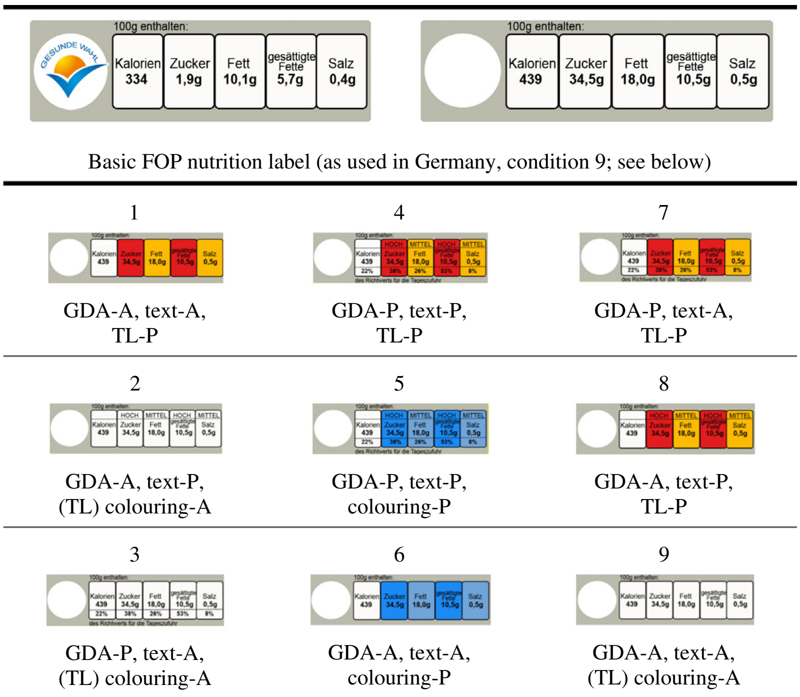

Fig. 1. The basic FOP nutrition label (top row) and the implementation of interpretative elements on the nutrition label (second to bottom row) following a fractional orthogonal design. *Notes.* The basic FOP nutrition label showed a health logo (or not) depending on whether the food products met the criteria to obtain such a logo (see example on the top left and top right). On the bottom rows of the figure, the experimental nutrition label conditions one to nine are shown (in this example all without the health logo), reflecting a fractional orthogonal design. Percentage of GDAs, text descriptors (three levels: low, medium, or high) and colouring was varied (green, amber, or red in the TL condition; light, medium, or dark blue in the blue shading condition). A 10th condition was added where no nutrition labels were shown on the products as a control group. The following abbreviations are used: GDA (guideline daily amount), TL (traffic light colours), and P (present) and A (absent) respectively. The translations are as follows: Gesunde Wahl (Healthy choice), 100 g enthalten: (100 g contain:), Kalorien (calories), Zucker (sugar), Fett (fat), gesättigte Fette (saturated fats), Salz (salt), hoch (high), mittel (medium), gering (low), des Richtwerts für die Tageszufuhr (of your guideline daily amount). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

relevance for consumers: sugar, fat, saturated fat, and salt (Grunert & Wills, 2007; Hawley et al., 2013); third, it is combined with a health logo (or a designated blank space) if the food does (not) meet the criteria for the latter.

The goal of this study is to find out whether the basic FOP nutrition label in general, and adding interpretative elements – that is, colour coding, text and percentage of GDAs – to the FOP nutrition label in particular (see Fig. 1; second to bottom row), helps consumers make more healthful food choices. The implementation of these elements may increase the healthfulness of food decisions in different choice set conditions (such as the range of products available, the product category under consideration, and the country where the products are made available to consumers). The first research question (RQ 1) is stated as follows:

RQ 1: Does the implementation of interpretative elements (i.e., colour-coding, text, percentage of GDAs) on the basic FOP nutrition label facilitate healthful food choices?

Another goal of the study is to investigate whether the different label formats affect consumers' motivation to make healthful food decisions (when consumers are asked to make their preferred choice) and whether they increase consumers' perceived capability of making such decisions (when consumers are asked to make a healthful choice). The first variable describes the potential of nutrition labels to serve as a reminder of health motives while making food decisions, activating thoughts on the healthfulness of food products and then act on them (Nordfält, 2010). In the presence of nutrition label formats, consumers' health motivation may become more salient, resulting in healthful choice behaviour (see RQ 2a).

Nutrition labels may also enhance consumers' perceived capability of choosing healthful foods, thereby enabling a mastery experience (Luszczynska, Tryburcy, & Schwarzer, 2007). Social cognitive theory suggests that performing a task successfully strengthens the sense of self-efficacy (Bandura, 1994, 2004). Furthermore, behaviour change models suggest that higher self-efficacy increase the likelihood of healthful choices (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003).

We therefore formulate RQ 2b as shown below. Both RQ 2a and 2b will be tested using different choice sets of products (e.g., range of products available, product category and country).

RQ 2: Does the implementation of interpretative elements (i.e., colour-coding, text, percentage of GDAs) on the basic FOP nutrition label increase (a) consumers' motivation and (b) consumers' perceived capability to make healthful product choices?

These two research questions are visualised in the conceptual model shown in Fig. 2 and have been tested in the experimental study as described in the following.

Table 1
Socioeconomic status of the sample.

Variable	Germany	Poland	Sample comparison
Age	$M = 44.3$ ($SD = 14.4$)	$M = 40.8$ ($SD = 15.3$)	$t(995) = 3.71$, $p < .001$[a]
Gender	75% females	80% females	$\chi^2(1) = 3.58$, $p = .06$
Households with children	29.8%	30.2%	$\chi^2(1) = 0.02$, $p = .89$
Education:			$\chi^2(3) = 10.71$, $p = .01$
Primary school	9.0%	13.6%	
Vocational	27.6%	20.2%	
Secondary school no college degree	38.4%	40.0%	
Higher education	25.0%	26.2%	
Employment status:			$\chi^2(2) = 38.11$, $p < .001$
Full-time	53.6%	58.6%	
Part-time	19.8%	6.8%	
Not working	26.6%	34.6%	

Notes. $n = 1000$.
[a] Three participants did not state their exact age but in a question about their age group.

Materials and methods

Participants

One thousand consumers who were at least partly responsible for household shopping were recruited in shopping centres and participated in the study. The study was conducted in June 2011 in two cities in Germany (Hamburg and Munich) and Poland (Poznan and Warsaw). Germany and Poland are neighbouring countries whose population is exposed to FOP nutrition labels in real life because around half of the products contained some type of FOP nutrition label in 2010 (i.e., 40% in Poland and 55% in Germany according to Storcksdieck genannt Bonsmann et al., 2010). Germany and Poland were selected because they offer a relatively similar product range in the food category surveyed (as explained under stimuli), which is conducive to finding matching product ranges.

The recruitment followed age quotas that mirrored the countries' population and the gender of those usually conducting the household shopping (Table 1). There were significant differences in socioeconomic variables between the participants in the two countries in terms of age, education and occupation. We conducted all calculations including the socioeconomic variables as independent variables, but none of these variables proved to be significant, which is why the analysis is presented without these factors.

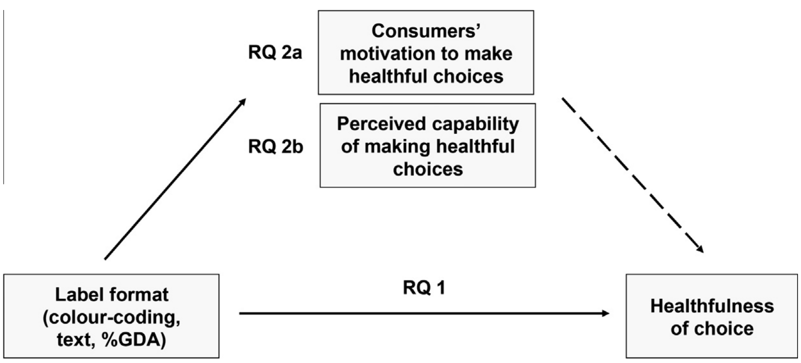

Fig. 2. The conceptual model of research questions.

Fig. 3. Examples of sweet snacks of similar (un-)healthfulness as presented in the study (A – German product, B – Polish product), and sweet snacks showing the bandwidth of healthfulness (Polish products, C – relatively more healthful option, and D – less healthful option).

Stimuli

Snack foods were selected as stimuli because the snack food category offers a large variation of brands and a spread of products with differing levels of healthfulness (e.g., muesli bar, chocolate bar), while still forming a realistic comparative choice scenario. These factors enabled us to use brands that are actually sold in the market. The high variation in both the amount and the types of ingredients and the potential consumer confusion arising from this indicate that nutrition labels on product packages of this category may be particularly beneficial for consumers to use during choice, which is why we deemed snacks to be a good example to study.

We selected 40 products in each country: 20 in the savoury snack food category and 20 in the sweet snack food category. The products were available in the respective markets (Poland and Germany) and were comparable between the two countries as regards the type of product (e.g., chocolate bar, cookies, and muesli bar) and as regards the nutritional values (i.e., the products had similar healthfulness scores and nutritional values). The full list and characteristics of the 80 snack foods used is available from the authors upon request (see Fig. 3 for examples of products that were used).

For feasibility reasons, the products were shown to participants on colour printouts. The nutrition label formats were implemented by using computer artworks according to the 10 experimental conditions, and all 40 products were labelled with a consistent format at a consistent position in each of the countries. The four most healthful products (assessed based on the healthfulness indicator, see below) of the 20 foods in each product category and country displayed a health logo on the basic FOP nutrition label. The space of the health logo was left blank on the 16 products that did not display the health logo, indicating participants that these products did not qualify for it. As described in Fig. 1, the interpretative elements on the nutrition labels described the nutrient levels of each food further. The nutrition information was obtained from the product's Nutrition Facts Panel and used to calculate the healthfulness indicator (see below). The latter also served to classify the main nutrients as high, medium or low content (or red, yellow, or green in the TL condition, and in differing shades of blue in the blue shading condition).

The overall healthfulness of each of the 80 snack food products was assessed on the basis of the SSAg/1 nutrient profiling system (Rayner, Scarborough, & Stockley, 2004). This healthfulness indicator takes into account energy content of food (in calories) and the nutrients fat, saturated fats, sugar and salt. It provides an evaluation of the relative healthfulness of a product using what is usually communicated on FOP nutrition labels. The score is generated by the food receiving a point for each 10% GDA bandwidth for each nutrient above an initial allowable threshold. The SSAg/1 score is the sum of the individual scores for each nutrient. The score starts at 0 for the most healthful foods and increases in units of 1 per a 10% increase in GDA of the energy and each nutrient contained in 100 g of the food. The higher score, the less healthful is the product. The mean SSAg/1 scores of the two product categories under consideration did not differ between countries (sweet snacks: $M = 9.20$, $SD = 3.46$ in Germany vs. 9.40, $SD = 3.59$ in Poland; $t(38) = -0.18$, $p = .86$; savoury snacks: $M = 7.10$, $SD = 3.80$ in Germany vs. $M = 7.00$, $SD = 4.04$ in Poland; $t(38) = 0.08$, $p = .94$).

Design

The study used a mixed design. It manipulated the presence (vs. absence) and different formats of FOP nutrition labels on the packaging between participants (see Fig. 1 for the 10 experimental conditions). Also, the product category was varied between participants (varying which product category was shown in the preference or health task: savoury vs. sweet snacks). Two factors were manipulated within participants: the choice task (preferred vs. healthy choice) and the size of the choice set offered (10 products to choose from vs. 20 products to choose from).

The presence and format of the nutrition label were treated as the between-participant factor. Nutrition label formats were developed on the basis of a factorial design, in which the basic FOP nutrition label was combined with up to three interpretative elements: (1) colour coding; (2) text describing low, medium or high nutrient levels; and (3) the percentage of GDAs (per 100 g). Two types of colouring were investigated: TL colour coding, with green, amber and red used to signify low, medium and high levels of nutrient, respectively, and a monochrome shading scheme, in which different shades of blue signified low, medium and high levels of energy and nutrient content.[3] These elements are the most common variants of interpretive aids in FOP nutrition labelling (Balcombe, Fraser, & Di Falco, 2010; Malam et al., 2009; Van Herpen, Seiss, & van Trijp, 2012). A second manipulation included the product category: half of the participants were shown the choice set of savoury snacks first

[3] The blue shading was used because qualitative FLABEL pre-studies revealed that some consumers associate the colour blue with healthfulness.

and sweet snacks second (vs. sweet snacks first and savoury snacks second).

The choice task was manipulated within participants. Participants were asked first to choose one product, and later on sort products, according to what they would prefer to buy (preferred choice). This procedure simulates a real-life choice. Next, participants were asked to choose one product, and later on sort products, according to what they regarded as most healthful (healthy choice). The two tasks (preferred vs. healthy choice) were not counterbalanced because the latter task likely influences any preferred choice task that is made by consumers.

The size of the choice set was also manipulated within participants. In both the preferred choice task and the healthy choice task, participants selected food products from a choice set of 10 products first and from an extended choice set of 20 products next. The extended choice included 10 products that had not been presented in the first, and the products were relatively more healthful. The mean SSAg/1 of these products was thus lower (first set of 10 sweet snacks: $M = 12.25$, range from 10 to 14 in Germany [10–15 in Poland] vs. second set: $M = 6.35$, range from 3 to 9 in both countries; $t(38) = 10.32$, $p < .001$; first set of 10 savoury snacks: $M = 10.40$, range from 7 to 13 in Germany [7–15 in Poland] vs. second set: $M = 3.70$, range from 1 to 6 in both countries; $t(38) = 11.24$, $p < .001$). In other words, participants could choose from a more healthful set of products when they were shown 20 food products (vs. 10 food products). This allowed us to assess whether the various nutrition label formats affect the consumer decision-making process if the choice set includes more healthful foods.

Procedure

Figure 4 describes the procedure of the study. In each country, 500 consumers were randomly assigned to one of the 10 experimental conditions (Fig. 1; $n = 100$ per condition). Participants first engaged in a warm-up choice task to make them familiar with the procedure of the study. In the warm-up task, participants were asked to choose their preferred product from a choice set of 10 dairy products. The nutrition label was already implemented on the packages (or not) according to the experimental condition.

Next, the choice set of (sweet or savoury) snack foods was shown to the participants, including 10 products in a first round and 20 products in a second round. First, participants made the choices based on their preferences (preferred choice). They chose one product out of 10 products that were available to them; and then they chose one product out of 20 products. This allowed them to switch to another product or to be consistent with the initial choice. The healthfulness of the product choices was assessed by recording the products SSAg/1 scores (RQ 1). Second, participants were asked to sort the 20 products into three piles according to their preference. This allowed us to assess the healthfulness of consumers' evoked set of products (RQ 1). The piles were designated as "would definitely consider buying" (coded 3), "would perhaps consider buying" (coded 2) and "would not consider buying" (coded 1). Third, participants responded to some questions about their motivation for their choice (RQ 2).

The procedure was repeated for the healthy choice condition. However, a different product category was used (savoury vs. sweet snacks; the order was counterbalanced). Participants were asked to choose the product they believed was most healthful. Again, the choices were recorded in both rounds (choice set of 10 and 20 products) and we matched the chosen products with their SSAg/1 scores. Also, participants were asked to sort the 20 products into three piles, this time designated as "healthful" (coded 3), "neither healthful nor un-healthful" (coded 2) and "not healthful" (coded 1). Participants then responded to some questions about their perceived capability to make a healthful choice.

Measures

We used two variables to answer RQ 1. The first variable – the SSAg/1 value of the chosen product – reflects the healthfulness of the decisions made in the different experimental conditions. A second variable was calculated in order to describe how well

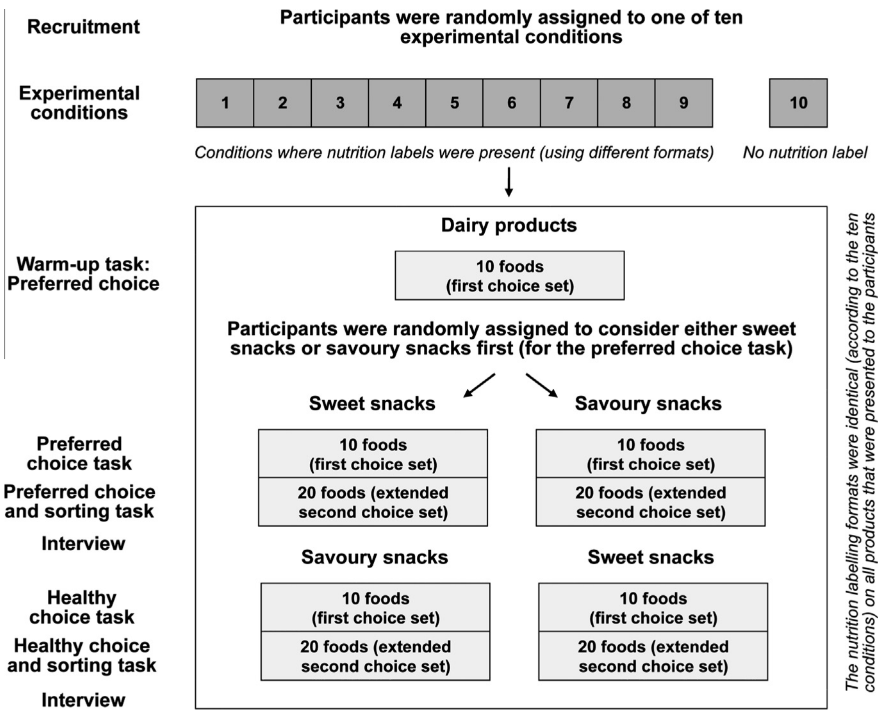

Fig. 4. Overview of the procedure of the study.

participants' classification of products into the three piles resembles the objective classification of healthfulness. We used Spearman rho coefficients between the coded values of the pile sorting task and a ranking based on the healthfulness of the products (most healthful product ranked lowest and coded as 1, least healthful product ranked highest and coded as 20) as a measure for this. It can therefore be considered an indicator of the fit between participants' classification of products and a classification of the products based on their SSAg/1 scores. Both in the preference and in the health choice task, this means that the more negative the correlation, the more resembles consumers' evoked set (preference task) or healthfulness sorting (health task) actually healthful food product choices.

The variables mentioned in RQ 2 – health motivation and perceived capability of choosing healthful foods – were measured using rating scales. Consumers' motivation to make healthful food choices was assessed by asking participants to indicate how important "nutrition and health" was when they made their preferred choice. We also included "taste", "this is what my family likes" and "other" in the survey. The variables were measured on a seven-point rating scale (1 = not at all important, 7 = very important).

The perceived capability of making healthful food choices was assessed via a five-item rating scale ($\alpha = .86$) after participants had made the healthy choice. The measure reflects the degree of mastery experience (Bandura, 1994, 2004) and is developed in line with instruments measuring self-efficacy (Luszczynska, Scholtz, & Schwarzer, 2005), but phrased so that it refers to the preceding choice decision. Participants were asked to indicate to what degree they agree with the following statements on a seven-point scale, anchored at 1 (strongly disagree) and 7 (strongly agree): "It was quite easy to choose", "I could well assess which is the best choice", "I had all the information I needed to make a good choice", "I did not worry about being able to arrive at a decision" and "I have no doubt that the choice I just made is right".

Statistical analyses

T-tests were used to compare the experimental conditions where a nutrition label was shown with the control condition where no nutrition label was shown. Mixed ANOVAs were conducted to find out whether the independent variables affected the healthfulness of both the food choice and the evoked set of choices in the sorting of products (RQ 1), and whether health motivation and perceived capability of making healthful choices were affected (RQ 2). In the ANOVAs, the size of the choice set was treated as repeated-measure factor. Country and product category were treated as independent variables; so was the presence of interpretative elements on the nutrition label.

Results

To answer RQ 1, we first present the results of the preferred choice task and then present the results of the healthy choice task. RQ 1 asked whether the implementation of interpretative elements (i.e., colour-coding, text, percentage of GDAs) on the basic FOP nutrition label facilitates healthful food choices.

Healthfulness of the product choice(s) in the preferred choice task condition

We first tested whether the experimental conditions where a nutrition label was shown guided participants to more healthful choices when compared to the control condition where no nutrition label was shown. The SSAg/1 scores did not differ between these two groups, neither for the 10 products choice set

Table 2
Influence of the size of the choice set, product category, country, and nutrition label formats on the healthfulness of food choices (SSAg/1 scores) in the preferred choice task condition, as revealed by a mixed ANOVA.

Independent variables	*F* value	*p* value	Partial η^2
Choice Set	1172.49	<.001	.57
Choice Set × Category	49.09	<.001	.05
Choice Set × Country	10.64	<.001	.01
Choice Set × Category × Country	2.03	.16	.00
Choice Set × Text	0.38	.54	.00
Choice Set × Colour	1.30	.27	.00
Choice Set × GDA	0.28	.60	.00
Choice Set × Category × Text	0.15	.70	.00
Choice Set × Category × Colour	1.10	.34	.00
Choice Set × Category × GDA	0.04	.84	.00
Choice Set × Country × Text	0.56	.46	.00
Choice Set × Country × Colour	0.40	.67	.00
Choice Set × Country × GDA	0.02	.88	.00
Choice Set × Country × Category × Text	0.89	.35	.00
Choice Set × Country × Category × Colour	1.54	.22	.00
Choice Set × Country × Category × GDA	0.00	.98	.00
Category	451.75	.001	.34
Country	7.81	.005	.01
Category × Country	0.13	.72	.00
Text	0.28	.60	.00
Colour	1.89	.15	.00
GDA	0.00	.95	.00
Category × Text	0.00	.96	.00
Category × Colour	2.55	.08	.00
Category × GDA	0.02	.88	.00
Country × Text	0.51	.48	.00
Country × Colour	1.36	.26	.00
Country × GDA	0.17	.68	.00
Category × Country × Text	0.95	.33	.00
Category × Country × Colour	0.12	.89	.00
Category × Country × GDA	1.69	.19	.00

Notes. Cell means and standard deviations describing the main and interaction effects are mentioned in the text; $n = 900$.

($M = 11.07$, $SD = 2.01$ vs. $M = 11.21$, $SD = 2.10$; $t(998) = -0.67$, $p = .50$) nor the 20 extended choice set ($M = 7.10$, $SD = 3.73$ vs. $M = 7.40$, $SD = 4.03$; $t(998) = -0.75$, $p = .45$). Thus, there was no effect of the presence of the FOP nutrition label on the healthfulness of the preferred snack food choice.

To find out whether the healthfulness of the chosen product was affected by other manipulations, we conducted a mixed ANOVA including the independent variables outlined before. Table 2 shows the results of the analysis. Extending the choice set from 10 to 20 products increased the healthfulness of the chosen product (from $M = 11.07$, $SD = 2.01$ to $M = 7.10$, $SD = 3.74$; $F(1,880) = 1172.49$, $p < .001$). Participants made more healthful decisions in the savoury snack food category (average for both choice sets: $M = 7.67$, $SD = 2.03$) than in the sweet snack food category ($M = 10.53$, $SD = 1.96$; $F(1,880) = 451.75$, $p < .001$), which is not surprising as the savoury category was more healthful on average. In Germany, participants made less healthful choices as compared to Poland (average for both choice sets: $M = 9.31$, $SD = 2.44$ vs. $M = 8.86$, $SD = 2.46$; $F(1,880) = 7.81$, $p < .01$). These two variables interacted with the choice set that was made available to the participants (Table 2). Extending the choice set, the effect of shifting towards more healthful products was larger in the savoury snack product category (improvement [i.e., SSAg1 points decrease from the first to the second choice set]: $M = 4.74$, $SD = 3.40$) than in the sweet snack product category from ($M = 3.18$, $SD = 3.30$; $t(898) = 7.01$, $p < .001$). This may be due to the fact that the savoury category spanned a broader range of products as regards their healthfulness. Also, Polish participants improved the healthfulness of their preferred choices in response to the increased choice set to a larger extent (improvement: $M = 4.36$, $SD = 3.47$) as compared to German participants ($M = 3.57$, $SD = 3.38$; $t(898) = -3.44$, $p < .001$).

Table 3
Influence of the product category, country, and nutrition label formats on the degree to which participants' sorting of their preferred products (out of 20 products) resembles healthful evoked sets of foods in the preferred choice task condition, as revealed by an ANOVA.

Independent variables	*F* value	*p* value	Partial η^2
Category	31.93	<.001	.35
Country	28.24	<.001	.31
Category × Country	1.00	.32	.00
Text	0.20	.66	.00
Colour	1.01	.37	.00
GDA	0.21	.65	.00
Category × Text	2.41	.12	.00
Category × Colour	1.43	.24	.00
Category × GDA	0.00	.99	.00
Country × Text	1.70	.19	.00
Country × Colour	0.64	.53	.00
Country × GDA	0.77	.38	.00
Category × Country × Text	0.57	.45	.00
Category × Country × Colour	1.11	.33	.00
Category × Country × GDA	0.05	.83	.00

Notes. Cell means and standard deviations describing the main and interaction effects are mentioned in the text. Model $F(19,875) = 4.31$, $p < .001$, $R^2 = .09$ (adjusted $R^2 = .07$); $n = 895$.

An ANOVA was conducted to find out whether the manipulations influenced the degree to which the participants' sorting of their preferred products resembles healthful evoked sets of foods, as indicated by individual sorting coefficients (Table 3).[4] The analysis again revealed a main effect of both product category and country. The sorting of German participants resembles relatively un-healthful product choices ($M = .12$, $SD = .30$) compared to Poland ($M = -.01$, $SD = .35$; $F(1,875) = 28.24$, $p < .001$). The preferred choice-induced sorting of piles in the savoury product category correlated more strongly with a favourable SSAg/1 healthfulness sorting ($M = -.01$, $SD = .32$) than those in the sweet category ($M = .12$, $SD = .34$; $F(1,875) = 31.93$, $p < .001$). However, none of the elements of the FOP nutrition label influenced the dependent variable. We therefore conclude that, in the condition of preferred choice, the nutrition label presence, or format, did not increase the healthfulness of chosen products and the healthfulness of evoked sets.

Healthfulness of the product choice(s) in the healthy choice task condition

We conducted further analyses to find out whether the relationship assumed in RQ 1 holds true when consumers are explicitly asked to make a healthful food choice. Again, the SSAg/1 scores did not differ between the pooled experimental groups that were shown a nutrition label when compared to the control condition where no nutrition label was shown, neither in the 10 products choice set ($M = 10.34$, $SD = 1.93$ vs. $M = 10.32$, $SD = 1.92$; $t(998) = 0.12$, $p = .90$), nor the extended choice set ($M = 4.48$, $SD = 3.30$ vs. $M = 4.40$, $SD = 3.15$; $t(998) = 0.24$, $p = .81$). Thus, the presence of the FOP nutrition label per se had no effect on the healthfulness of the product that was chosen.

A mixed ANOVA produced the same significant main and interaction effects as observed in the preferred choice condition (Table 4): Extending the choice set increased the healthfulness of the chosen product (from $M = 10.34$, $SD = 1.93$ to $M = 4.48$, $SD = 3.30$; $F(1,880) = 3339.51$, $p < .001$) and participants made more healthful decisions in the savoury snack food category (average for both choice sets: $M = 6.08$, $SD = 1.98$) compared to sweets

[4] The choice set was not included as an independent variable in this analysis because the sorting task was performed in the extended choice set conditions only (containing all 20 products).

Table 4
Influence of the size of the choice set, product category, country, and nutrition label formats on the healthfulness of food choices (SSAg/1 scores) in the healthy choice task condition, as revealed by a mixed ANOVA.

Independent variables	*F* value	*p* value	Partial η^2
Choice Set	3339.51	<.001	.79
Choice Set × Category	17.23	<.001	.02
Choice Set × Country	5.66	.018	.01
Choice Set × Category × Country	9.74	.002	.01
Choice Set × Text	0.65	.42	.00
Choice Set × Colour	0.82	.44	.00
Choice Set × GDA	0.16	.69	.00
Choice Set × Category × Text	0.09	.77	.00
Choice Set × Category × Colour	0.41	.67	.00
Choice Set × Category × GDA	5.44	.020	.01
Choice Set × Country × Text	0.74	.39	.00
Choice Set × Country × Colour	2.65	.07	.01
Choice Set × Country × GDA	0.42	.52	.00
Choice Set × Country × Category × Text	1.60	.21	.00
Choice Set × Country × Category × Colour	0.04	.96	.00
Choice Set × Country × Category × GDA	1.55	.21	.00
Category	428.30	<.001	.33
Country	14.74	<.001	.02
Category × Country	10.74	.001	.01
Text	0.36	.55	.00
Colour	1.38	.25	.00
GDA	0.23	.64	.00
Category × Text	0.00	.99	.00
Category × Colour	0.67	.52	.00
Category × GDA	0.96	.33	.00
Country × Text	0.43	.51	.00
Country × Colour	6.37	.002	.01
Country × GDA	2.76	.10	.00
Category × Country × Text	1.25	.27	.00
Category × Country × Colour	0.53	.59	.00
Category × Country × GDA	0.78	.38	.00

Notes. Cell means and standard deviations describing the main and interaction effects are mentioned in the text; $n = 900$.

($M = 8.73$, $SD = 1.68$; $F(1,880) = 428.30$, $p < .001$). In contrast to the preference task, in the health task, German participants made healthier food choices than Polish consumers (average for both choice sets: $M = 7.14$, $SD = 2.06$ to $M = 7.69$, $SD = 2.41$; $F(1,880) = 14.74$, $p < .001$). The latter two variables interacted with each other, so did choice set and category, choice set and country; the three-way interaction between these variables was also significant (Table 4). In the following paragraphs, we restrict the descriptions of the interaction effects to the two effects where the nutrition labels format was a significant determinant: the interaction between country and TL colour coding and the interaction between choice set, category and percentage of GDAs.

The first interaction can be described as follows: German participants made healthier choices, as indicated by lower SSAg/1 scores (on average in both choice sets: $M = 6.88$, $SD = 2.06$) in the TL condition compared to the condition without colour-coded labels ($M = 7.56$, $SD = 2.15$; $t(348) = 3.01$, $p < .01$) and in the condition with blue shading compared to the condition without colour-coded labels ($M = 7.03$, $SD = 1.84$; $t(249) = -2.02$, $p < .05$), whereas in Poland, the TL colour coding or the blue shading had no effect compared to the condition without colour-coded labels ($M = 7.80$, $SD = 2.52$ vs. $M = 7.54$, $SD = 2.29$; $t(348) = -1.02$, $p = .31$ and $M = 7.67$, $SD = 2.40$ vs. $M = 7.54$, $SD = 2.29$; $t(248) = 0.43$, $p = .67$, respectively).

The three-way interaction between choice set, category and percentage of GDAs indicated that the presence of percentage GDAs qualified the interactive effect between choice set and category. In the presence of percentage GDA information, consumers (directionally) switched to healthful savoury snack food choices more easily when the choice set was extended (with an improvement of the SSAg/1 value from $M = 6.55$, $SD = 3.18$ to $M = 6.07$, $SD = 3.04$; $t(445) = -1.62$, $p = .11$); the reverse was (directionally)

Table 5
Influence of the product category, country, and nutrition label formats on the degree to which participants' sorting of their preferred products (out of 20 products) resembles healthful evoked sets of foods in the healthy choice task condition, as revealed by an ANOVA.

Independent variables	*F* value	*p* value	Partial η^2
Category	66.26	<.001	.07
Country	43.73	<.001	.05
Category × Country	0.05	.83	.00
Text	4.53	.034	.01
Colour	2.40	.09	.01
GDA	0.29	.59	.00
Category × Text	0.05	.83	.00
Category × Colour	1.66	.19	.00
Category × GDA	0.05	.83	.00
Country × Text	0.29	.59	.00
Country × Colour	10.11	<.001	.02
Country × GDA	10.75	.001	.01
Category × Country × Text	1.68	.20	.00
Category × Country × Colour	0.70	.50	.00
Category × Country × GDA	0.08	.78	.00

Notes. Cell means and standard deviations describing the main and interaction effects are mentioned in the text. Model $F(19,825) = 8.44$, $p < .001$, $R^2 = .16$ (adjusted $R^2 = .14$); $n = 845$.

true for sweet snack food choices, where the improvement was smaller in the presence of percentage GDA information as compared to the absence of percentage GDAs ($M = 5.26$, $SD = 2.76$ vs. $M = 5.61$, $SD = 2.74$; $t(451) = 1.36$, $p = .18$). However, both follow-up comparisons were not statistically significant.

We again conducted an ANOVA to find out whether there was an effect on the resemblance of participants' sorting of healthful (vs. un-healthful) products compared to an ideal sorting according to the products' healthfulness in the healthy choice condition (Table 5). The analysis replicated the main effects of category and country that were found in the health choice task, only that this time, healthfulness was greater in the sweet category ($M = -.49$, $SD = .27$ vs. $M = -.32$, $SD = .28$; $F(1,825) = 66.26$, $p < .001$), and for Polish participants ($M = -.46$, $SD = .27$ vs. $M = -.35$, $SD = .29$; $F(1,825) = 43.73$, $p < .001$). In addition to that, we found a main effect of text descriptors. The presence of text resulted in a more accurate sorting ($M = -.43$, $SD = .28$ vs. $M = -.38$, $SD = .29$; $F(1,825) = 4.53$, $p < .05$). The results of the sorting task also demonstrated an effect of colour coding, depending on the country, which was in line with what we found for the healthy choice task. In Germany, participants were more successful in correctly sorting the products according to their healthfulness when TL colours were shown ($M = -.41$, $SD = .27$), as compared to blue shading ($M = -.30$, $SD = .29$; $t(270) = 3.12$, $p < .01$) and no colour coding ($M = -.28$, $SD = .30$; $t(319) = 3.97$, $p < .001$). There were no such effects in Poland ($M = -.44$, $SD = .29$ vs. $M = -.47$, $SD = .25$; $t(291) = -.93$, $p = .35$ and vs. $M = -.47$, $SD = .26$; $t(337) = -1.05$, $p = .29$, respectively). Lastly, we found an interaction effect between country and percentage of GDAs. In Germany, participants were (directionally) less successful in correctly sorting the products according to their healthfulness when percentage GDA information was shown ($M = -.32$, $SD = .29$), as compared to the condition where no percentage GDA information was shown ($M = -.36$, $SD = .29$). This effect was not significant when explored with a follow-up *t*-test ($t(408) = -1.42$, $p = .16$). Polish participants were more successful in correctly sorting the products according to their healthfulness when percentage GDA information was shown ($M = -.49$, $SD = .26$ vs. $M = -.43$, $SD = .28$; $t(433) = 1.99$, $p < .05$).

We observed that, in the condition of the healthy choice or healthfulness sorting task, some nutrition label formats increased the healthfulness of chosen products and the accuracy of healthfulness assessments. The TL colour coding produced some positive effects in Germany but not in Poland; the influence of text and percentage GDA was not consistent across the two dependent variables.

Interestingly, across both conditions – preferred and healthy choice task – the extension of the choice set produced the strongest effects on the healthfulness of the product choice. One may argue that the mere extension of the choice set by including more healthful products would lead to more healthful choices even if the participants chose products randomly. Therefore, we conducted additional analyses to consider this relationship more closely. We conducted the same analyses using a dependent variable that only measured the change in SSAg/1 over and above the change in the means of the SSAg/1 scores between the choice sets of 10 and 20 products. The effect of the choice set was still significant.[5] The finding can also be illustrated by one-sample *t*-tests: the improvement of the SSAg/1 value of the product chosen from the 10-product choice set to the 20-product choice set was significantly greater than the change in the average SSAg/1 value of the choice sets for both countries and in each product category, with the exception of sweet snacks in the preference task in Germany (Table 6). We can therefore conclude that the effect is stronger than a random selection of a product within the choice sets would produce.

The positive effect caused by the extension of the health set may be explained by stimulus-driven factors or by consumer-driven factors. The stimuli – here: the nutrition labels – were identical between the choice sets except that none of the products of the first choice set of 10 products showed a health logo and that four did in the second choice set when 20 products were available to participants. One may therefore assume that the presence of health logos may have driven the results. However, comparing the control condition where no nutrition label (and hence, no health logo) was provided on the label with the experimental conditions showing a label, a chi-square test revealed that the likelihood that one of the four stimuli products carrying a health logo (in case of the labelling condition) was chosen is the same in both conditions (60.0% vs. 61.7%, $\chi^2(1) = 0.11$, $p = .74$). This result suggests that the sheer presence of the health logos as a stimulus-driven factor likely does not account for the observed result. We argue that another reason might explain the observation, namely that larger assortments of products enable more healthful choices, perhaps because participants are more likely to find an appealing product at the more healthful end of the assortment.

Consumer-driven factors were considered in RQ 2. It provides an alternative explanation of the mechanism of the provision of FOP nutrition labels, namely that consumers are more motivated, or more empowered, to make healthful choices. In particular, it assessed whether the implementation of interpretative elements (i.e., colour-coding, text, percentage of GDAs) on the basic FOP nutrition label increases (a) consumers' motivation and (b) consumers' perceived capability to make healthful product choices. To answer RQ 2, we present the results of the healthy choice task using the two latent variables mentioned above as the dependent variables.

Consumer motivation and perceived capability to choose healthfully

We first tested whether the experimental conditions where a nutrition label was shown increased participants' motivation to make more healthful choices in the preference choice task when compared to the control condition where no nutrition label was shown. The stated motivation did not differ between these two groups ($M = 4.61$, $SD = 1.91$ vs. $M = 4.29$, $SD = 1.91$; $t(998) = 1.57$, $p = .12$).

An ANOVA was conducted to assess the influence of the manipulated variables (Table 7). Health motivation was used as the

[5] These results are not presented here due to limitations in space.

Table 6
Mean SSAg/1 value of the choice set and the choice and one-sample *t*-test results comparing the extent of improvement of choice with the change in the choice set value.

Task and choice set	Mean SSAg/1 of the choice set (mean SSAg/1 of product chosen)			
	Sweet snacks in Germany	Savoury snacks in Germany	Sweet snacks in Poland	Savoury snacks in Poland
Preferred choice task, 10 products	12.1 (12.0)	10.4 (10.2)	12.4 (12.3)	10.4 (9.9)
Preferred choice task, 20 products	9.2 (9.5)	7.1 (5.6)	9.4 (8.5)	7.0 (5.0)
Preferred choice task, extent of improvement	2.9 (2.5) $t(249) = -2.03$, $p < .05$	3.3 (4.6) $t(251) = 6.12$, $p < .001$	3.0 (3.8) $t(249) = 3.91$, $p < .001$	3.4 (4.9) $t(251) = 6.73$, $p < .001$
Healthy choice task, 10 products	12.1 (11.3)	10.4 (9.1)	12.4 (11.6)	10.4 (9.3)
Healthy choice task, 20 products	9.2 (5.4)	7.1 (2.8)	9.4 (6.8)	7.0 (2.9)
Healthy choice task, extent of improvement	2.9 (5.9) $t(251) = 16.98$, $p < .001$	3.3 (6.3) $t(249) = 14.79$, $p < .001$	3.0 (4.9) $t(251) = 11.83$, $p < .001$	3.4 (6.4) $t(249) = 15.99$, $p < .001$

Notes. The figures given are the mean SSAg/1 present in the choice set offered, with the mean SSAg/1 of the products actually chosen by participants given in parentheses. *T*-tests examined whether the extent of improvement of these two means (i.e., the reduction of SSAg/1 from the choice out of 10 products to the choice out of 20 products) was significant.

Table 7
Influence of the product category, country, and nutrition label formats on consumers' motivation to make healthful food choices, as revealed by an ANOVA.

Independent variables	*F* value	*p* value	Partial η^2
Category	1.62	.20	.00
Country	4.70	.030	.01
Category × Country	0.08	.78	.00
Text	1.03	.31	.00
Colour	0.49	.62	.00
GDA	1.98	.16	.00
Category × Text	0.12	.73	.00
Category × Colour	0.24	.78	.00
Category × GDA	2.06	.15	.00
Country × Text	0.31	.58	.00
Country × Colour	0.05	.96	.00
Country × GDA	0.22	.64	.00
Category × Country × Text	0.19	.67	.00
Category × Country × Colour	1.78	.17	.00
Category × Country × GDA	0.00	.96	.00

Notes. Cell means and standard deviations describing the main effect are mentioned in the text. Model $F(19,880) = 1.00$, $p = .46$, $R^2 = .02$ (adjusted $R^2 = .00$); $n = 900$.

Table 8
Influence of the product category, country, and nutrition label formats on perceived capability of making healthful food choices in the healthy choice task condition, as revealed by an ANOVA.

Independent variables	*F* value	*p* value	Partial η^2
Category	0.58	.45	.00
Country	51.83	<.001	.06
Category × Country	0.22	.64	.00
Text	3.36	.07	.00
Colour	5.46	.004	.01
GDA	0.11	.74	.00
Category × Text	0.01	.92	.00
Category × Colour	1.31	.27	.00
Category × GDA	1.31	.25	.00
Country × Text	1.02	.31	.00
Country × Colour	13.63	<.001	.03
Country × GDA	0.79	.38	.00
Category × Country × Text	3.34	.07	.00
Category × Country × Colour	0.90	.41	.00
Category × Country × GDA	0.31	.58	.00

Notes. Cell means and standard deviations describing the main effect are mentioned in the text. Model $F(19,880) = 5.21$, $p < .001$, $R^2 = .10$ (adjusted $R^2 = .08$); $n = 900$.

dependent variable. The results revealed that country is the only significant predictor (health motivation being lower in Germany than in Poland; $M = 4.47$, $SD = 1.83$ vs. $M = 4.75$, $SD = 1.98$; $F(1,880) = 4.70$, $p < .05$). We can therefore conclude that the presence of the nutrition label, and the formats of the labels, did not increase consumers' motivation to make healthful food choices.

The same analyses were conducted with perceived capability of making healthful food choices as the dependent variable. A *t*-test showed that the participants in the pooled experimental conditions where a nutrition label was shown rated their capability of making healthful choices significantly higher ($M = 5.37$, $SD = 1.26$) than the participants in the control condition where no nutrition label was shown ($M = 5.06$, $SD = 1.44$; $t(998) = 2.33$, $p < .05$).

ANOVA results (Table 8) revealed main effects of country and colour-coding: German participants perceived their capability as lower than Polish participants ($M = 3.64$, $SD = 1.02$ vs. $M = 4.04$, $SD = 4.04$; $F(1,880) = 51.83$, $p < .001$), and the colour coding increased the perceived capability of choosing healthful products ($M = 3.93$, $SD = 0.87$ in the TL condition vs. $M = 3.74$, $SD = 0.96$ in the no colour condition; $t(698) = -2.81$, $p < .01$; however, the blue shading condition did not prove to be significantly different from the no colour condition with $M = 3.80$, $SD = 0.85$, $t(499) = 0.79$, $p = .43$). In addition, an interaction effect between country and colour-coding was found. The interaction can be described as follows: In Germany, participants rated their perceived capability of making healthful choices higher when TL colours were shown ($M = 3.86$, $SD = 0.99$), as compared to no colour coding ($M = 3.34$, $SD = 1.03$; $t(348) = -4.81$, $p < .001$), and the same was true for the comparison between blue shading and no colour coding ($M = 3.63$, $SD = 0.96$; $t(249) = 2.25$, $p < .05$). There were no such effects in Poland ($M = 4.00$, $SD = 0.73$ vs. $M = 4.13$, $SD = 0.68$; $t(348) = 1.76$, $p = .08$ and vs. $M = 3.97$, $SD = 0.68$; $t(248) = -1.83$, $p = .07$, respectively).

Discussion and conclusions

General discussion

The study indicates that the implementation of nutrition labels per se, and interpretative elements (i.e., colour coding, text and percentage of GDAs) on them, does not influence the healthfulness of consumers' choice when they choose according to their preference. Healthfulness of preferred choice depends on the setting, that is, the country (Germany vs. Poland), the product category (savoury vs. sweet snack) and the choice set (10 vs. 20 products available). When consumers are asked to make a healthful choice, healthfulness of choice depends on the setting as well, but in addition, the nutrition label formats influence the healthfulness of the chosen product, the accuracy of classifying products based on their healthfulness, and the perceived capability of making healthful food choices. However, the patterns of the effects of the elements

Table 9
Overview of the results on the influence of the nutrition label format on the dependent variables in the preferred choice (top rows) and healthy choice task (bottom rows).

Variable	Colour-coding with TL or blue shading	Text (low, medium, high)	Percentage of GDAs
Preferred choice:			
Healthfulness of the chosen product	n.s.	n.s.	n.s.
Healthfulness of the sorting	n.s.	n.s.	n.s.
Health motivation	n.s.	n.s.	n.s.
Healthy choice:			
Healthfulness of the chosen product	Country × Colour: Germany (+) for TL and blue shading	n.s.	Choice set × Category × GDA: no significant follow-up test pattern
Healthfulness of the sorting	Country × Colour: Germany (+) for TL	Main effect (+)	Country × GDA: no significant follow-up test pattern
Perceived capability	Main effect (+) for TL; Country × Colour: Germany (+) for TL and blue shading	n.s.	n.s.

Notes. n.s. means that there was no significant effect in the mixed ANOVAs. (+) means that there was a positive effect on the healthfulness of the food choice.

of the nutrition labels formats were not consistent. Table 9 provides an overview of the patterns.

From a public policy perspective, the low impact of nutrition labelling is sobering. However, it is in line with Hieke and Wills (2012) who reported that nutrition labelling produces only little effects on consumer decision-making. Nevertheless, the study revealed new insights about the influence of the various label elements. In the forced health motivation task, colour coding, text and percentage of GDAs exerted some influence on the healthfulness of food choices and sorting, such that positive effects occurred for textual elements and partially for TL and blue shading colour, and both negative and positive effects partially occurred for percentage of GDAs, with colour-coding (and especially TL) showing to favourably influence participants in Germany, but not in Poland. However, none of these effects appeared consistently across the dependent variables.

Previous experimental research has indicated that TL colour coding has a greater potential of influencing healthfulness of consumers' food choices than other elements (Borgmeier & Westenhoefer, 2009; Food Standards Agency, 2008; Hawley et al., 2013). Also, studies focussing on the effect of colours suggests that TL colours, and especially the red, may affect consumers' food choices (Genschow, Reutner, & Wänke, 2012; Hieke & Wilczynski, 2012). Eye-tracking research showed that increasing the visual salience of nutrition labels by colours and contrasts increase the likelihood that consumers use nutrition labels (Graham, Orquin, & Visschers, 2012) in their choice (Bialkova & van Trijp, 2011). The TL colours help consumers focus on the nutrients that may have negative health consequences (Jones & Richardson, 2007).

However, revealed preference data analyses do not support that these tendencies translate into healthy behaviours at the point of sale. An analysis of scanner data from Sainsbury stores in the UK – collected when Sainsbury introduced TL labels on its private brand products – found no evidence that the new label shifted choices to more healthful products (Sacks, Rayner, & Swinburn, 2009). An Australian study in an online shopping environment also failed to identify any influence of TL colours on choices (Sacks, Tikellis, Millar, & Swinburn, 2011). Conversely, a study in a US hospital cafeteria found that TL colour-coded labelling improved sales of healthful products (Thorndike, Sonnenberg, Riis, Barracloug, & Levy, 2012). The current study, however, indicates that colour coding has a favourable influence in a forced healthfulness choice situation in Germany only.

The results of our study revealed strong differences between countries. What may be the reason for this? At the time of the study, TL colour coding was an issue of public debate in Germany but not in Poland, which we think may explain differences. The results might reinforce the attested importance of familiarity, as influenced by external sources such as the media (Van Herpen et al., 2012). However, this explanation is speculative, as media-generated familiarity with the formats was not measured in the study. Also unclear is the observed tendency of a negative influence of the presence of percentage GDA in interaction with country and product category, given that prior results have shown that most formats are equally well understood (Grunert, Fernández-Celemín, Wills, Storcksdieck genannt Bonsmann, & Nureeva, 2010; Grunert et al., 2010).

This study used a design that combined the manipulation of nutrition label elements with the manipulation of the size of the choice set. The results showed that offering an additional set of more healthful products triggered consumers to reconsider their initial choice. This effect is more powerful than the other factors considered in the study. The improvement of the healthfulness of choice exceeds the improvement that would have resulted from random choice. The crucial influence of the choice set expansion highlights the idea of 'nudging' consumers to favourable choices through simple changes in the environment (Thaler & Sunstein, 2008).

The nutrition labels did not increase consumers' health motive when making food choices. However, participants expressed a higher perceived capability of choosing healthfully in the presence of colour coding when asked to make healthy choices. According to social cognitive theory, perceiving that one's capability is improved should help raise a person's perceived self-efficacy; in turn, higher levels of self-efficacy are crucial for favourable behaviour change in healthful eating (Bandura, 2004; Baranowski et al., 2003; Luszczynska et al., 2007).

Public policy implications

Although the results of our study cannot finally resolve the hotly debated question about whether and which FOP nutrition label format performs best, it provides some policy implications. In addition to being an informational tool, FOP nutrition labels should be treated as an educational tool as well, which over time should help people develop competences to make healthful choices. The basic FOP nutrition label in combination with interpretative elements is an example of how various research findings can be combined into a practical tool. Based on the results of our study, policy makers should focus on the healthfulness of the overall food assortment. Larger choice sets with more healthful products may simply nudge consumers towards more favourable choices (Thaler & Sunstein, 2008). Whether and to which degree FOP nutrition labels support such strategies in real life remains to be shown.

Limitations and outlook

As limitations, several issues arise. We cannot rule out that preferences expressed in the study deviate from consumers' revealed preferences at the point of sale in real life. Also, the findings may be specific to the basic nutrition label format that was used in the study (i.e., the basic FOP nutrition label). It included nutrition information about calories and four negative nutrients, and showed a health logo at a penetration of 20%. Future studies may find out whether the presence (vs. absence) of health logos interacts with the interpretative elements considered in our study, and whether the varying penetration of health logos, the implementation of positive nutrients (such as fibre, vitamins, and minerals), or varying shape and size of the formats alter the influence on the decision-making process.

Another limitation is that the change in the size of the choice set was increased in all experimental conditions. It would be interesting to find out whether taking away healthful (vs. un-healthful) food options from the choice set produces the same effects as adding healthy options to the choice set. Furthermore, the study is limited in that it only measured effects within a short time frame. The results of other studies indicate that familiarity with the label (Bialkova & van Trijp, 2010; Van Herpen et al., 2012) is crucial for consumer decision-making processes. However, the impact of increasing familiarity can only be analysed with repeated exposure or long-term studies, and therefore further research should cover longer time spans or address the effect of accompanying information campaigns or interventions to support the use of the label (Sacks et al., 2011).

We can only speculate about the exact reason why the extension of the choice set improved the healthfulness of the choices. One mechanism may be that the focus of attention changed in response to an altering choice set of products. Lastly, research is necessary to establish whether and how perceived capability of choosing more healthfully translates into higher self-efficacy with regard to healthful eating and potentially into favourable dietary choices.

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