

Understanding how consumers categorise nutritional labels; a consumer derived typology for front-of-pack nutrition labelling.

Charo Hodgkins ^{a,1}, Julie Barnett ^b, Grazyna Wasowicz-Kirylo ^c, Malgorzata Stysko-Kunkowska ^c, Yaprak Gulcan ^d, Yesim Kustepeli ^d, Sedef Akgungor ^d, George Chryssochoidis ^{e,2}, Laura Fernández-Celemin ^f, Stefan Storcksdieck genannt Bonsmann ^f, Michelle Gibbs ^g, Monique Raats ^a

^aFood Consumer Behaviour and Health Research Centre, Faculty of Arts and Human Sciences, University of Surrey, Stag Hill, Guildford, Surrey GU2 7XH, UK
Department of Information Systems and Computing, Brunel University, Kingston Lane, Uxbridge UB8 3PH, UK

^cUniversity of Warsaw, Krakowskie Przedmieście 26/28, 00-927, Warsaw, Poland

^dDokuz Eylul University, Cumhuriyet Bulvarı No: 144 35210, Alsancak / Izmir, Turkey

^eAgricultural University of Athens, Iera Odos 75, Athens 11855, Greece

^fEuropean Food Information Council (EUFIC), Tassel House, Paul-Emile Janson 6, 1000 Brussels, Belgium

^gNutritional Sciences Division, Faculty of Health and Biomedical Sciences, University of Surrey, Stag Hill, Guildford, Surrey GU2 7XH, UK

¹Corresponding author E-mail address: c.hodgkins@surrey.ac.uk (Charo Hodgkins)
Not for publication: Tel: +44(0)1483686891; Fax: +44(0)1483682888

²Present address: Norwich Business School, University of East Anglia, Norwich NR4 7TJ, UK

Abstract:

Significant ongoing debate exists amongst stakeholders as to the best front-of-pack labelling approach and emerging evidence suggests that the plethora of schemes may cause confusion for the consumer. To gain a better understanding of the relevant psychological phenomena and consumer perspectives surrounding FoP labelling schemes and their optimal development a Multiple Sort Procedure study involving free sorting of a range of nutritional labels presented on cards was performed in four countries (n=60). The underlying structure of the qualitative data generated was explored using Multiple Scalogram Analysis. Elicitation of categorisations from consumers has the potential to provide a very important perspective in this arena and results demonstrated that the amount of information contained within a nutrition label has high salience for consumers, as does the health utility of the label although a dichotomy exists in the affective evaluation of the labels containing varying degrees of information aggregation. Classification of existing front-of-pack labelling systems on a proposed dimension of 'directiveness' leads to a better understanding of why some schemes may be more effective than others in particular situations or for particular consumers. Based on this research an enhanced hypothetical front-of-pack labelling scheme which combines both directive and non-directive elements is proposed.

Keywords

Nutrition labelling; Front-of-pack labelling; Labelling typology; Directiveness; Directive; Semi-directive; Non-directive; Consumer categorisation; Multiple Sort Procedure; Multiple Scalogram Analysis.

Introduction

Recent years have witnessed an increasing burden of diet-related diseases such as obesity, type-2 diabetes and cardiovascular disease (Astrup, 2001; Muller-Riemenschneider et al., 2008). In an attempt to address this growing public health problem, the World Health Organisation's Global Strategy on Diet, Physical Activity and Health highlighted nutrition as a key 'risk' factor recognising that a low intake of vegetables and fruits and increased consumption of foods that are high in fat, sugar and/or salt is detrimental (WHO, 2004). Nutrition labelling is generally accepted to be a way of providing information to consumers to support health conscious food choices (COM, 2008) and various forms of front-of-pack (FoP) nutrition labelling, often referred to as 'signpost' labelling have emerged across Europe as a possible tool to address these nutrition-related public health issues.

Government bodies, food manufacturers and retailers have actively embraced FoP signpost labelling and have developed a wide range of schemes in varying colours and formats in order to communicate the nutritional content and relative healthfulness of their foods. These schemes range from the presence of a detailed label on the front of the pack communicating the levels of key nutrients, possibly overlaid with interpretative text or colour as a benchmark, through to the presence of a simple visual symbol or 'health logo' indicating that the product is considered to be a more healthful choice. However, it is worth noting that the various schemes are often underpinned by different approaches to nutrient profiling, the detail of which is typically invisible to the consumer at point-of-purchase.

There is significant ongoing debate amongst stakeholders as to the best FoP labelling approach and alongside this, emerging evidence suggests that the plethora of schemes and their differing presentation on pack may cause confusion for the consumer (FSA, 2009). Efforts by the EU to establish a food profiling system to determine which foods actually deserve nutrition or health claims (Drenowski &

Fulgoni, 2008) highlighted the need for a uniform approach to nutrient profiling. This is reinforced by the suggestion that such an approach will ultimately help all stakeholders in Europe including consumers, manufacturers and retailers (Lobstein & Davies, 2008). The recently approved regulation of the European Parliament and of the Council of 25 October 2011 on the 'Provision of food information to consumers' (EU No 1169/2011) has attempted to address the area of nutrition labelling by making it mandatory for all pre-packed foods to display in the same field of vision, the energy value and amounts of fat, saturates, carbohydrates, protein, sugars and salt per 100g or per 100ml, and if desired per portion where the portion is clearly stated on the pack. Additionally, expression as a percentage of Guideline Daily Amounts per 100g/ml and per portion is permitted. Whilst this regulation does not legislate for mandatory front-of-pack nutrition labelling, it does allow for the energy value to be repeated in the principal field of vision either alone, or in conjunction with per portion values for fat, saturates, sugars and salt. Furthermore, within this legislation food manufacturers will only be allowed to continue supplementing the mandatory nutrition information with 'other forms of expression' e.g. graphical or symbolic 'signpost' schemes, if their current or proposed schemes meet a range of criteria including being both scientifically valid and not misleading for the consumer. Ultimately the FoP schemes employed must be principally aimed at facilitating consumer understanding of the energy/nutrient contribution of the food with evidence showing that they are understood by the average consumer, additionally they must not present barriers to the free movement of goods. Member states will be required to monitor the use of any additional forms of expression within their territory and submit supporting evidence to the Commission for a report to the European Parliament on the use of additional forms of expression and presentation, their effect on the internal market and on the advisability of further harmonisation within European Union.

Bearing in mind that the nutrition labelling element of this legislation becomes enforceable by December 2016 and the Commission's report on additional forms of expression is due in December 2017, more research is clearly pressing, not only from a compliance perspective for the manufacturers but more importantly to ensure we fully understand the degree to which they can contribute to healthier food choices over and above the provision of the mandatory nutrition labelling alone.

Prevalent front-of-pack labelling schemes and previous research

Within the EU, three main FoP labelling schemes prevail; Guideline Daily Amounts (GDA), Traffic Lights (TL) and Health Logos (HL) (Storcksdieck genannt Bonsmann et al., 2010). GDA schemes typically express the numerical values for calories, sugar, fats, saturates and salt that a portion of the food contains but they also express these as a percentage contribution to the daily requirements of an average reference adult. Guideline Daily Amounts were derived from the COMA report (Wiseman, 1992) on Daily reference Values (DRVs) and are championed by FoodDrinkEurope previously known as the Confederation of Food and Drink industries (CIAA) and many food manufacturers and retailers. When this scheme is employed, FoP labels appear on all foods regardless of whether they are considered to be a healthful choice or not.

The UK Food Standards Agency Traffic Lights scheme (FSA, 2007) also communicates numerical values for calories, sugar, fats, saturates and salt in either grams per portion or 100g on the front-of-pack but overlays the risk nutrients with an interpretative colour code of red (High), amber (Medium) or green (Low). The thresholds for the colour bands include both per 100g and per portion criteria and were derived from existing advice from COMA and SACN on fats, saturates and salt whilst an expert group was set up to determine appropriate criteria for sugars. Similarly to the GDA schemes, when employed, traffic light labels appear on all foods.

In contrast, health logos only appear on those foods deemed to be more healthful and they do not contain numerical values for the key risk nutrients since the presence of the logo itself indicates that the product meets the underlying nutritional criteria set by the organisation responsible for the logo scheme (Butler, 2010). The Swedish Keyhole (Larsson et al., 1999) and the Smart Choices logo (Lupton et al., 2010) are examples of such schemes which evaluate both positive and risk nutrients to establish whether the product is deemed to be healthy in relation to other foods in the same category.

There has already been much research in the area of nutrition labelling which has been detailed in a number of very comprehensive reviews (Cowburn & Stockley, 2005; Grunert & Wills, 2007; Campos et al., 2011; Hersey et al., 2011; Kroonenberg-Vyth, 2012). In their review, Grunert and Wills suggested consumers ultimately require three key things from FoP labels; they must be simple to use, include underlying nutritional information and must not be unduly coercive, but despite this little consensus has emerged as to the most effective approach. Whilst earlier research identified that consumers found percentage energy difficult to understand (Lobstein et al., 2007), more recent research suggests that consumers are able to identify more healthful products by using percentage guideline daily amount (GDA) labels (Grunert et al., 2010). However, there is little evidence to confirm whether consumers are able to effectively utilize GDAs in the context of their overall daily diet (Louie et al., 2008; Magnusson, 2010). Critics of the GDA approach also feel that there is potential for misrepresentation of portion sizes to make foods appear more healthful than they actually are and it has been suggested that consumers find it difficult to compare products when the nutritional information is presented in different portion sizes (Sanders, 2006; Lobstein & Davies, 2008). In earlier research Lobstein et al., (2007) reported that the Traffic Light (TL) labelling scheme was better at facilitating more

healthful food choices when compared to the GDA approach. This finding was reflected in a number of other studies (Kelly et al., 2009; Balcombe et al., 2010) however Grunert and Wills (2007) identified that although consumers generally liked the TL scheme, the red colour could potentially be interpreted to mean 'not allowed' rather than 'limit intake'. It has therefore been suggested this approach may lead to avoidance by the consumer of important food groups which are essential for a well-balanced diet e.g. dairy, because these types of food typically incur a high proportion of red or amber traffic lights. Advocates of health logo (HL) approaches argue that these schemes take into account the food as a whole, by addressing both positive and negative nutrients, and that the presence of a logo quickly communicates the healthfulness of the product, without the need for any numerical processing by the consumer at point-of-purchase, thus potentially being more useful in a real shopping situation. However, Feunekes et al. (2008) found that the TL scheme was rated higher than a HL scheme for liking, comprehension and credibility. Concerns have also been raised, particularly within the cereals category, regarding the potential for manufacturers to mask relatively high levels of risk nutrients such as sugar by fortifying their products with positive nutrients such as fiber in order to qualify for a logo (Centre for Science, 2009). In addition, a recent study by Andrews et al., concluded that health logos may be acting as 'implicit health claims' and lead to a higher subjective evaluation of product healthfulness when compared to a hybrid TL-GDA label or no FoP label condition (Andrews et al., 2011)

Across the board there is a lack of consensus as to whether the FoP nutrition information is really having the desired effect of leading consumers to make more healthful food choices in real-world shopping situations. Despite survey-based empirical research indicating that the presence of FoP labels is likely to increase purchase intentions of more healthful foods (Andrews et al., 2011, Feunekes et al.,

2008), studies in more realistic shopping environments have demonstrated little effect. A study in a cafeteria environment in the Netherlands concluded that the Choices International Foundation health logo did not result in a significant increase of sales of more healthful lunchtime foods (Vyth et al., 2011). Similarly a study on the introduction of TL labelling in a UK retailer (Sacks et al., 2009) showed no impact on the healthfulness of food purchases in the first four weeks of the FoP labelling being introduced, although this study outcome may have been limited by the small range of food categories included.

The need for a consumer derived typology

It is fair to suggest that previous FoP research may have been lacking a framework encompassing the range of dimensions which differentiate one system from another and which potentially explain why they perform as they do. Rather, past studies have focussed on simply comparing schemes and trying to establish a 'winner'. However, more recently publications have begun to address this. In his paper on regulation of nutrient profile labelling in the US, Lytton proposes a taxonomy of nutrient profile labelling which compares and contrast the various labelling schemes across a number of dimensions including source, scope, character, gradation, segmentation and aggregation (Lytton, 2010). Other approaches have categorised signpost labelling schemes as either 'fact-based' or 'criteria-based' but suggest that consumers are unlikely to recognise the difference between these two categories of labels (Periera, 2010) and this is most likely due to the fact that whilst both of these approaches effectively discuss the relative strengths and weaknesses of the various FoP schemes according to their chosen expert dimensions, none are based on dimensions elicited directly from consumers.

Experts, by definition, tend to have a higher degree of knowledge than non-experts and are likely to demonstrate a more extensive and sophisticated categorisation (Rugg

& McGeorge, 1997; Ellis, 1989). Since it has been suggested that there is a lack of understanding of the relevant psychological phenomena and consumer perspectives surrounding FoP labelling schemes and their optimal development (van Kleef & Dagevos., 2011) elicitation of categorisations from consumers i.e. non-experts, has the potential to provide a very important perspective in this arena. Ultimately, consumers are the ones expected to use FoP nutrition labels so it is appropriate that in developing a framework labelling typology, we seek deeper insight into how consumers themselves categorise the different forms of nutritional labels to which they may be exposed. The task of developing a typology of the current European FoP labelling systems based around consumer categorisations of FoP labels was approached by elicitation of constructs using the Multiple Sort Procedure (MSP) and subsequent analysis of the categorical data using Multiple Scalogram Analysis (MSA). This exploratory study was performed in four European countries to ensure any resultant typology reflected a range of differing cultural perspectives and historical exposure to FoP labelling.

Methods

The importance of categorization is well established in the field of psychology (Smith & Medin, 1981) and the Multiple Sort Procedure (MSP) (Rugg & McGeorge, 1997; Barnett, 2004) systematically explores the way in which participants' make sense of a particular topic area rather than, as is the case with questionnaires, the research being based on constructs pre-imposed by the researcher. This study involved free sorting of a range of nutritional labels presented on cards and elicited the way in which participants described and categorised these elements. The underlying structure of the qualitative data generated by the MSP was then explored using Multiple Scalogram Analysis (MSA) (Wilson, 2000; Lingoos, 1979; Zvulun, 1978; Hammond, 1997). MSA

provides visual representation of the elements being sorted in terms of geometric space and the resultant scatter plot depicts each card as a point in two dimensional space. The spatial proximity or distance between the points on the plot is a reflection of the adjudged conceptual similarity or difference of the sorted items (Barnett, 2004).

Participants

The study was carried out on a total of 60 participants regularly responsible for food shopping for the household and comprising of 15 participants from each of the following countries; UK, Poland, Turkey and France (Table 1). The study was approved by the University of Surrey Ethics Committee for the UK data collection and locally by the University of Warsaw, Dokz Eylul University and Agricultural University of Athens for the Polish, Turkish and French data collection respectively.

Data collection

Four trained interviewers, one per country, conducted individual face-to-face interviews using a standardised interview schedule translated into local language prior to use. Participants were given a set of 22 cards each of which displayed a single nutrition label. They were told that the label on each card had been designed to tell them something about how healthful a food product might be and instructed to sort the cards into groups so that all the cards in one group were similar to each other in some important way and different from the other groups. Whilst performing the free sort, participants were encouraged to 'think aloud' both about the cards and their sorting rationale. The interviewer then instructed the participant to sort the same cards again grouping the cards in a different way. If they felt able, participants were encouraged to perform up to three free sorts. The interviews were digitally recorded and on completion of each of the sorts, the interviewer manually recorded the overall sort

rationale used by the participant, the reasons for each grouping of cards and which cards were assigned to each group.

Stimuli

Selection of the FoP labels included in the study was based on the need to include a diverse selection of FoP labels that exist within Europe. Since the study was to be performed in the United Kingdom, Poland, Turkey and France, it was also important that representation of the most prevalent nutritional labelling elements from each of these markets were reflected including GDA, traffic light and health logo schemes. However, one scheme originating in the US was also included; the US retailer Hannaford's 'Guiding Stars' as it is an example of a graduated health logo which did not exist in Europe at that time but could possibly appear on the European market in the near future. This logo has the ability to communicate 'degrees of healthfulness' (i.e. good, better, best) however, similarly to the more typical health logos which do not differentiate between the healthful foods once they have been defined as such, this graduated logo is still only capable of signposting those products within the more healthful spectrum. It should be noted that this scheme is typically implemented as a shelf tag as opposed to a label that appears on the food package itself. The stimuli set also included three different representations of typical UK back-of-pack nutrition tables all of which included nutrition information both per portion and per 100g, one of which also displayed percentage guideline daily amount values and another which also displayed both percentage guideline daily amount values and traffic light colours. Whilst not typically considered as FoP nutrition labels, nutrition claims were also included in the stimuli set to explore how they might be conceptualised by the participants in each of the countries in relation to the various types of FoP labelling that might exist, bearing in mind that health logos may in fact operate as implicit health claims in some situations (Andrews et al., 2011).

The UK is one of the most developed European markets with respect to the availability of processed foods and accordingly it has the highest level of nutritional labelling activity. These include nutrition tables on back-of-pack and health logos (HLs), traffic lights (TLs), percentage guideline daily amounts (GDAs) and nutrition claims (NCs) on front-of pack, as demonstrated by the recent penetration study of nutrition information across Europe (Storcksdieck genannt Bonsmann et al., 2010). However, the Polish market is quite different as GDAs are predominant with very little incidence of HLs or NCs. Conversely Turkey has a minimal incidence of GDAs but some evidence of NCs and HLs. Whilst the French market has a reasonably high penetration and diversity of nutritional labelling using most of the elements existing in other European countries, it also has a number of unique systems. These include the Intermarché supermarket's 'Nutri-Pass' system which utilises an alternative traffic light colour system (amber, yellow and green) to the typical UK system (red, amber and green) and the 'Curseur Nutritionnel', an example of a nutrient profiling system that appears on pack as a graduated logo (Serog et al., 2006). Two major brands, McDonalds and Kelloggs had also recently introduced graphical representations for energy, and the other nutrients included on their nutritional signposts in an attempt to overcome the need for translation of the nutrient names into local languages thus minimising the number of packaging variants required for their pan-European or global brands.

The nutritional labelling schemes that exist in Europe and beyond differ widely in format, sequence and choice of nutrients, and for the purposes of this study it was necessary to focus only on the elements of the various schemes that attempted to communicate the healthfulness of the product rather than on specific format elements or aesthetics i.e. horizontal or vertical presentation or other design characteristics. The elements of the study were further contained by focusing on those nutritional claims and signposting elements that predominantly relate to energy, salt and the three most

commonly communicated macro nutrients; fat, saturated fat and sugar. However, one example of an 'energy only' GDA was included based on the Mars 'Be Treatwise' presentation as this is becoming quite prevalent across Europe on snacks and chocolate bars. The resultant 22 cards representing 6 overall expert categories are detailed in Table 2 and shown graphically in Figure 1. The label graphics were recreated in-house to produce the final label depictions since none of the 'real-life' examples existed in all languages and availability of the cards in local language was deemed to be essential. Therefore, the graphics used were close approximations of those typically used in the marketplace. The label text was generated in English and then translated into local language. All labels containing nutrient levels or numerical information were standardised to avoid participants simply sorting on the numerical values as opposed to the labels themselves. A typical UK ready meal (Lasagna) was used as the source of the nutritional information as it provided nutrient levels for which traffic light labels would display *at least* one red, amber and green signpost across the five nutrients. A brief explanatory statement was placed on four of the logos as it was felt that the participants would need some information regarding the provenance of these logos particularly if they had not encountered them before. For example, the Easy Choice health logo (Fig.1, label C3) was accompanied by the statement 'Food industry system for identifying products that are healthiest within a product category' (see Fig.1).

Analysis

Multiple Scalogram Analysis (Wilson, 2000; Lingoes 1979; Zvulun 1978) involves the preparation of a data matrix in which each column represents an individual participant's sort and each row represents a card i.e. an FoP label. The Multiple Scalogram Analysis (MSA) output provides an overall 'top' plot which depicts the relationships between all the cards in that analysis. Each card is a point in geometric

space and the closer the points are to each other the more similar they are considered to be. The program requires a 'coefficient of contiguity' of at least 0.9 to ensure that the solution being produced is an acceptable fit to the data. Regardless of whether differing numbers of categories were used by the participants during their free sorts, the cards that were most frequently placed together across the sample appear closest together on this top plot. In addition to this top plot, the MSA output also includes an 'item' plot for each sort included in the data matrix. The configuration of the points on these item plots is the same as for the top plot however, this time the points represent the category or group that the card was assigned to by the participant. Using the category descriptions, group headings and other qualitative data gathered during the sorting interviews, these item plots allow for the reasons that particular cards were grouped together in individual sorts to be overlaid onto the top plot in order to inform its' interpretation. In this way the researcher is able to partition the top plot on the basis of why particular cards were put together, and offer an interpretation of the categories that have informed the way that the study participants have sorted the cards.

Plots of the first free sorts for each country were prepared as a starting point for the analysis. Each country was analysed separately enabling exploration of the differences between countries. The resultant top plots are shown in Figures 2 to 5. Plots were also generated for the second free sorts for each country however these did not appear to add any additional dimensions to the interpretations already provided by the first free sort analysis therefore analysis at this level was not pursued.

Following the sorting, a content analysis was conducted in order to provide an overview of the constructs participants used in their first free sorts. All group headings were reviewed to identify meaningful categories within which sorts could be subsumed. These categories were then used in conjunction with the individual constructs to facilitate the interpretation of the MSA plots.

Results

Constructs utilised by participants in their first free sort

Categories elicited in an individual's first free sort are generally considered to have a higher salience than those in subsequent sorts (Barsalou, 1992). Of the twenty six constructs used as category/ group labels in the first free sorts, thirteen were used in three or more countries (Table 3), the top six of these accounting for over half that were used in total. The most frequent classification criteria used by the participants in their first free sorts related to the type and level of information that the labels provided. Other high frequency constructs related to how clear and understandable the participants' felt the labels were, the degree of healthfulness of the food being communicated and the overall impact/attractiveness of the labels. On the whole constructs utilised by participants in their second and third free sorting tended to repeat those already elicited.

The qualitative data gathered during the interviews suggested that it was the *lack of a direct decision* as to whether the food product overall was deemed to be healthy or not, i.e. the label's health utility, in the high information content labels which appears to drive certain participants to consider these labels as confusing and unclear and thus invoke a less favourable affective evaluation. Whereas, in the low information content labels which do communicate this direct decision, it was the lack of *'information'* on energy or nutrient levels which appeared to drive participants to categorise these labels as confusing and unclear and also invoke trust issues.

Legibility of the labels appeared to be an issue for the Polish participants, especially the older ones, possibly due to the fact that translation of the text into Polish meant the label often included more text characters. This finding was therefore considered to be an artefact of the experimental design rather than a particular difference between the Polish participants and the other countries.

Interpretation of the MSA plots

In the UK top plot (Fig. 2), the three main clusters of points and their distance from each other depicts the clear distinctions that participants made between three main groups of labels: health logos (HLs), nutrition claims (NCs) and the larger cluster of remaining labels which included the percentage guideline daily amount labels (GDA), traffic light (TL), hybrid (HB) and nutrition tables (NT). It is interesting at this stage to note that few UK participants used colour as a sort strategy or construct in their first free sort and the use of this construct only increased slightly in participants second free sorts. This contributes to some degree to the lack of separation between the TL and the GDA labels.

Using the qualitative data and item plots to help identify the reasons for sorting particular groups of labels together revealed that the health logo (HL) labels were consistently described as containing low levels of information. Conversely, the main mixed cluster of labels were categorised as containing high levels of information. The nutrition claim (NC) labels were often described as not having enough information to validate whether the claim was true or not and in the context of levels of information, this would appear to explain why they are separated from the other two clusters.

In terms of their health utility, labels containing numerical information on calories or macro nutrients, i.e. GDA, TL, HB and NT labels, were frequently categorised as relating to unhealthful foods, whereas participants recognised that the health logo (HL) label cluster related to healthful foods and categorised them as such. Some ambiguity regarding the degree of healthfulness was associated with the nutrition claims e.g. low fat (Fig. 1, label C17) and one of the graduated health logos (Fig.1, label C5). With regards to nutrition claims such as 'Low fat', participants expressed a need for more information to validate exactly how low the nutrient content actually was, and as such there was an element of mistrust associated with these types of statements. Despite the majority of health logos (HLs) being clustered closely

together on the plot, the French derived *Curseur Nutritionnel* system (Fig. 1, label C5) did not fall within that cluster. Similarly to the nutrition claims this logo was often perceived in terms of its health utility as ambiguous and it appeared to lack sufficient clarity of message for the UK participants. This is the most likely explanation for this label existing in the same partition on the plot as the nutrition claims and not within the health logo partition.

Based on the above interpretations, the UK top plot was partitioned with respect to the constructs of 'information content' and 'healthfulness of food'. For the other high frequency constructs; 'understanding/confusion' and 'clarity', further partitioning of the plots did not appear to be possible since the labels in each cluster were not consistently described with regards to the polarity of these constructs. Some participants described the health logos (HLs) as clear and easy to understand and the high information content labels as confusing whereas conversely, others found the health logos (HLs) confusing and the labels containing higher information content clearer and easier to understand. A similar effect was observed for the construct of impact/attractiveness; here too there appeared to be a dichotomy with some participants indicating that they found the high information labels impactful or attractive and others disagreeing and preferring the health logos (HLs) for impact and attractiveness. These differences in affective evaluation were not attributable to any socio-demographic factors.

For the Turkish data the interpretation process was repeated and the structure of the plot (Fig. 3) appeared to be dominated by the same two constructs prevalent in the UK plot, namely 'information content' and the 'health utility' of the label. In terms of the nutrition claims, overall the Turkish participants appeared to accept more readily these types of statements as indicators of the healthfulness over their UK counterparts but, similar to the UK plot, they were still categorised them as containing low levels of information.

Partitioning of the Polish plot (Fig. 4) based on the construct of 'information content' again appeared to best explain the separation of the clusters however, references to the health utility of the labels in the qualitative feedback from this sample related much more to the difficulties/ambiguity in building health inferences rather than a clear healthful/unhealthful food distinction. This heightened ambiguity associated with the health utility of the label most likely relates to a lack of familiarity with the various FoP schemes since many do not exist in Poland.

Partitioning of the French plot (Fig. 5) was dominated by the 'information content' construct alone. Similarly to the other three countries, health logos (HLs) and nutrition claims (NCs) appeared in the low information partition and the remaining labels appeared in the high information partition. However, in contrast to the other three country plots, the health utility of the label tended not to be used in the category descriptions of the French participants. Rather than use categories which related to how healthful they felt the foods that the labels represented were, they focussed more on the similarities/differences between the information presented on the labels and how useful they considered the various labels to be for their own needs. Interestingly this was not a construct used by any of the other countries in their first free sorts. Despite this slight difference, by virtue of the 'information content' construct alone the overall separation of the label clusters in the French plot is very similar to that of the other countries.

Once again, similarly to the UK plot, the label clusters on the Turkish, Polish and French plots were not consistently described in terms of their affective evaluation with some participants responding positively overall to the low information content labels and less positively to the high information content labels and conversely others responding more positively to the high information content labels. Again these differences were not attributable to socio-demographic factors.

Nutrition claims

Claims appear to offer some respondents a 'short-cut' cue to what they considered to be the most important message in the other nutrition information provided on pack. They indicated that claims such as 'low fat' for example, might prompt them to check the nutrition information provided on either front or back-of-pack for fat levels since many participants felt that these types of 'low' claims didn't offer sufficient detail to make a product choice and often invoked mistrust, a finding consistent with a number other studies on both nutrition and health claims (Chan, 2005; Mazis, 1997). Some participants even suggested that claims could be misconstrued as being targeted towards people with specific dietary needs and may therefore be discouraging for those outside the perceived target group. For example, it was suggested by some participants that low fat claims are only relevant for people on a weight-loss diet. However, this scepticism may have been amplified by the study being conducted in a lab setting since in a real-world shopping setting time constraints and other external factors often mean that evaluation of more detailed nutritional information is not possible. Indeed a recent study found that parents of children in the U.S. are influenced by health claims appearing on cereals (Harris et al., 2011) despite other lab-based studies having found that claims do not affect product evaluations or purchase intentions (Garretson, 2000).

Proposed consumer derived labelling typology

Partitioning the MSA plots demonstrates that there is a relationship between how directive an FoP labelling system is in its health utility and the amount of information that is included in the label. The relationship is in fact an inverse one such that the more directive, or by Lytton's typology the more aggregated the label becomes, the less information is included, the assumption being that the consumer doesn't need it as in terms of its health utility, the decision has already been made for them. This

research suggests that it is most likely this very assumption that results in the negative affective evaluation attributed to the labels by many of the participants. With less directive (non-aggregated) labels where the nutritional information is present, it is the absence of any decision for the overall health utility of the label at the food product level which appeared to cause many participants to consider these labels less favourably. Whilst the term 'directiveness' was not used verbatim as a construct by the participants, it does help to explain the relationship between the two dominant constructs and might lead to a better understanding of why some FoP schemes may be more effective than others in particular situations and for particular consumers. Many participants preferred the 'Directive' labels and felt they would help them make a quick decision on the product as a whole. However, others responded negatively to being told something was 'healthy' in the absence of any nutritional information and indicated that they would prefer to be able to make or validate their own decision based on the levels of a single nutrient, or a combination of nutrients which they felt were relevant to their specific needs via the 'Non-directive' type labels.

Whilst the participants within this study did not make a significant distinction in their sorting between high information content labels which contained traffic light information and those containing GDA information it is useful to discuss the dimension of 'directiveness' in the context of these types of labels to see how this dimension might enhance understanding over and above the use of the dimension of aggregation alone. Traffic light labels contain information on nutrient content but also communicate decisions on the healthfulness of the levels of these individual nutrients with either colour banding or use of text such as 'Red/High', 'Amber/Med' or 'Green/Low'. At either ends of the healthfulness spectrum, particularly when all the nutrients within the label for a given product are colour coded 'red' or alternatively all 'green', these labels communicate at a level more in line with the directive schemes. In these situations, the consumer is being given a greater degree of guidance as to the healthfulness of the

food as a whole, than by the presence of nutrient levels alone. It is important to note however, that the instances of an all 'red' or all 'green' food product are fairly low and in reality most consumers will be faced with an array of colours across the nutrients for a given food and therefore, if using these types of labels when shopping the decision as to where to place the product on the continuum of healthfulness is still located with the consumer for the majority of foods. In reality, their decision will most likely be based on the predominance of red or green within the traffic light label overall and so whilst Traffic Light labels are actually no more aggregated in terms of the amount of information that they display than GDA systems, they do in fact warrant a separate position on the dimension of 'directiveness' due to the fact that in some situations, as explained above, they are more directive than GDA systems. As such we propose that Traffic Lights schemes be classified as 'Semi-Directive'.

Classification of the stimuli labels according to the externally applied construct of 'directiveness' at food product level resulted in the proposal of three typology sub categories for the FoP labels; Directive, Semi-directive and Non-directive (see Table 4).

Discussion

Despite the differences in penetration of the various nutrition labelling systems in the four countries, on the whole consumers across the countries categorised and conceptualised the study labels in quite similar ways which is a positive when considering the possibility of developing an effective pan-European approach. Results demonstrated that the amount of information contained within a nutrition label has high salience for consumers, as does the health utility of the label although a dichotomy exists in the affective evaluation of the labels containing varying degrees of information aggregation. By recognising that when the directiveness of a FoP label's health message decreases, the level of detailed information for the consumer to process has to increase, classification of labels on the dimension of directiveness might lead to a

better understanding of why some FoP schemes may be more effective than others in particular situations and for particular consumers. In addition, a typology based on directiveness appears to better reflect the role of traffic lights in FoP labels than a typology based on aggregation alone.

In the 'real world' we know that most consumers don't have the time or motivation to process lots of nutritional information when they are shopping (Gerrier, 2010), however the expressed need for more information by some participants when presented with the low information content directive labels should perhaps be considered in the context of Judgeability Theory (Yzerbyt et al., 1994). This suggests that whilst people often understand and respond to simple cues better particularly when under time pressure, they often want to believe that they are making rational choices based on rational data. Non-directive labels with high information content have many attributes; nutrient names, grams, percentages, that possibly make people believe that they are being given important evidence. Even if they do not use the actual content, they are simply more likely to be reassured by the fact that the information is there.

Another possible explanation may simply relate to an individual's preferred thinking style. Individuals may choose to process information presented to them quickly and superficially (*heuristic*) or alternatively prefer to engage in more elaborate *systematic* processing (Epstein et al., 1996; Chaiken & Trope, 1999). This framework suggests that heuristic processing is more likely to be employed by individuals with a low level of knowledge about a subject and/or lack of background or detailed information to draw on. Conversely, systematic processing tends to be employed when people have both the ability and willingness to process more information i.e. when additional information is present or when they have the time/cognitive resources to process the information. Whilst individuals may have an inherent preference for one style over the other as a result of how well informed they are on the topic in question, it is likely that the processing style actually adopted will be influenced heavily by the

situation. In the context of a shopping visit, one might suggest that heuristic processing is very likely during routine shopping; low involvement, lack of time, overloaded cognitive resources etc. Under other circumstances, such as when following a weight loss programme or when attempting to eat more healthfully after an indulgent holiday period, individuals may be more motivated or involved and in consequence switch to systematic processing. It could be argued therefore that directive labels sacrifice all else for speed and ease of use, becoming both coercive and lacking in the necessary underlying nutritional information and subsequently contravening both the second and the third requirements for liking identified by Grunert and Wills (2007). Bearing in mind that to be effective an 'ideal' FoP labelling scheme must appeal to the widest audience across the widest set of shopping situations, one solution may lie in moving away from current thinking in terms of FoP labelling schemes utilising either an aggregated or alternatively a disaggregated approach, and more towards the development of FoP labels that consist of both directive and non-directive elements.

Whilst recent lab-based research by van Herpen and van Trijp (2011) found that health logos can enhance healthy product choice, in a supermarket environment this type of directive labelling will only ever be present on a small number of foods i.e. only the most healthful foods. Health logo schemes therefore only give half the story, leaving the consumer with no front-of-pack information to guide them on the relative healthfulness of their choices on the vast majority on foods that remain unlabelled by these approaches. The results of this research suggested that future studies may benefit from evaluating a hypothetical FoP labelling scheme which combines both directive and non-directive components according to this typology, and which clearly communicate both the presence and absence of the logo component. In its simplest form this potentially enhanced FoP label would consist of a logo supplemented by information on energy, sugar, fat, saturated fat and salt for those foods deemed to be healthful. For foods not deemed to be healthful, the FoP label should still be present

and display values for energy and the risk nutrients but make it visually clear when a product does not qualify for a health logo by leaving a space within the label where the logo should be. Further studies within the FLABEL project (Food Labelling to Advance Better Education for Life EU Contract n° 211905) went on to test this hypothetical FoP label in a real-store setting using eye-tracking and found that whilst overall attention to the label was only slightly increased, the healthfulness of choices made by shoppers with a lower degree of self-control (i.e. weaker in self-regulatory processes with regard to thoughts, emotions, impulsive behaviors) were increased (Grunert et al., 2012). Since this is a segment of the population that FoP labels should ideally be helping, this initial result is considered to be encouraging for further development and testing of this potentially enhanced approach to FoP nutrition labelling.

Limitations

This study was not concerned with testing the effectiveness of FoP labels in driving product choice, its purpose was to elicit semi-structured qualitative data to help us gain a deeper understanding of how consumers describe and differentiate the various FoP labels. As a small scale exploratory study conducted in a lab setting it should be noted that participants were more likely to be sceptical of the labels shown to them than they would be in a real-world shopping setting that often does not involve careful inspection of the labels. In addition, the participants were not required to use the labels in any 'real' way to facilitate a product choice and many of the labelling systems were unfamiliar to them. However, the value of the type of information gathered from this small scale study is that it is difficult to capture and is often missed in larger empirical studies focussed on outcome measures of final product choice.

Acknowledgements and Disclaimer

FLABEL receives research funding from the European Community's Seventh Framework Programme (Contract n° 211905). Its objective is to understand how nutrition information on food labels affects dietary choices and consumer habits. This project commenced August 2008, and ended in January 2012. The content of this 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. The authors gratefully acknowledge Bénédicte Brebion for her help in collecting the French dataset.

References

- Andrews, J., Burton, S. & Keys, J. (2011). Is Simpler Always Better? Consumer Evaluations of Front-of-Package Nutrition Symbols. *Journal of Public Policy & Marketing*, 30(2), 175-190.
- Astrup, A. (2001). Healthy lifestyles in Europe: prevention of obesity and type II diabetes by diet and physical activity. *Public Health Nutrition*, 4, 499-515.
- Balcombe, K., Fraser, I. & Di Falco, S. (2010). Traffic lights and food choice: A choice experiment examining the relationship between nutritional food labels and price. *Food Policy*, 35(3), 211-220.
- Barnett, J. (2004). The Multiple Sorting Procedure (MSP). In G. M. Breakwell (Ed.), *Doing Social Psychology Research*. The British Psychological Society and Blackwell Publishing Ltd (BPS Blackwell).
- Barsalou, L. W. (1992). *Cognitive psychology: an overview for cognitive scientists*. Hillsdale NJ: Lawrence Erlbaum Associates.
- Butler, K.M.L. (2010). Making smart choices: health claims, regulation, and food packaging. http://etd.library.pitt.edu/ETD/available/etd-04122010130208/unrestricted/Butler_K_April_2010.pdf: University of Pittsburgh – downloaded 14th January 2012.
- Campos, S., Doxey, J. & Hammond, D. (2011). Nutrition labels on pre-packaged foods: A systematic review. *Journal of Public Health Nutrition*, 14(8), 1-11.
- Centre for Science in the Public Interest (2009), Food Labelling Chaos: The case for Reform. http://cspinet.org/new/pdf/food_labeling_chaos_report.pdf - downloaded 12th February 2012.
- Chaiken, S., & Trope, Y. (Eds.), (1999). *Dual-process theories in social psychology*. New York: The Guildford Press.

- Chan, C., Patch, C. & Williams, P. (2005). Australian consumers are sceptical about but influenced by claims about fat on food labels. *European Journal of Clinical Nutrition*, 59, 148-151.
- Commission of the European Communities COM (2008) 40 final. *Proposal for a regulation of the European Parliament and of the Council on the provision of food information to consumers*. Europa, Brussels. Available at:
http://ec.europa.eu/food/food/labellingnutrition/foodlabelling/publications/proposal_regulation_ep_council.pdf.
- Cowburn, G., & Stockley L. (2005). Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutrition*, 8, 21-28.
- Drewnowski, A., & Fulgoni, V. (2008). Nutrient profiling of foods: creating a nutrient-rich food index. *Nutrition Reviews*, 66, 23-39.
- Ellis, C. (Ed.) (1989). *Expert Knowledge and Explanation; The Knowledge-Language Interface*. Chichester: Ellis Horwood.
- Epstein, S., Pacini, R., Denes-Raj, W., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality and Social Psychology*, 71, 390-405.
- EU Regulation No 1169/2011 on the provision of food information to consumers.
Europa, Brussels. Available at:
<http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:304:0018:0063:EN:PDF>.
- Feunekes, G., Gortemaker, I., Willems, A., Lion, R., & van den Kommer, M. (2008). Front-of-pack nutrition labelling: Testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. *Appetite*, 50, 57-70.

- FSA (2007). Food Standards Agency (UK): Front of Pack Traffic Light Technical Guidance, Issue 2, Nov. 2007. London: Food Standards Agency. Available at: <http://www.food.gov.uk/multimedia/pdfs/frontofpackguidance2.pdf>.
- FSA (2009). Comprehension and use of UK nutrition signpost labelling schemes. London: Food Standards Agency. Available at: <http://www.food.gov.uk/multimedia/pdfs/pmpreport.pdf>.
- Garretson, A. & Burton, S. (2000) Effects of Nutrition Facts Panel Values, Nutrition Claims, and Health Claims on Consumer Attitudes, Perceptions of Disease-Related Risks, and Trust. *Journal of Public Policy & Marketing*, 19(2), 213-227.
- Gerrier, S. (2010). Nutrient profiling systems: are science and the consumer connected? *American Journal of Clinical Nutrition*, 91, 1116S-1117S.
- Grunert, K. G., & Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health*, 15, 385-399.
- Grunert, K. G., Wills, J. M., & Fernández-Celemin, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite*. 55, 177-189.
- Grunert, K.G., Fernández Celemin, L., Storcksdieck genannt Bonsmann, S., & Wills, J.M., on behalf of the FLABEL consortium. (2012). Motivation and attention are the major bottlenecks in nutrition labelling. *Food Science & Technology*. 26(1), 19-21.
- Hammond, S. M. (1997) The Broadmoor Psychometric Library. Crowthorne, Berks: Clinical Decision Making Support Unit Broadmoor Hospital.
- Harris, J., Thompson, J., Schwartz, M. & Brownell, K. (2011). Nutrition-related claims on children's cereals: what do they mean to parents and do they influence willingness to buy? *Public Health Nutrition*, 14, 2207-2212.
- Hersey, J.E., Wohlgenant, K.C., Kosa, A. J.E. & Muth, M.K. (2011). Policy Research for

Front of Package Nutrition Labeling: Environmental Scan and Literature Review.
Report prepared for: Department of Health and Human Services, Washington, DC.
<http://aspe.hhs.gov/sp/reports/2011/FOPNutritionLabelingLitRev/> - downloaded
16th June 2012.

Kelly, B., Hughes, C., Chapman, K., Louie, J.C.Y., Dixon, H., Crawford, J. & Sleving, T. (2009). Consumer testing of the acceptability and effectiveness of front-of-pack food labelling systems for the Australian grocery market. *Health Promotion International*. 24 (2), 120-129.

Kroonenberg-Vyth, E. L. (2012). Evaluation of a front-of-pack nutrition label. Effects on consumer behavior, product development and public health. PhD Thesis, EMGO+ Institute for Health and Care Research, VU University, Amsterdam, the Netherlands.

Larsson, I., Lissner, L., & Wilhelmsen, L. (1999). The 'Green keyhole' revisited: Nutritional knowledge may influence food selection. *European Journal of Clinical Nutrition*, 53(10), 776-780.

Lingoes, J. (1979) *The Multivariate Analysis of Qualitative Data*. In Lingoes J., Roskam E. & Borg I. (Eds.) *Geometric Representations of Relational Data*. Mathesis Press: Ann Arbor.

Lobstein, T., Landon, J., & Lincoln, P. (2007). Misconceptions and misinformation: The problems with Guideline Daily Amounts (GDAs). A review of GDAs and their use for signalling nutritional information on food and drink labels. London: National Heart Forum. Available at:
http://www.heartofmersey.org.uk/uploads/documents/sep_08/hom_1221058649_p_s_food_labelling.pdf.

Lobstein, T., & Davies, S. (2008). Defining and labelling 'healthy' and 'unhealthy' food. *Public Health Nutrition*, 12, 331–340.

- Lupton, J.R., Balantine, D.A, Black, R.M., Hildwinw, R., Ivens, B.J., Kennedy, E.T., Packard, P.T. Sperber, B.R., Steffen, D. & Story, M. (2010). The Smart Choices Front-of-Pack Nutrition Labelling Program: Rationale and Development of Nutrition Criteria. *American Journal of Clinical Nutrition*, 91, 1078S-1089S.
- Lytton, T.D. (2010). Signs of change or clash of symbols? FDA regulation of nutrient profile labelling. *Health Matrix*, 19 (2), 1-52.
- Maziz, M.B. & Raymond, M.A. (1997). Consumer perceptions of health claims in advertisements and on food labels. *Journal of Consumer Affairs*. 31(1), 10-17.
- Muller-Riemenschneider, F., Reinhold, T., Berhofer, A., & Willich, S. N. (2008) Health-economic burden of obesity in Europe. *European Journal of Epidemiology*, 23(8), 499-509.
- Office for National Statistics. (2002). The National Statistics Socio-economic Classification (NS-SEC): user manual. Newport: Office for National Statistics, UK. Available at: <http://www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/soc2010/soc2010-volume-3-ns-sec--rebased-on-soc2010-user-manual/index.html>.
- Pereira, R. (2010). Understanding the maze of nutrition symbols and nutrition labelling systems. *Diabetes Spectrum*, 23(1), 57-63.
- Rugg, G. & McGeorge, P. (1997). The Sorting Techniques: a tutorial paper on card sorts, picture sorts and item sorts. *Expert Systems*, 14, 80-93.
- Sacks, G., Rayner, M. & Swinburn, B. (2009). Impact of front-of-pack 'Traffic Light' nutrition labelling on consumer food purchases in the UK. *Health Promotion International*. 24, 344-352.
- Sanders T. (2006). Breakfast Cereals Up Front – Debating the Issue of Food Labelling. Presentation to the Breakfast Cereal Information Service, London, 7 March 2006. Available at: <http://www.breakfastcereal.org/BreakfastCerealsUpFront.ppt>.

- Serog, P., Cohen, J.M., Rangheard, C., Martin, A. & Casamayou, C. (2006). Le curseur nutritionnel: un nouvel outil visuel d'information nutritionnelle. *Cahiers de Nutrition et de Diététique*, 41(6), 327-334.
- Smith E., & Medin D. (1981). *Categories and Concepts*. London: Harvard University Press.
- Storcksdieck genannt Bonsmann, S., Fernandez Celemin, L., Larranaga, A., Egger, S., Wills, J.M., Hodgkins, C. & Raats, M.M. (2010). Penetration of nutrition information on food labels across the EU-27 plus Turkey. *European Journal of Clinical Nutrition*, 64, 1379-1385.
- van Herpen, E. & van Trijp, H. C. M. (2011). Front-of-pack nutrition labels. Their effect on attention and choice when consumers have varying goals and time constraints. *Appetite*, 57, 148-160.
- Van Kleef, E & Dagevos, H. (2011). The growing role of front-of-pack nutrition profile labelling: A consumer perspective on key issues and controversies. *Critical reviews in Food Science & Nutrition*. Forthcoming. Available at SSRN: <http://ssrn.com/abstract=1977389>.
- Vyth EL, Steenhuis IHM, Heymans MW, Roodenburg AJC, Brug J, Seidell JC. (2011). Influence of Placement of a Nutrition Logo on Cafeteria Menu Items on Lunchtime Food Choices at Dutch Work Sites. *Journal of the American Dietetic Association*, 111, 131-136.
- WHO World Health Organisation. (2004). Global strategy on Diet, Physical Activity and Health. Fifty-seventh World Health Assembly, WHA57.17, Geneva. Available at http://www.who.int/hpr/NPH/docs/gs_process_english.pdf.
- Wilson, M.A. (2000). Structuring Qualitative Data: Multidimensional Scalogram Analysis. In G.M.Breakwell, S.Hammond, and C. Fife-shaw (Eds.), *Research Methods in Psychology* (pp 281-293). London: Sage.
- Wiseman (1993) The COMA Report: Dietary Reference Values for Food Energy

and Nutrients for the United Kingdom. *British Food Journal*, 94(3), 7-9.

Yzerbyt, V. Y., Shadron, G., Leyens, J. Ph., & Rocher, S. (1994). Social judgeability:

The impact of meta-informational cues on the use of stereotypes. *Journal of Personality and Social Psychology*, 66, 48-55.

Zvulun, E. (1978). Multidimensional Scalogram Analysis: the method and it's application. In Shye, S. (Ed.), *Theory Construction and Data Analysis in the Behavioural Sciences*. San Francisco: Jossey-Bass.

Table 1

Sample characteristics

	UK (n=15)	PL (n=15)	TK (n=15)	FR (n=15)	Total (n=60)
Gender					
Male	40	40	40	33	38
Female	60	60	60	67	62
Age group					
18-25 years	13.3	20.0	13.3	20.0	16.7
26-35 years	26.7	26.7	20.0	33.3	26.7
36-49 years	26.7	20.0	40.0	13.3	25.0
50-64 years	20.0	20.0	13.3	26.7	20.0
65+ years	13.3	13.3	13.3	6.7	11.7
NS-SEC five class^a					
1. managerial and professional occupations	46.7	20.0	66.7	53.3	46.7
2. Intermediate occupations	6.7	20.0	6.7	6.7	10.0
3. Small employers and own account workers	13.3	13.3	0	13.3	10.0
4. Lower supervisory and technical occupations	20.0	33.3	6.7	13.3	18.3
5. Semi-routine and routine occupations	13.3	13.3	20	13.3	15.0

^a Measured by NS-SEC, see Office for National Statistics (2002).

Table 2

Content elements of the label stimuli.

Construct	Description	Label Codes ^a
Health logos (HL)	5 labels in total; 3 representing the different types of endorsement found in the marketplace; authoritative endorsement - specified, authoritative endorsement - not specified and brand/retailer owned. 2 representing graduated logos.	C1-C5
% Guideline Daily Amounts (GDA)	5 labels in total representing monochrome, specific nutrient colouring, energy only and graphical representation of nutrient name and content.	C6-C10
Traffic lights (TL)	2 labels representing 'with text' (i.e. High, Med. Low) and 'no text' versions.	C11-C12
Hybrids (HB)	2 labels representing 'UK' traffic light/% GDA hybrid and an example of a hybrid label using an alternative TL scheme i.e. Amber, Yellow and Green.	C13-C14
Nutrition claims (NC)	5 labels each representing a different 'low' claim for energy (i.e. Low calorie) and one of the four key nutrients; fat, saturated fat, sugar or salt.	C15-C19
Nutrition tables (NT)	3 labels in total representing different levels of information in a nutrition table format; nutrients in grams, nutrients in grams plus % GDAs and nutrients in grams plus % GDAs plus traffic lights.	C21-C23

^a See Fig. 1 for the visual representation of the labels referred to in this table

Table 3

Frequencies of first sort constructs used in at least 3 of the 4 countries.

Construct	UK	Poland	Turkey	France	Total
Information content	13	15	18	13	59
Labelling systems	8	1	4	20	33
Understanding/confusion	9	7	11	0	27
Healthfulness of food	4	14	4	0	22
Impact/attractiveness	8	5	1	6	20
Clarity	12	2	4	1	19
Legibility	2	9	3	2	16
Complexity	5	0	3	4	12
Reliability/Trust	1	2	3	5	11
Colour	3	2	3	0	8
Silly/ nonsense	1	0	3	1	5
Serving/portion info	2	1	0	1	4
Persuading/warning	0	1	1	1	3

Table 4

Categorisation of study labels according to proposed typology

Category	Label Codes/ Descriptions ^a	Label is directive at		Label is present on	
		Food level	Nutrient level	Healthful foods	Unhealthful foods
Directive	C1, C2, C3, C4, C5 HL labels both simple and graduated.	Yes	No	Yes	No
Non- directive	C6, C7, C8, C9, C10, C20, C21 GDAs and NTs +/- GDA information.	No	No	Yes	Yes
Semi- directive	C11, C12, C13, C14, C22 TLs, HB and NTs incorporating traffic lights.	Partially	Yes	Yes	Yes

^a See Fig. 1 for the visual representation of the labels referred to in this table

Figure 1.

For a graphical representation of label stimuli used in the study please contact the author c.hodgkins@surrey.ac.uk

Figure 2.

UK MSA plot - See Fig. 1 for the visual representation of the labels referred to in this table. Key: HL= health logos; GDA = % guideline daily amount labels; TL = traffic light labels; HB = hybrid labels; NC = nutrition claims and NT = nutrition tables.

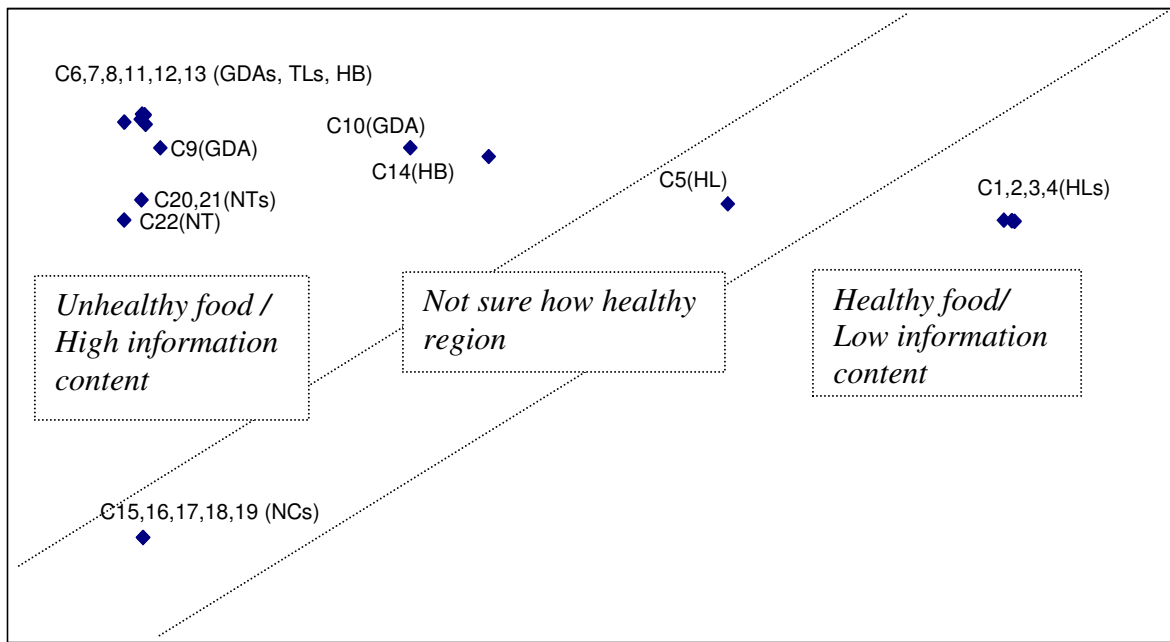


Figure 3.

Turkish MSA plot - See Fig. 1 for the visual representation of the labels referred to in this table. Key: HL= health logos; GDA = % guideline daily amount labels; TL = traffic light labels; HB = hybrid labels; NC = nutrition claims and NT = nutrition tables.

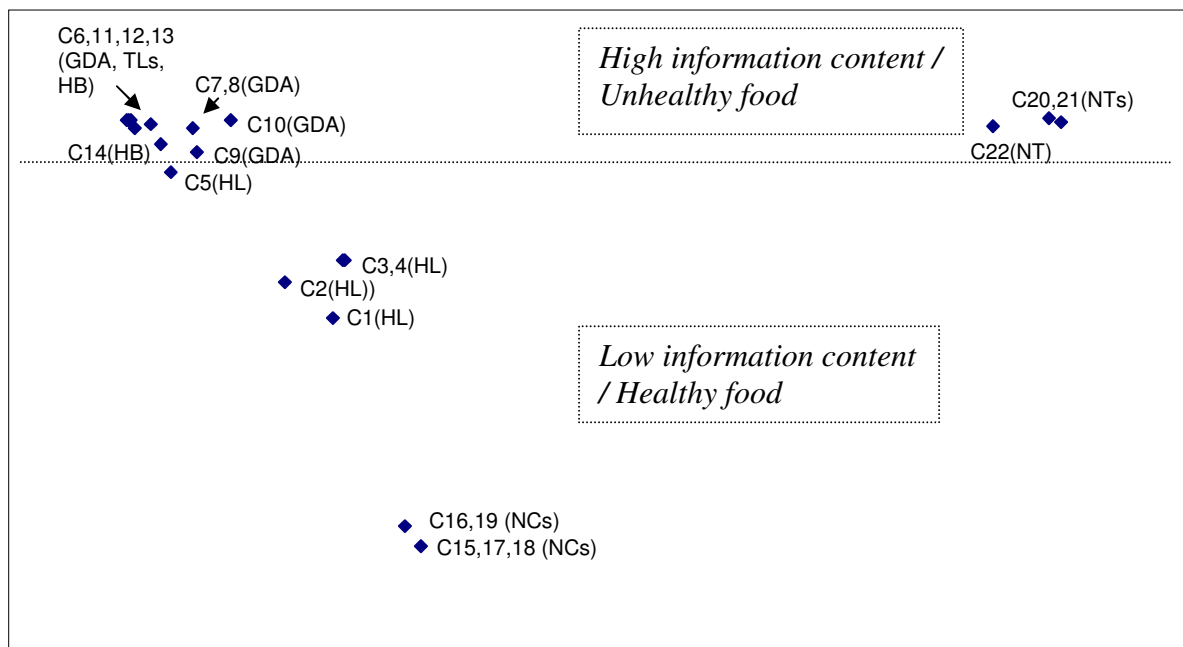


Figure 4.

Polish MSA plot - See Fig. 1 for the visual representation of the labels referred to in this table. Key: HL= health logos; GDA = % guideline daily amount labels; TL = traffic light labels; HB = hybrid labels; NC = nutrition claims and NT = nutrition tables.

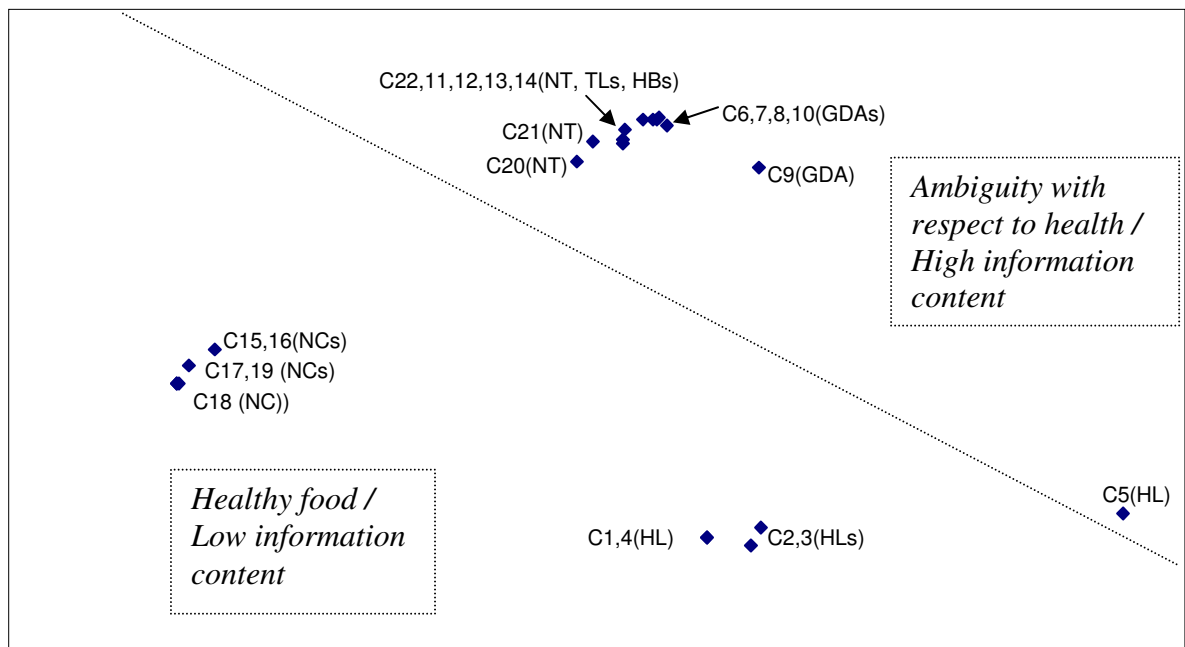


Figure 5.

French MSA plot – See Fig. 1 for the visual representation of the labels referred to in this table. Key: HL= health logos; GDA = % guideline daily amount labels; TL = traffic light labels; HB = hybrid labels; NC = nutrition claims and NT = nutrition tables.

