Consumer judgments of explicit and implied health claims on foods: Misguided but not misled

Jacob L. Orquin*, Joachim Scholderer

Department of Business Administration/MAPP/QUANTS, Aarhus University, Bartholins Allé 10, 8000 Aarhus C, Denmark

A R T I C L E   I N F O

Article history:
Received 15 July 2012
Received in revised form 21 May 2014
Accepted 12 January 2015

Keywords:
Nutrition and health claims
Halo effect
Magic bullet effect
Consumer judgments

A B S T R A C T

The regulation of nutrition and health claims made on foods is to a large extent based on the belief that consumers are easily misled by persuasive marketing communication and should therefore be protected. One common concern is that nutrition and health claims create ‘magic bullet’ or ‘halo’ effects that lead consumers to believe that a food carrying such a claim is healthier than it actually is. Five experiments were carried out to examine the extent to which nutrition and health claims used in marketing communication affect consumer judgments of food healthfulness. The studies manipulated both explicit health and nutrition claims and implied claims related to suggestive brand names, package design, and imagery. The results show that health and nutrition claims might not be as misleading as suspected. In fact, the studied claims had little effect on consumer judgments of food healthfulness. The claims, however, had detrimental effects on sensory expectations and purchase intentions for the carrier products. These effects were found both for misleading claims as well as for officially approved claims intended to guide consumer food choice.

Introduction

Nutrition labeling policy and regulation of nutrition and health claims (NH claims) has two main goals; to allow for easy recognition of food healthfulness characteristics and thus empower consumers to make healthier food choices, and simultaneously ensure that consumers are not misled by that selfsame nutrition information. Hence, the objective of front-of-pack nutrition labeling schemes like the Scandinavian keyhole label (Ministry of Food, Agriculture and Fisheries, 2009), the British traffic light label (Food Standards Agency, 2007), and the European GDA label (IDG, 2006) is to enable consumers to correctly distinguish between healthy and unhealthy foods.

Unfortunately, the distance between guiding and misleading is sometimes short which has been the cause of several conflicts between food industry on the one hand and policy makers and consumer activists on the other hand. Recently a major soft drink producer was forced to change their advertising for a line of products claimed to be ‘nutritious’ which referred to the fact that the drink contained 100% of the recommended daily allowance of vitamin C. A group of consumers complained to the UK Advertising Standards Authority who decided that the claim ‘nutritious’ was misleading based on the fact that the drink, besides the daily allowance of vitamin C, contained one quarter of a consumer’s recommended daily amount of sugar (Advertising Standards Authority, 2011). Front-of-pack nutrition labels have been at the center of similar disputes, particularly the industry-led labeling initiative Guideline Daily Amount (GDA) which has been claimed by consumer activists to make unhealthy foods appear healthier than they actually are. Whether or not the GDA label actually guides or misleads consumers is not certain (Feunekes et al., 2008).

The debate about misleading nutrition labels and NH claims has prompted a considerable amount of research on consumer understanding of labels and claims (for reviews see (Cowburn and Stockley, 2005; Drichoutis et al., 2006; Grunert and Wills, 2007; Leathwood et al., 2007; Pothoulaki and Chryssochoidis, 2009; Williams, 2005) with research topics ranging from consumer perception and understanding of NH claims (Andrews et al., 1998; Ford et al., 1996; Mazis and Raymond, 1997) and the effects of such claims on purchase decisions and consumption (Chandon and Wansink, 2007; Lee et al., 2007; Teratanavat and Hooker, 2006; Wansink and Chandon, 2006) to moderating effects of information and trust (Garretson and Burton, 2000; Patch et al., 2005; Urala and Lähteenmäki, 2003) and framing and context (Kozup et al., 2003; Verbeke et al., 2009; Wansink, 2003; Wansink et al., 2004). The impact of the particular structure and composition of NH claims

* Corresponding author. Tel.: +45 8716 5219.
E-mail address: jalo@badm.au.dk (J.L. Orquin).

http://dx.doi.org/10.1016/j.foodpol.2015.01.001
0306-9192/© 2015 Elsevier Ltd. All rights reserved.
has also been studied, including studies of claim length and functional claims versus reduction of disease risk claims (Bech-Larsen and Grunert, 2003; Grunert et al., 2009; Van Kleef et al., 2005; Van Trijp and van der Lans, 2007).

One of the seminal papers in this area interprets consumer misunderstanding of NH claims in terms of ‘magic bullet’ and ‘halo’ effects (Roé et al., 1999). A magic bullet effect occurs when consumers overgeneralize a claim and make inferences about the overall healthfulness of the product although the claim merely refers to a specific health benefit. A consumer might, for instance, understand the claim ‘phytosterols reduce cholesterol’ as a statement that the product carrying the claim protects against cardiovascular disease, which would be an unsubstantiated inference. A halo effect occurs when a claim colors the general perception of the product in such a way that more positive inferences are made about other product attributes as well. Demonstrations of magic bullet and halo effects have shown that NH claims have the potential to mislead consumers.

However, the question still remains as to what extent consumers actually are misled by such claims. Prior research on NH claims has not been particularly conclusive. Table 1 summarizes previous studies in which NH claims have been studied. The overview includes studies in which explicit or implied NH claims were used. Manipulations of claims are coded as general claims, such as “now healthier than ever”, or specific claims, such as “does your heart good” or “now with 1/3 less salt”. Abstract manipulations such as using Subway versus McDonalds as a manipulation of healthy versus unhealthy foods (Chandon and Wansink, 2007) are coded as general claims. The effect of NH claims on consumer health inferences are coded as general, specific or no effect. General health inferences are, for instance, measures of perceived healthfulness or nutritionalisness of a product whereas specific health inferences could be perceptions about the sodium content of a product or effects on heart disease or blood pressure.

Table 1 shows that 19 studies manipulated specific claims while only four studies manipulated general claims. Eight studies found effects of NH claims on specific health inferences, seven studies found effects on general health inferences, and seven studies found no effects of NH claims on health inferences at all. Considering the ‘file drawer’ problem one should take into account that more studies finding no effects might exist. Studies on publication bias in social science shows that papers with statistically significant results are typically accepted for publication about 80% of the time whereas papers with non-significant results are accepted 50% of the time (Hubbard and Armstrong, 1992). According to this estimate another three to four studies should exist finding effects of NH claims on either general or specific inferences and another seven studies should exist in which no effects are found. This file drawer corrected estimate results in 18 or 19 studies finding effects of NH claims on either general or specific inferences and 14 studies finding no effect of NH claims.

The diverging results are difficult to explain by variation in terms of samples, target categories or time periods as the studies confirming or disconfirming the effects of NH claims cover most of these possibilities. Another possible explanation is that some studies used methods that may have prompted a deeper and more systematic processing of NH claims than would normally be observed in a typical food choice context, which could increase the effect of NH claims on specific and general health inferences. The presence of an interviewer or the disclosure of study purposes could, for instance, easily lead to different processing styles such as a central route versus peripheral route processing (Petty et al., 1983). Similarly, measuring general and specific health inferences simultaneously could have the unintended effect of cross-contaminating each other. The mere act of evaluating the potential disease risk reduction effects of a NH claim product could easily lead to more systematic thoughts about healthfulness. If this is the case it might be desirable to study specific and general health inferences separately in order to obtain a more objective assessment of their respective impact.

Another possibility is that the studied NH claims have varied to a great extent, some being closer to the types of claims that are used in actual market communication than others. It has, for instance, been shown that consumers have more negative attitudes toward claims that refer to unknown compounds compared to well-known compounds (Lähteenmäki et al., 2010). According to these results, a NH claim about added omega-3 should perform better than a claim about phytosterols because the latter is less familiar to consumers. In light of these results it would be interesting to study NH claims which are already used in marketing.

### Table 1

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Category</th>
<th>Health inferences</th>
<th>Claim type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrews et al. (2000)</td>
<td>US</td>
<td>Soup</td>
<td>Specific</td>
<td>General/specific</td>
</tr>
<tr>
<td>Andrews et al. (1998)</td>
<td>US</td>
<td>Margarine</td>
<td>General</td>
<td>General/specific</td>
</tr>
<tr>
<td>Ares et al. (2009)</td>
<td>UR</td>
<td>Milk dessert</td>
<td>General</td>
<td>Specific</td>
</tr>
<tr>
<td>Burton and Creyer (2004)</td>
<td>US</td>
<td>Pot roast</td>
<td>Specific</td>
<td>Specific</td>
</tr>
<tr>
<td>Chandon and Wansink (2007)</td>
<td>US</td>
<td>Sandwich, burger</td>
<td>Specific</td>
<td>General</td>
</tr>
<tr>
<td>Ford et al. (1996)</td>
<td>US</td>
<td>Frozen dinners</td>
<td>Specific</td>
<td>Specific</td>
</tr>
<tr>
<td>Garretson and Burton (2000)</td>
<td>US</td>
<td>Frozen dinners</td>
<td>No effect</td>
<td>Specific</td>
</tr>
<tr>
<td>Gorton et al. (2010)</td>
<td>NZ</td>
<td>Cereals</td>
<td>No effect</td>
<td>Specific</td>
</tr>
<tr>
<td>Grunert et al. (2011)</td>
<td>GE</td>
<td>Yoghurt</td>
<td>Specific</td>
<td>Specific</td>
</tr>
<tr>
<td>Keller et al. (1997)</td>
<td>US</td>
<td>Frozen dinner</td>
<td>No effect</td>
<td>Specific</td>
</tr>
<tr>
<td>Kozup et al. (2001)</td>
<td>US</td>
<td>Wine</td>
<td>No effect</td>
<td>n/a</td>
</tr>
<tr>
<td>Kozop et al. (2003)</td>
<td>US</td>
<td>Lasagna</td>
<td>General</td>
<td>Specific</td>
</tr>
<tr>
<td>Lähteenmäki et al. (2010)</td>
<td>DK, FI, NO, SE, IC</td>
<td>Bread, yoghurt, pork</td>
<td>No effect</td>
<td>Specific</td>
</tr>
<tr>
<td>Mitter et al. (1999)</td>
<td>US</td>
<td>Soup, cheese, margarine</td>
<td>No effect</td>
<td>Specific</td>
</tr>
<tr>
<td>Murphy et al. (1998)</td>
<td>US</td>
<td>Oil, spread</td>
<td>Specific</td>
<td>Specific</td>
</tr>
<tr>
<td>Murphy et al. (2007)</td>
<td>US</td>
<td>Dairy products</td>
<td>No effect</td>
<td>Specific</td>
</tr>
<tr>
<td>Orquín (2014)</td>
<td>DK</td>
<td>Wine</td>
<td>General</td>
<td>General</td>
</tr>
<tr>
<td>Orth and Malzewitz (2008)</td>
<td>US</td>
<td>Cereal, lasagna, yoghurt</td>
<td>General</td>
<td>Specific</td>
</tr>
<tr>
<td>Roe et al. (1999)</td>
<td>US</td>
<td>Yoghurt</td>
<td>General</td>
<td>Specific</td>
</tr>
<tr>
<td>van Trijp and van der Lans (2007)</td>
<td>US, UK, GE, IT</td>
<td>Granola, M&amp;M</td>
<td>Specific</td>
<td>Specific</td>
</tr>
</tbody>
</table>

US = USA; UR = Uruguay; DK = Denmark; FI = Finland; NZ = New Zealand; GE = Germany; NO = Norway; SE = Sweden; IC = Iceland; UK = United Kingdom; IT = Italy.
communication as these claims are probably more familiar to consumers. Such an approach would minimize the possibility that claims are disliked due to unfamiliar compounds such as phytosterols or due to unfamiliar wording.

Experimental approach

To shed light on the inconsistent findings demonstrated above, we decided to carry out a series of experiments in which we manipulated general and specific NH claims. Our main interest was not whether consumers could potentially be misled by NH claims but whether consumers are actually misled by NH claims already used in marketing communication. Inspiration for the independent variables was therefore found in existing products carrying nutrition and health claims, nutrient reduction claims, and front-of-pack nutrition labels. We decided on an experimental approach that would not increase central route processing above what should be expected in a similar shopping situation. All experiments therefore used realistic product representations and cover stories to minimize demand characteristics, and the dependent variables were general product attitudes rather than specific health inferences. Measuring general product attitudes instead of specific health inferences should also provide a better estimate of the degree to which a claim misleads: according to the definition of magic bullet effects (see above), a claim can be characterized as misleading when it prompts consumers to make unjustified inferences about the general healthfulness of the product although the NH claim only refers to a specific health benefit. The chosen outcome variables were three seven-point Likert items measuring perceived healthfulness (1 = not at all healthy; 7 = very healthy), sensory expectation (1 = not at all tasty; 7 = very tasty), and purchase intention (1 = not at all likely; 7 = very likely). The perceived healthfulness item was adapted from Irmak et al. (2011).

In order to effectively operationalize the many variations of NH claims used in market communications, five experiments were carried out. Studies 1 and 2 manipulated implied NH claims related to packaging schemes, product images, and suggestive brand names. Any effect of these variables on perceived healthfulness could be characterized as misleading due to semantic confusion, according to the typology of misleading claims suggested by Hastak and Mazis (2011). Study 3 manipulated explicit claims, including nutrition claims (e.g., “Natural source of vitamin D”) and health claims (e.g., “Strengthens your stomach immune system”). According to the typology by Hastak and Mazis, any effect of nutrition claims would be considered an intra-attribute effect since the claims imply that other products do not contain such nutrients despite the fact that all dairy products contain these nutrients. Effects of health claims, on the other hand, would be considered inter-attribute effects since the specific effect is generalized to other attributes such as overall healthfulness. Study 4 manipulated two front-of-pack labels, one a state-controlled organic label indicating that a product is organically produced, and the other a state-controlled keyhole label indicating that a product has a healthy nutrition profile. Any effects of the keyhole label would be desirable and should not be considered misleading as the keyhole indicates that a product is in fact more healthful than similar products in the same category of foods. The organic label on the other hand does not imply that a product is healthful, and any effects on perceived healthfulness could be considered as misleading due to semantic confusion. Study 5 manipulated nutrient reduction claims such as “contains less fat” or “contains 50% less calories”. In this case, any effect on perceived healthfulness should not be considered as misleading since products with less fat or calories are typically also more healthful. An overview of the studies is shown in Table 2.

Study 1

Study 1 examined the effects of unqualified, implied claims on perceived healthfulness, sensory expectation, and purchase intention. The stimuli mimicked holistic packaging designs that have in previous been shown to affect consumer judgments of healthfulness (Orth and Malkewitz, 2008). Although no explicit NH claims are made on the package, the use of particular design elements can be thought of as constituting an implied health claim. The term ‘implied health claim’ is understood here as any form of communication that leads a consumer to infer increased product healthfulness although such a claim is not explicitly made on the package of the product. This interpretation is in line with the EU regulation on NH claims (European Parliament and Council of the European Union, 2006) which treats all messages and representations such as pictorial, graphic, or symbolic representations that are not mandatory as claims. A brand name or trademark appearing on the product or in the advertising of the product that can be construed as a claim is also subject to this regulation.

With this regulatory framework in mind three factors were selected for experimentation. The first factor was brand name: either a suggestive healthy brand name or a neutral control brand name. Similar manipulations have been used by Ford et al., 1996; Mitra et al., 1999 who found significant effects on specific health inferences. The manipulation was accomplished by using suggestive imagery, such as a heart-shaped logo versus a rectangular logo, and a suggestive brand name such as “Active” versus “Lixte” (see Appendix B). Inspiration for the manipulations was found in two existing health brands, a plant sterol margarine and a probiotic yoghurt, both of which are marketed using NH claims.

The second factor was the color scheme used on the package: either a green color scheme which has been strategically used by health brands such as those referred to above or a gray or blue control color scheme. The importance of colors in communicating brand identities (Bottomley and Doyle, 2006; Singh, 2006) and cue associations (Adams and Osgood, 1973; Madden et al., 2000) is well known and the strategic use of color schemes by health brands could therefore be understood as an attempt to capitalize on an association between green and health.

The third factor was front-of-pack imagery: manipulated using either a health related image featuring a person eating fruit or vegetables or one or more persons engaged in exercising or an unrelated control image. The choice of front-of-pack images was motivated by results from an earlier study which suggested that images used in advertisements for foods affected consumer perceptions of the healthfulness of the advertised product (Chrysochou, 2010).

Method

Pilot Study 1

Studies 1, 2, 3, and 4 used the same packaging designs as a basis for stimulus construction and studies 1, 2, and 4 were conducted as an omnibus survey to reduce the costs of data collection. The panel in studies 1, 2, and 4 was recruited through a commercial panel provider. To control for potential confounding effects of using existing brands such as prior differences in brand awareness or attitude a set of thirteen fictitious dairy brand designs was developed using graphic design software. Using the set of fictitious brands furthermore minimized the risk of experimental learning effects by disguising the purpose of the study to the participants. The fictitious brands were designed using similar graphical elements in order to adhere as much as possible to the market standard (examples are shown in Appendix A). To ensure that the fictitious brands did not differ in any meaningful way, a pilot study
was carried out in which perceived healthfulness, sensory expectation, and purchase intention were measured with respect to each brand. A convenience sample of 43 participants (16 men), age range 14–59 (M = 29.79, SD = 14.29) was recruited online for the pilot study. Each participant evaluated the thirteen fictitious brands in terms of perceived healthfulness, sensory expectation, and purchase intention using a seven-point Likert measure. Repeated-measures MANOVA revealed no significant differences between the thirteen fictitious brands on any of the dependent variables (F(36,1116) = .88, p = .67).

### Pilot Study 2

In order to assess the construct validity of abstract manipulations a second pilot study was conducted measuring the perceived healthfulness of colors, front-of-pack imagery, and health brand. Each manipulation was tested independently of brand and packaging and against the control manipulations using a convenience sample (N = 16). Each participant rated all manipulations on perceived healthfulness using a seven-point Likert measure. The analysis revealed a significant effect of color (F(4,11) = 8.05, p < .01), a significant effect of front-of-pack imagery (F(2,174) = 26.17, p < .01), and a significant effect of health brand (F(1,143) = 69.45, p < .01) on perceived healthfulness. The means and standard deviations for the manipulations are shown in Table 4. The manipulations are shown in Appendix 1.

### Analytical approach

In all five experiments, the dependent variables were measured using seven-point Likert scales. Most researchers routinely treat responses to Likert scales as interval-scaled. Although concerns have been raised about this practice and some researchers have suggested that Likert variables should be treated as ordinal (Jamieson, 2004), more recent analyses suggest that treating Likert variables as interval-scaled is appropriate as long as their distribution is approximately normal (Norman, 2010). Inspecting the distribution of the dependent variables in Studies 1–5 (Appendix F) revealed that the majority of the variables had approximately normal distributions. Only the purchase intention measures used in Studies 1, 3, and 4 were substantially skewed. As a robustness check, we re-analyzed the three variables using generalized estimating equations with multinomial response distributions and logit link functions, a specification that would be appropriate for ordinal responses collected in within-subjects designs. The results did not meaningfully differ from the results obtained with linear models. Therefore we decided to present linear models throughout the paper.

### Participants and design

One hundred and ninety-one Danish participants (87 men), age range 20–59 (M = 42.71, SD = 10.86) were recruited online for the experiment. Participants with a background in marketing or the food industry were excluded. The experiment used a 3 × 2 × 2 incomplete block design in which front-of-pack imagery (control image [C], healthy food image [H], exercise image [E]), brand type (control brand [C], health brand [H]), and color scheme (control color scheme [C], health color scheme [H]) were varied. The treatment combinations were blocked into three experimental groups where group I viewed cells EHC, CCG, CHG, ECC, HCC, group II viewed cells HHG, EHG, ECG, CCC, and group III viewed cells CHC, HHC, HCG.

### Materials and measures

The treatment variations were applied to the fictitious brands which had been pre-tested in the pilot study, ensuring that any treatment effects could be attributed to the treatment alone. Participants were shown one product photo at a time and rated each product in terms of perceived healthfulness, sensory expectation, and purchase intention on seven-point Likert scales (see Table 3). Besides the product ratings participants also completed a questionnaire measuring demographic characteristics such as gender, age, education, and income.

### Procedure

Participants were recruited online and randomly assigned to one of the experimental blocks. All participants signed an informed consent form before commencing the study. The first part of the

---

### Table 2

Overview of studies and potential misleadingness of NH claims.

<table>
<thead>
<tr>
<th>Study</th>
<th>Independent variables</th>
<th>Potential misleadingness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>Packaging color scheme</td>
<td>Misleading due to semantic confusion: Products with green packaging are not more healthful than similar products with gray or blue packaging unless the nutrition labels indicates so</td>
</tr>
<tr>
<td>1, 2</td>
<td>Product images</td>
<td>Misleading due to semantic confusion: Products with health related images are not more healthful than similar products without such images unless the nutrition labels indicates so</td>
</tr>
<tr>
<td>1, 2</td>
<td>Brand names</td>
<td>Intra-attribute misleadingness: Stating that a dairy product contains calcium and vitamin D should not change health perceptions since almost all dairy products contain these nutrients</td>
</tr>
<tr>
<td>3</td>
<td>Nutrition claims</td>
<td>Inter-attribute misleadingness: Stating that a product improves stomach immune systems does not imply that the product is more healthful nutritionwise</td>
</tr>
<tr>
<td>4</td>
<td>Organic label</td>
<td>Not misleading: The keyhole label indicates that a product is more healthful than alternatives within the same category of foods</td>
</tr>
<tr>
<td>5</td>
<td>Nutrient reduction claims</td>
<td>Not misleading: Products with 50% less fat should be considered healthful than similar products with 100% fat</td>
</tr>
</tbody>
</table>

### Table 3

Means and standard deviations for the manipulations of health brand, front-of-pack imagery, and color scheme on perceived healthfulness.

<table>
<thead>
<tr>
<th>Manipulation</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health brand</td>
<td>2.23</td>
<td>1.36</td>
</tr>
<tr>
<td>Control brand</td>
<td>3.84</td>
<td>1.48</td>
</tr>
<tr>
<td>Health brand</td>
<td>3.34</td>
<td>1.00</td>
</tr>
<tr>
<td>Control image</td>
<td>4.33</td>
<td>1.00</td>
</tr>
<tr>
<td>Exercise image</td>
<td>5.41</td>
<td>1.00</td>
</tr>
<tr>
<td>Color scheme</td>
<td>4.19</td>
<td>1.94</td>
</tr>
<tr>
<td>Red</td>
<td>2.53</td>
<td>1.51</td>
</tr>
<tr>
<td>Navy</td>
<td>2.13</td>
<td>1.25</td>
</tr>
<tr>
<td>Blue</td>
<td>2.88</td>
<td>1.96</td>
</tr>
<tr>
<td>Gray</td>
<td>1.67</td>
<td>0.98</td>
</tr>
<tr>
<td>Green</td>
<td>4.19</td>
<td>1.94</td>
</tr>
</tbody>
</table>
study consisted of product ratings and the second part measured individual characteristics.

Results

The analysis was carried out by means of a linear mixed model and revealed no significant main effects or interactions of front-of-pack imagery \( (F(2,456.35) = 47, p = .63) \), brand type \( (F(1,704.67) = 1.69, p = .19) \), or color scheme \( (F(1,704.67) = 1.59, p = .21) \) on perceived product healthfulness. There was, however, a significant effect of front-of-pack imagery \( (F(2,493.59) = 10.65, p < .01) \) and a significant interaction between front-of-pack imagery and brand type \( (F(2,493.59) = 3.28, p < .05) \) on sensory expectation. Sensory expectation was highest when control images were used on the front of the package \( (M = 3.50, SD = 1.40) \), lower when healthy food images were used \( (M = 3.26, SD = 1.46) \), and lowest when exercise images were used \( (M = 2.89, SD = 1.30) \). Pairwise comparisons revealed a similar tendency for the interaction effect between front-of-pack imagery and brand type, with significantly lower sensory expectations when healthy food images \( (M = 3.05, SD = 2.04) \) and exercise images \( (M = 3.03, SD = 1.80) \) were used than when control images were used \( (M = 3.47, SD = 1.85) \) on the control brand, and significantly lower sensory expectations when exercise images were used \( (M = 2.74, SD = 1.87) \) than when control images were used \( (M = 3.53, SD = 2.11) \) on a health brand. For purchase intention there was a significant main effect of front-of-pack imagery \( (F(2,482.06) = 3.39, p < .05) \) with the highest purchase intentions reported for the products on which control images were used \( (M = 2.45, SD = 1.37) \) and lower intentions when healthy food images \( (M = 2.24, SD = 1.36) \) and exercise images \( (M = 2.12, SD = 1.20) \) were used.

Discussion

The most striking result of the study is that none of the independent variables have any effect on perceived healthfulness. From a public policy perspective this could be considered a good thing: consumers did not infer a higher general healthfulness due to unqualified implied NH claims. However, one might also wonder if the absence of effects could have been a consequence of weak experimental manipulations. On the other hand if this was the case it would be difficult to explain why the manipulations did have an effect on sensory expectation and purchase intention. Another puzzling result is that the experimental manipulations decreased sensory expectation without increasing perceived healthfulness. Considering that consumers have been shown to associate healthy foods with lower palatability and unhealthy foods with higher palatability (Raghunathan et al., 2006) it seems only logical that manipulations affecting sensory expectations would also affect perceived healthfulness. One possibility is that although perceived healthfulness and sensory expectation are strongly associated, evaluations of perceived healthfulness and sensory expectation employ two separate types of processing. The manipulations could have increased the mental accessibility of product attributes such as expected amount of calories, fat, and sugar, and this could in turn have led participants to expect lower palatability in line with the results of Raghunathan and colleagues. At the same time, the healthfulness of the product could have been inferred from another attribute such as the product category, which is known to have a strong effect on perceptions of food healthfulness (Bech-Larsen and Grunert, 2003). This would mean that consumers are simultaneously processing taste evaluations in a systematic way and health evaluations in a heuristic way (Chen and Chaiken, 1999; Meyers-Levy and Maheswaran, 2004). Such a heuristic processing of health evaluations could furthermore have been reinforced by the experimental design as it allowed for an easy recognition of the food category; the participants were instructed to evaluate a selection of yoghurts. To test whether the experimental design had promoted heuristic judgments of healthfulness we decided to replicate the experiment, but instead of using a mixed design we used a between-subjects design that included several filler products from other food categories. The results are reported in Study 2.

Study 2

Study 2 was a conceptual replication of Study 1. However, in this study we used a between-subjects design so that each participant only evaluated one target product and the factor front-of-pack imagery was reduced by one level to reduce the required sample size. The purpose of the experiment was to test whether the inclusion of filler products from other food categories could change the heuristic processing of health evaluations and thus lead to a larger experimental effect.

Method

Participants and design

One hundred and twenty-seven Danish participants (70 men), age range 15 to 57 \( (M = 25.38, SD = 5.93) \) were recruited on campus for participation in the experiment. Compared to Study 1, the independent variables were slightly reduced, resulting in a \( 2 \times 2 \times 2 \) between-subjects design in which front-of-pack imagery (control image, healthy food image), brand type (control brand, health brand), and the color scheme of the package (control color scheme, health color scheme) were experimentally manipulated.

Materials and measures

The experimental stimuli were the same as in Study 1 except for the number of levels of the front-of-pack imagery factor. Besides the target products the study included four filler products from other categories (beer, M&Ms, frozen broccoli, frozen pizza). Participants were shown one product photo at a time and rated each product in terms of perceived product healthfulness, sensory expectation, and purchase intention using seven-point Likert scales. Besides the product ratings, participants also completed a questionnaire measuring individual characteristics such as gender and age.
Procedure
Participants were recruited on campus areas and randomly assigned to one of the experimental blocks. All participants signed an informed consent form before commencing the study. The first part of the study consisted of product ratings and the second part of a questionnaire measuring individual characteristics. All participants evaluated the same four filler products plus one target product.

Results
As a first step in the analysis the four filler products were compared to the pooled target products using a repeated measures ANOVA. The analysis revealed a significant effect of food category \(F(4,104) = 197.41, p < .01\) on perceived healthfulness thus demonstrating that the inclusion of the filler products had successfully affected health evaluations.

The main analysis did not include the filler products and was carried out by means of MANOVA. The multivariate test revealed no significant overall effect of front-of-pack imagery \(F(3,116) = 1.53, p = .21\), color scheme \(F(3,116) = 1.08, p = .36\), or brand type \(F(3,116) = 2.27, p = .08\). Univariate tests revealed a marginally significant effect of front-of-pack imagery on purchase intention \(F(1,118) = 3.47, p = .07\) with higher purchase intentions reported when a control image was present on the product package \((M = 4.80, SD = 3.35)\) and lower intentions reported when a healthy food image was present \((M = 4.29, SD = 2.13)\).

Discussion
The results of Study 2 are in accordance with the results of Study 1, showing no main effects of the experimental manipulations on perceived healthfulness. Changing the experimental design from a mixed-within-between subjects to a between subjects design did not lead to any changes nor did the inclusion of filler products. This should be considered a positive thing. First of all it corroborates the validity of Study 1 using a different experiment design and a different sample of participants. Second, it indicates that consumers are not being misled by implied NH claims such as color schemes, front-of-pack imagery or health brands. Instead consumers seem to judge food healthiness mainly based on the food category. The negative effects of the implied NH claims on sensory expectations and purchase intentions should on the other hand be taken into careful consideration by producers. Communicating health products and health brands could easily be a double edged sword leading to negative sensory expectations and purchase intentions.

Study 3
Study 3 examined the effects of unqualified, explicit NH claims on perceived product healthfulness, sensory expectation, and purchase intention. The term explicit NH claim is understood here as a verbal claim that is subject to the EU regulation of health and nutrition claims. The study manipulated nutrition claims such as ‘source of calcium’ and ‘high on vitamin D’ as well as health claims such as ‘strengthens your immune system’ and ‘keeps your stomach healthy’. Both types of claims mimicked actual nutrition and health claims made on dairy products and one of the chosen health claims has earlier been shown to mislead some groups of consumers (Grunert et al., 2011).

Method
Participants and design
Two hundred and four participants (92 men), age range 20 to 59 \((M = 43.12, SD = 10.87)\) were recruited online for the experiment. Participants with a background in marketing or the food industry were excluded. The experiment used a three-group incomplete block design in which NH claim (no claim [C], nutrition claim [N], health claim [H]) was manipulated. The NH claims used in the experiment are shown in Appendix C. Group I viewed treatments C and N, group II viewed treatments C and H, and group III viewed treatments C, N, H.

Materials and measures
All treatment variations were applied to the 13 fictitious brands which had been pre-tested in the pilot study, ensuring that treatment effects could be attributed to the treatment alone. Participants were shown one product photo at a time and rated each product in terms of perceived product healthfulness, sensory expectation, and purchase intention using seven-point Likert scales. Besides the product ratings participants also completed a questionnaire measuring demographic characteristics.

Procedure
Participants were recruited online and randomly assigned to one of the experimental conditions. All participants signed an informed consent form before commencing the study. The first part of the study consisted of product ratings and the second part of a questionnaire measuring the individual characteristics.

Results
The data were analyzed using a linear mixed model. The analysis revealed a significant effect of NH claims on perceived healthfulness \(F(2,1221.86) = 4.98, p < .01\), a significant effect on NH claims on sensory expectation \(F(2,1180.02) = 2.50, p < .05\), and a significant effect on purchase intention \(F(2,1131.11) = 2.48, p < .05\). Pairwise comparisons revealed a significant difference between the nutrition claim condition and the no claim and health claim condition on perceived healthfulness and sensory expectation and a significant difference between the health claim condition and the no claim and nutrition claim condition on purchase intention. The means and standard deviations are reported in Table 4.

Discussion
The study revealed a significant albeit small effect of nutrition claims on perceived healthfulness and sensory expectation. However, these positive health and sensory evaluation were not reflected in purchase intentions. Health claims on the other hand did not have any effect on perceived healthfulness or sensory expectation but they did have a significant and negative effect on purchase intentions in line with the results from study 1 and 2. Overall the study indicates that there could be a problem with explicit nutrition claims misleading consumers to believe that a product is more healthful than it is but these inferences did not lead to purchase intentions. Future studies should explore these nutrition claims further to establish whether consumers are consistently being misled due to, for instance, intra-attribute misleadingness.

Study 4
Study 4 examined the effect of two front-of-pack labels on consumer perceptions of healthfulness, sensory expectation, and...
purchase intention. The first label studied was the Scandinavian keyhole label which is a front-of-pack nutrition label used in the Scandinavian market to communicate that a food is considered healthy within its category. The label was first introduced in Sweden in 1989 and later in Norway and Denmark in 2009, where consumer awareness has grown from 12% in 2008 to 83% in 2010 (Ministry of Food, Agriculture and Fisheries and YouGov Zapera, 2010). The purpose of the keyhole label is to make it easier for consumers to choose healthy foods by clearly labeling which foods have comparatively desirable nutritional profiles (Ministry of Food, Agriculture and Fisheries, 2009). Front-of-pack nutrition labels have been shown to improve consumer understanding and recognition of healthy foods (Feunekes et al., 2008; Van Kleef et al., 2008) and considering the high awareness of the keyhole label we therefore expected an effect on perceived healthfulness. The second label studied was the Danish organic label which was introduced in 1989 as part of the official, state-controlled certification of organic products. Awareness of the organic label is very high and 82% of consumers report that the organic label is somewhat or very important for them when shopping for groceries (Ministry of Food, Agriculture and Fisheries and Zapera.com, 2009). Although the organic label only communicates the production method it has been shown that consumers associate organic foods with healthfulness (Bech-Larsen and Grunert, 2003; Harper and Makatouni, 2002; Magnusson et al., 2003). However, the nutritional quality of organic foods has not been shown to differ from that of other foods (C. M. Williams, 2002) and any perception of organic foods as more healthful would therefore have to be considered a halo effect.

**Method**

**Participants and design**

One hundred and eighty-seven Danish participants (85 men), age range 20–59 ($M = 42.96, SD = 10.81$) were recruited online for the experiment. Participants with a background in marketing or the food industry were excluded. The experiment was introduced in Sweden in 1989 and later in Norway and Denmark in 2009, where consumer awareness has grown from 12% in 2008 to 83% in 2010 (Ministry of Food, Agriculture and Fisheries and YouGov Zapera, 2010). The purpose of the keyhole label is to make it easier for consumers to choose healthy foods by clearly labeling which foods have comparatively desirable nutritional profiles (Ministry of Food, Agriculture and Fisheries, 2009). Front-of-pack nutrition labels have been shown to improve consumer understanding and recognition of healthy foods (Feunekes et al., 2008; Van Kleef et al., 2008) and considering the high awareness of the keyhole label we therefore expected an effect on perceived healthfulness. The second label studied was the Danish organic label which was introduced in 1989 as part of the official, state-controlled certification of organic products. Awareness of the organic label is very high and 82% of consumers report that the organic label is somewhat or very important for them when shopping for groceries (Ministry of Food, Agriculture and Fisheries and Zapera.com, 2009). Although the organic label only communicates the production method it has been shown that consumers associate organic foods with healthfulness (Bech-Larsen and Grunert, 2003; Harper and Makatouni, 2002; Magnusson et al., 2003). However, the nutritional quality of organic foods has not been shown to differ from that of other foods (C. M. Williams, 2002) and any perception of organic foods as more healthful would therefore have to be considered a halo effect.

**Materials and measures**

All treatment variations were applied to the fictitious brands which had been pre-tested in the pilot study ensuring that any treatment effects would be attributable to the treatment alone. Participants were shown one product photo at a time and rated each product in terms of perceived product healthfulness, sensory expectation, and purchase intention using seven-point Likert scales. Besides the product ratings participants also completed a questionnaire measuring demographic characteristics.

**Procedure**

Participants were recruited online and randomly assigned to one of the experimental conditions. All participants signed an informed consent form before commencing the study. The first part of the study consisted of product ratings and the second part of a questionnaire measuring the individual characteristics.

**Results**

The data were analyzed by means of MANOVA. The analysis revealed a significant overall difference between the three front-of-pack labeling conditions ($F(6, 328) = 2.60, p < .05$). Contrasts showed significantly higher perceived product healthfulness when the organic label was present on the package ($M = 4.10, SD = 2.98$) than when no label was present ($M = 3.22, SD = 3.15$), and a marginally significant difference in terms of purchase intention ($p = .051$), with higher levels when the organic label was present ($M = 2.87, SD = 2.85$) than when no label was present ($M = 2.30, SD = 3.00$). We found no significant differences between the keyhole label and the no-label condition on any of the dependent variables.

**Discussion**

The results of Study 4 are slightly unsettling in several respects. First and foremost, the keyhole label—generally regarded as the most important policy instrument in Scandinavian nutrition policy—did not affect perceived product healthfulness in any way one might have hoped for. Contrary to that, the organic label did so, even though an interpretation of organic products as more healthful than conventionally produced products is scientifically unsubstantiated (Williams, 2002) and therefore misleading. We cannot exclude the possibility that the keyhole might help some consumers make healthier choices at the point of purchase although the keyhole label did not affect purchase intentions in this particular group of consumers either. However, we can exclude that the keyhole facilitates recognition of healthful foods. The fact that this study and previous studies have consistently shown an effect of organic labels on perceived healthfulness makes one wonder whether organic labels would not be quintessential candidates for a legal case since they apparently operate as implied health claims. Note that the relevant EU regulation states that “any claim considered to have the same meaning for consumers as a nutrition claim included in the aforementioned list [of permitted claims] should be subject to the same conditions of use indicated therein” (European Parliament and Council of the European Union, 2006). Such an inclusion would be highly problematic for producers and consumers of organic foods alike and poses the question of whether some forms of misleading consumers are politically acceptable whereas others are not.

**Study 5**

Study 5 examined the effect of qualified, explicit NH claims on perceived product healthfulness, sensory expectation, and purchase intention. In this study we experimentally manipulated nutrient reduction claims such as ‘contains less fat’ or ‘contains 50% fewer calories’ which have become increasingly popular in many food categories. Such nutrient reduction claims, sometimes also referred to as relative nutrition claims, have been shown to increase consumption of snacks by decreasing consumption guilt especially among overweight consumers (Wansink and Chandon, 2006). Whether this is true for less hedonic foods is questionable since these foods might not induce consumption guilt in the first place. From a rational perspective one might expect an effect of nutrient reduction claims on perceived healthfulness since most products containing 50% less fat are objectively speaking more healthful. Such an effect would in combination with increased purchase intentions be desirable since it indicates an interest in healthy eating, but there is also a considerable risk that consumers might expect such a product to be rather bland (Raghunathan et al., 2006). Four factors were manipulated including food category, claim strength, claim concreteness, and outcome dimension. Claim strength had two levels, i.e. ‘contains 20% less calories’ (low claim strength) versus ‘contains 50% less calories’ (high claim strength).
Claim concreteness also had two levels, i.e. 'contains less fat' (low claim concreteness) versus 'contains 20% less fat' (high claim concreteness). The outcome dimensions were either fat or calories.

**Method**

**Participants and design**

Ninety-three Danish participants (52 men), age range 15 to 57 ($M = 24.93$, $SD = 5.45$) were recruited on campus areas for participation in the experiment. We used a $3 \times 2 \times 2 \times 2$ incomplete block design in which food category (cheese [C], butter [B], ready-to-eat soup [S]), outcome dimension (fat [F], calories [C]), claim strength (low claim strength [LS], high claim strength [HS]), and claim concreteness (low concreteness [LC], high concreteness [HC]) were experimentally manipulated. An overview of the incomplete block design is shown in Table 5 below.

**Materials and measures**

To minimize the confounding effects of brand familiarity and brand attitudes, three basic package designs were developed using graphic design software. The products resembled existing products from the different categories but used fictitious brand names, adapted from Study 1. Participants were shown one product photo at a time and rated each product in terms of perceived product healthfulness, sensory expectation, and purchase intention using seven-point Likert scales. Besides the product ratings participants also completed a questionnaire measuring individual characteristics such as gender and age. The NH claims used in the experiment are shown in Appendix E.

**Procedure**

Participants were recruited on campus areas and randomly assigned to one of the experimental conditions. All participants signed an informed consent form before commencing the study. The first part of the study consisted of product ratings and the second part of a questionnaire measuring individual characteristics.

**Results**

The data were analyzed using a linear mixed model. The first analysis compared the control condition to the pooled nutrient reduction claims. The analysis revealed a significant main effect of food category on perceived healthfulness ($F(2,192.11) = 13.47, p < .01$), a marginally significant interaction effect between food category and the presence of a claim on sensory expectation ($F(2,196.55) = 2.89, p = .06$), and a significant effect of food category on purchase intention ($F(2,189.02) = 4.20, p < .05$).

The second analysis did not include the control condition but factored in claim concreteness, claim strength, outcome dimension, and food category. The analysis revealed a significant main effect of food category ($F(2,143.19) = 54.18, p < .01$) and a marginally significant interaction between food category and claim concreteness ($F(2,143.19) = 2.58, p = .08$) on perceived product healthfulness, with higher levels of perceived healthfulness reported under low claim concreteness ($M = 6.91$, $SD = 2.77$) and lower levels under high claim concreteness ($M = 5.56$, $SD = 2.96$) for the food category butter. Sensory expectation was significantly affected by food category ($F(2,143.19) = 54.18, p < .01$) and claim concreteness ($F(2,143.19) = 54.18, p < .01$) with higher sensory expectations reported under low claim concreteness ($M = 4.76$, $SD = 1.90$) and lower expectations under high claim concreteness ($M = 4.23$, $SD = 1.89$). The analysis also revealed a significant two-way interaction between food category and outcome dimension ($F(2,143.19) = 54.18, p < .01$), a significant four-way interaction between food category, claim strength, claim concreteness and outcome dimension ($F(2,143.19) = 54.18, p < .01$), and a marginally significant two-way interaction between claim strength and claim concreteness ($F(1,216.24) = 3.55, p = .06$).

Purchase intention was significantly affected by food category ($F(2,138.96) = 13.22, p < .01$). In addition, there was a marginally significant effect of claim concreteness ($F(1,215.86) = 3.15, p = .08$) with higher purchase intentions reported under low claim concreteness ($M = 4.85$, $SD = 2.05$) and lower intentions under high claim concreteness ($M = 4.49$, $SD = 2.02$). The interaction between outcome dimension, claim strength, and claim concreteness is illustrated in Fig. 1 for the three dependent variables.

**Discussion**

Study 5 revealed a pattern similar to the previous studies: NH claims intended to increase perceived healthfulness did not have any of the intended effects. They did, however, have unintended detrimental effects on sensory expectations and purchase intentions. The results of Study 5 also corroborate the conclusion from the previous experiments that participants judge product healthfulness in a heuristic way using the food category as a main cue and sensory expectation in a systematic way using information from, for instance, NH claims. This seems to suggest that healthfulness judgments of particular products are based on a heuristic operating in such a way that the perceived healthfulness of the general category to which a product belongs is directly transferred to all exemplar products in that category. Taste judgments, on the other hand, appear to be processed systematically, and information from NH claims is used along with the food category to make inferences about the palatability of a particular product. The decrease in sensory expectation associated with NH claims
appears to make the food less desirable, resulting in decreased purchase intentions. The results are almost depressing from a public policy perspective. Note that in this experiment we manipulated qualified NH claims, that is, claims that indicate that a product actually has an improved nutritional profile. It would have been good news for policy makers if consumers actually cared enough about the healthfulness of food products to process the relevant information in a systematic way. But apparently they do not.

**General discussion**

**Overview of the findings**

The purpose of the paper was to examine whether consumer are being misled by NH claims used in market communication by, for instance, certain health brands and health products. The question was addressed in five experiments manipulating a total of eight different independent variables. Studies 1 and 2 examined the effects of implied NH claims which was manipulated as health brands versus control brands, green color schemes, and health related front-of-pack imagery. None of the manipulations had any effect on consumer perceptions of food healthfulness which suggest that consumers are not being misled by health branding into believing that the products are more healthful than they actually are. The health branding manipulations had on the other hand strong detrimental effects on sensory expectation and purchase intention. Study 3 examined the effects of nutrition claims and health claims on perceived healthfulness and the results show that nutrition claims do have a small positive effect on consumer perceptions of healthfulness and sensory expectation. These evaluations, however, did not change purchase intentions for the products carrying the nutrition claims. The health claims on the other hand had a negative effect on purchase intention in line with the
results from study 1 and 2. Study 4 examined the effects of an organic label and a keyhole label which is used as an official guideline indicating that a product is more healthful than similar products in the same category of foods. The study revealed no effect of the keyhole label on perceived healthfulness despite official campaigns and advertising for the label. The organic label however, had a positive effect on perceived healthfulness although the label does not communicate healthfulness. Study 5 examined the effects of nutrient reduction claims which indicate that a product has an improved nutritional profile thus being more healthful than similar products without such claims. The results showed no effects of such claims on perceived healthfulness in line with the other studies.

Overall the studies suggest that consumers are not in any great danger of being misled by NH claims although there are a few exceptions which should receive more attention. Study 3 showed a small but significant effect of nutrition claims on perceived healthfulness which indicates that adding redundant information to products, such as writing that a dairy product contains calcium, leads consumers to believe that the product is more healthful than similar dairy products. Study 4 showed that the organic label which is not intended to communicate anything about healthfulness did have a strong significant effect on perceived healthfulness. Such an effect could be classified as misleading due to semantic confusion since consumers seem not to understand how organic products differ from conventional products.

A more general finding from the studies reported here is that consumers appear to generate taste expectations in a systematic way using information from NH claims and health judgments in a heuristic way based on the food category. Paradoxically, this means that consumers do process health-related information such as NH claims, but they appear not to utilize this information in generating health-related judgments. Cues that are utilized in generating taste expectations appear to be more salient to consumers and are therefore processed systematically. This leads to a strange situation where health communication decreases sensory expectations and purchase intentions without changing the consumer’s beliefs about the healthfulness of the food. This partially systematic processing of health information may well be what protects many consumers from being misled by unqualified NH claims. However, it also prevents consumers from making healthy food choices when a qualified NH claim would actually enable them to do so.

Implications for public policy

The main conclusion from our studies is that consumers are protected from being misled and simultaneously excluded from being guided by health communication due to a pervasive food category heuristic. By relying on the food category as the only health cue consumers consistently fail to notice differences in healthfulness within food categories. The failure of front-of-pack nutrition labels such as the keyhole label to empower recognition of healthful foods could be due to the fact that the label indicates that a product is to be considered healthful within its category. This classification runs counter to the typical consumer understanding of food healthfulness which is that healthfulness is a cross-category attribute. Two different approaches present themselves: either to work against the category heuristic by educating consumers and using relative-to-category health and nutrition communication or actively using the category heuristic. Front-of-pack nutrition labeling could for instance focus on promoting entire food categories instead of individual products urging consumers to switch between functionally equivalent categories instead of searching for the optimal choice within a category. Another possibility could be to use sub-categorization as a strategic tool to communicate differences in healthfulness within superordinate food categories. No doubt most consumers have benefited from the sub-categorization of milk into skim milk and full-fat milk and the use of color codes that accompanies these categories (Danish skim milk packages are usually gray while full-fat milk packages are dark blue) and perhaps this approach could be used for other categories as well. Even though a category such as yoghurt lends itself to a similar sub-categorization there are no standard color codes that indicate whether the yoghurt is based on skim milk or full-fat milk.

Another point that needs consideration is the fact that consumers are consistently misled by the belief that organic foods are more healthful than their conventionally produced counterparts. If such a belief leads consumers to indulge in overeating, as has been shown for snack foods in previous research (Chandon and Wansink, 2007; Wansink and Chandon, 2006), then it might be appropriate to subject organic labels to the regulation on nutrition and health claims, and perhaps even to consider a mandatory disclaimer on organic products stating that organic foods are not healthier than their conventional equivalents.

Future research and limitations

One of the most important limitations of this study is the choice of independent variables. Although we aimed at incorporating as many relevant candidates as possible we cannot exclude the possibility that there are other factors that may have passed under our radar. An important step would therefore be to replicate the studies using existing products thereby factoring in more intangible variables such as design style or category prototypicality which are difficult to manipulate experimentally. Further studies could also focus on the interaction between nutrition and health communication and the food category. Some categories of vice foods could for instance motivate consumers to overinterpret nutrition and health claims in an attempt to lower consumption guilt.

Another point worth investigating is the relation between organic labeling and food consumption. There is no doubt that organic labels are misleading consumers into believing that the carrier food is more healthful than it actually is but whether this translates into indulgent or unhealthy food consumption is still unclear. Finally, future studies should examine nutrition claims in greater detail as these claims could be misleading to consumers.

Acknowledgement

This research was supported in part by the Danish Council for Strategic Research under grant 2101-09-044, “Bridging the gap between health motivation and food choice behaviour: A cognitive approach” (HEALTHCOG).
Appendix A. Examples of fictitious dairy brand packaging

Appendix B. Manipulations used in Study 1

B.1. Health brand manipulation

Health brand manipulation

Example of control brand manipulation

B.2. Health and exercise images

Health food image

Exercise image

Control image

B.3. Color scheme

Red

Navy

Blue

Gray

Green
Appendix C. Manipulations used in Study 2

C.1. Nutrient content claims

- High content of vitamins and calcium (højt indhold af vitaminer og kalcium)
- Your source of calcium (din kilde til kalcium)
- Natural source of vitamin D (naturlig kilde til D vitamin)

C.2. Health claims

- Acidophilus maintains your stomach healthy (acidophilus holder maven sund)
- Actively helps maintaining a healthy stomach (hjælper aktivt med at holde maven sund)
- With bifido which keeps your stomach in balance (med bifido som holder maven i balance)
- Strengthens your stomach immune system (styrker din maves immunforsvar)
- Keeps you stomach healthy (holder maven sund)

Appendix D. Manipulations used in Study 4

- The Scandinavian Keyhole label
- The Scandinavian organic label

Appendix E. Manipulations used in Study 5

E.1. Outcome dimension (fat)

<table>
<thead>
<tr>
<th>Concreteness</th>
<th>Low claim strength</th>
<th>High claim strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Contains less fat</td>
<td>Contains much less fat</td>
</tr>
<tr>
<td></td>
<td>(indeholder mindre fedt)</td>
<td>(indeholder meget mindre fedt)</td>
</tr>
<tr>
<td>High</td>
<td>Contains 20% less fat</td>
<td>Contains 50% less fat</td>
</tr>
<tr>
<td></td>
<td>(indeholder 20% mindre fedt)</td>
<td>(indeholder 50% mindre fedt)</td>
</tr>
</tbody>
</table>

E.2. Outcome dimension (calories)

<table>
<thead>
<tr>
<th>Concreteness</th>
<th>Low claim strength</th>
<th>High claim strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Contains less calories</td>
<td>Contains much less calories</td>
</tr>
<tr>
<td></td>
<td>(indeholder færre kalorier)</td>
<td>(indeholder meget færre kalorier)</td>
</tr>
<tr>
<td>High</td>
<td>Contains 20% less calories</td>
<td>Contains 50% less calories</td>
</tr>
<tr>
<td></td>
<td>(indeholder 20% færre kalorier)</td>
<td>(indeholder 50% færre kalorier)</td>
</tr>
</tbody>
</table>
Appendix F. Frequency distributions for the response variables for Study 1 (top row) to 5 (bottom row). Left column indicates health judgments, middle column taste judgments, and right column purchase judgments.
References


