European Journal of Clinical Nutrition (2014), 1–7

www.nature.com/ejcn

ORIGINAL ARTICLE

Consumer attitudes and understanding of cholesterol-lowering claims on food: randomize mock-package experiments with plant sterol and oat fibre claims

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BACKGROUND/OBJECTIVES: Few studies have examined consumer acceptability or comprehension of cholesterol-lowering claims on food labels. Our objective was to assess consumer attitudes and understanding of cholesterol-lowering claims regarding plant sterols (PS) and oat fibre (OF).

SUBJECTS/METHODS: We conducted two studies on: (1) PS claims and (2) OF claims. Both studies involved a randomized mock-packaged experiment within an online survey administered to Canadian consumers. In the PS study ($n = 721$), we tested three PS-related claims (disease risk reduction claim, function claim and nutrient content claim) and a 'tastes great' claim (control) on identical margarine containers. Similarly, in the OF study ($n = 710$), we tested three claims related to OF and a 'taste great' claim on identical cereal boxes. In both studies, participants answered the same set of questions on attitudes and understanding of claims after seeing each mock package.

RESULTS: All claims that mentioned either PS or OF resulted in more positive attitudes than the taste control claim ($P < 0.0001$), despite all products within each study having the same nutrition profile. How consumers responded to the nutrition claims between the two studies was influenced by contextual factors such as familiarity with the functional food/component and the food product that carried the claim.

CONCLUSIONS: Permitted nutrition claims are approved based on physiological evidence and are allowed on any food product as long as it meets the associated nutrient criteria. However, it is difficult to generalize attitudes and understanding of claims when they are so highly dependent on contextual factors.

European Journal of Clinical Nutrition advance online publication, 11 June 2014; doi:10.1038/ejcn.2014.107

INTRODUCTION

Cardiovascular disease (CVD) is one of the leading causes of morbidity and mortality in Canada.[1] Dietary and medical interventions to lower low-density lipoprotein cholesterol are the key strategies for primary and secondary prevention.[2] As the majority of Canadians do not have access to diet counselling,[3] food labels are a main source of nutrition information.[4]

Generally, nutrition labelling consists of the nutritional facts table (NFT) as well as different types of nutrition claims. Nutrition-related claims include both nutrient content (NC) and health claims.[5–7] They allow the food industry to communicate, on a voluntary basis, the health benefits of their products and, at the same time, help consumers interpret the NFT. Health claims are defined as 'any representation in labelling and advertising that states, suggests or implies that a relation exists between the consumption of foods and health.[5] In the past 3 years, Canada and the European Union (EU) have permitted several disease risk reduction (DRR) health claims (or Article 14(1)(a) claims in the EU) that link a food or food component with cholesterol lowering such as those for plant sterols (PS) and oat fibre (OF).[8–10] Also permitted are function claims (Article 13(1) claims), a subset of health claims differing from DRR claims, that state the specific benefits of a food/food component on normal function and biological activities in the body. NC claims, on the other hand, refer only to the level of a nutrient in a food and, therefore, are not considered as health claims. However, evidence suggests that if the awareness of the specific diet–health relationship is high, the mere mention of the specific nutrient will infer health benefits to consumers.[11–14]

In the EU, there is a regulatory requirement to demonstrate that claims are understandable to the average consumer before their approval.[7] Despite the recent approvals of cholesterol-lowering claims, few published studies have thoroughly examined consumer acceptability or comprehension of cholesterol-lowering claims. Therefore, our objective was to assess Canadian consumer attitudes and understanding of cholesterol-lowering claims regarding PS and OF.

MATERIALS AND METHODS

Experimental design

Randomized mock-package experiments were conducted through online surveys administered between September and October 2011 to the Advanced Foods and Materials Network's Canadian Consumer Monitor Panel, a longitudinal survey panel of adult grocery shoppers (18–69 years), as described previously.[14–16] Two randomly selected subsamples of the panel participated in a study on either the attitudes and understanding of cholesterol-lowering claims related to PS or OF.

In each study, using a randomized repeated-measures design, participants were exposed to four mock packages and were required to answer

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Received 27 October 2013; revised 18 February 2014; accepted 8 April 2014

questions quantifying their attitudes and understanding of the tested claims. The studies were identical in design and structure except for the mock packages and the claims that were tested. The study design was adapted from an earlier study conducted in Belgium.[17] Adaptations included the use of Canadian label formats and claims that complied with Canadian labelling regulations. Upon entry into the panel, all panellists were asked to complete a baseline survey that captured demographic variables such as age, gender, education and self-reported diagnosed health status, which were linked to the current survey. Panellists in the PS or OF study that did not complete the baseline survey were excluded in the final analyses.

Survey structure—mock-package experiment

In the PS study, we tested three different PS-related claims in the context of a mock margarine container: (1) NC claim; (2) function claim; and (3) DRR claim (Figure 1). The fourth claim was a 'tastes great' claim that served as a control. Similarly, in the OF study, we tested three claims related to OF and a 'taste great' claim in the context of a mock cereal box (Figure 1). The mock packages were professionally designed (OnBrand, Toronto, ON, Canada) based on similar Canadian food products.[18] An enlarged version of the claim appeared beside the product to ensure legibility on the computer screen.

Product variables, such as functional ingredients, nutritional profile and all other attributes of the label, were kept constant among all the mock packages within each study. Regardless of the claim carried, the nutritional profile for each food package was identical within each study. Links were made available below each mock package to view the NFT in a separate pop-up window, if panellists wished to do so.

During the mock-packaged experiment, participants were asked the same set of questions.[14] We asked questions regarding attitudes towards the claim, attitude towards the product and purchasing intentions. Several questions were also included to evaluate understanding of the claim. See Figure 2 for the wording of the questions.

After the mock-package experiment was completed, a series of questions on key participant characteristics, such as personal relevance, familiarity of the product (that is, margarine or cereal) and personal beliefs that have been shown to contribute to attitudes and understanding of health claims were obtained. Majority of the questions used a five-point Likert scale, whereby 1 = the least/negative end of the scale and 5 = most/positive end of the scale.

Procedures

Before administration, the survey underwent a plain language review, French translation and pilot testing. Snap 10 Professional Survey Software and Webhost (Snap Surveys Ltd., Portsmouth, NH, USA) were used to electronically design, randomized the mock packages within each survey and administer surveys.

Each panellist was provided a unique electronic link to the password-protected online survey by email. Panellists who did not complete the survey after the first email invite received up to three weekly email reminders. All panellists who participated in the studies were entered in a lottery for a chance to win one of two monetary prizes. The study protocol was approved by the Research Ethics Boards at the University of Toronto and at the University of Guelph. Consent was obtain from all participants at recruitment and was available with each survey.

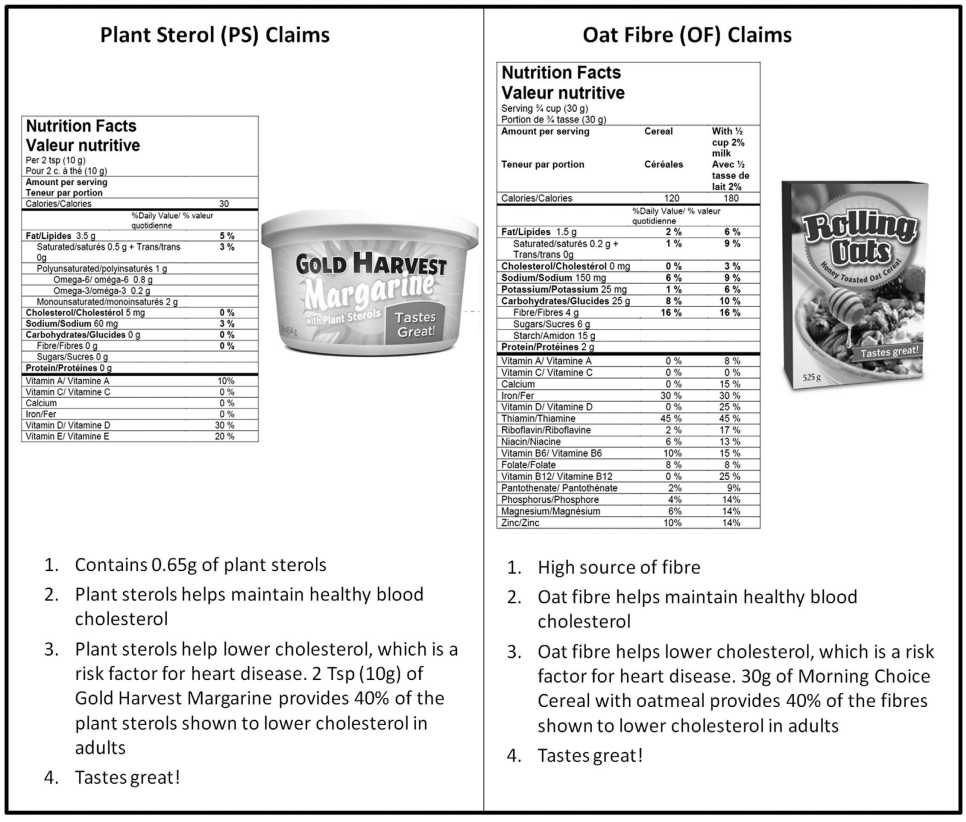

Figure 1. Mock packages and tested claims for two different groups of cholesterol-lowering foods/food components. Mock packages within each study were identical except for the claim on the front of the package. Depending on the study, panellists evaluated either four margarines or four cereals in random order, each carrying one of the four tested claims. The tested claims used within the plant sterol (PS) claims study and the oat fibre (OF) claims study are displayed: (1) nutrient content claim; (2) function claim; (3) disease risk reduction claim; and (4) taste control claim. The wording of the PS and OF disease risk reduction claims are based on the prescribed wording approved by Health Canada and the doses mentioned are based on amounts provided in the leading PS margarine and OF cereal in Canada. Participants had the choice of viewing the nutrition facts table by clicking on a link below the mock package. The nutrition facts table was identical for each mock package.

QUESTIONS DURING THE MOCK PACKAGE EXPERIMENT TO EVALUATE ATTITUDES AND UNDERSTANDING OF CLAIMS
(The following questions were repeated after exposure to each mock package)

Attitude towards the claim

- How much do you like the claim on the package? [*1 = Donot like at all; 5= Like very much*]
- Is the wording clear on this claim? [*1 = Not very clear; 5 = Very clear*]
- Do you trust the claim is true? [*1 = Not at all; 5 = Very confident*]

Attitude towards the product

- How healthy do you think this food is for you? [*1 = Not healthy at all; 5= Very healthy*]

Purchasing intentions

- Assume this product has a cost similar to other margarines/breakfast cereals; how likely would you buy this food? [*1 = Not very likely; 5 = Very likely*]
- Would the claim on the package above influence your decision to buy this food? [*1 = Not very likely; 5 = Very likely*]
- How useful is this claim in helping you decide whether or not to buy this food? [*1 = Not very useful; 5 = Very useful*]

Understanding

- Is the wording clear on this claim? [*1 = Not very clear; 5 = Very clear*]
- If you had to explain the claim to a friend, what would you tell them? [*open-ended question*]
- **Below is a list of certain types of people. For each type, please tell me how likely they would benefit by eating this breakfast cereal as a part of their diet. [*1 = Not very clear; 5 = Very clear*]
  i) all people;
  ii) healthy people;
  iii) those who wanted to lose weight;
  iv) those with high blood pressure;
  v) those with high blood cholesterol;
  vi) those with heart disease;
  vii) those who were constipated and
  viii) those with diabetes

QUESTIONS AFTER THE MOCK PACKAGE EXPERIMENT
Additional key participant characteristics:
Familiarity of the Product

- How often did you consume margarine/breakfast cereal? [*Never/1-6 times per year/7-11 times per year/ 1 time per month/2-3 times per month/1 time per week/2 times per week/ 3-4 times per week/5-6 times per week/ 1 time per day/2 or more times per day*]

Personal Relevance

- Have you been diagnosed with high blood cholesterol? [*Yes/No/ I don't know*]

Personal beliefs and barriers

- Please indicate the degree to which you agree or disagree with each of the following statements on the scales provided. [*1 = Completely disagree; 5 = Completely agree*]
  - What I eat has a major impact on my personal health
  - I feel I have control over my personal health
  - Some foods contain healthy ingredients that can lower my risk of disease and improve my long term health
  - Consuming food products with added healthy ingredients (i.e. Omega 3, added fibre, added vitamins, etc.) is good for my health
  - It is important to have food products with added healthy ingredients (i.e. Omega 3, added fibre, added vitamins, etc.) at the grocery store
  - Health related claims on food labels help me choose healthier foods
  - Health related claims are just gimmicks that food companies use to sell more food
  - I have never noticed a claim on lowering the risk of any diseases on the foods I normally purchase

Figure 2. Questions within the surveys. The survey structure and questions were identical in both the plant sterol claim and oat fibre claim study. The only difference between the studies were the mock packages and the claims that were tested. ** Results from this question are not presented in this article.

Data analysis

Descriptive statistics (means ± s.d.) were performed on all rating questions. Mean differences in ratings among the four tested claims were determined by LSMeans multiple comparisons analysis with Bonferroni adjustments. The fixed effects of the claim type and hypercholesterolaemia status were estimated using a repeated-measures analysis (proc mixed) with age, gender and education included as covariates in the model. Personal beliefs and relevant reported behaviours were included in the model when a significant fixed effect was observed in one or more of the outcome variables. Statistical analyses were conducted using SAS version 9.3 (SAS Institute Inc, Cary, NC, USA).

Responses to the open-ended question probing understanding were analysed by researchers using inductive thematic analysis whereby key themes in the responses were identified, coded and quantified.[19]

RESULTS

Participants

A total of 1017 and 1002 panellists completed the study on PS and OF claims, respectively. In all, 721 in the PS study and 710 panellists in the OF study completed both the baseline survey and

the mock-package experiment and were included in the final analysis. Baseline characteristics of the participants are presented in Table 1. Overall, both survey samples were older, more female and more educated compared with the most recent Canadian census data.

Attitudes towards claims

For PS claims, the type of claim had a significant effect on the perceived attractiveness, credibility and clarity of the wording of the claims ($P < 0.0001$) (Table 2). Participants found the DRR claim to be the most attractive, whereas the NC and the taste control claims were perceived as the least attractive. The DRR was also perceived as being most credible followed by NC and function claims, whereas the taste control claim was viewed as least credible. The wording of the DRR claim was also perceived as being the most clear, whereas the NC claim was found to be the least clear.

For the OF claims, the type of claim had a significant effect on the perceived attractiveness, credibility and clarity of the wording of the claims ($P < 0.0001$) (Table 2). The DRR claim was rated the most attractive and credible, whereas the taste control claim was rated the least. The wording of the NC claim was the most clear, whereas the function claims was rated the least clear.

Healthfulness of product

The PS margarine with the DRR claim was perceived as most healthy, followed by margarines with the function and NC claims, in that order, with the taste control claim perceived as the least healthy ($P < 0.0001$) (Table 2).

Participants thought the cereal carrying the OF DRR claim was the most healthy, whereas they perceived the taste control claim as the least healthy ($P < 0.0001$) (Table 2).

Claims and purchasing intensions

Participants were more influenced and reported higher purchasing intentions for margarine that carried the PS DRR claim than the function, NC and taste control claims ($P < 0.0001$) (Table 2). For perceived usefulness of claims, the longer DRR claim was found to be most useful, while both the NC and taste control claims were thought to be the least useful ($P < 0.0001$).

Table 1. Demographic information of participants who were included in the final analyses[a]

Sample characteristic	*Plant sterol survey*	*Oat fibre survey*
Sample size	721	710
Age (years, mean (s.d.))	52 (12)	52 (12)
Gender (n *(%)*)		
Male	235 (33)	238 (34)
Female	486 (67)	472 (66)
Caregiver of a child/youth < 18 years (*n* (%))	206 (29)	234 (33)
Education (n *(%)*)		
High school or less	144 (20)	164 (23)
Trades	67 (9)	56 (8)
College	252 (35)	238 (34)
University	258 (36)	252 (35)
Report having hypercholesterolaemia (*n* (%))	169 (26)	155 (24)

[a]Respondents who completed baseline survey and either a survey on plant sterol or oat fibre claims

All claims on OF were more influential on purchasing intentions than the taste control claim ($P < 0.0001$) (Table 2). Participants were most willing to purchase the cereal with the DRR claim and found the DRR claim to be most influential and useful when forming purchasing intensions. The taste control claim was rated the least influential or useful.

Understanding of claims: open-ended question

We asked participants to describe to a friend what the tested claims meant to them and the top 10 identified themes in their response to each PS claim or OF claim are presented in Table 3. Of the 1017 panellists who participated in PS claims study and 1002 who participated in the OF claims study ~63% ($n = 615$–661) and ~60% ($n = 589$–624) of respondents completed the open-ended question for each of the tested claims respectively.

DISCUSSION

The present two mock-package experiments were chosen because they tested consumer attitudes and understanding of claims that have been scientifically substantiated to lower blood cholesterol; one on an added ingredient (PS) vs the other in a whole food (OF). These two studies are a follow-up to a previously published study on sodium claims.[14] Similar to the sodium claims study, all claims that mentioned either PS or OF (that is, NC, function and DRR) resulted in more positive attitudes towards the claim, overall product healthfulness and purchasing intentions than the taste control claim, despite all products within each study having the same NFT (Table 2). This supports the marketing value of using nutrition claims to influence consumers' purchasing decisions. However, the manner in which consumers responded to the different types of nutrition-related claims differed among the studies.

How panellists responded to different claim topics (that is, PS, OF and sodium) depended on their familiarity of the food/food component being claimed and their familiarity with the specific food–health relationship. With the recent highly publicized initiatives to reduce dietary sodium, we have previously demonstrated that 67% of Canadian grocery shoppers are concerned with excess dietary sodium intakes[15] and that consumers rated a low-sodium NC claim similarly high as the more informative sodium and hypertension DRR claim in terms of attractiveness, purchasing intentions and health benefits.[14] However, unlike the case of sodium claims, in this study, we observed that consumers reacted more positively to claims with more information on the benefits of consuming OF and this was especially notable for PS. Participants had a clear preference for the more medical-like prescriptive claim wording used in the DRR claim that contained information on the quantity of the food/food component within the product in relation to the amount needed to be consumed for a physiologically meaningful effect, and on the function of the food/food component (that is, cholesterol lowering) that was responsible in reducing the risk of heart disease. Canada and the EU are pioneers in allowing DRR or Article 14(1)(a) claims to use the more therapeutic language such as 'lowers cholesterol'. We are not aware of any studies that have examined the use of such prescriptive and therapeutic language.

In the PS study, it was obvious that participants were unfamiliar with PS and their health benefits. Participants rated the NC claim, that only mentions the amount of PS, as being the least clear. In the open-ended question, more participants expressed their ignorance to the term PS when exposed to the NC claim, and this occurrence decreased as more information was provided about the health benefits of PS and as well as the dose of PS in the product (that is, function and DRR claims) (Table 3). With the longer and more informative PS claims, participants were more likely to state the product was a good or healthy choice (NC 2%; function 6%; DRR 12%) (Table 3). This aligned with higher ratings

Table 2. Ratings of consumer attitudes within the plant sterol claims and the oat fibre claims mock-package experiments[1]

	Claim type					
	Taste control	*Nutrient content*	*Function*	*Disease risk reduction*	P *(claim)*[2,3]	P *(chol)*[3,4]
Plant sterol claims						
Attitudes towards the claim						
Attractiveness	2.01 (1.13)[a]	2.04 (1.08)[a]	2.50 (1.18)[b]	2.77 (1.28)[c]	< 0.0001	0.90
Credibility	2.09 (1.09)[a]	2.41 (1.20)[b]	2.46 (1.19)[b]	2.56 (1.17)[c]	< 0.0001	0.99
Clarity	3.11 (1.48)[b]	2.65 (1.43)[a]	3.10 (1.38)[b]	3.40 (1.32)[c]	< 0.0001	0.87
Attitudes towards the product						
Healthiness	2.28 (1.11)[a]	2.40 (1.09)[b]	2.64 (1.13)[c]	2.84 (1.17)[d]	< 0.0001	0.73
Purchasing intentions and claims' effect on making purchasing decisions						
Purchasing Intentions	2.02 (1.14)[a]	2.10 (1.16)[b]	2.34 (1.24)[c]	2.52 (1.32)[d]	< 0.0001	0.63
Claim's Influence	1.84 (1.13)[a]	1.95 (1.15)[b]	2.28 (1.25)[c]	2.55 (1.35)[d]	< 0.0001	0.87
Usefulness	1.84 (1.14)[a]	1.91 (1.13)[a]	2.27 (1.25)[b]	2.58 (1.32)[c]	< 0.0001	0.23
Oat fibre claims						
Attitudes towards the claim						
Attractiveness	2.25 (1.14)[a]	2.92 (1.09)[b]	2.87 (1.11)[b]	3.10 (1.17)[c]	< 0.0001	0.57
Credibility	2.55 (1.13)[a]	2.93 (1.14)[b]	2.96 (1.18)[b]	2.97 (1.16)[b]	< 0.0001	0.58
Clarity	3.53 (1.36)[a,b]	3.63 (1.17)[c]	3.43 (1.21)[a]	3.57 (1.23)[b,c]	< 0.0001	0.71
Attitudes towards the product						
Healthiness	2.80 (1.05)[a]	3.24 (1.04)[b]	3.23 (1.03)[b]	3.36 (1.04)[c]	< 0.0001	0.53
Purchasing intentions and claims' effect on making purchasing decisions						
Purchasing Intentions	2.41 (1.19)[a]	2.68 (1.20)[b]	2.67 (1.22)[b]	2.87 (1.27)[c]	< 0.0001	0.33
Claim's Influence	2.05 (1.15)[a]	2.63 (1.20)[b]	2.58 (1.20)[b]	2.84 (1.28)[c]	< 0.0001	0.09
Usefulness	2.01 (1.19)[a]	2.72 (1.22)[c]	2.57 (1.21)[b]	2.85 (1.23)[d]	< 0.0001	0.64

Values with different superscripts within a row are significantly different from each other using LS Means multiple comparison with Bonferroni adjustments. [1]Means (s.d.); plant sterol claim survey: $n = 721$; oat fibre claim survey $n = 710$. [2]*P*-value for main effect of claim type. [3]Plant sterol study: the model controlled for cholesterol status, age, gender, education, significant beliefs (perceived impact food has on health, control of their own health, effectiveness of functional foods and helpfulness of health claims) and reported behaviours (frequency of consumption of margarine, looks for health claims and nutrition facts table when grocery shopping and seeks more information after seeing a health claim). Oat fibre study: the model controlled for cholesterol status, age, gender, education, caregiver status, significant beliefs (perceived effectiveness of functional foods, helpfulness of health claims and perception of health claims as being gimmicks) and reported behaviours (frequency of consumption of breakfast cereals, looks for health claims and nutrition facts table when grocery shopping, purchases functional foods and seeks more information after seeing a health claim). [4]*P*-value for the main effect of cholesterol status. No interaction between claim type and cholesterol status was observed.

on the claims attractiveness, credibility, influence and usefulness, as well as their perceived healthfulness and purchasing intentions of the product carrying the tested claim. Similarly, a previous study demonstrated that Europeans and Americans found the PS-related NC claims harder to understand than PS-related health claims and that PS health claims resulted in higher overall ratings of perceived healthiness and consumer appeal.[20] A Finnish study also found participants viewed products with a PS-related NC claim as less advantageous than products with PS health claims.[13] At the time of these studies, PS products have been on the US and European markets for 10–20 years.[21,22] At the time of the present study, PS as a food ingredient and its associated DRR health claim had only been approved for use on the Canadian market for little over a year.

For OF claims, the DRR claim was also often rated the highest, followed by the function and NC claims, which were often rated similar to each other. Participants may have appreciated the direct connection of the food and its health benefit as made in the DRR claim on OF and cholesterol lowering. Consumers seemed to be familiar with the term 'fibre', with 16% of respondents stating that the cereal was a good or healthy choice regardless of the type of claim (Table 3) and unlike the case of PS, participants also rated the OF NC claim 'high source of fibre' as being the clearest and similar to the DRR claim (Table 2). However, it was evident that consumers were aware of other health benefits associated with fibre that were not mentioned in the DRR claim. In the open-ended question, 12% of respondents listed other well-known health benefits of fibre such as promoting regularity and attenuating glycemic response to foods (Table 3). With the NC fibre claim, cholesterol lowering was rarely mentioned but when exposed to the function and DRR claims, the responses were concentrated on cholesterol-lowering or the heart health benefits of OF. Previous studies on fibre claims have examined regularity, satiety, cancer and glycemic control, whereas none examined OF and cholesterol lowering.[13,20,23,24] In addition, a significant portion of the sample (~8%) noted the overuse of the fibre NC claims on cereals (Table 3) and this may help explain why, in this instance, participants often rated DRR claim over the NC claim in terms of attractiveness, credibility, healthiness, influence and purchasing intentions (Table 2).

Although not statistically tested, the ratings for the products with OF claims were rated higher than products with PS claims. This may be an effect of the actual food product. The taste great claim was generally rated lower on the margarine than the cereal on all the survey questions. A larger number of the respondents advised against consuming margarine (11%), compared with participants that commented on avoiding sugar in cereals (6%) (Table 3), suggesting that margarines have a less healthy image than oat cereals in the minds of our participants. Therefore, it is likely that claims may be rated differently on different food products. Research has shown that the type of food product affects consumers interpretation of the claim and, thus, modifies

Table 3. Top 10 key themes identified in response to the open-ended questions to evaluate the understanding of plant sterol and oat fibre claims[a]

	Nutrient content		*Function*		Disease risk reduction	
Plant sterol claims						
1.	Participants claimed they were not familiar with PS	49%	Participants commented that PS or margarine with PS can maintain or keep cholesterol levels low	25%	Participants stated that PS or the test margarine lowers cholesterol	33%
2.	Participants mentioned that the margarine contained PS	17%	Participants claimed to be unfamiliar with PS	19%	Participants claimed to be unfamiliar with PS	14%
3.	Participants questioned the efficacy of consuming 0.65 g of PS or thought that amount was too low	7%	Participants were against consuming margarine or would not recommend the test margarine or recommended other foods instead	11%	Participants claimed the test product to be a healthy choice or superior than other margarines	12%
4.	Participants thought that the margarine was either heart healthy (i.e. prevented CVD, lowers or maintains blood cholesterol) or good for those with high cholesterol	7%	Participants expressed a distrust in the claims/labels	9%	Participants expressed a distrust in the claims/labels	11%
5.	Participants would advise their friend not buy or consume the margarine or would recommend an alternative product to purchase/consume (i.e. olive oil, butter, vegetables)	7%	Participants thought PS or the test margarine with PS lowers cholesterol	8%	Participants stated that the test margarine contains PS	8%
6.	Participants expressed a distrust in the claims/labels	4%	Participants stated that the test margarine contains PS	7%	Participants claim that they do not eat margarine or advises not to purchase or consume the test margarine	8%
7.	Participants either checked or advised to check the NFT	4%	Participants expressed that PS or the test margarine with PS was a good choice, has health benefits or good for health	6%	Participants demonstrated confusion over the 40%	5%
8.	Participants commented on the margarine being made from vegetable or plant oils or extracts	3%	Participants questioned the amount of plant sterols in the product	5%	Participants stated that they wanted additional information or needed to do additional research on PS	5%
9.	Participants questioned if claim was referring to per serving	2%	Participants asked questions about PS action on cholesterol lowering	5%	Participants thought the test margarine was good for people with heart disease or high cholesterol	4%
10.	Participants thought the test margarine was superior to other margarines on the market	2%	Participants either checked or advised to check the NFT	5%	Participants either checked NFT or advised to check the NFT	3%
Oat fibre claims						
1.	Participants stated that the cereal either contained fibre or was high in fibre	46%	Participants stated that either oat cereal/oats/oat fibre lowers or maintains cholesterol or prevents heart disease	37%	Participants stated that either oat cereal/oats/oat fibre lowers or maintains cholesterol or prevents heart disease	33%
2.	Participants either checked or advised to check the NFT, check the ingredients list or compare to other cereals	17%	Participants stated that the cereal or oats in general was a good or healthy choice	16%	Participants stated that the cereal either contained fibre or was high in fibre	20%
3.	Participants stated that the cereal was a good or healthy choice	16%	Participants stated that the cereal either contained fibre or was high in fibre	13%	Participants stated that the cereal was a good or healthy choice	16%
4.	Participants mention the health benefits of fibre beyond cholesterol lowering (i.e. regularity, blood sugar, GI health)	12%	Participants either checked or advised to check the NFT, check the ingredients list or compare to other cereals	12%	Participants either checked or advised to check the NFT, check the ingredients list or compare to other cereals	8%
5.	Participants believed that the test cereal is the same as all cereals, all cereals have this claim or that there are better cereals on the market	8%	Participants stated they did not know, would not tell their friend anything or stated that the claim means nothing to them	8%	Participants demonstrated an understanding that the serving of cereal provided 40% of fibre to lower cholesterol	6%
6.	Participant made a comment on sugar, honey or sweetness	6%	Participants questioned the amount of oat fibre or didn't believe there was much fibre in the cereal	6%	Participants made a comment on sugar, honey or sweetness	6%
7.	Participants stated they did not know, would not tell their friend anything or stated that the claim means nothing to them	5%	Participants demonstrated a distrust in the claims/labels	6%	Participants demonstrated confusion over the 40% of fibre needed to lower cholesterol	6%
8.	Participants demonstrated a distrust in the claims/labels	3%	Participants commented that the claim was a general statement that did not connect to the product	6%	Participants stated the oat cereal/oats/oat fibre was good for people with high cholesterol or heart problems	5%
9.	Participants would recommend to consume unprocessed oats/foods	3%	Participant made a comment on sugar, honey or sweetness	5%	Participants stated they did not know, would not tell their friend anything or stated that the claim means nothing to them	5%
10.	Participants stated that the cereal would be good for people who needed more fibre	2%	Participants stated the oat cereal/oats/oat fibre was good for people with high cholesterol or heart problems	4%	Participants demonstrated a distrust in the claims/labels	4%

Abbreviations: CVD, cardiovascular disease; GI, gastrointestinal; NFT, nutrition facts table; PS, plant sterol. [a]Some open-ended responses from participants contained multiple key themes; therefore responses do not always total to 100%.

perceptions of claims.[25] From a regulatory standpoint, permitted nutrition-related claims are approved on the basis of physiological evidence and are allowed on any food product as long as it meets the nutrient criteria that are associated with the claim. However, results from these studies suggest that it is difficult to generalize attitudes and understanding of claims when it is so highly dependent on contextual factors such as (1) their familiarity with the food/food component, (2) their awareness of the food–health relationship and (3) the overall food product carrying the claim.

The current findings along with the previous published study on sodium claims have practical implications for both industry, government and health professionals; who all benefit from knowing how consumers evaluate such claims. Results highlight scenarios where longer, more informative claims would achieve a maximum marketing impact than shorter claims and *vice versa*. Shorter claims save coveted marketing space on labels, but as we have demonstrated, when the diet–health relationship is unfamiliar longer claims are more appropriate. We have shown that it is difficult to generalize attitudes and understanding of claims, but unlike the EU, Canada and many other countries approve nutrition-related claims based on physiological evidence without consideration of consumers response to claims. However, consumer research, such as the studies presented, are subjective in nature and the current findings strongly support future studies involving measures such as sales and dietary intake data but development of methodologies that can better isolate the effect of claims on actual sales and dietary behaviour would be needed.

CONCLUSION

In both studies, all nutrition-related claims elicited more positive responses than the taste control claim, even though the NFTs were identical. Differences in consumer response to the different types of claims (that is, NC, function and DRR) were observed; however, how the participants responded to the different types of nutrition-related claims depends highly on contextual factors such as familiarity with the ingredient and the food product that carries the claim. Future research would have to investigate claims in the context of several different food products to confirm the range of consumer responses and continue monitoring consumers attitudes as consumer education and food/ingredient familiarity increases and labelling regulations continues to evolve.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

This study was supported by the National Centres of Excellence, Advanced Foods and Materials Network (MRL and SJH), an Earle W McHenry Research Chair (University of Toronto) unrestricted research grant 'Food and Nutrition Policy for Population Health' (MRL), an Ontario Graduate Scholarship (CLW) and two Canadian Institutes of Health Research Strategic Training Grants in (1) Public Healthy Policy (CLW) and (2) Population Interventions for Chronic Disease Prevention: A Pan-Canadian Program (grant 53893; CLW).

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