The American Journal of Clinical Nutrition
Official publication of the American Society for Nutrition

The American Journal of Clinical Nutrition
AJCN/2017/171256
Version 4

The effects of health claims on choice of foods in the presence of front-of-pack labels

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Trial registered: Australian New Zealand Clinical Trials Registry (ANZCTR) Reg No. ACTRN12617000015347

A randomized trial assessing the effects of health claims on choice of foods in the presence of front-of-pack labels

RUNNING TITLE: Health claims, FoPLs and food choice

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Sources of support:

This work was supported by an ARC Linkage grant (LP130100428), with contributions from the South Australian Health and Medical Research Institute, the National Heart Foundation, Cancer Council NSW and Cancer Council Victoria. KB was supported by an NHMRC Principal Research Fellowship (ID 1042442).

Abbreviations:

FoPL: Front-of-pack label

NFP: Nutrition Facts Panel

DIG: Daily Intake Guide

HSR: Health Star Rating

MTL: Multiple Traffic Light

NFP: Nutrition Facts Panel

SEIFA: Socio-Economic Indexes for Areas

CI: Confidence Intervals

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Abstract

Background: As a public health intervention, front-of-pack labels (FoPLs) have the potential to reach large numbers of consumers and promote healthier food choices. Of the different FoPLs, those summarising a product's overall nutritional profile tend to be most effective in guiding healthier choices. However, information is lacking as to whether FoPLs are as effective when nutrient or health claims also appear on-pack.

Objective: The aim of this study was to examine how choice of foods of varying levels of healthfulness (less healthy, moderately healthy, and healthier) are affected by the appearance of various FoPLs (Daily Intake Guide, Multiple Traffic Lights, Health Star Rating) when shown in combination with different claim conditions (no claim, nutrient claim, general level health claim, and higher level health claim).

Design: Adults and children (n = 2069) completed a discrete choice experiment online. Respondents were shown eight choice sets, each containing four alternatives of the same food type (cookies, cornflakes, pizza, or yoghurt) of varying levels of healthfulness and were asked which product they would likely purchase (or they could select none). Respondents were randomized to see one of the three FoPLs across all choice sets. Claim type and healthfulness varied within choice sets in accordance with a D-efficient design.

Results: The probability of choosing a healthy product and avoiding an unhealthy product was greatest when only a FoPL (especially the Health Star Rating) appeared on-pack. The addition of a nutrient or health claim did not affect the likelihood of picking healthier products, but did increase the likelihood of selecting less healthy foods, across all FoPL conditions.

Conclusions: FoPLs are most effective in helping consumers make better food choices when nutrient and health claims are not present. Policies are required to control how nutrient and health claims are applied to less healthy foods.

Keywords: front-of-pack label, daily intake, traffic light, health star rating, nutrient and health claims.

Introduction

Front-of-pack labels (FoPLs) summarising a product's overall nutritional profile, which have increasingly appeared on packaged foods around the world over the last decade, are considered an important obesity prevention tool (1,2). Research shows that FoPLs are easier to understand, facilitate faster and more accurate processing, and help consumers better differentiate between healthier and less healthy products compared to the Nutrition Facts Panel (NFP) that appears on the back or side of food packs in many countries (3–9).

Many different FoPL formats exist, ranging from reductive/nondirective to interpretive/directive variations (10,11). Reductive FoPLs (e.g., the Daily Intake Guide (DIG)) provide little interpretation of nutrient information, while more interpretive FoPLs (e.g., the Multiple Traffic Lights (MTL) and Health Star Rating (HSR)) provide visual cues to help consumers form a judgment about the food (e.g., colors to signify the level of nutrients within a food or a rating scale assessing the overall healthfulness of the food) (10,11). Research suggests that consumers prefer and are generally better at gauging product healthfulness with interpretive FoPLs than reductive FoPLs (12–14). However, there is some evidence to suggest that FoPLs (particularly reductive FoPLs) may create a positivity bias whereby consumers are more favorable towards a food when a FoPL is present compared to absent, regardless of food healthfulness (4,5,10,15,16).

Nutrient/health claims are additional sources of nutrition information that also often appear, written as text, on the front of food packs. Nutrient claims refer to the level of a nutrient within a product while health claims describe how this nutrient relates to physical outcomes (general level health claims) or is linked to a serious disease (higher level health claims). These claims provide less balanced nutrition information than FoPLs as they often highlight the presence or absence of isolated nutrients and/or any associated health benefits (17). Given their marketing function, claims are especially capable of creating a positivity bias

(16,18). This appears to apply more to higher level (5,19–21) and general level health claims (16,20–24) than nutrient claims (25–28). The existence of a positivity bias is particularly concerning when it occurs among less healthy foods due to the potential for these foods to be purchased and consumed more as a result (29).

Even though nutrient/health claims and FoPLs frequently occur together on-pack, few studies have examined consumers' responses to foods containing both (18). The aim of the present study was to better understand how consumers' food choices are affected when both claims and FoPLs appear on-pack. The tested FoPLs included a reductive FoPL (DIG) and an interpretive FoPL (HSR) that currently appear on pre-packaged foods in Australia (the context of the present study). The MTL; a nutrient-based interpretive FoPL that has been implemented elsewhere and widely studied, was also included to allow for comparisons with international research. The tested claims included three types currently widely used in Australia: nutrient claims, general level health claims, and higher level health claims.

Subjects and Methods

Participants

Adults and children (*n* = 2069) completed the study online from their personal computer in a location of their choice. Children were included in this study because they increasingly exert power over the foods they consume, either through direct purchases or by influencing their parents' purchasing decisions (30,31). Ethics approval for this study was granted by the Curtin University Human Research Ethics Committee. Consent was obtained from the adults, children, and the children's parents prior to participation in the survey. Respondents were recruited through a large web panel provider (PureProfile) and quotas were used to ensure adequate representation by gender and age. Respondents residing in areas of low socio-economic position (Socio-Economic Indexes for Areas (SEIFA) deciles 1 – 4) (32) were

deliberately oversampled to reflect their higher risk of diet-related diseases (33). **Table 1** provides a breakdown of the sample characteristics. Sample size was predetermined to comply with the recommended minimum of at least 20 respondents per choice set (34), and this minimum was exceeded with 51 respondents on average per choice set. Respondents were also screened to ensure they at least occasionally purchased or consumed two or more of the products used in the choice sets: cookies, cornflakes, pizzas, and yoghurts. Choice sets that included products that the respondent reported 'never' consuming were excluded from analyses.

TABLE 1 ABOUT HERE

Design and stimuli

The present study was part of a larger project (35,36) examining consumers' choice of mock food products across a range of attributes that were developed into choice sets using NGene, maximising D-efficiency. Price (which varied across foods within a choice set) and food type (which varied between choice sets) were manipulated in the larger study, with results reported elsewhere (36), and thus were not analysed in the present study. The NGene design used to create the choice sets meant that the variables manipulated in the larger project did not interact with other variables since levels within each variable (e.g., the levels of healthiness: unhealthy, moderately healthy, healthier) co-occurred in roughly equal frequency with the levels of the other variables. Thus, price or food type could not systematically bias the results. **Figure 1** shows the attributes relevant to the current study.

The mock packs (which were created by a graphic designer) and the prices used were developed to mimic real products found in Australian supermarkets and have been used in

previous studies (4,37). These packs featured fake products and brand names to avoid any influence of familiarity or loyalty. For 3 out of the 12 products it was necessary to slightly change some nutrient values to ensure the overall nutrient profiles differed substantially. The foods chosen (i.e., cookies, cornflakes, pizza, yoghurt) represent frequently purchased foods for which nutrition information is often consulted by consumers (38,39). These foods were also considered to be desirable to both children and adults. The healthier, moderately healthy, and less healthy nutrition profiles for each food type were also adapted from real products. Within each food type, nutrition profiles varied from less to more healthful based on Nutrient Profiling Scoring Criterion (NPSC) scores (40).

The three levels of claims (i.e., nutrient claims, general level health claims, and higher level health claims) were applied to each food category. As shown in Figure 1, within each food type the claims described a common nutrient and, in the case of general and higher level health claims, the associated bodily function or disease relationship relevant to that food (e.g., calcium being good for bones in the case of yoghurt). To address the aims of this study, all levels of claims appeared on mock products across all levels of healthfulness, although in reality some of the claims would not be permitted on these products, depending on national food labelling regulations.

FIGURE 1 ABOUT HERE

Procedure

The survey comprised one practice choice task using a non-related food product (muesli bars) and eight experimental choice tasks. Respondents were randomized to one of the three FoPL conditions and thus only saw one type of FoPL across all eight choice sets. Figure 2 shows the

number of people who commenced the study and the number who made it through to the end minus those who were excluded based on screening criteria or dropped out before finishing the survey. Reflecting the current marketplace reality in Australia of a voluntary FoPL system, the allocated FoPL was present on half the packs within each choice set, with the other two packs bearing no FoPL. All other attributes were presented according to the efficient design script created by NGene. Each choice set comprised four mock packs of foods from the same product category and respondents indicated which of the four products they would prefer to purchase (or they could select "none of the above"). Across the eight choice sets, each food type was randomly presented twice, but never consecutively.

FIGURE 2 ABOUT HERE

In line with recommendations from the choice task literature, the tasks in the present study were designed to incorporate elements of a real world shopping context (41–43). Respondents could zoom in on the mock packs to see them in more detail and the NFP could be accessed by clicking a link below the mock pack image. Additionally, a 30 second time limit (based on previous studies (44–46) and pilot testing) was imposed for each choice, after which time the survey progressed to the next choice set.

Analysis

Only choice sets for which the respondent did not select "none of the above" and indicated that they consumed/purchased that food more often than never were included in analyses. This constituted 11244 out of a possible 16551 choice sets (68%) across 1 953 respondents. The outcome variables (choice probabilities for the interaction between no FoPL, the DIG, MTL and HSR FoPLs and the no claim, nutrient, general and higher level claim conditions)

were calculated in STATA and plotted according to level of product healthfulness. Meaningful differences between conditions were inferred when the 95% confidence intervals (CIs) around each coefficient did not overlap (47).

Results

Across all the choice sets presented to respondents, 18% (n = 3027) of individual choice sets were not completed due to respondents opting out of making a choice, and 5% (n = 900) were not completed due to the time limit being exceeded for making that particular choice. Respondents were significantly less likely to opt out of individual choices in the MTL condition (17%) than the DIG (19%, $z = 4.43$, $p < 0.001$) and HSR conditions (19%, $z = 3.63$, $p < 0.001$). There was no significant difference in the frequency with which respondents timed out across conditions.

Figure 3 provides an overview of the results relating to the 'claims x FoPL x healthfulness' interaction. Non-overlapping error bars indicate a statistically significant difference between points on the graph that represent different forms of nutrition information. Choice frequency was relatively low across all levels of product healthiness for mock packs with no claim and no FoPL. Although 50% of the products within each choice set featured no FoPL, choice frequency for mock packs with no FoPL was low (ranging from 10 – 13% across the different FoPL conditions). This is most likely explained by the fact that the healthiness of no FoPL products could only be interpreted through the NFP (which, in this study, was only viewed on 6% of all mock packs) and the view rate was not higher for packs without a FoPL. Furthermore, research suggests that consumers value the provision of useful nutrition information on packs (14), and therefore they are highly likely to exhibit a preference for

products that feature more useful nutrition information. Thus, some level of FoPL positivity bias was to be expected.

The 'HSR, no claim' condition resulted in the choice trajectory that was most closely aligned with objective product healthfulness (i.e., fewer respondents chose the less healthy products and more chose the healthier products). In the case of less healthy products with a FoPL, the presence of claims resulted in a positivity bias where there was a higher probability of choice in the 'claim present' conditions relative to the 'no claim' conditions. The same positivity bias produced by health claims was observed among moderately healthy/healthier products with no FoPL. However, when FoPLs were present on the moderately healthy/healthier products there was no significant difference in choice according to whether a claim was present versus absent. Finally, there were no significant differences between males and females or age groups (10-17, 18-46, 46+ year olds) in their choice of mock packs based on healthiness x FoPL x health claim combinations.

FIGURE 3 ABOUT HERE

Given that, when a FoPL was present, the presence of a claim consistently increased choice of less healthy foods (for which increased choice is most concerning), this interaction was explored in more detail to determine whether certain claims had a stronger impact on choice. Figure 4 shows the results for each claim type. Across products with a FoPL, choice probability was lowest in the 'no claim' condition and was significantly lower for the HSR than the DIG and MTL, suggesting that the HSR was the most effective at signalling less healthy foods. The positivity bias highlighted in Figure 4 was evident across all three types of claims within each FoPL condition. The combination of a DIG and any claim resulted in the

highest choice probability for less healthy foods. General and higher level health claims boosted choice to a greater extent than nutrient claims among packs with the MTL.

FIGURE 4 ABOUT HERE

Discussion

When FoPLs appeared on-pack without any claims, product choice more closely corresponded with product healthfulness than when FoPLs appeared on products with claims. This was most evident among products bearing the HSR. When any claim was present in combination with a FoPL on less healthy products, a strong positivity bias was observed such that respondents were more likely to choose less healthy products bearing a claim. These results suggest that claims can counteract the potential for FoPLs to alert consumers to less healthy products. This finding is supported by other choice studies showing that consumers are more likely to choose a less healthy product if it contains a claim, regardless of whether a FoPL is present (3,5,48). Among healthier and moderately healthy products, claims did not significantly affect choice over and above FoPLs. This may be explained by the fact that respondents are already more likely to select these products because the FoPLs communicated a positive message about them.

Choice probability was not consistently higher for any particular type of claim across the entire sample. However, among less healthy products specifically, the combination of certain claims and FoPLs had a greater impact on choice. Choice probability increased when any claim appeared with the DIG, but decreased when general level health claims appeared with the MTL or HSR. These findings suggest that, of all the FoPLs tested, the DIG is least likely to discourage the choice of less healthy foods when claims are present.

The finding that both nutrient and health claims boosted choice of less healthy products has important policy implications as countries currently regulate these types of claims differently (49,50). In Australia, the overall healthiness of a food is assessed against nutrient profiling criteria before the product can be deemed eligible to carry health claims, but this does not apply to nutrient claims, which only have to meet nutrient specific criteria (51). The results of the present study suggest that the same restrictions should apply to nutrient claims.

In previous research relying on self-reported food choice behaviors, respondents reported being sceptical of nutrient and health claims and preferring to use FoPLs when they are available (37,52). The results of the present study indicate that even when FoPLs are present on less healthy products, nutrient and health claims can, perhaps subconsciously, increase choice of those products. This was evident from the greatest alignment between product healthfulness and choice occurring when packs included a FoPL with no accompanying claim. The finding that particular FoPLs (i.e., the HSR) were more effective in helping consumers select healthier foods while others increased choice across all food regardless of healthfulness (i.e., the DIG) supports regulations to mandate effective FoPLs rather than leaving the decision to manufacturers.

It is important to acknowledge the use of an online, simulated food choice task as a potential limitation of the study. However, this approach afforded greater control over the variables of interest and design techniques were used to maximize ecological validity (e.g., including different types of foods, creating time pressure, allowing respondents to opt out of making choices, using realistic mock packs, and providing an NFP). Although respondents were not specifically instructed to select the healthiest product from the choice set, nutrition

information was the main source of variance between the mock packs. This could have led to overestimation of the influence of this information on food choice. Future research using real purchase situations would be valuable in assessing the validity of the present findings. Although much past research has suggested that nutrient and health claims positively bias consumers' food choices, these results illustrate the magnitude of their impact when paired with specific FoPLs. Overall, these results serve to highlight the role of FoPLs in facilitating healthier choices and the negative consequences of allowing claims to appear on less healthy products.

Acknowledgements: SP, BK, HD, BN, CM, ZT designed the research; ZT and SP conducted research; RN and ZT analysed the data; ZT and SP took primary responsibility for preparing the paper, and all authors reviewed and approved the final manuscript. The authors declare no conflict of interest.

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Table 1. Sample profile (*n* = 2069)

Males (*n* = 1015)			**Females** (*n* = 1054)		
Age (years)	**Socio Economic Status**		**Age (years)**	**Socio Economic Status**	
	Low[1]	Medium-High		Low[1]	Medium-High
	(*n* = 494)	(*n* = 521)		(*n* = 518)	(*n* = 536)
10-14	69	73	**10-14**	73	76
15-18	65	68	**15-18**	69	78
19-25	42	58	**19-25**	51	53
26-35	64	64	**26-35**	65	67
36-45	63	64	**36-45**	65	66
46-55	63	65	**46-55**	64	65
56-65	64	66	**56-65**	66	66
65+	64	63	**65+**	65	65

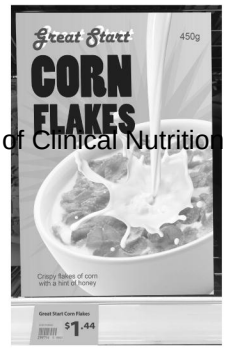
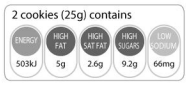
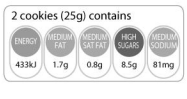
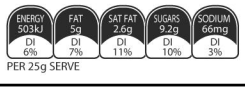
[1]Low Socio Economic Status category comprised those in deciles 1 to 4 of the Australian Bureau of Statistics' Socio-Economic Indexes for Areas (SEIFA) (32)

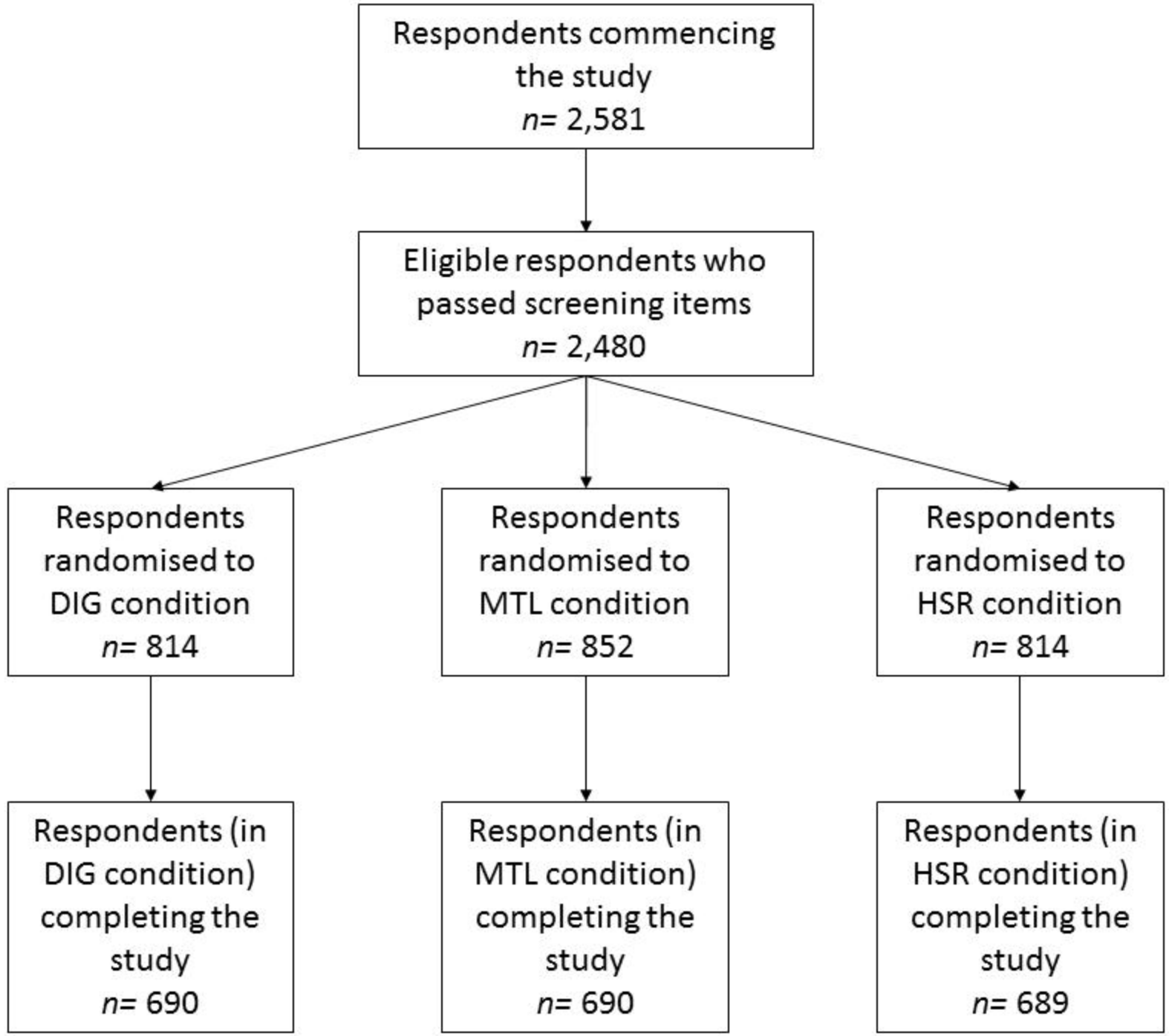
Figure 1. Levels of attributes displayed on mock packs relevant to the current study. Note: NPSC scores decrease from the less healthy to the more healthy product within each food category.

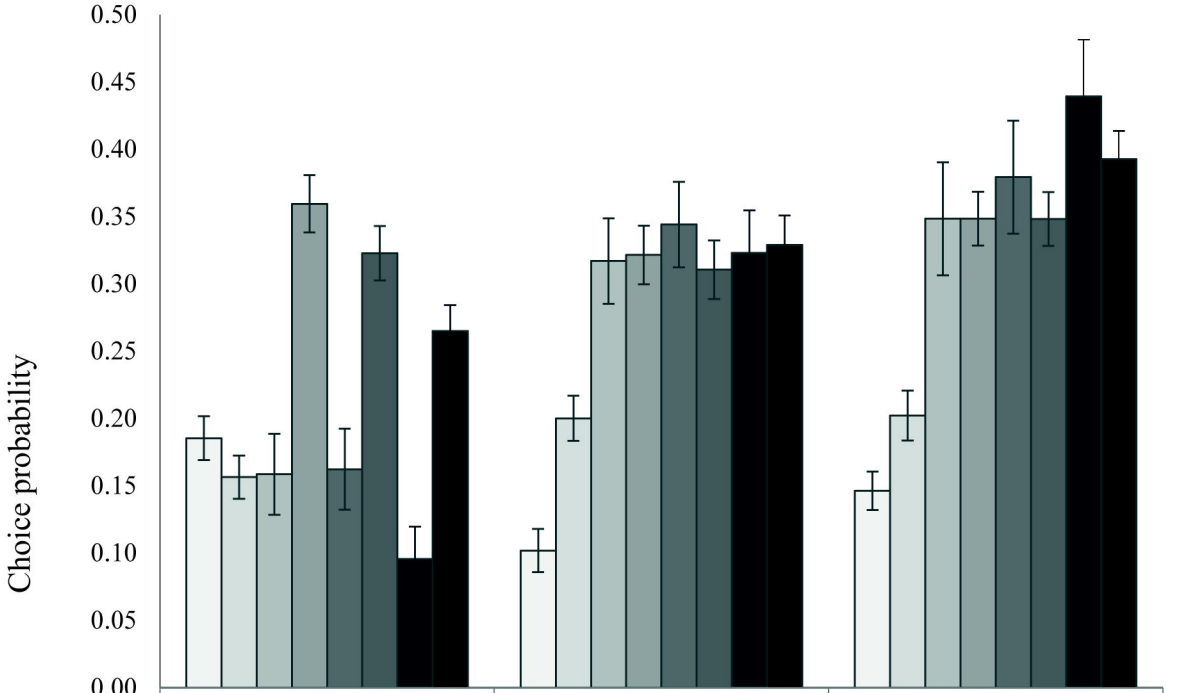
Figure 2. Participant flowchart

Figure 3. Probability of choice according to product healthfulness, FoPL type (DIG, MTL, HSR), and claims (present/absent), *n* = 1953. Choice probabilities were calculated in STATA.

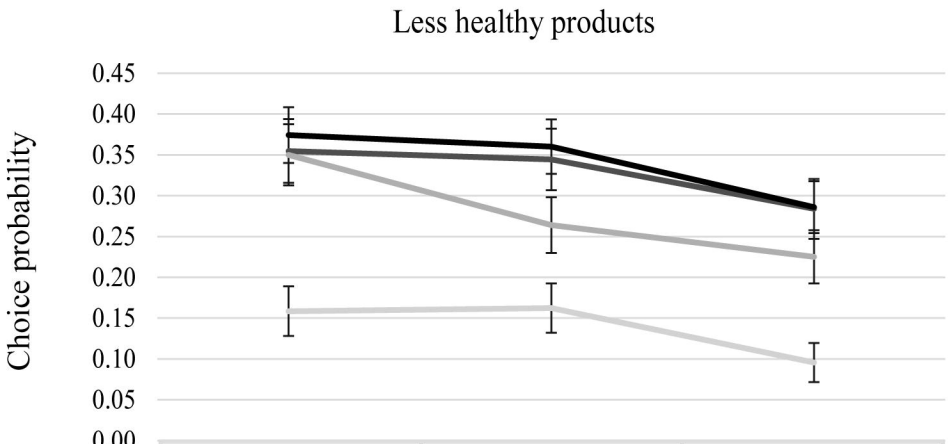
Figure 4. Choice probability for less healthy products according to FoPL type (DIG, MTL, HSR), and claim condition (no claim, nutrition claim, general level health claim, higher level health claim), *n* = 1953. Choice probabilities were calculated in STATA. [a,b,c] Different superscript letters indicate a significant difference between means.

		Cookies	Corn flakes	Pizza	Yoghurt
Sample mock pack					
Attribute	**Level**	**Cookies**	**Corn flakes**	**Pizza**	**Yoghurt**
Claims	**No claim**				
	Nutrition claim	Reduced saturated fat	High in fiber	Reduced salt	High in calcium
	General level health claim	Reduced saturated fat to help reduce total blood cholesterol	High in fiber to help improve digestive function	Reduced salt to help maintain healthy blood pressure	High in calcium for strong bones
	Higher level health claim	Reduced saturated fat. A diet low in saturated fat helps reduce the risk of coronary heart disease.	High in fiber. A diet high in fibre helps reduce the risk of bowel cancer.	Reduced salt. A diet low in salt helps reduce the risk of hypertension.	High in calcium. A diet high in calcium helps reduce the risk of osteoporosis.
Healthfulness	Less healthy			
	Moderately healthy			
	Healthier			
FoPL	No FoPL				
	Daily Intake Guide				
	Multiple Traffic Light				
	Health Star Rating				


Respondents commencing the study
n= 2,581
Eligible respondents who passed screening items
n= 2,480
Respondents randomised to DIG condition
n= 814
Respondents randomised to MTL condition
n= 852
Respondents randomised to HSR condition
n= 814
Respondents (in DIG condition) completing the study
n= 690
Respondents (in MTL condition) completing the study
n= 690
Respondents (in HSR condition) completing the study
n= 689



	Less healthy	Moderately healthy	Healthier
No FoPL, no claim	0.19 (0.17, 0.20)	0.10 (0.09, 0.12)	0.15 (0.13, 0.16)
No FoPL, all claims	0.16 (0.14, 0.17)	0.20 (0.18, 0.22)	0.20 (0.18, 0.22)
DIG, no claim	0.16 (0.13, 0.19)	0.32 (0.29, 0.35)	0.35 (0.31, 0.39)
DIG, all claims	0.36 (0.34, 0.38)	0.32 (0.3, 0.34)	0.35 (0.33, 0.37)
MTL, no claim	0.16 (0.13, 0.19)	0.34 (0.31, 0.38)	0.38 (0.34, 0.42)
MTL, all claims	0.32 (0.3, 0.34)	0.31 (0.29, 0.33)	0.35 (0.33, 0.37)
HSR, no claim	0.1 (0.07, 0.12)	0.32 (0.29, 0.35)	0.44 (0.4, 0.48)
HSR, all claims	0.26 (0.25, 0.28)	0.33 (0.31, 0.35)	0.39 (0.37, 0.41)



	DIG	MTL	HSR
	Mean (95% CIs)		
No claim	0.16 (0.13, 0.19)[a]	0.16 (0.13, 0.19)[a]	0.1 (0.07, 0.12)[a]
Nutrition	0.35 (0.32, 0.39)[b]	0.34 (0.31, 0.38)[b]	0.28 (0.25, 0.32)[b]
General level	0.35 (0.31, 0.39)[b]	0.26 (0.23, 0.3)[c]	0.23 (0.19, 0.26)[b]
Higher level	0.37 (0.34, 0.41)[b]	0.36 (0.33, 0.39)[c]	0.29 (0.25, 0.32)[b]