What If You Stop and Think About it?
Nutrition Logos and Product Selection Behavior

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Abstract

This paper explores the effect of healthy priming on food choices, and how the food choices are influenced by front-of-pack (FOP) nutrition labels. The results from our choice experiment show that the product choice without healthy priming was significantly affected by both FOP labels and product type, but the product choice after the healthy prime was affected only by whether the product was selected as healthier in the priming stage. Obese individuals were less susceptive to such priming, or potentially counter-acted on the health prime, as they were more likely to choose unhealthier products. We also found that selection of the healthiest product during the priming stage was affected by the product type, but not the FOP labels, potentially because subjects relied on their own knowledge or the product perception to assess the healthiness of the product rather than the label information. The implication is that consumers seemed to behave differently if they are nudged into a "choose healthy" state of mind before they make a product choice, and whether they rely on the FOP label information to assess the healthiness of the product may be product and context dependent.

There is robust evidence that dietary factors are related to health status. A high consumption of energy-dense nutrient-poor foods has become a global public health problem, contributing to the development of overweight and obesity, and obesity-related conditions such as type-2 diabetes, cardiovascular diseases and certain types of cancer. The World Health Organization has recommended that food manufacturers reduce the levels of saturated fatty acids, trans-fatty acids, sodium and sugar in their products to reduce the burden of diet-related diseases on society (WHO, 2004). In addition, consumers have to make healthier food choices to reduce the intake of these nutrients. However, due to a variety of reasons, maintaining a healthy diet is not necessarily an easy undertaking. Eating right (the right kind of food, the right amount, etc.) is a daunting task when a vast amount of food products are available, and time is limited for food choice and meal preparation in a busy everyday life.

In order to make healthier choices, consumers must be able to distinguish healthier products from unhealthier ones, thus the back of pack (BOP) labels (i.e. the numerical nutrition fact boxes) were designed to help people make healthier choices (Jordan Lin, Lee & Yen, 2004; Kurtzveil, 1993). However, research suggests that a majority of consumers find these BOP labels confusing, especially the numerical information and the terminology used (e.g. Cowburn & Stockley, 2005; EUFIC, 2005; Wandel, 1999). When using BOP labels in making healthy food choices, consumers have to take into account several nutrients simultaneously. A study by Black & Rayner (1992) showed that consumers find it difficult to make comparisons between products based on the BOP label information. Thus, they tend to use a single nutrient (e.g. fat) as a measure to compare the overall healthiness of different products. This strategy may lead consumers to make the wrong choices, as products low in fat may well be high in sugar or sodium. Thus, a number of simpler front of pack (FOP) labels (or logos) that summarize the

product's nutritional profile and provide an overall presentation of the healthiness of the product have been developed to simplify and improve consumers' decision-making regarding healthy foods.

Some of these labels can be characterized as absolute labels, implying that they offer easy to comprehend, but very specific, information on the content of the product. The Wheel of Health label (which is similar to the Multiple Traffic light label) is one example of such a signaling strategy, as it shows the amount of calories, total fat, saturated fat, sugar, and salt per serving of the product, and each amount is color coded for high (red), medium (amber), and low (green). Other labels can be termed relative labels, as they do not portray absolute content measures, but rather shows how healthy a product is compared to other products or relative to some pre-defined standard. The Keyhole label is an example of such an information entity, as it indicates the healthiest choice within a product category without revealing any attribute specific information. Again, it is the product's content of calories, fat, sugar, and salt that is crucial in order to acquire the label. However, while the Keyhole label communicates simple, "short and snappy" information, the Wheel of Health provides relatively more multifaceted and complete information.

Many of the previous studies on FOP nutrition labels either ask consumers to report their usage or elicit their preferences using hypothetical scenarios, thus the effects of nutrition information is likely to be overstated (Balcombe, Fraser, & Di Falco, 2010). Accordingly, there is a need for more methodologically advanced research on consumer use of such information, and its actual effect on consumer food choices (Van Trijp, 2009). In the present study, we examine the influence of health information, communicated through the FOP nutrition labels, on food product choice, and the effect of a health prime on the actual food choices made.

Specifically, we focus on how consumers might behave differently if they are nudged into a "choose healthy" state of mind before they make a product choice. Thus, the definition of what is "healthier" is not an exogenous stimulus that ranges the products in terms of healthiness, but the subject's own assessment of the alternatives. The specific research questions we aim to answer are: 1) Do consumers choose products with a relative FOP label over equal products with an absolute FOP label, and 2) do consumers behave differently when they are primed with a "choose healthy" message before they make their product choice? We believe that the answers to these questions will provide useful insights into consumers' use of FOP nutrition labels, as well as the behavioral significance of a prime to simply stop and think about the healthy alternatives while shopping for food items.

Experimental Design and Procedure

We conducted a choice experiment to assess the actual food choice behavior. The situation we try to re-produce is one where consumers make product choices in a retail setting without picking up products to look at the BOP information (i.e. without studying the detailed nutrition information). We chose to apply this specific type of choice situation as it closely resembles what consumer researchers has found to be the typical in-store behavior in terms of information processing (e.g. Hoyer, 1984; Higginson et al, 2002). We considered three factors in this experiment; FOP nutrition label, product type and health prime. The labels employed were the Keyhole and the Wheel of Health (see Figure 1). The presence of the Keyhole label indicates that the product is the healthiest choice *within the same product category*. The Keyhole is a voluntary scheme for food producers, but products labeled with the symbol must conform to nutritional regulations in different food groups. Foods eligible to carry the Keyhole symbol must fulfill

certain conditions. For example, there are many different kinds of frozen pizza, but one with the Keyhole label indicates that it is healthier than other frozen pizzas. It does not necessarily mean that frozen pizza is healthy; it only shows that given that the individual is determined to consume frozen pizza, it is relatively healthier to choose the one with this label. The authorities in Norway, Sweden and Denmark have agreed to use the Keyhole as a joint FOP nutrition label.

The Wheel of Health label is similar to the widely used Traffic light label, and is an example of color-coded nutrition information. It is believed to be intuitive and easy to understand by consumers. It summarizes the content of key nutrients and shows if the level of each nutrient is high (red), medium (amber), and low (green). Balcombe, Fraser, and Di Falco (2010) studied the use of traffic light labels and found that UK consumers did respond to the color-coded nutrition information and tried to avoid "red" lights.

The product types used in the experiment were salted ram and pork rib in a ready-to-eat (RTE) meal package. These are traditional Norwegian Christmas dishes. The experiments were conducted in late November to early December. The products chosen are usually considered as unhealthy food, as both of the dishes are high in fat and salt. These typical Christmas dishes were selected as the target products as they are very commonly eaten and much liked before and during Christmas. Thus, there was only a very small chance that any of the participants would reject both alternatives.

The experimental design was a 2 (label) x 2 (product type) x 2 (prime) between subjects factorial design. Each subject received one choice set, and each choice set contained the two RTE meal alternatives. Both meal types and both label types were always included in the choice set. For example, if the first alternative was the salted ram with the Keyhole label, then the second alternative would be the pork rib with the Wheel of Health label, and vice versa. In order

to avoid any ordering or demand effects, the experimental manipulations were fully counterbalanced.

In addition to FOP labels and food types, a health prime was used as a manipulation. In particular, subjects in the prime condition were first asked to indicate which of the two RTE options they thought was healthiest one. They were later asked to choose one dish to take home after the session was over. The subjects in the no-prime condition were only asked to choose the product they wanted to take home.

The experiments were conducted using paper-and-pencil format, rather than using the actual product packaging. This is because if the actual packaging was used it would be difficult to control the amount of information that an individual utilized, as more detailed information for the product is provided at the back of the package (i.e. BOP nutrition information). In this experiment, we wanted to isolate the effect of the FOP labels, and thus constrained subjects' access to further information (see Figure 2 for the sample choice set).

Before the session began, each subject was assigned a random ID number that was used throughout the experiment. All the experimental material was identified with this number, which preserved the anonymity while enabling researchers to link all the experimental materials to one subject. In the experimental session, subjects were gathered in one room and seated individually, then asked to complete a questionnaire on a topic completely unrelated to food. Then, the no-prime subjects were told that as a token of our appreciation for their willingness to participate, they would receive food items to take home as gifts and asked to indicate the product they wanted in the colored booklet with product pictures (see Figure 2). The prime-group were given the similar colored booklet, but here we first asked them to consider what they thought was the healthiest alternative. Succeeding this task, they were given the same "As a token of our

appreciation…" information, and told that they could choose one of the products to take home. After the product choices, all subjects were instructed to fill in a final questionnaire measuring a number of variables like food label use and different perceptions related to food. At the end of the session, subjects received the product they chose before heading home.

A total of 108 subjects were recruited to participate in the experiment using a food research institute's subject pool. This pool consists of members, and the parents of members, of everything from church choirs to boy scouts and soccer teams. For each participating member, the club or organization received approximately 33 USD, and as such participation can be viewed as pro-bono work for their or their children's leisure activity organization. The age distribution of the sample ranged from 20 to 64 years, with a mean of 46.21 (st.d. 11.33). Fifty-eight percent were women, and 39 percent had an educational level equal to college or higher. Further characteristics of the sample are shown in Table 1.

Data analysis

To analyze the data, we employed a standard random utility model where a subject chooses a product that gives the highest utility. An alternative j ($j = 1,\ldots,J$) that an individual i faces is characterized by alternative specific profiles represented by a $k \times 1$ vector x_{ij}. The individual choices are also affected by individual specific characteristics Z, which can contain variables such as attitudes and perceptions. The utility that an individual i derives from choosing the alternative j is therefore written as

$$U_{ij} = V_{ij} + e_{ij} \quad (1)$$

where V_{ij} is the deterministic component of the utility as a function of both alternative and individual characteristics, and e_{ij} is the random error. The deterministic portion is specified as a linear function of the product and individual characteristics;

$$V_{ij} = \alpha_j + x_{ij}\beta_k + \gamma_j Z_i, \quad i = 1, \dots, N, j = 1, \dots, J, k = 1, \dots, K. \tag{2}$$

The random error term e_{ij} arises due to the unobserved nature of the individual agent's decision-makings to researchers, and is assumed to have extreme value distribution. The specification in equation (2) allows for separating the effect from label and the product type, thus, statistical test on the parameters in **β** will directly provide the major empirical test.

The above specification leads to the standard logit probability for the choices such that the probability that an individual *i* with the characteristics Z_i chooses the alternative *j* defined by attributes x_{ij} is written as

$$\Pr(Alt\ j) = \frac{\exp(V_j)}{\sum_{s=1}^{J} \exp(V_s)} \tag{3}$$

There are two attributes explicitly considered in this experiment; FOP label and food type. Each attribute consists of two levels (Keyhole vs. Wheel of Health for FOP labels, salted ram vs. pork rib for food type). Thus, the characteristics x_{ij} is a 1×2 vector of indicator variables, representing the four different combinations of the experimental manipulation.

There are two separate choices that are analyzed using the above framework. The first one is the product choice to take home, for both the priming and the no-priming group, and the second one is the "healthier" choice after priming (thus, only for the priming group).

Estimation results

All the estimation results are summarized in Table 2. The result for modeling the choice of selecting the product to take home without healthy priming is shown in Model 1. As expected,

the products with the Keyhole label are more likely to be chosen, holding everything else equal. The salted ram dish is also more likely to be chosen, probably reflecting a general preference for this product. The effect of the label and the meal type are comparable in magnitude.

Model 2 in Table 2 shows the results of the same model as in Model 1 but with the health prime, while Model 3 shows the results of the model with an additional variable indicating a product "chosen as healthiest after the priming." Model 3 is superior to Model 2 by likelihood ratio test ($\chi^2 = 15.6162, p < 0.01$), indicating that when selecting the product to take home, the only consideration that seems to influence the choice is whether the product was selected as healthier in the priming condition. On the other hand, the FOP nutrition label or the product type did not significantly affect the choices. Thus, the groups with and without health priming behaved very differently when choosing the product that they wanted to take home.

In terms of selecting which product is healthier (priming group only), results are shown in Model 4, Table 2. Only the product type is significant; no significant effect of the FOP nutrition label. This result is somewhat counterintuitive, as we expected that the label would have a significant effect. This may be due to the fact that subjects are very familiar with both of the meal types, so when asked to assess the healthiness of the products, they might have relied more on their own memory-based perceptions than the stimulus based on the label information.

Who are more susceptive to priming?

The priming seems to create a different behavior between two groups. In order to gain insights on the effect of priming, we modeled the decision to take home the same product that they assessed as healthier (i.e., choice consistency after health priming). The estimation results are shown in Table 3. The only significant difference was found for obese subjects. These

individuals were less likely (than normal weight subjects) to choose the product that they assessed as healthier. The same effect was not found for overweight individuals. Thus, the results suggest that obese subjects are less susceptive to health priming than those who are not obese, and thus ended up taking home the product that they believed to be less healthy. However, it is also possible that obese subjects are in fact susceptive to priming but counter-acted on the priming. For example, fattier and saltier food may be considered to have better taste, so the health priming might have worked as negative priming for taste (Raghunathan, Walker Naylor & Hoyer, 2006). Either way, this response is only significant among obese subjects, and shows some behavioral differences between obese and non-obese people.

Discussion and Conclusion

The importance of understanding consumers' food choices and the effect of nutrition/health information on these choices is well recognized, as individual consumers, as well as policy makers strive to reduce overweight and obesity by promoting healthy eating. However, the actual use of nutrition labels and how the label information affects purchase decisions are relatively less understood areas within consumer research.

The results of our experiment show that a fairly small experimental manipulation resulted in significant behavioral differences in product selection. For those who did not get a health prime, both the label and the product type had significant effect on their choices. The products with Keyhole labels were more likely to be chosen, thus, subjects seemed to utilize this label when selecting the product. Regarding the product type choice, more people chose the salted ram, which we believe reflect a preference for this product. On the other hand, in the choice of product to take home after healthy priming, the product believed to be most healthy was more

likely to be chosen, regardless of FOP label or food type. This shows that, if an individual has been nudged into a "choose healthy" state of mind before product choice, then the actual product choice is largely affected. However, we also found that obese individuals were less susceptive to such priming, or potentially counter-acted on the health prime, and that they were more likely to choose the "unhealthier" product.

In terms of the task of choosing the product that is healthier, the subjects seemed to utilize the product type information but not the FOP nutrition label. This may indicate that subjects relied on their own knowledge or the product perception to assess the healthiness of the product rather than the nutrition information. Given that the Keyhole label indicates "the healthiest alternative within the same product category" and that the other product appeared with a Wheel of Health label that was mostly red (red is a stop signal/a signal of danger), this result was somewhat unexpected. However, considering that the subjects are reasonably familiar with both product types, it may be that there is an interactive relationship between label use and the familiarity of food. Intuitively, consumers may rely more on the FOP labels when choosing unfamiliar food than when choosing familiar food. However, further research is needed to investigate such potential relationships.

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Table 1. Sample Statistics

	N	Category	Percent	Min	Max	Mean	Std. Dev.
Age	108			20	64	46.21	11.33
Gender	108	Male	42%				
		Female	58%				
Annual household income (million NOK)	100			.15	4.00	1.03	.52
	108	Elemantary	2%				
		Middle School	27%				
Educational Level		High School	32%				
		College	32%				
		Above College	7%				
Num of adults	107			1	5	2.03	.69
Num of children	108			0	4	1.25	1.19
BMI	107			17.0	33.1	25.8	3.83
		Normal weight	42%				
		Overweight	42%				
		Obese	16%				

Table 2. Estimation Results

	Product choice (no-priming group)		Product choice (priming group)			Choose Healthier (primeing group only)	
	Model 1		Model 2		Model 3		Model 4	
Label (base=Wheel of Health)	1.5164	**	0.0000		-0.6924		0.9335	
Product type (base=rib)	1.3065	**	1.2720	**	0.3234		1.9982	***
Chosen as Healthiest					2.9186	***		
Constant	-1.2120	**	-0.6360		-1.6210	**	-0.9991	*
Log-likelihood	-32.1062		-33.5417		-25.7336		-28.9884	
N	55		52		52		52	
Pseudo R^2	0.156		0.0694		0.286		0.1736	

Table 3. Logit Model for the Choice Consistency

	Coefficient	
Type (Salted ram chosen as healthier = 1)	-0.1144	
Label (Keyhole label chosen as healthier = 1)	-0.3069	
Obese (= 1, = 0 otherwise)	-1.5463	*
Overweight (= 1, = 0 otherwise)	0.1903	
Constant	1.8186	
Log-likelihood	-21.5722	
N	52	
Pseudo R^2	0.1960	

Figure 1. Labels Used for the Experiment

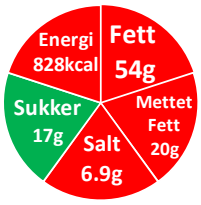
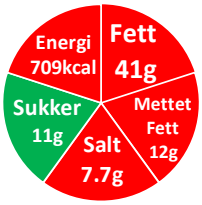
	Keyhole label (both products) • Indicating the healthiest alternative within the same product category • Green background with while keyhole picture in the middle
	Wheel of Health label for salted ram • Fat (54g), Saturated fat (20g), Salt (6.9g), Sugar (17g), Energy (828 kcal) • All categories except for sugar are coded red (high), sugar is green (low)
	Wheel of Health label for pork rib • Fat (41g), Saturated fat (12g), Salt (7.7g), Sugar (11g), Energy (709 kcal) • All categories except for sugar are coded red (high), sugar is green (low)

Figure 2. Sample choice set

Please select **one** product by ticking a box.

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