Can the new label make a difference?
Comparing consumer attention towards the current versus proposed Nutrition Facts panel

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Abstract

Recently FDA proposed a new Nutrition Facts panel. In this study, we analyze whether the proposed changes to the Nutrition Facts panel have the potential to increase consumers' attention. In doing so, we account for involvement and familiarity as determinants of attention. In order to measure attention we conducted a laboratory experiment using eye tracking with two treatments testing differences in consumer attention towards the current and the proposed Nutrition Facts panel. Our findings highlight empirical evidence regarding the separate and joint effect of involvement with the Nutrition Facts panel and product familiarity on consumers' visual attention. Our results suggest that the proposed new format of the Nutrition Facts panel has a significant positive effect on consumers' attention. The proposed label leads low-involvement or less-familiar consumers to attend longer to the Nutrition Facts panel. Our findings are important for policy makers and the food industry more generally in providing critical information regarding the outcomes of a revision of the Nutrition Facts panel.

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Introduction

Since attention is a fundamental but limited cognitive processing resource (Anderson, 2005; Kahneman, 1973), consumers only attend to information they deem relevant and neglect other information. For that matter attention has attracted a surge of research interest in order to understand which and how consumers process information. Given that attention is limited there is a need to understand factors that influence how and when consumers attend to a stimulus (Rosbergen, Pieters, & Wedel, 1997). Among factors that affect attention, consumers' involvement with stimuli has been recognized as playing a motivational role in consumers' attention and even comprehensive processes (Celsi & Olson, 1988). Consumers spend more time attending to the relevant information when they are highly involved with the stimuli. At the same time, when consumers become more familiar with the stimuli, their attention may decline. Pieters et al. (1996, 1999) show that the amounts of time consumers attend to certain messages (gaze duration) decrease when they repeatedly see the message, which implies that familiarity is negatively related to visual attention. While previous research examined the separate effects of involvement or familiarity on attention, research is scarce regarding the joint effects. In addition, since most of the previous literature focused on the domain of advertising, little is known regarding how involvement and familiarity affect consumers' attention towards other labels. For example, previous studies share the common argument that people exert only minimum effort to read product labels (Balasubramanian & Cole, 2002; Cole & Balasubramanian, 1993; Folkes & Matta, 2004). In fact, lack of attention is one of the main barriers regarding the use of nutrition labels (Bialkova & van Trijp, 2010; van Trijp, 2009). Therefore, the research objective of this paper is to investigate the role of involvement and product familiarity on consumer attention concerning the Nutrition Facts panel.

Given the lack of attention towards the Nutrition Facts panel, the Food and Drug Administration (FDA) proposed changes to the current Nutrition Facts panel in early 2014—more than 20 years after the introduction of the Nutrition Labeling and Education Act (NLEA). Policy advisors to the FDA indicated that the goal of the proposed revision is to help consumers to know more about food products and to make healthier choices. However, research has yet to test if the proposed, new format of the Nutrition Facts panel will indeed be effective in increasing consumers' attention towards the label, and subsequent usage. We aim to answer the question whether the proposed label increases consumers' attention compared to the current label. We contribute to the literature by studying attention, and related determinants towards the Nutrition Facts panel.

Studying attention towards the Nutrition Facts panel is relevant since fighting obesity is one of the most intractable issues facing US policy makers. Data from the National Center for Health Statistics show that two thirds of adults were either overweight (BMI over 85% percentile) or obese (BMI over 95% percentile) (Ogden, Carroll, Kit, & Flegal, 2013, 2014). Using food labeling to alter food choices is one of the commonly used public policy interventions to reduce obesity (e.g., see Unnevehr (2013) for a review of research related to policy practices). The Nutrition Labeling and Education Act (NLEA) of 1990 made the Nutrition Facts panel mandatory for most food products and set clear regulations and guidelines on nutrition content claims and health claims (Burton, Biswas, & Netemeyer, 1994). The mandatory disclosure of calorie and nutritional information make nutrition information more accessible to consumers and the nutrition label enables promotion of better purchasing behavior and healthier consumption (Drichoutis, Lazaridis, & Nayga, 2006). However, only few consumers actually look at the Nutrition Facts panel when they are shopping in the grocery store (Grunert, 2009; Wills, Grunert, Celemín, & Bonsmann, 2009) and currently, consumers' actual usage of the nutrition labels is very low (Cowburn & Stockley, 2005).

Hence, in this study we investigate whether the proposed changes to the Nutrition Facts panel have the potential to increase consumers' attention. Furthermore, we account for involvement and familiarity as determinants of attention. Since eye movements are a

valid measure of visual attention (Wedel & Smith, 2013), we conducted an eye tracking experiment with two treatments to investigate consumers' visual attention towards the current and the proposed Nutrition Facts panel as well as the role of involvement and, familiarity on attention.

Our research provides empirical evidence regarding the separate and joint effect of involvement with the Nutrition Facts panel and product familiarity on consumers' visual attention towards the Nutrition Facts panel. We examine how these two factors interact with the format revision in influencing visual attention. The results of this study contribute to the literature of visual attention on nutrition labels by providing insight into how different consumer segments (i.e., low- vs. high-involvement consumers) respond to format revision. Our results are important for policy makers and the food industry more generally, as they provide critical information regarding the outcomes of a revision of the Nutrition Facts panel.

In the following sections, we describe the theoretical background of attention and visual attention, involvement, and familiarity. We then present the proposed changes of the Nutrition Facts panel, and discuss previous related literature. Afterwards, we explain our study design, econometric model and empirical results. We finish with some concluding remarks.

Theoretical Background

Attention and Visual Attention

"Everyone knows what attention is. It is the taking possession by the mind in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought...It implies withdrawal from some things in order to deal effectively with others" (William James, 1890).

Attention is a selective mechanism which allocates processing capacity to a stimulus (Pashler, 1998). Visual attention, as a physiological response, is a reliable and very important measure of attention (Krugman, 1965; Rosbergen et al., 1997; Wedel & Pieters, 2008). Visual attention is often conceptualized as a "window" or "spotlight" that

controls the localized priority and speed of information processing (Deubel & Schneider, 1993; Rosbergen et al., 1997). Thus, visual attention plays a vital role in monitoring consumers' attention. People's eye movements reflect their visual attention (Hoffman, 1998) and they are the operational definition of visual attention (Rosbergen et al., 1997). When people gaze on a stimulus, attention is paid to the stimulus and key information is extracted from it (Kessels & Ruiter, 2012; Rayner, 1998; Wedel & Pieters, 2000).

Involvement

The concept of "involvement" has been defined in different ways, but there exists a common agreement that high involvement is equivalent to high personal relevance regarding an issue or product (Petty & Cacioppo, 1986). The extent to which an issue or a product is personally relevant is the essence of measuring levels of involvement. Previous research has documented the important role of involvement on attention, information processing, comprehension, attitude, and food purchase behavior (Cacioppo & Petty, 1986; Celsi & Olson, 1988; Drichoutis, Lazaridis, & Nayga Jr, 2007; Drichoutis, Lazaridis, & Nayga, Rodolfo M., 2006; Rahtz & Moore, 1989). Celsi and Olson (1988) show that involvement plays a motivational role in consumers' attention, thus a highly involved consumer is more motivated to attend to relevant information. In this study, we focus on consumers' involvement with the Nutrition Facts panel, i.e., their personal relevance related to the Nutrition Facts panel. This definition is akin to "product-class involvement" (Drichoutis et al., 2007; Rahtz & Moore, 1989), known as the level of importance consumers placed on certain product-related attributes such as price, nutrition, brand name, or taste.

Nutrition label information could be categorized into two types: intrinsic cues or extrinsic cues (Olson & Jacoby, 1972; Walters & Long, 2012). Intrinsic cues are product related internal attributes such as ingredients, nutrition content and physical characteristics that cannot be manipulated without changing the product's nature. Nutrient-specific information is considered more as intrinsic/central cues. Extrinsic/peripheral cues are environmental product-related information such as the

formatting of the label. Processing intrinsic cues requires more cognitive effort than processing extrinsic cues. Compared to the current label, the proposed Nutrition Facts Panel contains more prominent, large font information that takes less cognitive effort to process, and thus is considered heuristic cues[1].

In the present study, we expect consumers' Nutrition Facts panel involvement to moderate consumers' visual attention towards the label. High-involvement consumers are expected to pay more attention to the Nutrition Facts panel in general because they are more motivated to examine the nutritional information than low-involvement consumers. In addition, since high-involvement consumers focus on intrinsic information (Petty & Cacioppo, 1986; Petty, Cacioppo, & Schumann, 1983), their attention should not be affected by extrinsic cues such as the format of label. In contrast, low-involvement individuals will use peripheral route processing and search for peripheral cues in information processing (Petty & Cacioppo, 1986). For low-involvement consumers, an extrinsic cue such as a prominent format is preferred as it reduces the cognitive effort and simplifies the evaluation (Petty & Cacioppo, 1986). We expect that low-involvement consumers are more likely to subject to extrinsic cues, thus their attention will increase in response to formatting changes in Nutrition Facts panel.

Familiarity

Familiarity refers to a consumer's previous product-related experience, knowledge, or simply repeated exposure to the stimuli. Familiarity is also defined as the "restored representation of an item" (Christie & Klein, 1995), repeated exposures (Pieters, Rosbergen, & Hartog, 1996; Pieters, Rosbergen, & Wedel, 1999), or the number of consumers' accumulated product related experiences (Alba & Hutchinson, 1987). Pieters et al. (1996, 1999) show that advertisement familiarity has a negative effect on visual

[1] Heuristic, or peripheral cues refer to information that requires less cognitive effort in information processing and often lead individuals to use mental shortcuts. It's opposed to

attention towards the ad messages (Pieters et al., 1996; Pieters et al., 1999). Similarly, Graham, Orquin and Visschers (2012) indicate that visual attention towards the Nutrition Facts panel can be sensitive to familiarity because participants who are familiar with the product may retrieve previous memory about the product information and be less likely to look at the nutritional information. To avoid dealing with the "familiarity problem", previous research tends to strip of brand name or use unfamiliar product (e.g., foreign brands) in nutrition label studies. However, it is unrealistic to assume the absence of product familiarity when consumers look at the Nutrition Facts panel of certain products when they shop in the grocery store. Despite previous literature having the general agreement on the buffer[2] role of familiarity, their inferences are based on the literature regarding the buffering effect of familiarity on consumers' attention towards advertisement. Little to no research has directly examined the effect of product familiarity in influencing consumers' visual attention to nutrition labels.

We argue that this buffering effect may not apply to the Nutrition Facts panel which has more numerical and detailed information that are not likely to be precisely stored in memory. Thus, when consumers are examining products, even if they are very familiar with the product, they might not have a clear memory of the nutritional information, thus they are still motivated to check the Nutrition Facts panel for the information they are interested in. As a result, it is possible that product familiarity per se does not decrease attention towards the Nutrition Facts panel.

In addition, if familiarity indeed decreases consumers' visual attention, we are interested to examine whether this buffering effect applies to both low- and high-involvement consumers. As discussed above, high-involvement consumers focus on intrinsic information (i.e., nutritional facts), thus they are expected to pay less attention on the Nutrition Facts panel as they become more familiar with the product and the nutritional information can be easily retrieved from consumers' memory. In contrast, we

[2] Buffer effect refers to the reducing or negative effect of familiarity on attention discussed above.

expect low-involvement consumers to experience no buffering effect of familiarity because they are less motivated to search and scrutinize the nutritional information (i.e., intrinsic information) in the first place. Instead, low-involvement consumers may pay more attention to the Nutrition Facts panel when extrinsic cues such as format changes are present. Thus, we expect that low-involvement and high-involvement consumers to experience different degree of the buffering effect of familiarity, and we test these effects not only on the current Nutrition Facts panel but also on a new Nutrition Facts panel with proposed format changes.

Background Information and Previous Literature

Nutrition Facts panel

In early 2014, the Food and Drug Administration (FDA) proposed several changes to the Nutrition Facts panel (see Figure 1) in order to improve the current Nutrition Facts panel which has been used for more than 20 years. The proposed label includes notable changes (see a list of all proposed changes in Appendix 1) that can be categorized into format and content changes. First, the prosed label makes key nutritional information more prominent. Specifically, the proposed label highlights the calories and the number of servings per container by increasing the font larger and making it bolder; the daily value percentage of all nutrients is moved to the left column to be more noticeable. Second, the proposed label tailors the nutrient information provided in the Nutrition Facts panel. In the macronutrients section, "added sugar" is added underneath the total carbohydrates since added sugar is often seen as "empty calories" that consumers would want to avoid consuming. In the micronutrients section, Vitamin D and Potassium are listed as mandatory listed nutrients instead of vitamins A and C since they are becoming the nutrients of public health concerns.

Figure 1 The Proposed Nutrition label (left) and the Current Nutrition Label (right)
Source: FDA federal register (Mar 2014)

Nutrition Facts

8 servings per container

Serving size 2/3 cup (55g)

Amount per 2/3 cup

Calories 230

% DV*	
12%	**Total Fat** 8g
5%	Saturated Fat 1g
	Trans Fat 0g
0%	**Cholesterol** 0mg
7%	**Sodium** 160mg
12%	**Total Carbs** 37g
14%	Dietary Fiber 4g
	Sugars 1g
	Added Sugars 0g
	Protein 3g
10%	**Vitamin D** 2mcg
20%	**Calcium** 260mg
45%	**Iron** 8mg
5%	**Potassium** 235mg

* Footnote on Daily Values (DV) and calories reference to be inserted here.

Nutrition Facts

Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

Calories 230 Calories from Fat 40

	% Daily Value*
Total Fat 8g	**12%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 4g	**16%**
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Previous Literature

The design of the proposed Nutrition Facts panel is based on consumer research regarding the Nutrition Facts panel as well as graphic design principles (FDA, 2014). For example, previous research demonstrated that increasing type size would capture consumers' attention and assist reading and understanding the key information (Goldberg et al., 1999; Wogalter & Leonard, 1999; Wogalter & Vigilante, 2003). Popper and Murray (1989) showed that the increased type size could increase the recall of the information in a study of health warning advertising format. Lando and Lo (2013) demonstrated that highlighted servings per container helps consumers to understand that there is more than one serving in a package and to calculate the calories per container. Anchor lines help with attention landing and thinner alignment lines help with information searching (Goldberg et al., 1999). An increasing surface size and saliency of packaging elements such as claims and labels can boost the likelihood of being visually attended (Orquin, Scholderer, & Jeppesen, 2012). Furthermore, nutritional information

located at the top of the Nutrition Facts panel are more viewed than those at the bottom (Graham & Jeffery, 2011), and finally, Nutrition Facts panels located at the center of the package attract more view time than the same label located at the sides (Graham & Jeffery, 2011).

These studies provide insight into the label format's influence on consumer attention, but motivational and experiential factors regarding consumers' reaction to format changes have yet to be considered. We extend the previous literature by testing the effect of involvement and familiarity on consumers' attention using the example of the current versus the proposed Nutrition Facts panel. First, we examine whether the proposed changes to the Nutrition Facts panel increase consumers' attention. Then, we investigate if and how individuals react differently to the proposed label and whether the effect on attention holds or varies among different products. Specifically, we expect consumers to have differences in response to the proposed label due to individual differences (e.g., Nutrition Facts panel involvement and product familiarity) as well as product-related factors (e.g., product healthiness).

We expect these factors to interact with the proposed label format in influencing consumers' attention since previous research demonstrated how consumers with heterogeneous preferences place importance on different aspects or attributes of the product, and how product-class involvement subsequently influences the use of nutrition labels (Drichoutis et al., 2005; Drichoutis, Lazaridis, & Nayga Jr., 2007; Nayga, Lipinski, & Savur, 1998). For example, consumers who place more importance on price will be more likely to search and use price information and less likely to look at nutrition labels; in contrast, consumer placing higher importance on nutrition will be more likely to examine the nutrition information on nutrition labels and less likely to examine other attributes (Drichoutis et al., 2007). Hence, we expect that the proposed format changes will be more likely to increase low-involvement consumers' attention towards the Nutrition Facts panel because low-involvement consumers tend to focus on heuristic/extrinsic cues such as formatting. For high-involvement consumers, they are motivated to read the nutritional information in the first place. Therefore, their attention

towards the Nutrition Facts panel may remain the same because nutritional information on the proposed label is almost identical to that on the current label, or even decrease because now the more prominent label format make it easier to search key nutrients information.

In addition, a previous study related to nutrition labels found that health motivations will stimulate deeper information processing of the nutritional information, thereby increasing duration and frequency of visual attention on nutrition information on food products (Visschers, Hess, & Siegrist, 2010). Previous research also shows that people are more sensitive to negative nutrition attributes such as fat and sodium than positive attributes (Balasubramanian & Cole, 2002; Worsley, 1996). Consumers may want to identify quickly the negative nutrients information. Once they recognize the unhealthiness nature of the unhealthy products, they may quickly switch their attention away from the Nutrition Facts panel. As a result, they actually spend less time looking at the Nutrition Facts panel. Thus, we expect consumers to have shorter attention duration (i.e., dwell time) on products that are rather unhealthy (which contain more negative nutrients attributes such as calories, fat, sugar, and sodium) than products that are rather healthy. On the other hand, we expect consumers pay more attention on the Nutrition Facts panel on healthy products, looking for potential negative information and trying to confirm their perception about the product healthiness. We test this by using products that are more (bagged salad) or less (cookies) healthy.

Finally, since overweight people may be more likely to use nutrition label (Drichoutis, Lazaridis, Nayga, Kapsokefalou, & Chryssochoidis, 2008), we test the effect of a participants Body Mass Index (BMI) on attention paid towards the Nutrition Facts panel. Furthermore, exercising (Drichoutis et al., 2008) and low fat intake (Neuhouser, Kristal, & Patterson, 1999) were found to be related to label use. Moreover, perceived attractiveness of the self has been found to bias people's visual attention (Roefs et al., 2008) and their self-schema (Wiederman & Hurst, 1997).

Methodological Background

Data Collection

Eye Tracking

Eye movements have been established as a valid measure of attention (Wedel & Smith, 2013), and there has been a rapid growth of eye tracking studies in marketing research to investigate attention towards stimuli such as advertising (Wedel & Smith, 2013) and nutrition labels (Graham et al., 2012).

Eye tracking technology records participants' eye movements and gaze to examine visual attention. Eye movements consist of fixations during which the eye keeps relatively still and saccades where rapid movements occur. The eye fixation and gaze time captured in an area of interest (i.e., AOI) are used as measurements for consumers' visual attention. The measures in eye gaze data (e.g., number of fixations, dwell time, first fixation) provide different information regarding visual attention (Rik Pieters & Warlop, 1999; Rayner, 1998). The number of fixations indicates the frequency of participants' gazes on a certain AOI. The total fixation duration (also called gaze time or dwell time) is the sum of all fixation durations. Dwell time measures the attention duration and often serves as an indicator of visual attention (Christianson, Loftus, Hoffman, & Loftus, 1991). In this study, we focus on an important measure of visual attention: dwell time, also called gaze time. Dwell time serves as our dependent variable.

Design of the Study

In a laboratory experiment, we recorded participants' eye movements and gaze time to examine visual attention. The experiment consisted of two treatments: current label (CL) versus proposed label (PL). We used a between subjects design to compare the attention paid to the different labels (as measured in dwell time).

We included six different products in the experiment: Lay's chips, Fresh Express bagged salad, Yoplait Greek Yogurt, Kellogg's Raisin Bran, Nilla wafers, Healthy Choice frozen meal (See Appendix 2). These food products were chosen because we aim

to test if there is a difference in attention towards the label due to healthiness. For example, yogurt and salad are considered healthier than chips and cookies.

We displayed the front, sides and/or back of each product to participants on a computer screen during eye tracking (see Figure 2). In treatment 1 all packages carried the current label, in treatment 2 all packages carried the proposed label. The proposed label for each product was created using the graphic design principles proposed by FDA (FDA, 2014). See an example in Figure 3.

Figure 2 Experiment Product Image Front and Back for Yoghurt

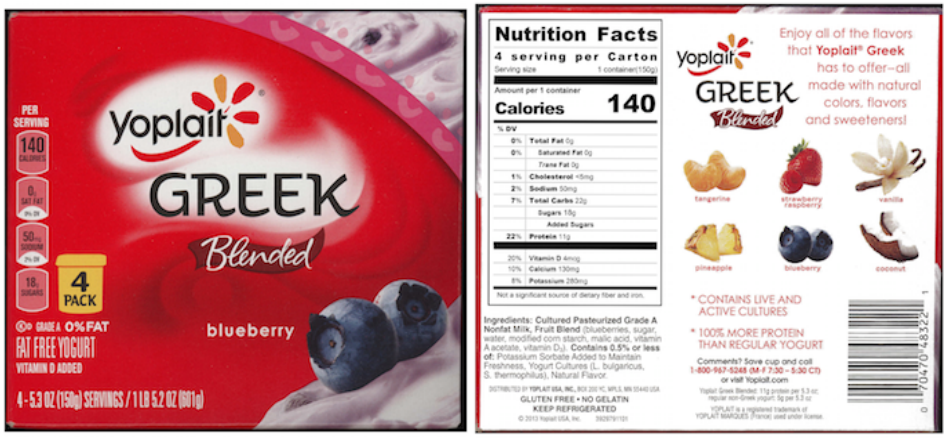

Figure 3 - Back of Package (The Example of Lays)

Current Label Proposed Label

After eye tracking participants completed a supplementary questionnaire. To explore the effect of ***familiarity*** on attention towards the Nutrition Facts panel, we used branded products (e.g., Lays chips and Health Choice frozen meal) in this study and measured consumers' familiarity with each product. Familiarity was measured using a five-point Likert scale from 1 = Not at all familiar to 5 = Extremely familiar (Vagias, 2006). To measure participants' ***involvement*** with the Nutrition Facts panel, we used Zaichkowsky's (1985) involvement scale. The involvement scale contains 20 semantic differential items that measure needs, values, and interests towards the objective (i.e., Nutrition Facts Panel here) on a 7-point scale. The sum of the scores of all the items provides the measure for involvement, and can range from 20 to 140.

In addition, the questionnaire contained general ***demographic questions*** regarding age, gender, household size, income, education, and number of children in the household. Furthermore, we measured participants' ***BMI*** by including questions regarding weight

and height. ***Physical activity*** was measured on a scale from 0 to 5 (see Appendix 3 for the complete physical activity scale categories), and whether participants were on a diet or not (0=no; 1=yes). Perceived attractiveness was measured using the ***self-rated attractiveness scale*** that ranges from 1= well below average to 7= well above average (following Wiederman & Hurst, 1997).

Data Analysis

Descriptive Analysis

In analyzing the data, we first used t-tests to see if there is significant difference between the proposed label and the current label in terms of the dwell time. We then performed a random effect panel Tobie model to obtain estimates for the hypothesized effects.

Random Effects Panel Tobit Model

To estimate the impact of (1) involvement with the Nutrition Facts panel, (2) product familiarity, and (3) the proposed label changes on consumers' visual attention towards the Nutrition Facts panel and whether the impact differs across products, we use a random effects Tobit model (Wooldridge, 2002, 2003). Since there is a substantial amount of zeros in the eye tracking data (i.e., zero total fixation time where the consumer did not gaze at the Nutrition Facts Panel), the sample is censored at zero. If there is significant fraction of the observations that is censored at zero in the dependent variable, estimates produced by an ordinary least squares (OLS) are biased (Henningsen, 2010). Thus, a Tobit model is preferred as it provides a censored regression model that fits well with the censored sample. A panel Tobit model was used because each participant evaluated six different food products, which creates a panel. Following Greene (2003), the lower bound was set to zero to account for participants' none visual attending to the nutrition label.

Following Wooldridge (2002, 2003), in the random effects panel Tobit model, the latent dependent variable is expressed as:

$$y_{ij}^{*} = \alpha + \boldsymbol{\beta} x_{ij} + v_i + u_{\boldsymbol{it}} \qquad (1)$$

where x_{ij} is a vector of explanatory variables for individual i and product j, and $\boldsymbol{\beta}$ is the vector of parameters for x_{ij}. v_i represents the random effect that is i.i.d normally distributed with mean of zero and a variance of σ_v^2 (i.e., $v_i \sim N(0, \sigma_v^2)$). The error term u_{it} is i.i.d. N(0, σ_ε^2) independently of v_i. In a Tobit model (1958), the observed y_i is related to the latent variable y_i^* through the observation rule:

$$y_{ij} = \begin{cases} 0 \;\; if \;\; y_{ij}^* \leq 0 \\ y_{ij}^* \;\; if \;\; y_{ij}^* > 0 \end{cases} \qquad (2)$$

Following Wooldridge (2002, 2003), the likelihood function for the random-effect panel Tobit model for each observation is expressed as:

$$lnL\ (\beta, \sigma) = 1\big(y_{ij} = 0\big) \ln\left[1 - \Phi\left(\frac{x_{ij}\beta}{\sigma}\right)\right] + 1(y_{ij} > 0)\left\{-ln\sigma + ln\Phi\left[\frac{(y_{ij} - x_{ij}\beta)}{\sigma}\right]\right\} \quad (3)$$

where $\Phi(\cdot)$ is the standard normal probability distribution function. The estimation of $\boldsymbol{\beta}$ is obtained by maximizing the log-likelihood. An *xttobit* command in STATA is used to perform the estimation.

Expanding equation (1) to incorporate the explanatory factors, the model specification takes the following form:

$$y_{ij}^* = \alpha + \beta_1 Newlabel_{ij} + \beta_2 Chip_{ij} + \beta_3 Frozenmeal_{ij} + \beta_4 Kellog_{ij} + \beta_5 Nilla_{ij} + \beta_6 Salad_{ij} + \beta_7 Involvement_{ij} + \beta_8 Familiarity_{ij} + \beta_9 BMI_{ij} + \beta_{10} Diet_{ij} + \beta_{11} Phys_{ij} + \beta_{12} Attract_{ij} + \beta_{13}\big(Newlabel_{ij} * familiarity_{ij}\big) + \beta_{14}\big(Newlabel_{ij} * Involvenment_{ij}\big) + \beta_{15}\big(Newlabel_{ij} * Familiarity_{ij}\big) + \beta_{16}\big(Familiarity_{ij} * Involvenment_{ij}\big) + \beta_{17}\big(Newlabel_{ij} * Familiarity_{ij} * Involvenment_{ij}\big) + v_i + u_{it} \quad (4)$$

where *Chip, Frozenmeal, Kellog, Nilla, Salad* are dummy variables for the particular food products. Yoplait yoghurt was set as the base level and omitted in the regression. *Phys* is frequency of physical activity; *Diet* is a binary variable that equals to one if the participant is currently on a diet; *BMI* equals to the value of body mass index calculated

using height and weight; *Attract* is the level of self-rated attractiveness. We included the binary variable of *Newlabel* and the other two continues factors of interest – *Involvement* and *Familiarity*. We also included the interaction effects of *Newlabel* and involvement; *Newlabel* and familiarity; familiarity and involvement; and *Newlabel,* involvement and familiarity. $\beta_{13} \ldots \beta_{17}$ denote the interaction effects.

Empirical Results

Sample

In a laboratory experiment with n=115 participants, we recorded participants' visual attention via eye tracking. Participants were recruited though ad flyers and email invitations. Each participant received $25 as compensation for participation. We use a threshold of 70% percent for accuracy in calibration. Twelve participants were excluded from the analysis since they did not calibrate properly. Thus, we have 103 usable observations: the current label (CL) group has 50 participants while the proposed label (PL) group has 53 participants. We conducted a t-test and Chi-squared test to compare the demographic characteristics between the two groups. The CL and PL groups are not statistically different from one another in terms of demographic background.

Descriptive results

To start with, we explain descriptive results of the study.

Involvement

In Table 1 the results for involvement with the Nutrition Facts panel are depicted. The average level of Nutrition Facts panel involvement is above 100 (total score =140) in both treatments, suggesting the general high motivation in reading the Nutrition Facts panel. A t-test shows that in both groups, CL and PL, participants' involvement levels were statistically the same.

Table 1. Involvement

Characteristics	CL group (n=50)		PL group (n=53)	
	mean	St.d	mean	St.d
Nutrition label involvement	109.46	23.93	115.85	15.13

CL=current label; PL=proposed label.

Familiarity

Table 2 illustrates the results of participants' familiarity with each product. As determined by t-tests, the familiarity ratings are not statistically different between the two groups. Among products, Lays chips have the highest familiarity whereas bagged salad has the lowest familiarity. Between the medium familiarity products, Kellogg cereal and Yoplait yogurt have higher familiarity than Nilla cookies and Healthy Choice frozen meal.

Table 2. Familiarity

Characteristics	CL group n=50)		PL group(n=53)	
	M	SD	M	SD
Familiarity with products				
Chips	3.32	1.06	3.32	1.01
Frozen Meal	2.32	1.22	2.45	1.31
Cereal	2.92	1.26	2.85	1.26
Cookies	2.34	1.56	2.85	1.28
Bagged salad	1.80	1.41	2.42	1.26
Yogurt	2.80	1.34	2.85	1.06

CL=current label; PL=proposed label.

Personal Characteristics

Table 3 displays the mean or percentage for the personal characteristics that serve as independent variables. In the current label group and the proposed label group, participants' average level of BMI, physical activity frequency, nutrition label reading frequency, self-rated attractiveness are not statistically different from one another as

determined by t-tests. There are more participants on a ***diet*** in the proposed label treatment (13 participants) than in the proposed label treatment (4 participants).

Table 3 also shows that the ***BMI*** of both groups is around 25, which is approaching the overweight threshold and indicates the prevailing obese issue. Another characteristic of the participants worth noticing is that the average self-rated ***body attractiveness*** in both groups is over 4 (1=well below average… 4= average… 7= well above average), indicating that participants are on average confident about their appearance and attractiveness.

Table 3. Personal Characteristics Descriptive Results

Characteristics	CL group (n=50)		PL group (n=53)	
	Count/ Mean	%/SD	Count/ Mean	% /SD
BMI (Mean)	24.8	5.11	25.29	5.1
Not on a diet*	46*	94%	40*	75%
Physical activity (Mean)	2.26	1.38	2.6	1.5
Self-rated attractiveness	4.54	1.13	4.26	1.2

CL=current label; PL=proposed label. * $p<0.01$.

Differences in Attention between current and proposed Nutrition Facts panel

Figure 4 shows a box-plot graph of the dwell time (in seconds) regarding the entire label for each product. We compare the visual attention towards the Nutrition Facts panel in the two different formats. Table 4 shows the mean of dwell time for the two format treatments.

We observe that PL captured longer dwell time for five food products (Chips, frozen meals, cereal, yoghurt, bagged salad) than CL. Only for Nilla cookies, PL captured a slightly longer dwell time (0.35 seconds compared to 0.40 seconds). Longer dwell time (total fixation duration) indicates that more visual attention was paid to the label.

However, although we observed eye movement differences between the two groups, these differences are not statistically significant as determined by t-tests. Thus, there is no significant difference between the two label groups based on dwell time.

Figure 4 Box Plots for Dwell Time

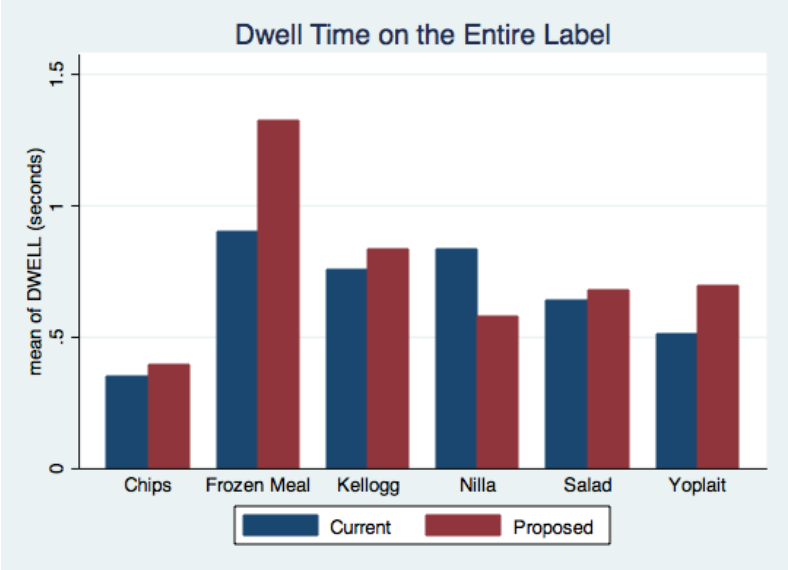

Table 4. Dwell time on Current label and Proposed label (for the entire label)

Attention measures	**Products**	**CL (n=50)**	**PL (n=53)**
		M (SD)	M (SD)
Dwell time	Chips	0.35 (0.80)	0.40 (0.79)
	Frozen Meal	0.90 (1.44)	1.33 (2.34)
	Kellogg	0.75 (1.28)	0.83 (1.41)
	Nilla	0.83 (1.36)	0.58 (0.87)
	Salad	0.64 (1.40)	0.67 (1.06)
	Yoplait	0.51 (0.92)	0.70 (0.99)

CL=current label; PL=proposed label.

* Significant different between CL and PL based on t-test at 95% level.

Differences in Attention between Products

To test whether the attention paid to the nutrition label differs between products, we conducted a one-way ANOVA for the visual attention measure of dwell time in both treatments. We reject the null hypothesis that the dwell time is equal across products for the proposed label in the PL treatment (p=0.000) but the difference between products is

not significant in the CL treatment (p=0.212). Thus, consumers' total time attended towards the Nutrition Facts panel does not differ between the products for the current version of label but becomes significantly different when the current label is presented.

Homogeneity of variances was tested using Levene's test. Levene's test is also used to analyze whether the variance of the sub-samples (i.e., different products) have equal variances. The Levene's statistic rejects the null hypothesis that the variances equal across products for the proposed label (p= 0.00 for both treatments). Similar to the findings of the ANOVA, the variance of dwell time among all the products in the CL treatment is not significantly different for the CL (p= 0.055) but significantly different for PL treatment (p= 0.00). T-test and ANOVA are both fairly robust to the violation of homogeneity when the sample sizes of the groups are really close.

Econometric Model

The results above do not account for the zeros in dwell time. To address this issue, we used a random effects panel Tobit model (see equation 4) to estimate the main effects and interaction effects of involvement, familiarity, the proposed label format, and other consumer characteristics on consumers' visual attention. Table 5 displays the panel Tobit estimated for dwell time.

The Proposed Label (*Newlabel*). The label format has a significant positive effect on dwell time ($p < 0.01$). Thus, the new format increases the visual attention duration towards the Nutrition Facts panel.

Products. The dummy variable for Lays Chips has a significant effect on dwell time with a negative sign. This supports our expectation that consumers quickly search for critical or negative nutritional information on the Nutrition Facts panel of an unhealthy product, and then stop looking at the nutrition label once they find negative information that confirms their thoughts. "Healthy Choice" frozen meal has significant positive effect on dwell time, suggesting that this particular product may be perceived as healthy and consumers pay more attention to its Nutrition Facts panel.

Involvement. The main effect of involvement ($p < 0.01$) on dwell time is significant and positive. Thus, this result supports the hypothesis that highly involved consumers pay more attention to the Nutrition Facts panel.

Familiarity. In contrast to previous research that suggests a negative effect of familiarity on attention (Pieters et al., 1996; Pieters et al., 1999), our results show that product familiarity does not affect the attention on the Nutrition Facts panel. This may be because previous research focused on advertisement messages, which are easy to fully comprehended and stored in memory. However, this buffering effect may not apply to Nutrition Facts panel, which contains much more information and numeric numbers that are less likely to be remembered and precisely recalled.

Table 5. Random Effects Panel Tobit Model

Dep. Variable: Dwell Time	Coef.		Std. Err.	z-value
Newlabel	6.191	***	2.292	2.70
Chips	-0.582	***	0.212	-2.75
Frozenmeal	0.756	***	0.197	3.83
Kellog's	0.271		0.199	1.36
Nilla	0.117		0.200	0.58
Salad	0.067		0.204	0.33
Involvement	0.029	**	0.012	2.45
Familiarity	0.444		0.386	1.15
BMI	-0.060	**	0.029	-2.07
Diet	0.120		0.380	0.32
Physical activity	0.218	**	0.095	2.31
Attractive	-0.297	**	0.141	-2.11
Newlabel*Familiarity	-1.510	**	0.681	-2.22
Newlabel*Involvement	-0.059	***	0.020	-2.93
Familiarity*Involvement	-0.005		0.003	-1.32
Newlabel*Familiarity*Involvement	0.015	**	0.006	2.46
Constant	-0.658		1.771	-0.37
LR chi2(16)	71.34			
Prob > chi2	0.000			
Log Likelihood	-841.695			

*p < 0.1; ** p < 0.05; *** p < 0.01

Personal characteristics. The higher the BMI the lower the dwell time with regards to the Nutrition Facts panel. Diet has no effect on dwell time, which indicates that people's attention towards the Nutrition Facts panel is independent of restricted eating behaviors. Physical activity frequency has a significant positive effect ($p < 0.05$) on dwell time. Thus, the more frequently an individual works out, the more time they spend reading the Nutrition Facts panel. Finally, the more attractive the participant perceives her-/him-self the less attention is paid to the Nutrition Facts panel.

Interaction effects. As shown in Table 5, we find all interaction effects to be significant ($p < 0.01$), with the only exception for the marginal significant interaction effect between involvement and familiarity ($p < 0.1$). The negative interaction effect of the new label format and familiarity suggests that if the familiar product is labeled with the proposed format, people spend less time reading the Nutrition Facts panel. This is intuitive because if consumers are familiar with the product, they may already have a vague memory about the nutritional information, thus reading the Nutrition Facts panel is just to confirm the precise numbers. Once they found the information they need, they direct their attention towards other information.

The negative interaction effect of the new label format and involvement supports our hypothesis that low-involvement consumers will more likely be influenced by extrinsic cues (i.e., the new label format), thus their attention towards the Nutrition Facts panel increases when the new label is presented. When involvement is high, consumers focus more on intrinsic nutrition information. Therefore, their fixation duration on the Nutrition Facts panel decreases because they are highly motivated to look for the information they want, and the prominent format makes that easier.

The non-significant interaction effect of involvement and familiarity doesn't support our hypothesis regarding the joint effect of involvement and familiarity. We expected high-involvement consumers to experience more if any buffering effect of familiarity than low-involvement consumers, because higher familiarity may foster the memory recall for high-involvement consumers but not the low-involvement consumers

who lack of motivation. The non-significant interaction, however, may indicates that low- and high- involvement consumers do not differ in their attention towards the Nutrition Facts panel when they are highly familiar with the product. Thus, the effect of involvement may be stamped out by familiarity.

The three-way interaction between involvement, familiarity, and new label format is significant with a small positive coefficient (coefficient =0.011). This result shows that when an individual is highly involved with the Nutrition Facts panel and highly familiar with the product, he or she may still have a slight increase in the attention when the proposed new label is presented.

Conclusion and Discussion

In this paper, we investigated the role of consumers' involvement and product familiarity on their visual attention towards the current and proposed Nutrition Facts panels. In addition, we examined how these potential factors interact with each other in influencing consumers' attention. Applying an eye tracking experiment, we compared the dwell time for the current or the proposed label. In the study, we included six different products to test whether attention differs between more and less healthy products. T-tests and ANOVAs were utilized in comparing the eye tracking measure (i.e., dwell time) between the two labels and between products. We performed a random effects panel Tobit model to estimate the potential effects of involvement, familiarity, and the proposed label format on consumers' visual attention.

Our results suggest that the proposed new format of the Nutrition Facts panel has a significant positive effect on consumers' attention. Its interactions effects with involvement and familiarity show that consumers have individual differences in their responses to the new label. The proposed label leads low-involvement or less-familiar consumers to attend longer to the Nutrition Facts panel.

Nutrition Facts panel involvement has significant positive effects on consumers' total gaze time towards the Nutrition Facts panel. The interaction effect of the proposed label and involvement has a significant negative effect on attention, indicating that low-

involvement consumers have less motivation to search for nutrition information but they are more likely to be influenced by extrinsic cues such as formatting, thus their attention towards the Nutrition Facts panel increases when the new label is presented. In contrast, high-involvement consumers are motivated to examine the intrinsic information (i.e., nutritional information), thus their dwell time decreases when the key nutritional information is more prominent on the proposed label.

Our results also suggest a non-significant effect of product familiarity on attention, which is different from the negative effect of familiarity found previous research. In contrast to previous research that is mostly concerned with advertising, our study focuses on Nutrition Facts which have more numerical and detailed information that are not likely to be precisely stored in memory. Thus, when consumers look at the Nutrition Facts panel, even if they are familiar with the product, they do not necessarily have a clear memory of the nutritional information, thus they are still motivated to check the Nutrition Facts panel for the information they are interested in. Therefore, product familiarity itself will not decrease attention towards the Nutrition Facts panel. However, the interaction between familiarity and the new label format is significant with a negative sign, suggesting that the buffering effect of familiarity occurs when there is a formatting change in the Nutrition Facts panel. With the key nutritional information highlighted in the Nutrition Facts panel, consumers' attention decreases when they become more familiar with the product because they have to hold more prior knowledge about the nutritional facts. The interaction between familiarity and involvement is not significant, indicating that the involvement effect could be weakened by the familiarity. The interaction of all three factors (i.e., familiarity, involvement, and the proposed label format) is significant. To conclude, product familiarity per se does not influence consumers' attention towards the Nutrition Facts panel, but its buffering effect occurs when combined with involvement and label formatting changes.

We also find that consumers' attention towards the Nutrition Facts panel varies among products. For example, *Lays* chips and *Healthy Choice* frozen meals have an opposite significant impact on dwell time towards the Nutrition Facts panel. This may be

an indication that people's attention towards the Nutrition is influenced by the product healthiness. Chips are usually considered unhealthy food products and frozen meals may be perceived as comparably healthy. When the proposed label is presented, consumers will more easily notice the negative nutrition information on the nutrition label of unhealthy products and thus stop looking at the label after a short dwell time; for healthy products, consumers would spend more time exploring the proposed Nutrition Facts panel since it provides additional nutrition information.

Our study has limitations that could be further addressed in future research. First, consumers' attention on different labels may vary as they have different goals and tasks (Rik Pieters & Warlop, 1999; van Herpen & Trijp, 2011). Different goals may be manipulated in future research to test whether the proposed label has a consistent effect across different goals. Future research could also investigate the impact of the proposed label under more constraint treatments (e.g., time constraint). In addition, an extension of the present research could go beyond attention and focus on consumers' food choices.

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Appendix 1 List of the FDA proposed changes of the Nutrition Facts panel (FDA Federal Register, 2014)

- Increasing the type size of the total calorie number with bold type to make the calorie more prominent on the label.
- Highlighting the number of serving per container.
- Adding a line declaring "added sugar" beneath "sugars". Replacing "Total Carbohydrate" with "Total Carbs".
- Replacing vitamins A and C with vitamins D and Potassium to the list of mandatory nutrients.
- Shifting the column of Percentage Daily Value (DV %) to the left side of the table.
- Changing the portion size from how much consumer "should" eat to the amount they "actually" eat – known as reference amounts customarily consumed (RACCs), aiming at reducing the consumers' confusion when they consult the nutrition labels.
- Removing the current footnote.

Appendix 2 Products use in the experiment

Chips

Cereal

Cookie

Yoghurt

Salad

Frozen Meals

Appendix 3 Physical activity scale

During the past month, which statement best describes the kinds of physical activity you usually did? Do not include the time you spent working at a job. Please read all six statements before selecting one.

	I choose
I did not do much physical activity. I mostly did things like watching television, reading, playing cards, or playing computer games. Only occasionally, no more than once or twice a month, did I do anything more active such as going for a walk or playing tennis.	
Once or twice a week, I did light activities such as getting outdoors on the weekends for an easy walk or stroll. Or once or twice a week, I did chores around the house such as sweeping floors or vacuuming.	
About three times a week, I did moderate activities such as brisk walking, swimming, or riding a bike for about 15-20 minutes each time. Or about once a week, I did moderately difficult chores such as raking or mowing the lawn for about 45-60 minutes. Or about once a week, I played sports such as softball, basketball, or soccer for about 45-60 minutes.	
Almost daily, that is five or more times a week, I did moderate activities such as brisk walking, swimming, or riding a bike for 30 minutes or more each time. Or about once a week, I did moderately difficult chores or played sports for 2 hours or more.	
About three times a week, I did vigorous activities such as running or riding hard on a bike for 30 minutes or more each time.	
Almost daily, that is five or more times a week, I did vigorous activities such as running or riding hard on a bike for 30 minutes or more each time.	