Effects of Front-of-Package Marketing and Corrective Labels on Consumer Perceptions of the Healthfulness of Nutritional Bars

Catherine Fernan[1]

Last Edited: April 12, 2016

In April 2015, KIND™ bars made national headlines when the company received a warning letter from the FDA about its improper use of front-of-package (FOP) claims. Products with front-of-package claims have proliferated on grocery store shelves across the United States and elsewhere. Research has found that consumers use these labels but also find them confusing. The goal of this paper is to understand how FOP claims and product titles (e.g., "Protein" Bar) affect consumer perceptions of healthfulness. Additionally, this paper examines how the presence of a traffic light, which is a front-of-package labeling scheme recommended by health advocates to aid consumers in identifying healthier products, can change these perceptions. This thesis begins with an overview of FDA regulation and then describes the rise of FOP marketing along with increased sales of nutrition bars. I then review findings from previous research on FOP labeling, consumer perceptions and standardized FOP labeling schemes and, in doing so, identifies key gaps in the literature. I continue by describing the study design, measures, methods, and analytic approach. Next, I describe results from tests of key hypotheses from a 3 x 2 factorial design randomized experiment which analyzed the effect of front-of-package labeling on nutrient level perceptions and healthfulness perceptions. I conclude by discussing the policy, theoretical, and practical applications of this work.

[1]Department of Policy Analysis and Management, Cornell University

The author expresses immense gratitude to Jeff Niederdeppe, who provided thankless support which enabled the apt formulation of research questions and design of the survey and whose comments throughout the process greatly improved this thesis.

Effects of Front-of-Package Marketing and Corrective Labels on Consumer Perceptions of the Healthfulness of Nutritional Bars

The Food and Drug Administration (FDA) is responsible for regulating food labeling in the United States (U.S. Food and Drug Administration, 2015). This includes the standard back-of-package Nutrition Facts panel as well as product label information appearing on the front of the package. The FDA has required the presence of specific nutritional information in a standardized format known as the Nutrition Facts panel, which typically appears on the side or back of food products, since the Nutrition Labeling and Education Act was signed into law in 1990. The presence of front-of-package (FOP) nutrition information, however, has been largely driven by the food industry's own promotional efforts and has far fewer FDA rules governing its practice. The food industry describes FOP as their effort to "provide consumers with key nutrition information that can be quickly and easily interpreted" (U.S. Food and Drug Administration, 2015; U.S. Government Accountability Office, 2011). The two main features of an FOP label are the title of the product and specific product claims.

The FDA regulates four main types of food label claims that are relevant to FOP labeling: nutrient content claims, health claims, qualified health claims, and structure/ function claims. Over eighty-six percent of claims appearing on food packages are nutrient content claims (U.S. Government Accountability Office, 2011). Nutrient content claims (NCC) refer to the level of a specific nutrient (vitamin A, protein, fiber, etc.) in the product (U.S. Food and Drug Administration, 2015). The terms "good source," "contains," and "provides" may be used on a product that contains 10% to 19% of the FDA's recommended daily value of that nutrient. The terms "high," "rich in," or "excellent source of" may be used on a product that contains 20% or more of the recommended daily value of the nutrient (U.S. Government Accountability Office, 2011).

Two other prominent features on the FOP are the statement of identity and the brand name. The statement of identity refers to the name of the food (e.g. "nutritional bar") and the brand name refers to the maker of the nutritional bar (e.g. "Clif"). The FDA has specific requirements for the choice of statement of identity, with rules stating that if there is not a mandated name or a common name, then the name of the food should be a non-misleading, descriptive name (U.S. Food and Drug Administration, 2015). These FOP elements also have specific sizing requirements. NCCs may be no more than twice as large as the statement of identity, while the brand name should not be more prominent than the statement of identity (U.S. Food and Drug Administration, 2015). Either the statement of identity or the nutrient content claim can be the largest aspect, but the size of the nutrient content claim is restricted by the size of the statement of identity.

FOP claims clutter today's grocery and convenience store shelves. Today, food products display more statements proclaiming nutrition and health benefits than ever before (Nestle & Ludwig, 2010). In the year 2009, for example, sales of food with nutrition claims totaled over $100 billion (Harris, Thompson, Schwartz, & Brownell, 2011). One product category that is well-known for its nutrition-based, FOP marketing is so-called "nutrition bars." Nutrition bars encapsulate cereal bars, granola bars, energy bars, snack bars, nutrition bars and protein bars. Some well-known nutrition bar brands are Clif Bars, KIND Bars, Special K and Luna. There used to be a distinction between cereal bars/breakfast bars and energy/protein bars, but that distinction is becoming more blurred (Watson, 2012). Sales of nutrition bars have skyrocketed in recent years, and the industry is projected to have $6 billion in revenue by 2018 (MacVean, 2013). One-fifth of Americans eat at least one nutrition bar a day (MacVean, 2013). A particular segment of the nutrition bar industry that has seen rapid growth is "protein" bars, which are nutrition bars that typically make NCCs via the product title or on the FOP (Moss, 2014). There is a wide range of healthfulness when it comes to these products ("Choose the Best Bars for a Healthy Snack - Consumer Reports," 2015).

The popularity of these products, combined with the wide range of healthfulness (particularly widely varying levels of sugar, salt and fat), raises questions about the effect of front-of-package marketing on people's purchase decisions and perceptions of their healthfulness. The rise in the number of products using FOP labeling also elicits concerns over the effect of these products on consumers. Additionally, since FOP labeling is designed and selected by the manufacturer, there is a wide range of symbols and rating systems which could also lead to confusion (Wartela, Lichtenstein, & Boon, 2010).

Previous Research on Public Responses to FOP Claims in Packaged Food

The U.S. FDA, U.S. Congress, and non-governmental organizations and researchers have investigated the impact of various forms of FOP labeling. The FDA recently launched a FOP Labeling Initiative in which their Commissioner has encouraged food companies to "review their labeling to ensure that they [are] in compliance with FDA regulations" (Food and Drug Administration, 2015). As of December 2014, the agency had sent warning letters to 17 manufacturers for 22 different food products explaining how the product's labeling was in violation of FDA regulations (Food and Drug Administration, 2015). The FDA is also working on a set of guidelines for the industry to improve the ability of FOP labels to help consumers select healthy food choices, but these have not yet been made public (Food and Drug Administration, 2015).

Congress has also expressed concern that the ubiquity of FOP labeling may lead to consumer confusion about nutritional information (Roberto et al., 2012). Congress directed the Centers for Disease Control and Prevention (CDC) and asked the Institute of Medicine (IOM) to investigate FOP labeling (Wartela et al., 2010). Phase I of the joint report examined current labeling systems and found that these systems vary widely. The authors recommended that serving sizes should be presented more predominantly on FOP and that FOP labels should focus on nutrients that are specifically related to prevalent health issues (Wartela et al., 2010). Phase II of the report identified attributes that would make for a successful FOP system in terms of transmitting important health and nutrition related information to consumers, recommending that an FOP symbol system be simple and ordinal (Wartella, Lichtenstein, Yaktine, & Nathan, 2011).

In a survey conducted by the FDA, 67% of respondents reported using FOP labels "often or sometimes when making purchasing decisions." (Roberto et al., 2012). Despite widespread use of these labels and recent federal efforts to improve them, existing FOP labels often lead to confusion. Concern over the confusing nature of FOP labels stems partly from the fact that there are many FOP labeling schemes in the U.S. instead of one standardized system which makes it difficult to compare products (Hawley et al., 2013). Specifically, one area where consumers often get confused is the distinction between the different types of claims (health, structure/function, and nutrient content; Schuldt & Pearson, 2015). A 2011 U.S. General Accountability Office Report referenced several studies in their report to illustrate that consumers have difficulty distinguishing between the different types of claims and their different requirements (U.S. Government Accountability Office, 2011). Health claims are the most stringently regulated and require pre-approval by the FDA (U.S. Food and Drug Administration, 2015; U.S. Government Accountability Office, 2011). One GAO-cited study found that when participants were familiar with a nutrient-disease relationship (in this case, calcium and osteoporosis) the type of claim (health, structure/function, nutrient content) did not influence one's belief in a stated health benefit (Lin, 2008). Another study also provided evidence that nutrient-content claims can "convey similar health-related benefits as stringently regulated health claims" (Harris et al., 2011). This paper will analyze the effect of the less strictly regulated nutrient content claims on perceptions of health.

Another concern surrounding FOP labeling confusion is the potential for industry manipulation of ingredients and product context. Manufacturers can alter the ingredients and nutritional content of products in ways that increase the health rating by FDA standards but do not actually improve the nutritional quality of the product (Nestle, 2007; Nestle & Ludwig, 2010; Schofield & Mullainathan, 2008). One example of this strategy would be replacing sugars or fats in these products with refined starches (Nestle & Ludwig, 2010). Additionally, the differing serving sizes can portray nutritional qualities in misleading contexts (Nestle & Ludwig, 2010; Wartela et al., 2010). The IOM recommends providing information about serving sizes in measures that are familiar to consumers to ensure a meaningful context (Wartela et al., 2010). Nestle (2007) has claimed that one-fourth of so-called functional foods (foods described as having nutritional benefits) entering the market in recent years are actually "junk food" that have been modified. This is of special concern for nutritional bars, as the least healthy nutrition bars are arguably only as healthy as a candy bar (Moss, 2014).

Mechanisms Shaping FOP Nutrient Claim Effects on Perceived Healthfulness

How consumers process FOP labels is an important part of understanding the impact of FOP labels. Short FOP claims that indirectly imply that a product can improve one's health can be more persuasive than longer, more direct claims (Friestad & Wright, 1994; Harris et al., 2011; Wansink, 2003). Harris et al. found that 80% of respondents believed that a cereal would "grow strong bones" after seeing the nutrient content claim "good source of Calcium and Vitamin D." (Harris et al., 2011). The impact of short FOP claims will be a key part of analysis in this paper.

The phenomenon of the "health halo" plays a role in consumer perceptions about FOP labels. "Health halos" describe the phenomenon when a consumer infers that a product is healthier overall because of one healthy characteristic (Chandon, 2012). There is evidence that this occurs with NCCs on children's cereals (Harris et al., 2011). Additionally, studies have shown how the name of a product and its perceived healthfulness influence caloric estimates about the product (Wansink & Chandon, 2006). In one study, respondents falsely believed granola to be less caloric than M&Ms because granola is seen as healthy (Wansink & Chandon, 2006). This paper will analyze perceived healthfulness in response to the presence of a NCC or a descriptive title.

Referencing specific nutrients in a NCC or product title may further cause consumers to think a product is healthier because consumers often think of a product in terms of its nutrients rather than as a whole food (Schuldt & Pearson, 2015). This mindset is called nutrient centrism (Schuldt & Pearson, 2015). Marketing of food typically focuses on the absolute or relative quantities of nutrients and thus can distract attention away from the overall health value of the food (Schofield & Mullainathan, 2008). Additionally, scientific knowledge and certainty about nutrient impact are constantly changing, which contributes to consumer confusion (Schofield & Mullainathan, 2008).

One way that FOP claims can be confusing and misleading is that claims can appear on products that besides the healthy attribute being highlighted are somewhat unhealthy. For example, a product can have a claim highlighting high amounts of Vitamin B while the product has low amounts of other beneficial nutrients (e.g., protein and fiber) and high levels of constituents to limit (e.g., sugar, sodium, fat; Chandon & Wansink, 2007; Harris et al., 2011; Nestle & Ludwig, 2010). For instance, Drewnowski et al. (2010) found that consumer perceptions of healthfulness were largely driven by the declared *presence* of beneficial nutrients or declared *absence* of product constituents to limit (like sugar, salt, and fat). The declared presence of beneficial nutrients was more important than the level of the nutrient the product contained (Drewnowski, Moskowitz, Reisner, & Krieger, 2010). Protein was one of the key determinants of perceived healthfulness, which raises the question of whether or not protein should be included in nutrition facts information at all, given that most Americans already achieve daily standards of protein intake (Drewnowski et al., 2010).

Study Hypotheses

In light of this body of research, I offer a several hypotheses about the potential impact of NCCs and product titles on perceived nutrient content and perceived product healthfulness. First, consistent with the large body of previous work described above, I predict that NCCs will increase both perceived protein content and overall healthfulness.

H_1: A product with a protein nutrient content claim (NCC) will lead consumers to perceive higher levels of protein than a neutral product.

H_2: A product with a protein nutrient content claim (NCC) will lead consumers to perceive higher levels of healthfulness than a neutral product.

The title of products and claims are currently regulated in the same way as NCCs. However, the FDA has appeared to be more focused on regulating FOP claims than titles. The majority of the warning letters sent in connection to the FDA's Front-of-Package Labeling Initiative were related to violations of claims. There do appear, however, to be products that violate title regulations. For example, there is a product called "Special K Protein Snack Bar" which has "protein" in the title but has only 7% of the recommended daily value of protein which would invalidate this product for a nutrient content claim and hence an implied nutrient content claim in the title (Figure 1). This difference in observed levels of enforcement draws into question the relative effect of titles and claims.

Given that titles are often more prominently featured on the FOP for many products, one might expect that a nutrient-focused title would have more of an effect on consumers than a nutrient content claim as consumers would be more likely to read it. Additionally, Wansink et al. found that shorter health claims were more persuasive than longer health claims as they led to higher levels of persuasive, attribute-specific thoughts relative to general thoughts (2003). That finding would predict that a title would be more persuasive than a claim as titles are typically shorter. To test these claims, I predict that products with protein in the title will lead to greater perceptions of protein content and healthfulness relative to both a neutral product and one containing a NCC.

H_3: A product with protein in the title will lead consumers to perceive higher levels of protein than a neutral product.

H_4: A product with protein in the title will lead consumers to perceive higher levels of protein than a product with a protein nutrient content claim (NCC).

H_5: A product with protein in the title will lead consumers to perceive higher levels of healthfulness than a neutral product.

H_6: A product with protein in the title will lead consumers to perceive higher levels of healthfulness than a product with a protein nutrient content claim (NCC).

Corrective Labels – Traffic Light Systems

Research suggests that NCCs and descriptive product titles are likely to lead consumers to perceive a product as healthy even if the product contains significant amounts of nutrients that should be limited. Additionally, the lack of a uniform FOP labeling systems adds to confusion. Another important question, therefore, is how the effect of these FOP claims might be offset through a uniform, mandated form of FOP labeling. Two general types of FOP are *nutrient specific* and *summary systems* (Roberto et al., 2012). Nutrient specific FOP labels are similar to NCCs in that they display a few nutrients (Roberto et al., 2012). Examples of this are the "Facts Up Front" label which is a label highlighting the percent of the Guideline Daily Amount (GDA) that appears on many items in the U.S., as well as the traffic light system which appears on many products in the U.K. GDA systems "display nutrients per portion and include the amount in grams and as a percentage of a person's GDA for each nutrient" (Hersey, Wohlgenant, Arsenault, Kosa, & Muth, 2013). Traffic light (TL) schemes are color coded to indicate the levels of highlighted nutrient. TL state if the level of the nutrient is "high", "medium," or "low" and the statements are respectively colored red, yellow, and green (Roberto et al., 2012). Summary systems rank the overall healthfulness of a product. Some of these are binary and some of these provide a score from 1 to 5 (Roberto et al., 2012).

Several studies have focused on comparing theses common FOP schemes to identify the most effective scheme. One recent review concluded that the multiple traffic light system is the most effective in aiding consumers to identify healthier products (Hawley et al., 2013). Another systematic review reviewed 38 empirical studies and concluded that FOP labels with text and symbolic color are more effective than the Guideline Daily Amount systems (Hersey et al., 2013). Various other studies or syntheses that were not included in these reviews have indicated that the traffic light scheme is an effective FOP labeling scheme (Hawley et al., 2013; Roberto et al., 2012; Wartella et al., 2011). Based on this evidence, I hypothesize that a TL label highlighting high levels of sugar and moderate levels of fat in a nutrition bar will reduce perceived healthfulness of the product, relative to one without the TL label.

> H_7: The presence of a traffic light on a nutrition bar product with high amounts of sugar and moderate levels of fat will lead to lower perceptions of healthfulness than a product with no traffic light.

It remains an open question, however, whether TL labeling schemes may be particularly important when a product makes a specific NCC or includes a nutrient in the descriptive title. In the absence of previous research on the topic, I ask the following:

> RQ_1: How does the effect of the presence of a traffic light differ for products with a descriptive title vs. products with a NCC?

Methods

Procedure and Stimuli

To examine these hypotheses and research questions, I conducted a randomized control trial with six conditions. The experiment was conducted via the SONA system run by the Communication Department at Cornell University between February 19, 2016 and April 7, 2016. I recruited additional participants to take part in the study within the same time period by distributing an email link to the survey via Qualtrics to a variety of student list-serves on campus. All study participants were Cornell students, and a small number of duplicate participants (n = 21) were identified and dropped from the analytic sample. These duplicate respondents were identified by asking them to report (at the end of the survey) whether or not they had taken the study previously, or by asking them to report their SONA ID (at the end of the survey) and dropping the duplicate respondents. Students taking part in the study through the SONA system were able to receive extra credit for their participation.

I randomly assigned each participant (n = 274) to view one of six versions of the FOP label on a "Zing" bar product using a 3 (descriptive title, NCC, or neutral) by 2 (TL warning or not) design (see Figure 2). "Zing Bars" are an actual nutrition bar that is sold in stores. I chose "Zing" bars in hopes of minimizing the likelihood of a respondent having tried the product before as it is a lesser-known product within the nutrition bar category (versus, for example, Clif or KIND). Additionally, "Zing" bars appear (based on the color of the packaging) to be a gender-neutral nutritional bar as opposed to female-targeted nutritional bars like "Luna" or male-targeted bars like "Clif Builder Bar." I edited an image of a "Zing" bar wrapper to only display the name of the product, the flavor and the net weight. I then manipulated what additional nutritional information would be added to the package. These manipulated aspects were a descriptive title, a nutrient content claim and a traffic light symbol that displays the number of calories and summarizes the levels of certain nutrients. The control condition was a product that only displayed “Zing Bar”, the flavor (held constant), and the net weight. The descriptive title condition displayed “Zing Protein Bar” in addition to the flavor and net weight, and the nutrient content claim condition displayed “Good source of protein” in addition to the flavor and net weight. I duplicated each of these three conditions with the addition of a TL warning making a total of six conditions (Figure 2). The TL depicted the level of saturated fat as medium, the level of sugars as high, and the level of sodium as low.

Recall and Manipulation Check: At the end of the study, I asked participants whether or not they recalled the name of the product that they were exposed to. The vast majority of participants (n = 210; 86.8%) correctly reported that the name of the product started with the letter “Z” or gave the specific flavor of the product (Dark Chocolate Coconut). I also asked participants which of the following best described the product they saw: nutrition bar, protein bar, candy bar, or snack bar. The majority of participants (59%, 95% CI: 48% - 69%) who were randomized to a product with protein in the descriptive title identified the product as a protein bar, a plurality of participants (38%, 95% CI: 28%-48%) who were randomized to a product with a NCC identified the product as protein bar, and very few in the neutral condition (16%, 95% CI: 9%-26%) described it as a protein bar. Thus, the descriptive title and, to a lesser extent, NCC conditions appeared to make protein more salient. I thus deemed the manipulation successful.

Randomization Check. I ran chi-square tests on cross tabs between the treatment groups and all measured demographic variables to assess if there were any significant demographic differences between treatment groups. The p-value of the chi square tests were all greater than .22, suggesting that randomization produced balanced groups.

Participants

The final analytic sample included 274 participants. As noted above, five respondents had taken the survey twice, so I only kept their data from the initial time they participated in the survey. Participant age ranged from 18 to 30 (M = 20.6, SD = 1.9). Nearly 70% of the sample was female, consistent with the demographics of the SONA participant pool in the Department of Communication. Most participants self-identified as White (63%) or Asian (25%) and non-Hispanic (83%). The sample was mostly composed of sophomores, juniors and seniors (73%). A large majority of participants reported that their health is important to some degree (89%). Additionally, a large majority reported eating a nutritional, snack or protein bar in the past 30 days (73%) with roughly one in five reporting having consumed 9 or more in the past 30 days (22%).

Measures

Perceived Nutrient Content. I measured perceived level of protein, saturated fat, salt, and total fat (Targeted Nutrients since they were directly referenced in either the NCC/descriptive title or in the TL label) in two different ways (the order of these modules and the questions within them were randomized). In one set of questions, I asked respondents to "please indicate how much [protein; saturated fat; etc., 8 total nutrients] you believe the product contains") with a 3-point scale ranging from "a little" (assigned a value of 1) to "a moderate amount" (assigned a value of 2) to "a lot" (assigned a value of 3). I also asked respondents how they perceive the level of these nutrients to be "compared to similar products" using a 3-point scale ranging from "less" (assigned a value of 1), "about the same" (assigned a value of 2) and "more" (assigned a value of 3). I averaged these items into four separate scales (correlations ranged from .43 to .48; protein M = 2.20, SD = .59; sugar M = 2.34, SD = .58; salt M = 1.76, SD = .55; saturated fat M = 1.94, SD = .55; total fat M = 2.00, SD = .53).

I also measured respondents' perceptions of the levels of fiber, vitamin C, calcium and iron in a single question (Non-Targeted Nutrients), in response to the item asking respondents to "please indicate how much [fiber, vitamin C, etc.] you believe the product contains") (fiber M = 2.04, SD = .75; vitamin C M = 1.33, SD = .50; calcium M = 1.66, SD = .58; iron M = 1.63, SD = .64). Unlike the Targeted Nutrients, these nutrients were not mentioned in any direct way on the packaging, but I measured them to capture any potential health halo effects on these outcomes.

Perceived Caloric Content. In a separate question, I asked respondents how many calories they believe the product contains (also to capture health halo effects). I top-coded responses for a few high outliers (n = 3) at 500 calories (M = 204.61, SD = 79.19).

Perceived Healthfulness. In a separate module, I asked respondents to report their level of agreement (on a 7-point scale from "strongly disagree" (assigned a value of 1) to "strongly agree" (assigned a value of 7) with three statements relating to their perceptions of the overall nutrition and healthfulness of the product. These statements read, "the product is healthy," "the product is nutritious," and "the product is good for me." I averaged these items into a scale (Cronbach's alpha = .89, M = 3.78, SD = 1.24).

Analytic Approach

To test the effect of NCCs and descriptive titles on perceived levels of protein ($H_{1,}$ H_3 and $H_{4)}$, I ran an OLS regression to examine the impact of NCCs, descriptive titles and TLs on consumer perceptions of the perceived level of protein. The model is the following equation:

$$Protein = \beta_{1NCC} + \beta_{2TITLE} + \beta_{3TRAFFIC\ LIGHT}$$

where *Protein* is the scaled measure of perceived level of protein. On the right hand side, *NCC* is a dummy variable set equal to one if the respondent was exposed to a product displaying a NCC ("good source of protein"). *TITLE* is a dummy variable set equal to one if the respondent was exposed to a product with "protein" in the name of the product. *TRAFFIC LIGHT* is a dummy variable set equal to one if the respondent was exposed to a product displaying a TL. A positive and significant β_1 and β_2 will confirm H_1 and H_3, respectively. A statistical test confirming a higher magnitude β_2 relative to β_1 would confirm H_4.

To examine the effect of NCCs, descriptive titles and TLs on perceived levels of healthfulness (H_2, H_{5-7}) I ran an OLS regression predicting perceptions of healthfulness. The model is the following equation:

$$Health = \beta_{1NCC} + \beta_{2TITLE} + \beta_{3TRAFFIC\ LIGHT}$$

where *Health* is the scaled measure of health perceptions. On the right-hand side, the variables are the same as the previous model. A positive and significant β_1 and β_2 will confirm H_2 and H_5, respectively. A statistical test confirming a higher magnitude β_2 relative to β_1 would confirm H_6. A negative and significant β_3 will confirm H_7.

Lastly, I ran an OLS regression with interaction terms to test RQ_1. The models were as follows:

$$Health = \beta_1 NCC + \beta_2 TITLE + \beta_3 TRAFFIC\ LIGHT + \beta_4 NCCxTL + \beta_5 TITLExTL$$

$$Protein = \beta_1 NCC + \beta_2 TITLE + \beta_3 TRAFFIC\ LIGHT + \beta_4 NCCxTL + \beta_5 TITLExTL$$

where *Health* and *Protein* are the same measures used in the previous models. The right-hand side variables are the same as previous models with the addition of the interaction terms.

Results

Effect of Descriptive Titles, NCC, and TL Labels on Perceived (Targeted) Nutrient Content

Table 2 shows the results of a series of OLS regressions predicting perceived levels of protein and other nutrients featured on the FOP (Targeted Nutrients). Column 1 of the table shows that a descriptive title and a NCC each had a positive effect on perceived level of protein relative to the neutral product (neither 95% CI overlaps with zero and the t-test for significance was $p < .05$ for both coefficients), confirming H_1 and H_3. The 95% CIs for the coefficients for the descriptive title and NCC did overlap, however, thereby rejecting H_4.

Table 2 also provides evidence that TL labels are effective at conveying nutritional information. Column 2 shows that a TL label had a positive effect on the perceived level of sugar relative to the version of the bar without such a label ($p < .05$). The traffic light manipulation depicted the level of sugar has high, so the results of this regression support the notion that consumers obtain nutrition information from traffic lights. To examine RQ_1, I added interaction terms to the model. However, neither of the interaction coefficients were statistically significant. ($\beta_{Title * Traffic Light}$ = -.22 [-.57 - .12]; $\beta_{Nutrient Content Claim* Traffic Light}$ = -.17 [-.51 - .16]; not shown in tables).

Effect of Descriptive Title, NCC, and TL Labels on Perceived Healthfulness and Product Intentions

Table 3 shows the results of a series of OLS regressions predicting healthfulness and product intentions. There were no significant effects of any labeling feature on product intentions ($p > .10$ for all coefficients). The NCC did not produce higher levels of perceived healthfulness relative to the neutral product (the 95% CI around the coefficient overlaps zero and $p > .05$), rejecting H_2. Versions of the product featuring protein in the title, however, produced increased perceptions of healthfulness relative to the neutral product (the 95% CI does not overlap with zero and the t-test for the coefficient's significance was $p < .05$), confirming $H_{5.}$ The 95% CIs for the coefficients for the descriptive title and NCC did overlap, however, thereby rejecting H_6.

The presence of a TL label did not lead to a statistically significant decrease in the perception of healthfulness relative to the non-TL label version. The coefficient approaches statistical significance at the 95% level but does not reach it (β_{TL} = -.33 [-.67 - .01]), leaving H_7 unconfirmed. To examine whether the effect of the presence of a traffic light differed for products with a descriptive title vs products with a nutrient content claim (RQ_1), I added interaction terms to these regressions. None of the coefficients approached statistical significance ($\beta_{Title * Traffic Light}$ = -.17 [-.98 - .64]; $\beta_{Nutrient Content Claim* Traffic Light}$ = -.10 [-.90 - .69]; not shown in tables).

Effect of Descriptive Titles and NCC on Perceived (Non-Targeted) Nutrient Content

To further understand the pattern of findings whereby the presence of a descriptive title increased perceived protein content and perceived healthfulness while a NCC only increased perceived protein content, I ran a series of additional OLS regressions predicting perceptions about additional, non-targeted nutrients. Table 4 shows that a product with protein in the title led to higher perceptions of fiber and of iron (Column 1 and Column 2) relative to the neutral product. The NCC referencing protein led to perceptions of higher levels of fiber but at a magnitude roughly half of the effect for a product with protein in the title (Column 1). This suggests, therefore, that calling a product a "Protein Bar" leads to perceptions of higher levels of protein and at least two additional nutrients. This perception of higher levels of nutrients besides protein suggests a health halo effect. This possible health halo effect is seen when calling a product a "Protein Bar", but not when proclaiming that a product is a "good source of protein."

Effect of Perceived Level of Nutrients on Perceptions of Healthfulness

In order to further understand what drives perceptions of healthfulness, I ran an OLS regression of perceived nutrient levels predicting healthfulness perceptions (Table 5). This table shows that higher levels of perceived protein levels and fiber levels lead to higher levels of perceived healthfulness. Meanwhile, higher levels of sugar and total fat lead to lower levels of perceived healthfulness.

Discussion

Summary of Findings

This thesis offers evidence that descriptive titles and nutrient content claims both influence people's perceptions about the level of protein in a product. This finding illustrates that consumers do gain information from FOP labeling. Furthermore, this thesis examined what other sorts of effects are seen besides this relatively direct result of individuals perceiving higher levels of protein. The effect on healthfulness is of particular interest. The descriptive title had an effect on healthfulness that was significantly different from the neutral bar whereas the NCC did not. This finding is valuable as it illustrates how essentially the same message (this product contains protein) presented in two different ways results in different perceptions of healthfulness.

The effect of NCCs and titles on perceived non-targeted nutrients provides some insight into why this difference in perceptions of healthfulness exists between NCCs and titles. Titles have an effect on the perceived levels of other nutrients to a higher degree than NCCs. This suggests that titles produce a health halo and, for that fact, produce a health halo that is greater than the health halo produced by a NCC. This greater health halo may be the reason for higher perceived healthfulness but more research is needed to confirm this.

Another factor to consider in understanding the presence of the effect of a title on perceived healthfulness and the absence of the effect of a NCC on perceived healthfulness is the salience of "protein". The results of the manipulation check which asked respondents to identify the product they saw show that more people who were exposed to the title condition identified the product as a "protein bar" compared to those exposed to a NCC. This implies that the title condition was more effective at portraying protein than the NCC condition. To a certain degree, this finding is expected as the word "protein" is somewhat larger in the title condition than in the NCC condition. More research is needed, however, to fully understand the differences in message delivery mechanisms between titles and NCCs.

The results of the regression of nutrients on perceived healthfulness also provide insight into the effect of the title on perceived healthfulness. Calling a product a "protein bar" led to higher perceptions of protein and fiber. These two nutrients were found to be the significant, positive drivers of nutrients on health perceptions. The title condition led to higher perceptions of fiber relative to the control condition whereas the NCC condition did not. This suggests a possible mechanism through which the title leads to higher perceptions of healthfulness: title leads to higher levels of fiber and higher levels of fiber lead to higher levels of perceived healthfulness.

The effect of titles on perceived healthfulness also has interesting implications in regards to nutrient centrism. Nutrient centrism theory proclaims that people think of food in terms of its nutrients rather than overall health. This research found that calling a product a “protein bar” leads to higher perceptions of protein and higher perceptions of healthfulness. Additionally, this research found that the presence of a traffic light had no effect on perceived healthfulness. These two findings imply that people are making health judgments more off the stated presence of one nutrient than an icon summarizing the levels of several nutrients. This combination of findings is in line with the theory of nutrient centrism.

This thesis provides evidence that a traffic light works to effectively inform individuals of nutrient levels. This research, at least, supports that traffic lights work to inform consumers of nutrients at high levels as the effect was seen for the nutrient given the “high” designation (sugar). However, this thesis does not find that traffic lights work to “correct” any of the healthfulness perceptions caused by the FOP labeling.

Policy Implications. This thesis has found that titles have a significant, positive effect on perceived healthfulness whereas NCCs had no significant effect on perceived healthfulness. This difference has interesting policy implications, as the FDA appears to regulate NCCs with more scrutiny. The FDA should consider, at minimum, regulating the title of products with more scrutiny, especially, as there are some examples of products that appear to be in violation of the current regulations in place (Figure 1). Additionally, this thesis shows that titles were more persuasive, so the FDA should consider developing stricter regulations for titles. However, there is a great need for more research to better understand the effect of descriptive titles as there is currently not a lot of literature on the topic.

The finding that traffic lights do not reduce perceptions of healthfulness brings into question what products should be able to make claims. In this study, traffic lights failed to "correct" any health halo effects from calling the product a "protein bar." This finding supports some of the fears that health experts have: manufacturers can put "protein" on basically a candy bar and individuals will regard it as healthy. More research is needed to see if there is a corrective label that works more effectively in this specific instance, however, traffic lights have been found to be the most effective at informing consumers. Policy makers should consider requiring products to pass certain nutritional standards before being allowed to display a nutritional FOP label.

The need for better policy regulating nutritional bars is exacerbated by how popular nutrition bars are. Nutrition bars have become nearly ubiquitous on grocery and convenience store shelves. Their sales continue to grow and they are consumed at high numbers as Table 1 in this paper illustrates.

Limitations. This sample of college students does not reflect the general population. However, college students are heavy consumers of these products as 1 in 5 reported eating 9 or more in the last 30 days. Although I chose a product that is lesser known, there is a chance that individuals may have seen the product before. Some nutrients (e.g., fiber, iron, calcium, and vitamin c) were measured with a single item which leaves more room for measurement error. Another limitation is that this study analyzed an individual's exposure to a single item at a single point in time.

This study analyzed perceptions and not actual behavior. However, perceived healthfulness is an important factor for informed consumers so there are still implications. Previous research has found that consumers use FOP labels in purchase decisions so understanding how individuals perceive FOP labels is crucial. Additionally, understanding how consumers make judgments on healthfulness is pivotal in designing ways to help consumers make healthier decisions. Future research is still needed, though, to understand how perceptions connect to actual purchase behavior. This is especially true as I found no significant effects on product intentions.

Conclusion

The goal of this research was to evaluate how FOP claims, titles and traffic lights affect consumer perceptions of healthfulness and nutrient levels. This paper offers evidence that descriptive titles, nutrient content claims and traffic lights all have effects on consumer perceptions of nutrient levels, but that only descriptive titles have an effect on perceived healthfulness. This finding raises questions about how well current policy regulates the use of descriptive titles on products in this class. Future research is needed to better understand how people process descriptive titles and how people make decisions in this product category in general.

Figures

Figure 1

source: http://www.specialk.com/en_us/products/granola-bars/chocolatey-peanut-butter.html

Figure 2
Condition 1)

Condition *2)*

Condition *3)*

Condition *4)*

Condition *5)*

Condition *6)*

Tables

Table 1. Descriptive Statistics

Variable	**Category**	**Percent of Total Sample (N = 274)**
Gender	Male	27.37%
	Female	62.77%
	Intersex or Decline to Answer	0.36%
Age	18	9.85%
	19	5.47%
	20	19.71%
	21	22.99%
	22	21.17%
	Above 23	12.77%
	Decline to Answer	9.85%
Race	White	62.77%
	Black	4.38%
	Asian	24.45%
	Other	0.36%
	Decline to Answer	12.04%
Ethnicity	Hispanic	8.03%
	Not Hispanic	82.48%
	Decline to Answer	9.49%
Year of School	Freshman	8.76%
	Sophomore	24.45%

	Junior	23.72%
	Senior	24.45%
	Graduate Student	9.12%
	Decline to Answer	9.49%
Weight Status	Underweight	7.66%
	Normal Weight	78.47%
	Obese	3.28%
	Decline to Answer	10.22%
Importance of Health	Not at all important	0.73%
	Somewhat important	13.87%
	Important	28.10%
	Very important	32.48%
	Extremely important	14.96%
	Decline to Answer	9.85%
Number of Nutritional Bars, Snack or Protein Bars consumed in the past 30 days	None	16.79%
	1-2	17.52%
	3-4	14.23%
	5-6	12.77%
	7-8	7.30%
	9 or more	21.53%
	Decline to Answer	9.85%

Table 2: Effect of Nutrient Content Claims and Descriptive Titles on Perceptions of Nutrient Levels

VARIABLES	(1) Protein	(2) Sugar	(3) Salt	(4) Saturated Fat	(5) Total Fat	(6) Calories
Product has Protein in the Title	0.367**	-0.0422	0.113	-0.157	-0.130	8.522
	(0.197 - 0.536)	(-0.218 - 0.133)	(-0.0579 - 0.284)	(-0.327 - 0.0130)	(-0.295 - 0.0357)	(-15.71 - 32.75)
Product makes a NCC	0.537**	-0.101	-0.0316	-0.158	-0.0352	7.877
	(0.370 - 0.704)	(-0.274 - 0.0717)	(-0.199 - 0.136)	(-0.325 - 0.00909)	(-0.198 - 0.127)	(-16.20 - 31.96)
Traffic Light	0.00452	0.230**	-0.103	0.0190	-0.00537	-25.84**
	(-0.132 - 0.141)	(0.0888 - 0.372)	(-0.240 - 0.0343)	(-0.118 - 0.156)	(-0.139 - 0.128)	(-45.41 - -6.263)
Constant	1.887**	2.282**	1.786**	2.036**	2.060**	211.5**
	(1.748 - 2.027)	(2.138 - 2.427)	(1.645 - 1.927)	(1.896 - 2.176)	(1.924 - 2.197)	(191.3 - 231.7)
	1.887**	2.282**	1.786**	2.036**	2.060**	211.5**
Observations	250	251	250	250	251	252
R-squared	0.144	0.045	0.024	0.018	0.010	0.030

Notes. Confidence interval in parentheses. NCC = Nutrient Content Claim. ** p<0.05, * p<0.001

Table 3: Effect of Nutrient Content Claims and Descriptive Titles on Perceptions of Healthfulness

	(1)
VARIABLES	Health Perception
Product has Protein in the Title	0.486**
	(0.104 - 0.868)
Product makes a NCC	0.171
	(-0.203 - 0.546)
Traffic Light	-0.243
	(-0.551 - 0.0644)
Constant	3.673**
	(3.360 - 3.986)
Observations	248
R-squared	0.038

Notes. Confidence interval in parentheses. NCC = Nutrient Content Claim, ** p<0.05, * p<0.001

Table 4: Effect of Nutrient Content Claims and Descriptive Titles on Perceptions of Healthfulness

	(1)	(2)	(3)	(4)
VARIABLES	Fiber	Iron	Vitamin C	Calcium
Product has Protein in the Title	0.417**	0.318**	0.147	0.0194
	(0.190 - 0.645)	(0.123 - 0.513)	(-0.00962 - 0.305)	(-0.160 - 0.199)
Product makes a NCC	0.190	0.151	0.0658	-0.0788
	(-0.0340 - 0.414)	(-0.0413 - 0.342)	(-0.0888 - 0.220)	(-0.255 - 0.0976)
Traffic Light	0.118	-0.00469	0.0276	-0.0865
	(-0.0646 - 0.301)	(-0.162 - 0.152)	(-0.0988 - 0.154)	(-0.231 - 0.0577)
Constant	1.773**	1.470**	1.246**	1.718**
	(1.586 - 1.960)	(1.309 - 1.630)	(1.117 - 1.375)	(1.571 - 1.865)
Observations	250	250	250	250
R-squared	0.054	0.041	0.014	0.012

Notes. Confidence interval in parentheses. NCC = Nutrient Content Claim. ** $p<0.05$, * $p<0.001$

Table 5: Effect of Perceived Nutrient Levels on Perceptions of Healthfulness

	(1)
VARIABLES	Health Perception
Protein	0.302**
	(0.0558 - 0.548)
Sugar	-0.452**
	(-0.710 - -0.195)
Salt	-0.0517
	(-0.295 - 0.191)
Saturated Fat	-0.0692
	(-0.398 - 0.259)
Total Fat	-0.597**
	(-0.960 - -0.234)
Calories	0.000334
	(-0.00142 - 0.00209)
Fiber	0.319**
	(0.122 - 0.515)
Vitamin C	0.230
	(-0.0702 - 0.531)
Calcium	0.0216
	(-0.235 - 0.278)
Iron	0.0660
	(-0.173 - 0.305)
Constant	4.432**
	(3.377 - 5.487)
Observations	245
R-squared	0.349

References

Chandon, P. (2012). *How Package Design and Packaged-Based Marketing Claims Lead to Overeating* (SSRN Scholarly Paper No. ID 2083618). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=2083618

Chandon, P., & Wansink, B. (2007). *The Biasing Health Halos of Fast Food Restaurant Health Claims: Lower Calorie Estimates and Higher Side-Dish Consumption Intentions* (SSRN Scholarly Paper No. ID 2474843). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=2474843

Choose the Best Bars for a Healthy Snack - Consumer Reports. (2015). Retrieved November 23, 2015, from http://www.consumerreports.org/cro/news/2015/01/how-to-choose-the-best-bars-for-a-healthy-snack/index.htm

Drewnowski, A., Moskowitz, H., Reisner, M., & Krieger, B. (2010). Testing consumer perception of nutrient content claims using conjoint analysis. *Public Health Nutrition*, *13*(5), 688–694. http://doi.org/10.1017/S1368980009993119

Food and Drug Administration. (2015). Labeling & Nutrition - Front-of-Package Labeling Initiative [WebContent]. Retrieved November 23, 2015, from http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm202726.htm

Friestad, M., & Wright, P. (1994). The Persuasion Knowledge Model: How People Cope with Persuasion Attempts. *Journal of Consumer Research*, *21*(1), 1–31.

Harris, J. L., Thompson, J. M., Schwartz, M. B., & Brownell, K. D. (2011). Nutrition-related claims on children's cereals: what do they mean to parents and do they influence willingness to buy? *Public Health Nutrition*, *14*(12), 2207–2212. http://doi.org/10.1017/S1368980011001741

Hawley, K. L., Roberto, C. A., Bragg, M. A., Liu, P. J., Schwartz, M. B., & Brownell, K. D. (2013). The science on front-of-package food labels. *Public Health Nutrition*, *16*(3), 430–439. http://doi.org/10.1017/S1368980012000754

Hersey, J. C., Wohlgenant, K. C., Arsenault, J. E., Kosa, K. M., & Muth, M. K. (2013). Effects of front-of-package and shelf nutrition labeling systems on consumers. *Nutrition Reviews*, *71*(1), 1–14. http://doi.org/10.1111/nure.12000

Lin, C.-T. J. (2008). How Do Consumers Interpret Health Messages on Food Labels? *Nutrition Today*, *43*(6), 267–272. http://doi.org/10.1097/01.NT.0000342701.19798.25

MacVean, M. (2013, October 4). For food on the go, bars are eating up the competition. *Los Angeles Times*. Retrieved from http://articles.latimes.com/2013/oct/04/health/la-he-bars-20131005

Moss, M. (2014, January 28). A Look Inside the Protein Bar. *The New York Times*. Retrieved from http://www.nytimes.com/2014/01/29/dining/protein-bars.html

Nestle, M. (2007). *Food Politics: How the Food Industry Influences Nutrition, and Health, Revised and Expanded Edition* (Revised and Expanded Edition edition). Berkeley: University of California Press.

Nestle, M., & Ludwig, D. S. (2010). Front-of-package food labels: public health or propaganda? *JAMA*, *303*(8), 771–772. http://doi.org/10.1001/jama.2010.179

Roberto, C. A., Bragg, M. A., Seamans, M. J., Mechulan, R. L., Novak, N., & Brownell, K. D. (2012). Evaluation of Consumer Understanding of Different Front-of-Package Nutrition Labels, 2010–2011. *Preventing Chronic Disease, 9*. http://doi.org/10.5888/pcd9.120015

Schofield, H., & Mullainathan, S. (2008). The psychology of nutrition messages. *Advances in Health Economics and Health Services Research*, *19*, 145–172.

Schuldt, J. P., & Pearson, A. R. (2015). Nutrient-centrism and perceived risk of chronic disease. *Journal of Health Psychology*, *20*(6), 899–906. http://doi.org/10.1177/1359105315573446

U.S. Food and Drug Administration. (2015). Guidance for Industry: A Food Labeling Guide [WebContent]. Retrieved November 23, 2015, from http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm2006828.htm

U.S. Government Accountability Office. (2011). *Food labeling. FDA needs to reassess its approach to protecting consumers from false or misleading claims*. Retrieved from http://www.gao.gov/products/GAO-11-102

Wansink, B. (2003). How Do Front and Back Package Labels Influence Beliefs About Health Claims? *Journal of Consumer Affairs*, *37*(2), 305–316. http://doi.org/10.1111/j.1745-6606.2003.tb00455.x

Wansink, B., & Chandon, P. (2006). Can “Low-Fat” Nutrition Labels Lead to Obesity? *Journal of Marketing Research*, *43*(4), 605–617. http://doi.org/10.1509/jmkr.43.4.605

Wartela, E., Lichtenstein, A., & Boon, C. (2010). *Examination of Front-of-Package Nutrition Rating Systems and Symbols: Phase I Report*. Retrieved from http://www.nap.edu/read/12957/chapter/1

Wartella, E., Lichtenstein, A., Yaktine, A., & Nathan, R. (2011). *Front-of-Package Nutrition Rating Systems and Symbols: Promoting Healthier Choices*. Washington, D.C.: National Academies Press. Retrieved from http://www.nap.edu/catalog/13221

Watson, E. (2012, April 4). Line between cereal bars and energy/nutrition bars is blurring, says report. Retrieved March 24, 2016, from http://www.foodnavigator-usa.com/Markets/Line-between-cereal-bars-and-energy-nutrition-bars-is-blurring-says-report