Misleading or Informing? Examining the Effects of Labeling Design on Consumers' Perception of Gluten-Free Products and Wheat Safety

Occurring naturally in grains, gluten is a mixture of proteins that functions as a binding agent and adds to the strength and elasticity of products that are made of wheat, barley, and rye (Biesiekierski, 2017). In August 2013, the United States Food and Drug Administration (FDA) issued a regulation to define the term of "gluten-free" as it relates to food products. According to the definition, food products must contain less than 20 parts per million (ppm) of gluten to be labeled as "gluten-free." This applies to foods that do not naturally contain gluten or are manufactured to be gluten-free (U.S. Food and Drug Administration [FDA], 2017). Between 2011 and 2014, the retail sales of gluten-free food in the U.S. tripled from $464 million to $1.6 billion (Packaged Facts, 2016). Meanwhile, a 2015 Gallup poll determined that 21% of consumers actively include gluten-free foods in their diet, which greatly exceeds the total percentage of people with celiac disease or other gluten-processing disorders (i.e., non-celiac gluten sensitivity and wheat allergies) (Riffkin, 2015; University of Chicago Medicine, 2018; Sapone et al., 2012; Pietzak, 2012).

While gluten-free products have been specially produced for years for celiac disease patients, many consumers choose to follow gluten-free diets mainly for non-medical reasons, such as managing weight or gaining overall health benefits (Moore 2014; Mintel Group, 2015). However, the overall benefit of gluten-free diets has not yet received sufficient support from the medical and scientific communities (Kirkpatrick, 2014). Research has shown that products manufactured to be gluten-free typically contain higher levels of fat and sugar (Kulai & Rashid, 2014; Niland & Cash, 2018). Medical experts have identified nutrient deficiencies in those who follow a gluten-free diet due to a lack of consuming nutrient-rich grains (Wild, Robins, Burley, & Howdle, 2010). In some cases, obesity, weight gain, and insulin resistance have been associated with the adoption of a gluten-free diet (Kabbani et al., 2012).

In addition, the fast-growing market of gluten-free products may have accelerated the decline of wheat industry. Wheat acreage has been decreasing since the 1980s. According to the USDA, declining wheat production is primarily attributable to "lower relative returns for wheat, changes in government programs that give farmers more planting flexibility, and increased competition in global wheat markets" (USDA Economic Research Service, 2019, para. 1). However, since the market of gluten-free products has expanded beyond consumers with medical needs, the U.S. wheat consumption has slightly but steadily decreased since 2013 (USDA Economic Research Service, 2019). Many commodity producers and traders believe that the increasing adoption of gluten-free diets has misled consumers to believe traditional wheat and similar grains are unhealthy and unsafe (Luginsland, 2017).

The various designs of current gluten-free labels may contribute to consumers' misperceptions regarding the functions, source, and potential risks of gluten. According to the FDA, the use of gluten-free labeling is voluntary, and no particular claim or symbol is required to indicate that the food is gluten-free (FDA, 2017). Besides, the FDA does not recommend or accredit any particular third-party gluten-free certification program (FDA, 2017). It is the food manufacturers' responsibility to make sure the product contains 20 ppm or less gluten in order to have it labeled as "gluten-free." As far as the label appearance is concerned, it can become inconsistent and confusing. While some labels are purely text based and contain phrases like "Certified Gluten-Free" or "GF," other labels are more visually stimulating and feature a wheat head or backslash over a wheat image. Such labels, despite serving as useful cues aiding in

consumers' purchasing decisions, may end up exaggerating their concerns over the safety of gluten and wheat products in general.

Considering the potential impact of gluten-free labels on consumers' perception of food products and wheat safety, we manipulated the design of such labels to reflect common labels used for popular food products (e.g., pretzels and potato chips). We intended to understand how the graphic design of gluten-free labels might influence consumers' evaluations of the labels as well as their perceived benefits of labeled products and wheat products in general. The results not only offer insights into the psychological process through which consumers process the front-of-package (FOP) labels as marketing devices, but also inform future practices on food label design and implementation.

Theoretical Framework

To differentiate their products and help consumers identify healthier diets, U.S. food manufacturers have been adding nutritional labels to the front of food packages to supplement the mandated nutrition label on the back. Such FOP labels can catch consumers' attention and motivate them to purchase the labeled product (Ares et al., 2013; Taliti et al., 2017). Research showed that consumers tend to rely on FOP labels as heuristic cues and time-savers to support their purchasing decisions (Ares et al., 2013; Schuldt, 2013; Taliti et al., 2017; Verbeke & Ward, 2006). Nonetheless, previous research also indicated that consumers' trust in FOP labels could be low, especially when potentially misleading information is present (Schuldt, 2013; Skubisz, 2016; Sütterlin & Siegrist, 2015; Taliti et al., 2017). More importantly, FOP labels can lead consumers to overrate a labeled product's healthiness and neglect the complete nutritional information on the back (Schuldt, 2013; Skubisz, 2016; Sütterlin & Siegrist, 2015 Taliti et al., 2017).

Presumably, the effects of such labels on consumers' perception and purchasing tendencies may vary as a function of the term used and graphic design. Verbal and visual cues are both effective cues for equivalency framing, which refers to "a form of framing that involves manipulating the presentation of logically equivalent information" (Cacciatore, Scheufele, & Iyengar, 2015, p.8). Numerous studies have shown logically equivalent words, phrases or graphics can lead to distinct attitudinal or behavioral changes (see Schefuele & Iyengar, 2013 for a review). According to Price et al. (1997), a "framing effect is one in which salient attributes of a message (its organization, selection of content, or thematic structure) render particular thoughts applicable, resulting in their activation and use in evaluations" (p. 486). When it comes to food labeling, such effect is replicable when logically identical terms or visuals are used to trigger different thoughts in consumers' minds.

For example, Sütterlin and Siegrist (2015) compared individuals' perceptions of products labeled to contain "fruit sugar" to identical products labeled with "sugar" as an ingredient (Sütterlin & Siegrist, 2015). Despite indicating identical ingredients with the same nutritional content, the phrase "fruit sugar" convinced people the product was healthier than the one with "sugar" (Sütterlin & Siegrist, 2015). While both descriptions are technically accurate, the phrase "fruit sugar" caused participants to associate the product with fruit, which is widely accepted as healthy food, and overestimated the product's benefits (Sütterlin & Siegrist, 2015).

Skubisz (2016) conducted an experimental study where participants were exposed to a food or beverage product that contained no front-of-package label or one label with the term "natural" (Skubisz, 2016). Contrary to previous research, Skubisz (2016) found consumers had a negative view of products with a "natural" label. The results of this study indicated consumers correlate the term "natural" with fewer calories in a food or beverage product (Skubisz, 2016).

The findings also indicated older participants and those with higher levels of education have more negative views of a "natural" label than younger ones and those with lower levels of education (Skubisz, 2016).

Previous research shows consumers may discredit food labels if they perceive them to be confusing on misleading. For instance, Roe and Teisl (2007) found labels with simple GM claims (e.g., "this product contains genetically modified ingredients") were viewed as more credible than labels with nuanced claims (e.g. "genetically modified to reduce fat"). In the same study, labels with fundamental claims (i.e. "50% less fat or 50% fewer pesticides used") were viewed as highly credible when the label indicated the added benefits were due to genetic modification (Roe & Teisl, 2007). To investigate consumers' perceived credibility of gluten-labels of various designs, we adapted Ganesan's (1994) definition of credibility, which refers to the perceived expertise of the advertiser and the belief that the adviser's "word or written statement can be relied on" (p. 3). In addition, we used Roe and Teisl's (2007) measures to evaluate consumers' perceived credibility of gluten-free label.

As one of the most commonly seen FOP labels on the U.S. market, gluten-free labels are not strictly regulated and can look differently on different products. Currently, there are four independent gluten-free certification organizations in the U.S. Although the FDA does not endorse or recommend any of these programs, such programs certify tens of thousands of products in the country and globally (FDA, 2017). Two out of the four programs, including the Gluten Free Certification Organization and National Sanitation Foundation, use text-only labels, containing terms like "GF," "Gluten-Free" and "Certified." In contrast, the National Celiac Association and the Beyond Celiac Gluten Free Certification Program use graphic designs for their labels that feature a backlash over wheat heads.

Considering the loose regulations on gluten labeling and the various designs of current GF labels on the U.S. market, it is important to examine how the design characteristics of a label (e.g., color theme, graphic, and terminology) may influence consumers' perceived credibility of the label and perceived healthiness of the product. While the established designs are easily acknowledgeable and can serve as a quick point of reference, they may accidentally mislead consumers to believe that wheat or grains are unsafe as it appears to be "banned" on the label. Frequent exposure to such labels may instill an inaccurate and negative perception regarding the safety of wheat in consumers. In contrast, some other labels present a more positive frame by showing a check mark along with the wheat picture or the term "gluten-free." Such labels, compared to the negatively framed ones, may elicit positive perceptions among consumers regarding the safety and healthiness of wheat products.

In addition to the use of wheat picture and check/backlash marks, colors can function as equivalency framing devices and cause changes in attitudes as well. Colors represent societal and symbolic meanings; food companies have used certain colors to market their products (Schuldt, 2013). Two commonly used colors in labeling are green and red as their intrinsic meanings are widely understood and accepted (Elliot, Maier, Binser, Friedman, & Pekrun, 2009; Fetterman, Robinson, Gordon, & Elliot, 2011). In many situations, green symbolizes "go;" however, it has gained new meanings in other contexts (Elliot et al., 2009). For example, in regards to policy or activism, green can further portray concepts like naturalism, environmentalism, and holistic approaches and methods (Elliot et al., 2009). The color green has also come to symbolize health and wholesome ingredients in the case of food and nutrition (Elliot et al., 2009). Just like green holds intrinsic meanings, so does the color red. While red most often symbolizes "stop" or "no," it can also portray aggression, anger, or extreme passion (Fetterman et al., 2011). Not only can

color have an impact on psychological processes, it can also influence decision-making and behavioral intent. Research has found information using a dominantly red scheme can lead to behavior avoidance while green dominated designs can lead to higher levels of engagement and positivity (Fetterman et al., 2011). These findings can be compared to the reactions that participants have when exposed to equivalency framed messages.

Purpose & Objectives

The intent of this study was to evaluate the effects of label design characteristics on consumers' perceived credibility of the label and perceived benefits of the labeled products, as well as their perceptions of wheat safety in general. We also examined how consumers evaluate the quality of labels with different graphic designs. In particular, we were interested in whether the label effects vary for popular food products manufactured to be gluten-free (e.g., pretzels) and foods that do not naturally contain gluten (e.g., potato chips). Answers to the following research questions (RQ) will allow us to provide evidence-based strategies for marketers and communicators to optimize the design and implementation of gluten-free labels.

RQ1: Do positive-framed labels make consumers perceive more benefits associated with the labeled products than negative-framed labels?

RQ2: Do gluten-free labels with images of wheat make consumers more concerned about the healthiness and safety of wheat compared to labels without wheat images?

RQ3: Does the main effect of wheat images on consumers' perceived healthiness and safety of wheat vary for positive- versus negative-framed labels?

RQ4: Do consumers perceive any difference in the credibility of gluten-free labels based on the type of products on which the labels appear?

In order to separate the effects of gluten-free labels from that of potential confounding variables, we included lifestyle profiles, knowledge of gluten, risk and benefit perceptions of gluten, agricultural involvement, as well as demographic variables in the analysis. Previous research shows that one's lifestyle profile (e.g., whether actively seeking a healthy diet) has closely related to his or her food choice and consumption (Kearney et al., 2001). In addition, individuals' knowledge of gluten and perceptions of its benefit and risks may contribute to their interpretation of gluten-free labels (do Nascimento, Fiates, dos Anjos, & Teixeira, 2014; Navarro, 2016). Moreover, for those who are actively involved in agricultural production, their perception of wheat products may be significantly different from that of non-agricultural populations. Demographical factors, including age, gender, education, and socioeconomic status may determine one's reaction to food marketing strategies as well (Skubisz, 2016). With such considerations in mind, we included these constructs as control variables in the analytical models.

Methods

Design and Procedures

This study conducted a 2 (pretzels vs. potato chips) * 2 (positive- vs. negative- frame) * 2 (wheat image vs. no wheat image) experiment to examine the effects of labels on consumers' perceived benefits of labeled products, perceived healthiness of wheat, and evaluation of the shown labels. Because this was a researcher-developed instrument, a panel of experts was invited to determine the face validity of questions, and a pilot test was conducted to establish reliability of the measurement. We recruited 561 participants from the Amazon Mechanical Turk workers' panel, which is an online crowdsourcing site that allows third-party groups to request services from voluntary participants.

Compared to convenience samples of college students or local shoppers, Amazon MTurkers ("Turkers") meet the psychometric standards required for published research and are demographically comparable to the general U.S. population in regards to age, partisan preferences, voting patterns, news interests and education levels (Huff & Tingley, 2015). However, "Turkers" are notably younger, mostly reside in urban areas and lean more toward liberal ideology (Berinsky et al., 2012).

At the beginning of the study, we provided participants a brief description of the research and requested their consent to participate in the study. After agreeing to participate in the study, participants were asked about their perceptions and knowledge of gluten and the crop production industry, as well as other descriptive measures. Following the completion of these questions, participants were randomly assigned to one of the ten treatment groups. After viewing the stimuli, participants were asked about their perceptions of the product and gluten-free labels they were shown, as well as their perceived safety of wheat. Finally, we asked questions to determine the demographic makeup of the participant pool. The average completion time was 6.6 minutes. Upon completion of this instrument, participants received $2.00 as compensation.

Stimuli

To avoid any brand bias or preference, we created two mock products as stimuli (see *Figure 1* and *Figure 2*). Pretzels were chosen because of the wheat flour that is traditionally used to make baked goods; however, they can be manufactured to be gluten-free by using non-wheat based flour. Potato chips were selected because they are a comparable snack food that is naturally gluten-free, and many potato chip bags are marketed with gluten-free labels. The packages used consistent fonts, colors, and layouts to rule out potential founding effects introduced by other design components.

Figure 1.
Pretzel Product

Figure 2.
Potato Chip Product

In addition, we created and added four different labels (i.e. two positive-framed and two negative-framed labels) to the food packages to evaluate the effects of label framing and wheat images. These labels were designed using images (e.g., images of wheat) as peripheral cues, as well as a manipulation of the stoplight system (e.g., colors of the labels and backslashes or check marks) to test the effects of different frames. The positive-framed labels were primarily designed featuring different shades of green and a check mark, and the negative-framed labels were created using red and a backslash over the visual. All labels contained the text "Certified Gluten-Free" around the wheat head or the gluten text.

One positive-framed label featured a wheat head (see *Figure 3*), and the other one featured a check mark and the text "gluten" (see *Figure 4*). Similarly, one negative-framed label featured a backslash over the wheat (see *Figure 5*) and the other one featured a backslash over the text "gluten" (see *Figure 6*). All labels were also shown on the potato chips. Two products without labels served as controls. Overall, there were ten treatment groups.

*Figure 3.*Positive-framed label with wheat image

Figure 4. Positive-framed label with gluten text

Figure 5. Negative-framed label with wheat image

Figure 6. Negative-framed label with gluten text

Dependent Variables

Perceived benefits of the labeled products. After viewing the stimuli, participants were asked a series of questions to determine their perceptions of the healthiness and safety of the product they viewed. Participants who saw potato chips were asked about the healthiness and safety of potatoes while participants within pretzel treatment groups were asked about the healthiness and safety of flour. On a five-point scale (1 = "strongly disagree," 5 = "strongly agree"), participants reported their level of agreement or disagreement with four statements: "The (potatoes/flour) used in these (potato chips/pretzels) are safe/healthy/nutritious/unhealthy (reversely coded)." The mean value of these items was used as an index to measure this concept (Cronbach's alpha = .68, M = 3.49, SD = .73).

Perceived healthiness and safety of wheat. Following the product specific question, all participants indicated their agreement on four statements using a five-point scale (1 = "strongly disagree," 5 = "strongly agree"). Statements included "Food products containing wheat are

healthy/nutritious/safe/unhealthy (reversely coded)." This construct yielded a mean of 3.64 (Cronbach's alpha = .67, *SD* = 0.69).

Perceived credibility of gluten-free labels. Participants who were not in a control group were asked about their agreement on four statements regarding the viewed labels (1 = "strongly disagree," 5 = "strongly agree"). The statements included "The label is informative/misleading (reversely coded)/well designed/credible." The mean score was used as an index to measure this construct (Cronbach's alpha = .57, *M* = 3.71, *SD* = 0.88).

Control Variables

Lifestyle profile. Participants were asked to rate their level of engagement (1 = "hardly ever," 5 = "most of the time") for each of the following statements: "I choose a diet low in fat, saturated far, and cholesterol," "I limit the use of sugars and foods containing sugar (sweets)," "I read labels to identify nutrients, fats, and sodium content in packaged food," "I try to keep the amount of fat I eat to a healthy level." Following these statements, participants were asked to rate their level of agreement or disagreement (1 = "strongly disagree," 5 = "strongly agree") with the following statement: "I do not need to make any changes to my diet, as it is healthy enough (reversely coded)." This scale was adapted from the original measures used by Kearney et al. (2001). The mean score of the lifestyle profile yielded a result of 3.38 (Cronbach's alpha = .84, *SD* = .90).

Gluten knowledge. Ten true or false questions were asked to evaluate participants' knowledge of gluten. Sample statements included "Gluten is a mixture of naturally occurring proteins;" "Gluten is a cereal grain similar to wheat, barley, and rye;" "Gluten is manufactured;" "Gluten is a GMO (genetically modified organism);" "All organic foods are gluten-free." Correct responses were coded as 1 and incorrect answers, including "don't know," were coded as 0. The sum of these items was used to measure participants' overall gluten knowledge on a scale of zero to 10. The largest proportion of participants (*n* = 76) answered seven questions correctly, while the least amount of participants (*n* = 20) did not answer any of the questions correctly. Over half of the participants correctly answered five or more questions. Reliability for this measure was calculated as *a* = .72.

Risk perception of gluten. We asked participants to indicate their agreement with the following statements on a five-point scale (1 = "strongly disagree," 5 = "strongly agree") to determine their perception of risks associated with gluten. Statements included "Food products with gluten can present health risks," "Eating products with gluten can increase the likelihood of developing celiac disease/developing a gluten intolerance/ developing food allergies (reversely coded)." The mean value of these items was used as an index to measure risk perception of gluten (Cronbach's alpha = .88, *M* = 2.91, *SD* = 1.04).

Benefit perception of gluten. Similarly, we asked participants to indicate their agreement with the following statements on a five-point scale (1 = "strongly disagree," 5 = "strongly agree") to determine their perception of benefits associated with gluten. Statements included "Gluten-free products are more nutritious/make me healthier/are safer." The mean value of these items was used as an index to measure benefit perception of gluten (Cronbach's alpha = .90, *M* = 2.97, *SD* = 1.12). Noticeably, previous research has suggested that risk and benefit perceptions are conceptually distinct and should be measured using multiple-item indexes that allow for meaningful translations of the results (Binder, Cacciatore, Scheufele, Shaw, & Corley, 2011). Hence, we chose to use separate measures to examine the effects of risk/benefit perceptions on the attitudinal outcomes.

Agricultural involvement. To determine participants' level of involvement in production agriculture, we asked them to rate their level of agreement or disagreement with six items on a five-point scale (1 = "strongly disagree," 5 = "strongly agree"). Sample statements included "I am involved in production agriculture," "I am emotionally connected to the agriculture industry," "I strongly identify with the agriculture industry," "I trust the crop production industry." This scale was adapted from Tarpley et al. (2017). The mean score of this construct was 2.77 (Cronbach's alpha = .80, *SD* = 0.87).

Demographics and political ideology. In addition, we measured age, gender, education, income, and political ideology as control variables. Among the 561 participants, 62.4% (*n* = 350) were male, and 35.7% (*n* = 200) were female. The majority of participants, 43.7% (*n* = 245) were in the 20 to 29 age range. Another 39.2% (*n* = 220) of participants were in the 30 to 39 age range. In regards to education, 47.8% (*n* = 268) reported their highest level of education to be a bachelor's degree. Another 15.5% (*n* = 87) of participants stated they had attended college, but had not earned a degree. In terms of income, 29.1% (*n* = 163) of participants reported their income to be within $30,000-$49,000 income range. Another 27.3% (*n* = 153) of the participants indicated their income to be within the $50,000-$79,000 range. A total of 47.1% (*n* = 264) identified their party affiliation to be Democrat. Another 22.1% (*n* = 124) of participants reported they belonged to the Republican Party. The remaining 27.5% (*n* = 154) of participants stated that they are Independents.

Data Analysis

To examine the impacts of gluten-free labels on consumers' perceptions and attitudes, we ran a series of Analysis of Covariance (ANCOVA) to determine the main effects of treatment groups on three dependent variables, including perceived benefits of labeled products, perceived healthiness and safety of wheat, and perceived credibility of the shown labels. To separate the main effect of treatment groups from other potential confounding impacts introduced by demographic and other factors, we included a number of covariates, including the lifestyle profile, gluten knowledge, risk/benefit perceptions of gluten, agricultural involvement, and demographic measures (i.e., age, gender, education, income, and political ideology). Including those control variables in the model will help ensure the significant effects of treatment (if there is any) cannot be attributed to potentially uneven distribution of participants.

Results

Perceived Benefits of Labeled Products

RQ1 asked whether the positive-framed labels would lead consumers to perceive more benefits of the labeled products than negative-framed ones. ANCOVA results (see Table 1) showed that the mean difference among groups is significant ($F = 2.3$, $p = .015$). However, post-hoc comparisons showed that the difference does not exist between groups viewing positive-framed labels versus those viewing negative-framed ones (see Figure 7). In other words, participants did not associate more benefits with the labeled products when they viewed a positive-framed label than when they saw a negative-framed one.

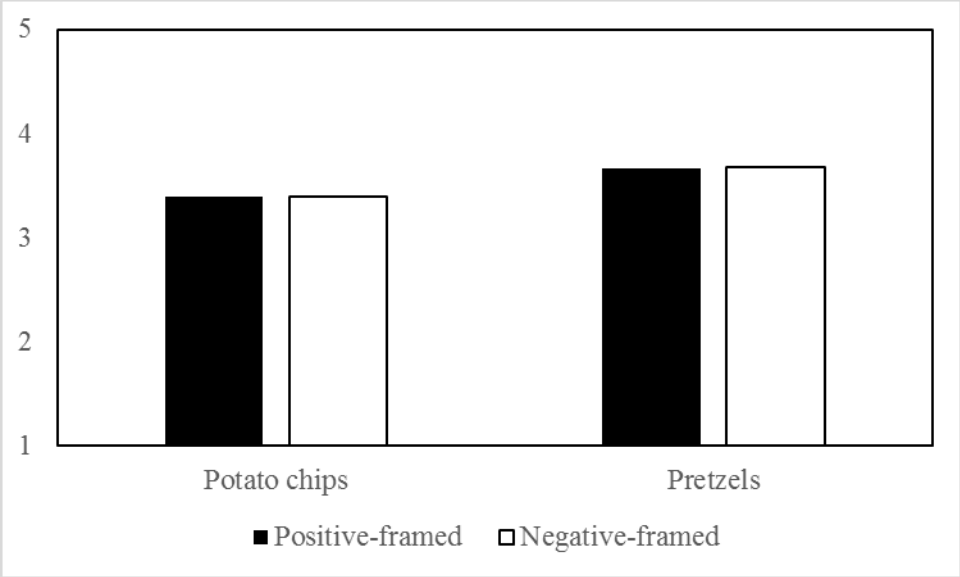
Surprisingly, a comparison across all groups showed that participants who viewed gluten-free pretzels without wheat images on the labels were more likely to perceive the product to be beneficial, compared to those who viewed the same product with no label ($t = 2.392$, $p = .018$). An analysis of covariates showed benefit perception of gluten is positively related to the perceived benefits of labeled products (b = .108, p = .017), indicating people who thought gluten is healthy were more likely to think the shown products are healthy.

Table 1.
ANCOVA Results for Perceived Benefits of Labeled Products

Predictor	Sum of Squares	*df*	*F*	*p*	Partial Eta Square
Treatment group	10.645	9	2.301	.015*	.038
Lifestyle profile	.007	1	.013	.909	.00
Risk perception of gluten	1.148	1	2.233	.136	.004
Benefit perception of gluten	2.939	1	5.718	.017*	.011
Gluten knowledge	.213	1	.415	.520	.001
Age	.741	1	1.441	.230	.003
Gender	1.490	1	2.900	.089	.006
Education	.338	1	.657	.418	.001
Income	.005	1	.011	.918	.000
Political ideology	.526	1	1.023	.312	.002

Note: $*p < .05$.

Figure 7
Combined Group Mean of Perceived Benefits of Labeled Products



Perceived Healthiness and Safety of Wheat

RQ2 questioned if an inclusion of wheat images on gluten-free labels would increase consumers' concerns of the healthiness and safety of wheat in general. Again, ANCOVA results (see Table 2) showed that the overall mean difference among groups was significant ($F = 2.126$, $p = .026$); however the difference did not exist between groups who had seen wheat-imaged labels and those who had seen non-wheat labels (see Figure 8). RQ3 asked if the main effect of wheat

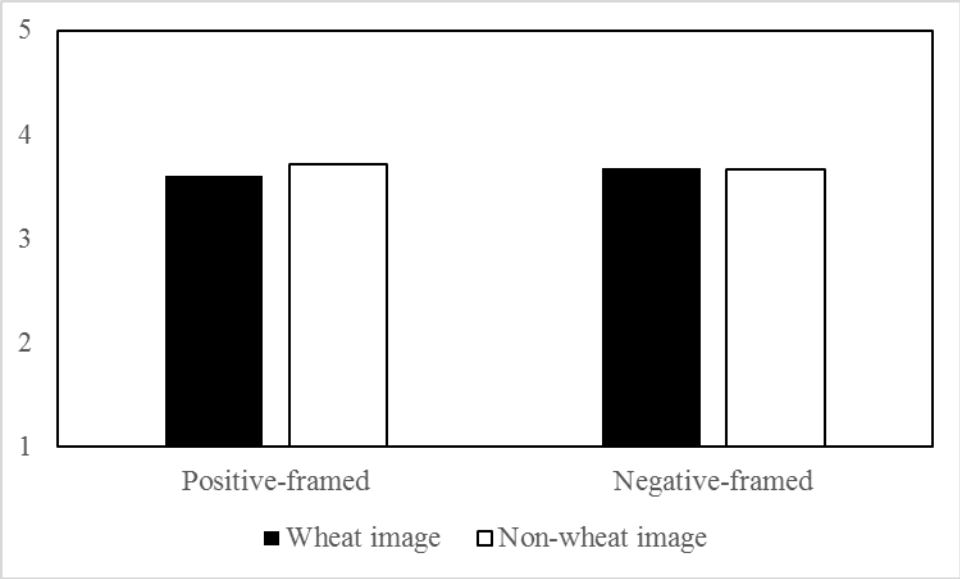
image on wheat perceptions (if there were any) would vary for negative- and positive-framed labels. We did not find any evidence to support this hypothesis.

Table 2.
ANCOVA Results for Perceived Healthiness and Safety of Wheat

Predictor	Sum of Squares	*df*	*F*	*p*	Partial Eta Square
Treatment group	8.641	9	2.126	.026*	.035
Risk perception of gluten	2.394	1	5.3	.022*	.010
Benefit perception of gluten	.142	1	.314	.576	.001
Gluten knowledge	.942	1	2.085	.149	.004
Agricultural involvement	1.342	1	2.972	.085	.006
Age	2.689	1	5.952	.015*	.011
Gender	.573	1	1.268	.261	.002
Education	.070	1	.156	.693	.000
Income	2.253	1	4.987	.026*	.009
Political ideology	.833	1	1.844	.175	.004

Note: $*p < .05$.

Figure 8.
Combined Group Means for Perceived Healthiness and Safety of Wheat



Interestingly, while no significant difference was found among participants who received the same product, a significant difference existed between people who had viewed pretzels with non-wheat labels and those who had viewed potato chips without any label (t = 2.672, p = .009). An analysis of covariates showed that risk perception of gluten is negatively related to perceived healthiness and safety of wheat (b = -.100, p = .024). In addition, older participants tended to

hold more positive perceptions toward wheat (b = .084, p = .017). Participants with higher level of income also tended to perceive the wheat to be more beneficial (b = .051, p = .027).

Perceived Credibility of Gluten-Free Labels

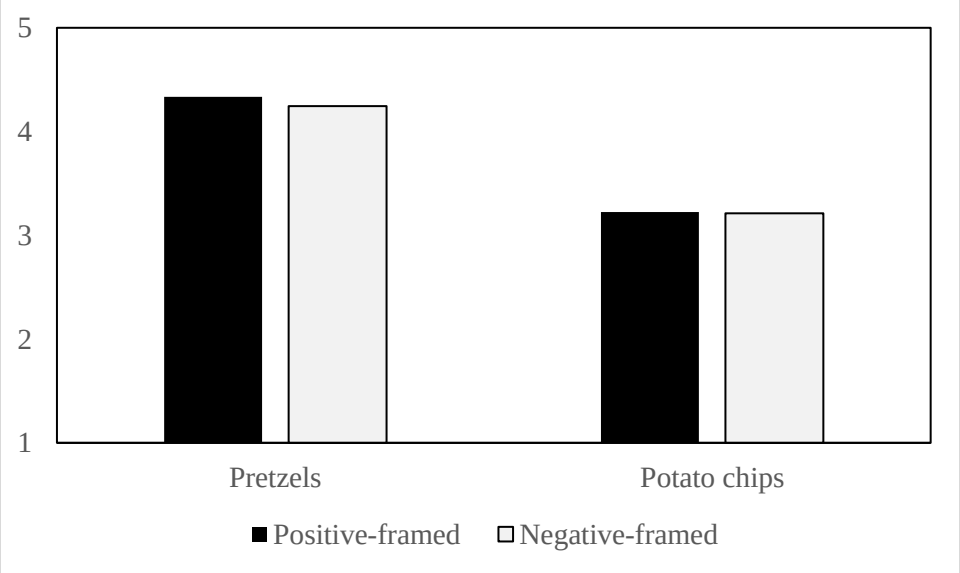
RQ4 asked if consumers perceived any difference in credibility and necessity of gluten-free labels based on the type of product on which they appeared. ANCOVA and post-hoc comparison results (see Table 3) showed that the product type was significant in determining participants' perceived credibility and necessity of gluten-free labels. Participants were more likely to perceive a gluten-free label as credible and necessary when it appeared on a package of gluten-free pretzels compared to potato chip products. The control groups for each product type were not included in this measure.

Table 3.
ANCOVA Results for Perceived Credibility of Gluten-Free Labels

Predictor	Sum of Squares	*df*	*F*	*p*	Partial Eta Square
Treatment group	102.036	7	48.547	.000***	.454
Lifestyle profile	3.187	1	10.615	.001***	.025
Risk perception of gluten	7.238	1	24.105	.000***	.056
Benefit perception of gluten	5.575	1	18.569	.000***	.044
Age	1.029	1	3.427	.065	.008
Gender	.359	1	1.195	.275	.003
Education	3.699	1	12.32	.000***	.029
Income	.999	1	3.326	.069	.008
Political ideology	.057	1	.191	.663	.000

Note: ***p < .01.

Figure 9.
Combined Group Means for Perceived Credibility of Gluten-Free Labels



The lifestyle profile reported a positive correlation (b = .112, p = .001). Participants who were more health conscious viewed gluten-free labels as more credible compared to participants who were less concerned with their health. Those who viewed gluten as more risky perceived gluten-free labels to be more credible for food products (b = .193, p = .001). Participants who perceived gluten to be beneficial also showed higher levels of perceived label credibility (b = .163, p = .001). Finally, Participants who reported higher levels of education were more likely to view gluten-free labels as credible (b = .063, p = .001).

Discussion

This study determined how consumers rely on the graphic design of food labels as peripheral cues to evaluate the label itself and the labeled products. Based on the findings, while food type does determine consumers' perceived healthiness and safety of the product in the first place, the appearance of gluten-free labels further differentiates their perceptions. For instance, participants viewed traditional pretzels as similar to potato chips in terms of healthiness and safety; however, when participants saw the same pretzel product featuring a gluten-free label without a wheat image, they perceived it to be significantly healthier than the traditional pretzel. Yet, such effects were not replicated when wheat images were included in the label. In other words, when gluten-free labels without potentially misleading information (such as wheat image) are present, consumers tend to rely on such labels to increase their perceived benefits of the product. Interestingly, when gluten-free labels appeared on naturally gluten-free products (e.g., potato chips), participants tend to ignore such cues and did not vary their perceptions when seeing different types of labels.

In addition, the graphic design of gluten-free labels appeared to influence consumers' perceptions of the healthiness and safety of wheat products to a modest degree. In particular, when being asked to judge the safety of wheat products in general, participants reported the highest level of confidence in the healthiness of wheat when seeing gluten-free labels without wheat images on a bag of pretzels. However, pairwise comparisons showed that the difference is not significant between groups seeing labels with wheat images and those seeing labels without wheat images. Notably, participants in the gluten-free pretzel treatments showed significantly higher levels of concern about the healthiness and safety of wheat compared to those in the potato chip treatment groups. These findings could imply that labels on products manufactured to be gluten-free may cause more concern regarding wheat safety than gluten-free labels on naturally gluten-free products.

Finally, we were interested in whether the graphic design of food labels would shape consumers' perceived credibility of gluten-free labels. First, product type appeared to be the strongest predictor of one's credibility perception of a gluten-free label. Participants who viewed gluten-free labels appearing on pretzels were significantly more likely to believe the labels are credible than those who saw such labels appearing on potato chips. Presumably, by indicating lower levels of credibility and necessity for gluten-free labels on potato chip packages, participants exhibited awareness of the difference between products that are naturally gluten-free and those manufactured to be gluten-free.

Overall, gluten-free labels are shown to influence consumers' perceptions positively only when such labels do not contain potentially misleading information and are placed on the products manufactured to be gluten-free. In order to avoid misconceptions and confusion, we recommend food manufacturers and retailers identifying whether the labeled product is naturally gluten-free or manufactured to be gluten-free in addition to using a FOP gluten-free label. This differentiation would allow consumers to build their knowledge of gluten and evaluate the safety

of the labeled products accurately. In addition, such information may boost consumers' confidence and trust in gluten-free labels and certification programs.

More importantly, while the graphic design of gluten-free labels does not make much of a difference in changing individuals' evaluations of such labels and the labeled products, we caution against the use of potentially misleading information, such as a wheat image, on the food label. The use of wheat image, while serving as a cue indicating the source of gluten, could undermine consumers' perceived benefits and healthiness of the labeled products. Additionally, gluten-free labels with images of wheat can have negative impacts on consumers' perceptions of the wheat and agricultural industries. To mitigate these effects, we recommend food companies using text, color, or symbols to identify a product as gluten-free, rather than wheat images, as such information may lead consumers to misinterpret the label's meaning and draw unfounded conclusions about wheat or gluten based on the design.

Although the positive versus negative framed labels did not vary in their effects on consumers, we recommend further studies exploring the implications of other design factors, such as symbols, acronyms, and terms. As more and more experts and consumer groups have called for improved regulations on food labeling, it would be critical to examine how design factors may influence consumers' interpretations and perceptions. Similar studies should also include gluten-free labels that are more consistent with current gluten-free labels seen on food packages.

Studies should evaluate the effects of other "free-from" labels commonly placed on food products that are made to be without controversial additives and supplements (i.e. antibiotic-free and GMO-free). Furthermore, cognitive pathway research could provide insights into the ways in which consumers evaluate and interpret gluten-free labels. Studies using Petty and Cacioppo's (1986) Elaboration Likelihood Model or Chaiken's (1987) Heuristic Processing Model could be used to determine which cognitive pathways consumers utilize to process food and nutrition labels and gather content relevant for their food and health information. Further research endeavors should also be done to determine motivations for purchasing gluten-free products. By further establishing motivations to purchase gluten-free products, future communication messages can be better developed to be more effective and permanent.

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