Consumer Use of Nutrition Labels: An Examination of Label Effectiveness

& Dual-Process Theories

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Introduction

Greater adherence to a healthy diet and understanding the link between food and obesity may minimize the impact of diet-related health problems and diseases, which have skyrocketed over the last few decades. As processed food and difficulties assessing the healthfulness of food products became increasingly prevalent in the 1990s, legislative changes and efforts to raise awareness around the importance of food labeling was necessary (Dumoitier, Abbo, Neuhofer, & McFadden, 2019). In 1990, ingredient and health claim labels were nothing new; as of The Federal Cigarette Labeling and Advertising Act of 1966, health warning labels have appeared on cigarette packages to inform the public about the hazardous risks of smoking (U.S. Food & Drug Administration, 2021). Since 1966, the Food and Drug Administration (FDA) has issued several reforms to strengthen health warning labels on cigarette packages. To effectively present the negative health consequences of smoking, the FDA’s most recent proposal requires realistic pictorial warning labels with both color visuals and textual warning claims on all packages and advertisements (Brennan, Maloney, Ophir, & Cappella, 2017). Just as cigarette labels aim to inform consumers about health risks and discourage tobacco consumption, nutrition labels take a similar approach intended to help consumers make healthy choices by communicating key information on nutrients, calories, serving size, and percent daily values (Cowburn & Stockley, 2005).

Salient nutrition information as well as motivation to pursue a nutritious diet are two important aspects of making an informed food purchase. Nutrition labeling allows consumers to compare nutrient profiles across different products and select products that are low in sugar, sodium, and fats– which in turn, can positively impact diet quality and minimize the risk of diet-related diseases (Cowburn & Stockley, 2005). To support and enforce these goals, the FDA
implemented the Nutrition Labeling and Education Act (NLEA) in 1990; this legislation mandated a standard nutrition facts label (NFL) on the back of most packaged foods, often supplemented by voluntary information on the front (Dumoitier et al., 2019). In 2016, the FDA proposed several revisions to the NFL in response to growing concern surrounding diet-induced health conditions. Shown in Figure 1, the changes to the NFL included increasing font size, bolding elements such as ‘calories’ and ‘serving size,’ and differentiating between total and added sugars (Dumoitier et al., 2019).

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**Figure 1:** Changes to the NFL in 2016 (CDC, 2021)

While the NLEA is a U.S. regulation, many other regions including Australia, Canada, New Zealand, and more recently, the European Union, have all enforced mandatory nutrition
labeling under their own systems and guidelines. Nutrition labels are meant to serve consumers and ease the stress or confusion around purchasing healthy foods. Thus, these labels must find the right balance between including information that reflects advances in science and nutrition as well as changes in consumer lifestyle and behavior (Boon, Lichtenstein, & Wartella, 2010). However, this is a difficult feat, and many studies have indicated that clutter, information overload, and certain food attributes on labels can overwhelm or over-inform consumers—ultimately resulting in underutilization (Drichoutis, Lazaridis, & Nayga, 2006).

To increase nutrition label use and attract consumers’ attention, policymakers and food manufacturers have examined simpler labeling approaches, specifically front-of-pack (FOP) labels, which display a concise, summarized version of the NFL on the front (Boon et al., 2010). FOP labels are prevalent worldwide and exist in varying formats, including Australia’s Health Star Rating (HSR), The Netherlands Healthy Choices Logo, France’s NutriScore, the U.S’s Hannaford Guiding Stars, and most commonly, Guideline Daily Amounts (GDA) and traffic-light labels (Dumoitier et al., 2019). The FOP labels in Figures 2-5 utilize clear, concise combinations of numbers, words, symbols, and colors to highlight nutritional information.

**Figure 2:** Australia’s HSR (Carrad, Louie, Yeatman, Dunford, Neal, & Flood, 2016)

![Australia's Health Star Rating](image)

**Figure 3:** Health Choices Logo (Dumoitier et al., 2019)

![Health Choices Logo](image)

**Figure 4:** Traffic-light (Muller & Ruffieux, 2020)

![Traffic-light](image)

**Figure 5:** NutriScore (Ma & Zhuang, 2020)

![NutriScore](image)
Because FOP labels aim to quickly attract consumer attention and provide relevant information without too much clutter, this labeling system has generated increased interest regarding consumer behavior (Bialkova, Grunert, & van Trijp, 2013). There is a substantial amount of literature examining what labels are the most effective in attracting and holding consumer attention, as well as the dynamic interactions between consumer characteristics, stimuli, and situational factors (Moorman, 1990). To answer some of these questions, it is necessary to explore consumers' processing strategies, specifically how motivation for processing is dependent on perceived personal relevance between the consumer and the message or information presented.

Understanding nutrition information is critical for all consumers, but especially for adolescents and young adults; establishing healthy eating habits and health literacy abilities at a young age can have a huge impact on health awareness and outcomes later in life (Conklin, Cranage, & Lambert, 2005). Still, regardless of age, it is important to promote nutrition education and label use by motivating consumers to pay close attention to ingredients and nutrient profiles (Rasberry, Chaney, Housman, Misra, & Miller, 2007). Thus, policymakers are tasked with a challenge: what is the most effective FOP label, and how can it convey fundamental nutrition information without overwhelming or confusing consumers? While it is difficult for a singular label design to meet the cognitive capacity, needs, and preferences of all consumers, this review aims to examine the connection between the determinants of nutrition label use and cognitive processing strategies in response to messages or label claims that increase or decrease perceived personal relevance and involvement. The first part of this paper will discuss consumer confusion around nutrition labels and how FOP labeling tactics may combat confusion. Through a close analysis of dual-process theories of persuasion—Petty and
Cacioppo’s Elaboration Likelihood Model (1986) and Chaiken’s Heuristic Systematic Model (1980)—the second half of the paper will highlight how cognitive processing strategies influence consumer utilization of nutrition information.

**Consumer Confusion**

Before exploring the underlying causes and processes consumers engage in when purchasing foods, it is necessary to address the food attributes and labels that are increasingly common in grocery stores and why they may cause confusion. As much as the FDA and manufacturers would like to assume all consumers have the same understanding when it comes to reading food labels, that is not the case. Certain green label claims or attributes especially ‘organic,’ ‘non-GMO,’ and ‘all-natural’ have been found to be confusing to consumers (Amos Pentina, Hawkins, & Davis, 2014). Although these specific attributes might evoke positive feelings of health and food safety, they are often met with skepticism and open to interpretation, as they are not always clearly defined or regulated by governing bodies (Amos et al., 2014). There is also evidence that consumers lump many of these label claims together and have difficulty differentiating between their meanings and implications (Rahman, Zasadzinski, Zhu, Edirisinghe, & Burton-Freeman, 2020). Several studies indicate that consumers often believe ‘organic’ and ‘natural’ have similar meanings, despite having different federal regulatory standards (Kuchler, Bowman, Sweitzer, & Greene, 2020). By examining Google trends and retail scanner data, Kuchler and colleagues (2020) found that web searches for both organic and natural products strongly correlated with purchases of organic food, implying that consumers are not aware of the differences in the two claims and view them as related or identical. Rather than communicating healthiness and credibility, the inclusion of multiple different food attributes on a product might instead overwhelm and confuse consumers, especially if food manufacturers use
misleading phrases to make less nutritious products seem healthier (Amos et al., 2014). Thus, it is no surprise that consumers express skepticism or may be easily persuaded by salient food claims and attributes without really knowing what they mean.

Most food quality attributes are also accompanied by the standard NFL on the back of the package (BOP). According to the FDA, the NFL is required to list serving size, servings per package, fats (total, trans, and saturated), calories, cholesterol, sodium, total carbohydrates, total sugars, dietary fiber, protein, and micronutrients (i.e. vitamin D, iron, potassium, and minerals) (Dumoitier et al., 2019). Detailed nutrition and ingredient information is undoubtedly a great way for manufacturers to assist consumers in making healthy decisions, but effectively presenting this plethora of information on one package is difficult; research across the U.S., Europe, Australia, and New Zealand highlights that many consumers view BOP labels confusing, primarily due to information overload, complex numerics and terminology, and inconsistency in label regulations (Feunekes, Gortemaker, Willems, Lion, & Van Den Kommer, 2008).

The Benefits of Front-of-Pack Labels

To combat confusion and increase attention, manufacturers and policymakers have continued to develop and redesign nutrition labels that will successfully educate and encourage consumers to select healthier products. The FOP label is a promising solution that condenses information from the NFL into a simple format by emphasizing bold text, colors, graphics, and whole numbers. These labels focus on conveying key nutrition information such as calories, saturated fat, sodium, and sugars, and are useful when comparing products at a glance (Dumoitier et al., 2019). Numerous studies have indicated that color-coded FOP labels—compared to numeric-based or monochrome labels—are the most effective in attracting consumer
attention, reducing confusion, and influencing purchasing decisions (Muller & Ruffieux, 2020). In addition to color-coded labels, studies show that presenting nutrition information symbolically through star ratings, such as the Hannaford Guiding Stars program or Australia’s HSR, may help consumers better differentiate between non-nutritious and nutritious foods (Lundeberg, Graham, & Mohr, 2018).

Globally, the traffic-light color-coded system is central to ongoing research and policy, and has been widely suggested as a better alternative to the traditional GDA label (Zhang, Liu, Gu, Wang, & Chen, 2020). Traffic-light labels indicate the levels of four key nutrients that are prevalent in processed foods (fat, sugar, saturates, and salt); red represents a high level, amber a medium level, and green a low level of each nutrient. Using colors as the main indicator or healthiness allows consumers to quickly assess a product’s nutrient summary (Lundeberg et al., 2018). Cecchini and Warin (2016) concluded that traffic light schemes are significantly effective in changing consumers’ behavior by increasing the selection of healthy products and reducing calorie intake and choice. Similarly, using fMRI techniques, Zhang et al. (2020) found that, compared with the GDA label, red traffic-light labels enhanced the activity of the inhibitory frontal lobe regions, which are associated with salient information monitoring—thus reducing unhealthy food-related decision-making. In order to make healthier choices, consumers must be able to identify and differentiate between healthy and unhealthy products, and visually-salient labels seem to effectively facilitate this.

While traffic-light labels may provide meaningful advantages, it is important that manufacturers develop FOP labels that collectively optimize package design and layout in terms of information proximity and density. Research by Bialkova and colleagues (2013) indicates that additional design elements on a food package that increase information density are associated
with longer reaction times and less accuracy during visual search tasks. Additionally, several studies suggest that simpler FOP labels have a greater impact on usage intention than complex labels (Feunekes et al., 2008). To examine how consumers respond to different FOP label designs and formats, eye-tracking is a popular method that measures attention allocation and gaze. In real-world shopping situations where time pressure and distraction are frequent, a label’s ability to attract and hold consumers' attention is critical (Bialkova, Grunert, Juhl, Wąsowicz-Kiryło, Styśko-Kunkowska, & van Trijp, 2014). Some label formats, especially ones with high numeric content, require more attention to process the label information depending on visual saliency and clutter. Findings suggest that products with color-coded labels are most effective in capturing attention and optimal amounts of fixation (Ma & Zhuang, 2020). Generally, motivation and product design have the largest impact on attention and gaze duration, as consumers with health-based motivations usually attend to nutrition information more than those with taste motivations (Visschers, Hess, & Siegrist, 2010).

A FOP label that concisely communicates the healthiness of a product and does not require extensive cognitive effort should encourage and facilitate healthier purchasing decisions (Feunekes et al., 2008). Although most consumers express support for simple FOP nutrition labels, such as the traffic-light system, there are individual differences when it comes to preferred level of information and detail—what is most effective for one group of consumers may not align with the motivations, abilities, and preferences of others. Thus, the next section will synthesize findings about the profile of consumers most likely to use labels by examining key individual and situational factors.

**Determinants of Label Use**
FOP labels are generally considered an effective and efficient nutrition labeling strategy. Yet, just because FOP labels are visually-salient and require less time to process, not all consumers utilize them or BOP labels for that matter. In fact, research shows that only 50-60% of consumers actually read labels on packaged food when buying a product for the first time (Dumoitier et al., 2019). To address this disparity, it is necessary to explore several categories: individual characteristics; nutrition knowledge; and situational, behavioral, and attitudinal factors (Drichoutis et al., 2006). Understanding the interactions between consumer characteristics and stimulus characteristics that impact utilization of nutrition labels can help explain differences in individual information processing strategies, decision-making accuracy, and purchasing behavior (Moorman, 1990).

Consumer characteristics including age, gender, and education have been investigated in depth. Older adults tend to perceive labels as less understandable, as aging may heighten consumers' perceptions of their abilities but also worsen their comprehension (Moorman, 1990). Research by Byrd-Brenner (2000) indicates that a majority of college-aged women read nutrition labels when purchasing a product for the first time. When looking at gender, women traditionally bear most of the responsibility for food purchasing; they play a large role in educating children about health, nutrition, and diet, and are more likely to use nutrition labels than men (Byrd-Bredbenner, 2000). Women also express stronger health attitudes compared to men, and feel more certain that diet impacts health (Rasberry et al., 2007). These findings translate to education as well, as greater educational attainment is positively correlated with nutrition label use and higher levels of information search and processing (Drichoutis et al., 2006).

Aside from demographic factors, level of nutrition knowledge and nutrition education is one of the most important underlying predictors of nutrition information usage. Understanding
CONSUMER USE OF NUTRITION LABELS

food labels, whether FOP or BOP, requires some degree of health literacy: the ability to obtain, understand, and process health-related information to make appropriate, informed decisions (Persoskie, Hennessey, & Nelson, 2017). Interpreting serving sizes and percent daily values are vital, but potentially challenging, parts of nutrition labels. Using labels effectively requires being able to read and perform basic math, as well as the ability to reason with numbers and words (Byrd-Bredbenner, 2000). Unfortunately, more than one-third of the U.S. population significantly lacks sufficient health literacy and numeracy skills, and mandated nutrition labels have been criticized for being too complicated for certain groups of consumers to use (Persoskie et al., 2017). For these individuals, nutrition labels may be ineffective, resulting in poor food decisions and adverse health outcomes. On the other hand, consumers who can accurately interpret food claims and percentages demonstrate higher nutritional literacy which is associated with better health outcomes. Eye-tracking studies have been used to reveal individual differences in nutrition literacy and label comprehension based on eye-movement patterns and gaze duration (Ma & Zhuang, 2020). Shorter gaze duration and rapid eye-movement are correlated with lower levels of health literacy (Ma & Zhuang, 2020). Several studies also measure participants’ quantitative literacy using health literacy screening tools, such as the Newest Vital Sign (NVS). The NVS asks questions such as “If you eat the entire container, how many calories will you eat,” and “If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat 1 serving?” (Persoskie et al., 2017). Implementing the NVS, Persoskie and colleagues (2017) found that for U.S. adults, ability to interpret nutritional information was poor, especially for those with low educational attainment. Also, higher scores on label comprehension tasks were associated with consuming more healthy food and less sugar-sweetened soda. In terms of age, older adults are susceptible to low health literacy, primarily due to sensory and
cognitive deficiencies later in life which may contribute to challenges in understanding and using nutrition labels (Kessler & Wunderlich, 1999). Contrastingly, a majority of young adults, especially women, can successfully manipulate information on a label and perform basic diet-related computations in response to questions such as “How many servings of this food would you need to eat to get all the calcium you need in a day?” (Byrd-Bredbenner, 2000). Closely aligned with the idea that women utilize nutrition labels to a greater extent, there is consistent research that young women are able to skillfully locate and retrieve NFL information. Nutrition labels are densely packed with information and require basic numeric and literacy skills that some consumers struggle with. Therefore, educating individuals of all ages on how to interpret food labels through interventions and training programs is incredibly important to shape new habits and encourage healthy food decisions. In fact, receiving nutrition education from a healthcare professional, such as a nurse, doctor, or dietician, is positively correlated with higher levels of nutrition knowledge and health literacy (Kessler & Wunderlich, 1999).

Situational, behavioral, and attitudinal factors can also influence label utilization and behavioral outcomes. People under time constraints when food shopping are less likely to use nutritional labels. Time pressure goes hand in hand with convenience, as consumers use labels significantly more when they are easily accessible and comprehensible (Drichoutis et al., 2006). When time is of the essence, it is important to present food labels that maximize convenience and accessibility and minimize time spent reading and processing. Type of household also highlights differences in label usage; households with married couples or preschool-aged children are the most likely to search and pay attention to on-pack nutrition information, especially if children have specific allergies (Drichoutis, et al., 2006). This finding is closely related to the idea that people with health or diet-related concerns represent a group of
consumers very cognizant of nutrition labels and motivated to purchase healthy foods—whether due to a special medical situation or a general awareness of diet-disease relationships. People suffering from diabetes, high cholesterol, or other health conditions are usually advised to adhere to nutrition recommendations and alter their eating habits. Kessler and Wunderlich (1999) found that people with diabetes use nutritional labels 22% more than the general U.S. population, primarily to look for high/low amounts of nutrients (especially sugar and carbs) and to avoid certain ingredients. This finding is consistent among people who have high cholesterol and high hypertension, as these consumers frequently access NFL information to find products with low levels of sodium, cholesterol, and saturated fats (Cook, Burton, & Howlett, 2011). Individuals with allergies or special medical conditions are much more likely to search and utilize nutrition information because they value the benefits to their personal health more than the average consumer (Dean, Lampila, Shepherd, Arvola, Saba, Vassallo, & Lähteenmäki, 2012). With a greater understanding and appropriate use of nutrition labels, more consumers are likely to make smarter food choices, especially when motivated by external factors that make a product’s label more relevant. Thinking about how personal relevance may impact cognitive processing, there is evidence that perceived relevance is a key motivating factor influencing nutrition label use and food choice; consumers with higher self-rated personal relevance, such as those with diabetes or high cholesterol, tend to engage deeply with products to evaluate the positive or negative health benefits (Dean et al., 2012).

**Dual-Process Theories**

If personal relevance and involvement of some degree are present when selecting a product, consumers tend to take extra time to search for, read, and process nutrition information. Thus, it is important to explore how perceived personal relevance impacts the relationship
between cognitive processing and utilization of food labels. The cognitive strategies and shortcuts consumers employ when assessing a nutrition label are not universal; just as there are disparities in which groups of consumers are more likely to use a nutrition label, there are vast differences in how consumers, whether consciously or subconsciously, process label information. Much of the research in this area revolves around an individual’s need for cognition and ability to evaluate, comprehend, and recall information cues and messages (Cacioppo, Petty, & Morris, 1983). Need for cognition refers to one’s tendency and desire to seek out effortful cognitive activities that will require high amounts of processing (Cacioppo et al., 1983). The consumer characteristics, attitudes, and motivations identified previously interact with various stimulus characteris (i.e. a product’s information format and content) to influence processing and decision making (Moorman, 1990). This section of the paper provides an in-depth analysis of two theories of human cognition and persuasion, Petty and Cacioppo’s Elaboration Likelihood Model (ELM) and Chaiken’s Heuristic Systematic Model (HSM) (Petty & Cacioppo, 1986; Chaiken, 1980). Both theories predict how people perceive and process stimuli and how processing strategies can affect attitude and behavior change. These changes, in terms of health awareness or food intake patterns, result from a person’s level of involvement in an issue or message and their conscious consideration and retention of information regarding that issue (Levi, Chan, & Pence, 2006). Understanding the competing processes of cognition and persuasion as a function of perceived personal relevance provides valuable insight into consumer utilization of health and nutrition information.

In a persuasive context, elaboration refers to the degree in which an individual thinks about, or “elaborates” on the issue-relevant arguments or claims in a message (Clare & Burghardt, 2015). Petty and Cacioppo’s ELM (1986) includes two routes of processing that
categorize individuals based on their need for cognition and elaboration when facing a message or information. The first is called central route processing which involves a high level of elaboration and diligent, in-depth thinking and consideration. Here, an individual might focus more on the argument itself and scrutinize a message’s content because of a high level of motivation or personal relevance (Clare & Burghardt, 2015). Contrastingly, the second route is peripheral processing, or low elaboration thinking. These individuals are less concerned about a message’s effectiveness, more susceptible to distractions, and more likely to use cognitive shortcuts. This group of consumers tends to pay greater attention to eye-catching secondary factors or cues that might accompany a message, such as visuals or graphics. In this case, certain cues can be strong enough to influence attitudes even when motivation is low and issue-relevant messages or arguments are not present (Petty, Cacioppo, & Goldman, 1981). After hearing a message with high personal relevance, participants’ attitudes were influenced primarily by the quality of the message argument (central route), whereas low personal relevance was associated with peripheral cues (Petty et al., 1981). Also, individuals high in need for cognition expend more cognitive effort and view persuasive messages more personally relevant (Cacioppo et al., 1983). One explanation for this finding is that as an issue increases in its personal implications or consequences, it becomes increasingly important for the individual to form a reasonable, accurate opinion and make a decision. On the other hand, under conditions of low personal relevance, individuals are not motivated to expend the cognitive work necessary to evaluate and interpret the message (Petty et al., 1981).

The ELM (1986) and Chaiken’s HSM (1980) share most of the same concepts and overarching principles, but the HSM focuses heavily on peripheral-based heuristics. Chaiken’s model states that individuals process messages and information in two distinct ways:
systematically or heuristically. These two types of processing are quite similar to that of central and peripheral routes, respectively. According to Chaiken, “a heuristic view deemphasizes detailed information processing and focuses on the role of simple rules or cognitive heuristics in mediating persuasion” (Chaiken, 1980, p. 752). Heuristic processing is often the result of general schemas or scripts individuals have formed overtime to minimize their use of cognitive resources. Similar to peripheral processing, with heuristics, message recipients may rely heavily on information such as the source's identity or credibility when making a decision. Chaiken (1980) found associations between high issue involvement and systematic information processing, and low issue involvement and heuristic processing. High involvement participants were strongly influenced by the amount of argumentation and information provided in the message, rather than the communicator's likability or expertise (Chaiken, 1980).

**Dual-Processing & Nutrition Labels**

Dual-process theories offer functional approaches for assessing nutrition label effectiveness. Both the ELM (1986) and the HSM (1980) have been applied and expanded upon in the context of nutrition and consumer behavior, as the success of nutrition label formats and designs depend on a consumer’s dominant processing system (Sanjari, Jahn, & Boztug, 2017). The dynamic interactions between various characteristics such as gender, nutrition knowledge, and time pressure— all of which contribute to personal relevance and involvement— impact how consumers process nutrition information and purchase products. Consistent with the principles of dual-process models and past literature, food choices can be explained in terms of thoughtful, reason-based deliberation or quick, automatic responses to contextual cues (Sanjari et al., 2017). In any situation, either one of the processing systems can dominate and control how a consumer responds to stimuli.
A person’s need for cognition and elaboration strongly influence nutrition information search and label reading. Consumers with a high need for cognition, high health awareness, and high involvement in healthy eating respond more positively to numeric and percentage-based nutrition labels (Clare & Burghardt, 2015). Health consciousness and awareness have a significant impact on perceived knowledge gain, attitude, and behavior, especially for younger adults; because these individuals care more about their health and actively seek health information to make healthier, informed choices, they receive more enjoyment and are more willing to spend time reading and analyzing health claims and nutrition labels (Dong, 2015). Also, initial attitudes towards nutrition information are an important part of the persuasive effect and can explain differences in post-attitude and behavioral intentions. People who express more positive initial attitudes regarding health consciousness and awareness are more likely to carefully scrutinize labels and be persuaded by nutrition information (Dong, 2015). These findings support the idea that consumers who process information via central route processing are expected to demonstrate deep reasoning, deliberation and think more about the outcomes of their food choices. On the other hand, the likelihood of engaging in peripheral or low elaboration processing increases when consumers have low health awareness and motivation. In these cases, FOP labeling formats such as the traffic-light or star-rating are less time-consuming and easier to process because they allow consumers to focus primarily on colors or symbols to make decisions regarding a product’s healthiness (Sanjari et al., 2017). As previously discussed, there are significant gender differences regarding nutrition label utilization, and these findings extend to processing approaches as well. For young adults, food decisions are of greater personal importance and relevance to females than males, illustrating that females tend to engage in central route decision making (Levi et al., 2006). There is evidence that men’s low involvement
in food purchasing decisions can be attributed to cultural and gender ideologies surrounding masculinity and the idea that food shopping is generally seen as a feminine activity. Several studies discuss peripheral-route intervention programs to target consumers, such as men, who display low levels of health motivation and involvement in their food choices (Levi et al., 2006). If these programs can enable individuals to change their eating habits and adopt greater health awareness, ideally people will start to view food choices as more personally relevant and important.

However, processing and engaging in one system over the other is not always clear-cut. There is evidence that even when individuals process nutrition information systematically (central route), it is not complete. Many consumers infer some elements of nutrition quality and content of food products from other cues (Gomez, 2013). These cues are not always nutrition-related, as many heuristics rely on sensory (post-ingestive effects or taste perception) or visual elements (product appearance, familiarity, or brand image; Gomez, 2013). While there is evidence that highly educated people tend to engage in systematic deliberate processing, several studies also show that heuristic processing occurs among participants with high education levels and high interest in health. Thus, utilizing cognitive shortcuts to interpret nutrition labels and make food-related decisions is not restricted to consumers lacking nutrition knowledge or cognitive abilities. Under certain conditions, nutrition labels that trigger heuristic processing can be effective in encouraging healthy food choices by minimizing cognitive load and confusion, especially when accompanied by more advanced, in-depth processing.

**Conclusion & Future Recommendations**

Recently, the prevalence of obesity and diet-related diseases have increased, indicating that many people are consuming energy-dense, nutrient-poor diets—over consuming sodium and
fats and under consuming potassium, iron, and calcium (Dumoitier et al., 2019). Now more than ever, people are invested in improving their health and are much more attune to nutrition information, content, and quality. With new products, nutritious alternatives, and food label attributes, it is crucial that consumers are aware of the nutrition information for all foods they purchase. While NFLs aim to be effective, consumer-friendly tools, not everyone understands the information included and its value to personal health. There is a significant gap between those who understand nutrition information and those who do not. Bridging this gap requires increasing all consumers’ health knowledge, motivation, and most importantly, perceived relevance. Below are several strategies and recommendations to optimize nutrition label effectiveness, and while some are already in practice, it is important to highlight which strategies are most influential. The images alongside the recommendations feature packaged food labels that are currently on the market at grocery stores.

1. **Dual Columns**

   Dual column labeling has been implemented within the past few years on certain products that are larger than a single serving and not meant to be eaten in one sitting. These labels have two columns, as shown below on the rice-cake and pasta labels (Figures 6 & 7), one with the information for a single serving and the other with per package/container. Dual columns can help consumers better understand serving size and calories per serving, especially when the serving size listed is realistic to how much people typically consume in one sitting.

**Figure 6**

**Figure 7**
2. Specificity

Increased specificity on products is important, especially when it comes to natural versus artificial flavors, or sugar content. As of the 2016 changes to the NFL, all labels should list total sugars and added sugars separately. This is important as natural sugars (from milk or fruit) are different from added sugars (syrups, honey, sucrose). To a similar point, clearly highlighting specific nutrient content such as ‘whole-grain’ is another way to help consumers differentiate between healthy and less nutritious products. In Figure 8, Cheerios does a great job conveying the nutritious content and quality of their multigrain cereal.

3. Expand the scope of nutrition labels

Mandating nutrition labels (and including FOP labels) on other types of products, such as meat and produce, would be beneficial. Although these products typically contain fewer ingredients, knowing which cuts of meat are the leanest or which types of fruit have the highest vitamin content is valuable information for consumers. Since it is not realistic to put a NFL on an apple or banana, grocery stores could include nutrition information on nearby signs, shelves, or price labels.

4. Include list of healthy pairings

To encourage healthy eating beyond just the product itself, it is helpful when products also include healthy pairing options, such as a bowl of cereal with fat-free milk or oatmeal with
The image in Figure 9 from a box of Life cereal shows the cereal mixed with fresh fruit and, albeit very small, also mentions “fresh fruit added as a serving suggestion.” If healthy pairing suggestions and claims are prioritized and made more salient to consumers (i.e. bigger, bolder font) this strategy could take food labeling to the next level by potentially elevating the overall health content of a meal.

Figure 9

5. New Message Framing Approaches

Several tactics from cigarette labeling might also be relevant to nutrition labels. Cigarette labels rely heavily on fear appeals and threatening messages from the “Surgeon General” which have proven to be effective in reducing tobacco consumption. While these tactics might not necessarily have the same impact on food consumption, manufacturers could explore creating labels that include realistic graphics and threatening messages to dissuade consumers from purchasing and consuming unhealthy foods. Also, the FDA requires that cigarette packages must incorporate rotating warnings or health claims; these warnings are rotated quarterly to help
prevent the messages from becoming “worn out” or ignored (U.S FDA, 2021). There is evidence that using a larger number of rotating warnings is more likely to provide consumers with at least one message or claim that will be perceived as personally relevant (Bonnie & Lynch, 1994). These findings could translate to nutrition labeling as well, given the importance of increasing perceived personal relevance and involvement. Most nutritional labels focus on communicating the key nutrients in a product and helping consumers distinguish between healthy and unhealthy foods. While this is important, nutrition labels that feature more threatening warning messages (i.e. what happens if you consume too much sodium, or linking diet with specific health concerns like obesity or heart disease) could have a greater impact on consumers' health awareness and food purchasing decisions.

6. Innovation

Regardless of type of label format, design, or color, the most important aspect of nutrition labeling is presenting and communicating the information in the most consumer-friendly way. Many brands and food manufacturers are branching off of the traditional FOP formats and creating their own labels that highlight what makes their product standout from a nutritional perspective. Below are several packaged products including granola, rice, and trail mix that present nutrition information in various different ways (Figures 10-13). Both of the rice packages utilize a similar style to that of the GDA or traffic-light labels, but not in the traditional format.

**Figure 10**

**Figure 11**
The strategies mentioned above outline several key updates and recommendations to maximize consumer use and understanding of nutrition labels. However, it is crucial that manufacturers continue to create innovative designs and experiment with new aesthetics and message tactics in the future. It is also important to promote nutrition labeling education programs or classes that are tailored to focus on the abilities and needs of different groups of consumers. Given the benefits of establishing healthy eating habits at a young age, there should be greater emphasis on campus-based nutrition education programs for college students, a time when many people are gaining autonomy over their food choices and habits. Additionally, doctors, dieticians, and other health providers need to educate their patients on how to use these labels when making dietary recommendations (i.e. how to interpret percent daily values, awareness of portion sizes, and which ingredients to look for). Based on the underlying factors and processing strategies that influence nutrition label usage, it is necessary for policymakers to continue to identify and develop innovative, meaningful ways to display nutrition information.
that capture the attention of consumers—focusing specifically on designing better numeric and non-numeric strategies to convey information through the NFL and FOP labels.
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