INFLUENCE OF NUTRITION LITERACY ON COLLEGE-AGE POPULATION'S DIETARY BEHAVIOR

by

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Abstract

Background: With the growing concern of obesity in the United States, food, as the main source of energy and nutrition has become an issue of research interest. Though the *Nutrition Labeling and Education Act of 1990* (NLEA) requires nutrition information to be made available for customers in order to guide their dietary choices and intake, obesity rate has increased significantly in the past 20 years. This study examined how nutrition literacy affects college-age population's reading nutrition labels, and how motivation of label reading associated with predictors of the label reading behavior.

Method: An online, self-administered questionnaire was conducted among a randomized sample of 171 students from a Mid-Western university. The questionnaire was structured with key variables derived from the Theory of Planned Behavior (TPB) and the Elaboration Likelihood Model (ELM); such as attitude to make food choices based on reading nutrition labels. Levels of nutrition literacy were measured by questions derived from a nutrition labels survey. Data analysis was conducted with Pearson's correlation and analysis of variance (ANOVA).

Results: Majority of the college student respondents in this study had adequate nutrition literacy. Though no significance was revealed from the correlation between nutrition literacy and the dependent variables due to the limit variance in nutrition literacy data, this study found that individual's motivation to read nutrition label and attitude towards reading nutrition label are positively related. Results also showed that individuals with higher motivation to read nutrition labels have better perceived behavioral control of reading nutrition labels.

Conclusion: Participants in this study, as an emerging adulthood population with college-level education, revealed adequate nutrition literacy in general. It can also be concluded that improvement in attitude towards certain behavior relates to development in motivation and perception-based involvement.

Table of Contents

List of Figures

List of Tables

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Chapter 1 - Introduction

Background

As one of the alarming global health issues, obesity has raised much public health concern in the United States with a significant obese population. By 2010 about 35.7 percent of the US adult population were obese (Ogden, Carroll, Kit, & Flegal, 2012). Obesity in adults refers to individuals with a body mass index of 30 or higher (Ogden, Carroll, & Flegal, 2008), and one of the most commonly reasons is the overconsumption of calories, which directly relates with foods, as they are the main sources of nutrition (World Health Organization, 2004).

Though regarded as a prime source of excessive caloric intake (Jeffery & French, 1998), food is not the only thing to blame for obesity. Once people have a good understanding of food content, they are able to manage their dietary choice and balance the caloric intake. Meanwhile, the U.S. Food and Drug Administration (FDA) provides guidance and requirements for mandatory food labels and claims as a health education intervention and a prominent way for healthy eating promotion (Cowburn & Stockley, 2005). Such governmental regulations on claims on food products assist consumers to acquire certain nutrition information, recommended daily nutrient values, and have a better knowledge of nutrient intake.

The Nutrition Labeling and Education Act of 1990 (NLEA) is a federal law that "provides U.S. Food and Drug Administration with specific authority to require nutrition labeling of most foods regulated by the Agency; and to require that all nutrient content claims (i.e., 'high fiber', 'low fat') and health claims be consistent with agency regulations" (FDA, 1995). Considered as a major leap forward of food regulation on behalf of consumers, the NLEA aims to enable consumers with "better assessment of what they are eating" (Moss, 2013, p. 218).

Food claims are what manufacturers use to describe a relationship between a food, food component, or dietary supplement ingredient, and reducing risk of a disease or health-related condition (FDA, 2003). Among the claims, health claims are favorable marketing tools of food manufacturers for communicating their products' health benefit to consumers as a way of promotion (Caswell, Ning, Liu, & Mojduszka, 2003). Health claims can affect both consumers' attitudes and purchase intentions, and stronger effects have been found through nutrition facts panels (Kozup et al., 2003). Such effects are especially significant with the "consumer-driven

nutritional factors," for instance, low calories, reduced fat, reduced salt, no calories, and high calcium (Moss, 2013).

In order to make informed decision regarding claims on food products, it is important for consumers to also have a good understanding of nutrition information provided. Though health claims and nutritional facts can reduce consumer misperceptions (Andrews et al., 2009), consumers are not always using these claims appropriately. For instance, low-fat claims have led to underestimating calories, which may contribute to overconsumption of high-calorie diets (Wansink & Chandon, 2006). Claims on food products have, however, not often been informative. As has indicated, in recent years there has been a trend in food advertising toward making unproven claims that eating certain foods can improve health and even reduce the risk of serious illnesses such as prostate cancer and heart disease (FDA, 2005). It has also been found that consumers form erroneous inferences from the omission of negative information (Hastak & Mazis, 2011).

As the regulator of all national food advertising, the Federal Trade Commission (FTC) has expressed concern that consumers may sometimes draw misleading conclusions from some of the claims on food products (Federal Trade Commission, 1994). It has indicated that food advertisements varied significantly according to the changes in regulations, for instance, health claims were modified to meet the expectation of policies, and nutrition claims were modified according to the rise and fall in health issues (Andrews, Burton, & Netemeyer, 2000). With the similar concern, Moss has also put forward the issue about sweetened breakfast. He noted that whenever health concern arose with regard to any one ingredient among salt, sugar, or fat, the food manufacturers would simply substitute the "problem ingredient" with another that has less concern at the moment (Moss, 2013). Reduced saturated fat in foods has been tested to be effective in reducing the risk of cardiovascular disease (Siri-Tarino et al., 2010), which made it easy for food products such as jelly beans and soft drinks that have no fat while high in carbohydrate or sodium legally use health claim as an appeal in advertising. To prevent such high-carb and low-fat food from making health claims, the FDA has revised the regulation with the so-called jelly bean rule, which gives requirement and nutrition value standard for making health claim. This revision also prevents nutrition deficient food from making health claims by fortification (FDA, 1994).

Problem Statement

Overall, nutrition labels on food products have made nutrition information available for consumers, which means with complete understanding of the nutrition facts, consumers are likely to manage their nutrition and caloric intake. While the prevalence of obesity indicates that even with the help of nutrition labels and claims, some consumers have a difficult time staying within their daily calorie intake. Thus, the knowledge of consumers may have an influence on obesity. Meanwhile, the disclosure of claims on food products that help to remedy misperception and overgeneralization from some comparative nutrient content claims are found to depend upon the level of nutrition knowledge and type of ad claim employed (Andrews et al., 2000). Having appropriate nutrition knowledge can thus be seen as being nutrition-wise literate, which in a broader perspective, is an important part of adequate health literacy.

Introduced in 1974 (Ratzan, 2001, p. 21; Simonds, 1974), health literacy refers to one's capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions (Peerson & Saunders, 2009; Ratzan & Parker, 2000). And such capacity has been suggested connected to appropriate health-related behaviors (Nutbeam, 2008). Health literacy is known as 'critical to empowerment by improving people's access to health information, and their capacity to use it effectively' (p. 2075), 'to exert greater control over their health' and enabling them 'to use health information in ways that promote and maintain good health' (p. 2076). These definitions imply that health literacy is directly linked to changed health behaviors and practices such as food choices, engagement in social action for health and participation in altered social norms (2008). Thus, it is important to examine individuals' level of nutrition literacy and the related behavior.

In the United States, the country of a variety of low-fat foods but significant obesity rates, it is revealed that though people have easy access to low-fat food, some of them are not able to manage their total calories intake (Wansink & Chandon, 2006), and that switches the attention of researchers from fat to carbohydrate – another energy-supply nutrition factor besides fat. Moss (2013) pointed out in his book Salt, Sugar, Fat that sugar has long being something "that manufacturers have eagerly touted in their foods with a long list of charming euphemisms" (p. 152). In terms of advertising, words related with sweetness such as honeyed and sugarcoated are also proved to be effective marketing tools in attracting consumers – the word "sweet" itself has already conveyed the idea of innocent and attractive. Based on this fact, it is important to

examine individuals' self-efficacy and nutrition knowledge so as to understand how such food advertising influences them.

Previous researches focused much on how food advertising influences children and adolescents, and there are already evidence that indicates association between television food advertising and children's food-related behaviors such as food choice and preferences (Institute of Medicine, 2006). Meanwhile, the World Health Organization (2003) has noted that there is a probable causal link between persistent unhealthy food and beverage marketing and weight gain and obesity. Evidence has also shown that after exposed to snack food ads, adults consumed more of both healthy and unhealthy snack foods compared to the other conditions in which food ads promoted either nutrition benefits or no food advertising (Harris, Bargh, & Brownell, 2009). Recent data suggested that nearly 34% of college students have BMI greater than 25 kg/m2 and approximately 94% of college students eat less than 5 servings of fruit and vegetables daily (American College Health Association, 2013). This presented the significance of examining factors that lead to college-age population's obesity.

Purpose of Study

The purpose of this study was to assess how nutrition literacy affects one's behavior of reading nutrition label for food choice, and how motivation to read nutrition labels for food choice associated with other predictors of such label-reading behavior. Based on the elaboration likelihood model and the theory of planned behavior, this study has special focus on the level of nutrition literacy, motivation to read nutrition labels for dietary choices, attitude towards reading nutrition labels for dietary choices, estimation of food claim, and perceived control over their label-reading behavior. This study provided updated information for nutrition and health communication professionals and the public, with the aim of promoting healthy dietary choice among emerging adulthood population, preventing obesity, and improving public health.

Theoretical Framework

To identify the key influencers of nutrition label reading behavior, two theories: the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986) and the Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980) were used to inform this study. The ELM was presented with a focus on persuasion-behavior relations, and the TPB was applied with focus on attitude-behavior relations.

As a dual process model of information processing that provides a theoretical perspective on how attitudes evolve and change over time, the ELM suggests that the degree to which receivers are likely to engage in elaboration of persuasive information vary under different conditions (O'Keefe, 2002). Basically, this model posits that there are two routes to persuasion: the central route by which a careful and thoughtful assessment of arguments is necessarily involved; and the peripheral route that based on some cognitive, affective or behavioral cue in the context of the persuasion which allows a simple inference about the merits of the argument without complex cognitive processing (Frewer, Howard, Hedderley, & Shepherd, 1997). In processing the same information, receivers with different levels of motivation generate different levels of processing, and thus lead to different effects of persuasion (Kenrick, Neuberg, & Cialdini, 2002). The degree of elaboration is affected by personal relevance, need for cognition, distraction, and prior knowledge (O'Keefe, 2002).

Meanwhile, influences on food choice are also likely to be moderated by the beliefs and attitudes held by an individual (Shepherd, 2005). Proposed by Fishbein and Ajzen, the TPB is a framework developed from the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and focuses on examining the influences of attitude, subjective norms, and perceived behavioral control on behavioral intention (Fishbein & Ajzen, 1980). This theory suggests that intention is the most critical determinant of behavior (Dutta-Bergman, 2005), and that intention is a product of both individual and normative influence (Hale, Householder, & Greene, 2003).

In order to understanding individual's behavior as a result of nutrition literacy, the persuasive sources of information, one's attitude towards the information, perceived relevance of oneself and the information, one's motivation to elaborate the information, and one's knowledge for elaborating the information were examined. Based on the two theories, the survey used in this study included questions that assess nutrition literacy, attitude, perceived behavioral control, and food ad perceptions with the belief that these factors have an influence on the participants' food purchasing behavior in accordance with elaboration likelihood model.

Justification of Study

With the increasing obesity rate, the United States is facing serious problems related to obesity (Ogden et al., 2012). One of the main reasons that cause obesity is the excessive intake of calories. On the other hand, there has been a set of strict regulation for claims on food products

and labeling that assist consumer with managing their nutrition intake that includes calorie intake, with the aim of improving healthy eating. That is to say, with the correct understanding of the information from claims on food products, consumers are able to manage their calorie intake. It also indicates that the reason for excessive intake of calories is the consumers' not being able to notice or correctly interpret the claims on food products. Meanwhile, though health literacy has been focused, there has not been much study on nutrition literacy yet (Gibbs, 2012).

Targeted at the college-age population in the U.S., this study focused on how nutrition literacy influence one's nutrition label reading for making dietary choice. This study aimed to contribute to policy makers, health communication and nutrition professionals, extension practitioners, etc., as information towards better understanding of the college-age population's nutrition literacy and overcoming the barriers of unhealthy dietary choice In addition, it will add onto the existing literature on nutrition literacy, and propose suggestions for health professionals to improve healthy food choice of the public more effectively.

Organization of the Thesis

This thesis is organized into five chapters. This first chapter provided a brief overview of the background and rationale of the study, problem statement, the goal and objectives as well as the significance of the research. Chapter two provided a review of literature on obesity in the U.S., direct and indirect influencers of obesity, health consequences and social impact of obesity, food labeling, food claims, food advertising, nutrition literacy, food choice in a behavioral context, and health communication intervention. This chapter also included the theoretical framework and hypotheses of the study. Chapter three outlined the methodology used to obtain and analyze the data. Chapter four presents the results from the data analysis, including a descriptive of the sample's characteristics and testing hypotheses. Chapter five elaborated on the findings presented in the previous chapter and discussed the major themes that emerged from the analysis, this chapter also illustrate the limitations of this study and implications for future research.

Chapter 2 - Literature Review

By reviewing the existing literature, this chapter addressed the following issues: the causes and health consequences of obesity; food labeling, claims, and advertising; nutrition literacy; and how these topics are connected to the research topic as a whole. After identifying key issues from the literature review, a theoretical framework was introduced followed by hypotheses of this study.

Obesity in the US

With approximately 1.6 billion adults overweight and over 400 million adults obese, obesity has become a worldwide public health issue (WHO, 2003). Obesity is also a significant public health problem in the United States. By the year 2010, over one-third of the US adult population was obese (Ogden, et al., 2012). Obesity has an impact on a wide range of population, with significant problem identified among children, adolescents, and adults (Carroll, Kit, & Flegal, 2012; Hedley et al., 2004).

Besides the significant obesity rate in the majority of the white population that has been revealed in previous studies, obesity is also a major problem among minority populations with even substantially higher prevalence than that in whites. High prevalence of obesity has been identified among African Americans, Hispanic Americans, Asian and Pacific Islander Americans, American Indians and Alaskan natives in the United States, with more significance in female than in male (Kumunyika, 1993; Kumunyika, 1994). Obesity issue in minority groups raised more concern about such societal energy balance problem with regard to differences among ethnicities and population (Jeffery, 1991).

Causes of Obesity

Obesity is considered as a result of an interaction between genetic predisposition and exposure to environmental variables such as diet, of which caloric intake and the composition are likely to play a major role (Drewnowski, Kurth, Holden-Wiltse, & Saari, 1992). Excessive caloric intake, in terms of obesity, relates mostly with the overconsumption of carbohydrates, proteins (including essential amino acids), and fats (including essential fatty acids). Known as macronutrients, these three nutrients are what constitute the bulk of the diet and supply energy as

well as many essential nutrients, and are interchangeable as sources of energy: fats yield 9 kcal/g (37.8 kJ/g); proteins and carbohydrates yield 4 kcal/g (16.8 kJ/g) (Wilson, 2007).

There are many factors that lead to obesity; main reasons have been seen as a lack of physical activity (Kruger, Kohl III, & Miles, 2007), age-related metabolism, and genetics (Kushner & Bessesen, 2007, Wright & Aronne, 2012). Non-physical factors such as culture, socioeconomic factors, reliability of food supply and peer pressure, have all been recognized as contributors to obesity (Bouchard, 1991, Dowse, Zimmet, Collins, & Finch, 1992, McLaren, 2007, Wright & Aronne, 2012). For instance, first, economic growth results in a globalization and a development in human diet. As incomes grow, people tend to diversify their diet with more meat, milk, and sugars, and thus the grain-based diets rich in complex carbohydrates and fiber are reduced; such phenomenon is seen as a taste and income-driven nutrition transition toward palatable sweet and high-fat foods (Drewnowski, 1997). Secondly, peers and families have significant influences on one's diet and eating behavior. It is suggested that youths view their peers' weight and, indeed, their own weight as outcomes of personal efforts and results to achieve the "thin ideal" (Quinn & Crocker, 1999); meanwhile, a person's chance of becoming obese increased by 57% if he or she had a friend who became obese in a given interval (Christakis & Fowler, 2007). Thirdly, socially dominant gender imposes preference can have an impact on the opposite gender. For instance, in male dominated societies, female fatness is related with male preference (Anderson, Crawford, Nadeau, & Lindberg, 1992; Craig, 2010). What is more, low level of nutrition literacy has been proved to be a barrier in using caloric information, which is associated with obesity (Berman & Lavizzo-Mourey, 2008).

Taste Preferences and Obesity

People choose to consume foods not only because of the need to acquire nutrition, but also because of the sensory characters of the food such as taste and texture that have certain appeals to them. Taste, including the chemical senses of taste and olfaction, and the oral perception of texture, has been identified as the main influence on food selection (Drewnowski, 1997; Food Marketing Institute, 1996). Palatable foods lead to preference in food choice, and on the negative side, overeating (Berthoud & Zheng, 2012). Basically, foods that combine sugar and fat are preferred, while bitterness is disliked. Hedonic responses from the sensory perception of taste result in food preferences, and such preference-guided food intake has effect on one's

nutritional status and body weight (Drewnowski, 1997). Higher preferences for fat-dense food are associated with higher body weight; for instance, many of the obese women selected fat-rich taste stimuli in sensory studies and listed high-fat foods, especially those high in both fat and sugar such as ice cream, as their favorites on food preference checklists. While obese men tend to choose foods that are mixture of fat, protein and salt (Drewnowski, Kurth, Holden-Wiltse, & Saari, 1992). On the other hand, in order to catch up with the consumer-driven trends like fiber or low-fat, manufacturers adjust the ingredients by increasing the less-problematic ingredient so as to maintain the flavor. For instance, if one of fat, sugar and salt is reduced, the other two are likely to increase (Moss, 2013).

Culture and Obesity

Culture is a complex and influential factor that could impact on body weight, and is usually related to ethnicity (Craig, 2010). It has been indicated that obesity and culture are inter-related in a non-random way (Brown & Krick, 2001). For example, instead of considering overweight as a stigma, many Arab societies regard overweight as a sign of good health, local media also promote weight gain instead of thinness, which is opposite from the dominant aesthetic in the West (Keel & Klump, 2003; Younis & Ali, 2012). In addition, the preference for male fatness in Japan can be seen in wrestlers from the time-honored Sumo wrestling, a sport in which a high body weight is an advantage. Overweight combined with obesity is estimated to exist in over 50% of Sumo wrestlers (Berglund, Sundgot-Borgen, & Berglund, 2011; Hattori, Kondo, Abe, Tanaka, & Fukunaga, 1999; Nishizawa, Akaoka, Nishida, Kawaguchi, & Hayashi, 1976). Meanwhile, the Massa of West Africa practice “guru” so as to make male plump or obese, since protruding stomach and full figure are considered indispensible of an esteemed male body shape (Craig, 2010).

In many Western countries, people are more likely to regard heavy weight as a sign of unhealthy life style such as poor eating habits (Schiavo, 2007). In the United States, Black women on average weigh more than White women (David, Morrison, Johnson, & Ross, 2002), and mostly Black women have a higher degree of weight tolerance and body image satisfaction than White women, which means a lower incidence of weight-related concerns and eating disorders in Black women (David, Morrison, Johnson, & Ross, 2002; Perez & Joiner, 2003). A focus group study showed that the majority of American black women participants were

generally satisfied with their bodies and did not conform to societal standards of appearance. These participants were largely influenced by their own cultural group, in which men, family, and peers have significant influence; however, some of them also acknowledged relying on the media for the standard of beauty (Kelch-Oliver & Ancis, 2011).

Genetics and Obesity

Besides culture, genetics play a crucial and more fundamental role in obesity (Caprio et al., 2008). African American and Hispanic children have lower insulin sensitivity than white children, which indicates that different races or ethnicities have different resting metabolic rate and insulin secretion and response (Goran, Bergman, Cruz, & Watanabe, 2002). It is also revealed that ethnic disparities in the metabolic comorbidities of obesity may be related to different patterns of fat distribution. For example, African American adults and children have less visceral and hepatic fat than white and Hispanic individuals (Bacha, Saad, Gungor, Janosky, & Arslanian, 2003). Research also showed that habituation to sweet-tasting foods varies across ethnicities. In one study, young African Americans had a greater desire and greater perceived stress than young European Americans. The greater desire for intense sweet tastes and the possible sweet-taste compensation under stress may be factors in the elevated incidence of obesity and diabetes in African Americans (Schiffman, Graham, Sattely-Miller, & Peterson-Dancy, 2000).

Environmental Factors and Obesity

Genetic factors and environmental factors are commonly seen working together in contributing to obesity. Individuals with a genetic propensity for overweight are likely to select environments for themselves and their children that promote weight gain, this includes low levels of activity and high fat intake. Family environment is one of the most influential factors in obesity. Overweight parents are more likely to have overweight children than non-overweight parents. This is because familial patterns of adiposity result from genes and family environmental factors working in concert, particularly for young children growing up within the family. What's more, behavioral genetics research illustrates the important contribution of genetics to the obese phenotype (Birch & Davison, 2001).

Living environment is another significant contributor to obesity. People who have access to safe places to be active, neighborhoods that are safe to walk, and local markets that offer

healthy food at affordable prices are likely to be more active and to eat more healthful food—two types of behavior that can lead to good health and may help decrease the risk for obesity (Sallis & Glanz, 2006).

Socioeconomic Status and Obesity

Socio economic status (SES) is also a factor that can lead to obesity. The correlations between SES and obesity vary based on other economical and societal factors. For instance, negative correlation (lower SES associated with larger body size) were found among women in highly developed countries, while positive associations for women in medium- and low-development countries were most common with income and material possessions (McLaren, 2007).

One of the identified reasons is fresh food and vegetables are relatively expensive and cost more to satiate, while fatty meat and processed carbohydrates that can easily "fill" are relatively cheap in some of the developed countries (Wrigley, Warm, Margetts, & Whelan, 2002). What is more, as one of the societal factors, urbanization results in reduced physical activities and increased consumption of an energy-dense diet, and thus contributes to obesity (Craig, 2010). Meanwhile, for those in low SES that face food insecurity, female fat ensures survival when food supply unreliable or variable, this may also explain how obesity problem occurs among some of the low SES population (Anderson, Crawford, Nadeau, & Lindberg, 1992).

Low-SES College Students and Obesity Risk Factors

Research into preventative health beliefs and behaviors identified moving to college as one of the vulnerable, change-filled stages in life. College years are formative stages in terms of creating lifelong healthy behaviors (Lau, Quadrel, & Hartman, 1990). For many college students, the move from a structured home environment to one where they are the primary decision maker often results in bad choices related to health, such as eating poorly or a lack of exercise (Small, et al., 2012). College years are often the time when individuals start facing new living environment, social groups, and personal budget management. In other words, students start to be physically and financially independent from families during college years. Research shows that college students with the lowest incomes and socioeconomic positions are more likely to be obese than college students with relatively higher socioeconomic positions (Nelson et al., 2007). Budget has

also been an identified barrier to healthy food choices among college students despite nutrition knowledge and self-efficacy (Mahmudiono, Byquist, Song, & Muturi, 2013). Thus, it is important to examine college-age population's using nutrition labels in dietary choices.

Media and Obesity

Media, especially television, has long been a concern in the increase of childhood obesity (Robinson, 2001). Particularly, increased calorie intake, poorer dietary quality, and reduced physical activity are the identified mediators that link television viewing to childhood obesity; for instance, number of advertisements that market high fat, high sugar, high calorie foods and beverages to children is increasing, and such ads can affect children's food preferences; meanwhile, what children eat while watching television are likely to be calorie-dense foods (Dennison & Edmund, 2008).

Media, on the other hand, are messengers that convey information around the world. Media play a role in individuals' perception and behavior that are related to body weight, and is especially significant in female, as dieting and weight control measures become common preoccupations that are evidenced by the number of low calorie diet foods in the market, the proliferation of commercial establishments for losing weight, and the many articles and advertisements on dieting and slimming in women's magazine and the media (Nasser, 1988). In a triple-experiment study with mostly white young female participants in the US, exposure to media images of attractiveness has shown the potential to increase some young women's concern with their weight, and exposure to images of fashion models has been identified as particularly likely to increase perceivers' concern with weight because the media ideal is so extreme; such concerns result from a social comparison process whereby female perceivers assess their appearance relative to the media's perfected image of slim feminine attractiveness (H. Posavac, S. Posavac, & E. Posavac, 1998). Besides the influence of body weight perception in western society, media have also been serving as channels to infiltrate Western cultural norms in other non-Western societies such as the Arabs, and changed local traditional values regarding ideal body shape and weight (Younis & Ali, 2012). With globalization and the development of science and technology, many of the non-English speaking countries are now introducing English in education and entertainment, thus facilitating access to Western culture through television, radio, Internet and print media. However, it is also found that exposure to the differences between the

two cultures contributes to the etiology of eating disorders (Benar, Kamal, Tewfik, & Sabuncuoglu, 2006; Younis & Ali, 2012).

Although advertisements and television viewing could promote unhealthy dietary behaviors that lead to weight gain (Benar, Kamal, Tewfik, & Sabuncuoglu, 2006), media could serve as effective tools in educating people on healthy body weight. With the wide spread of Western aesthetic for body image, the media have the potential to either increase the obesity rate, or serve as an educational tool for obesity prevention.

Health Consequences of Obesity

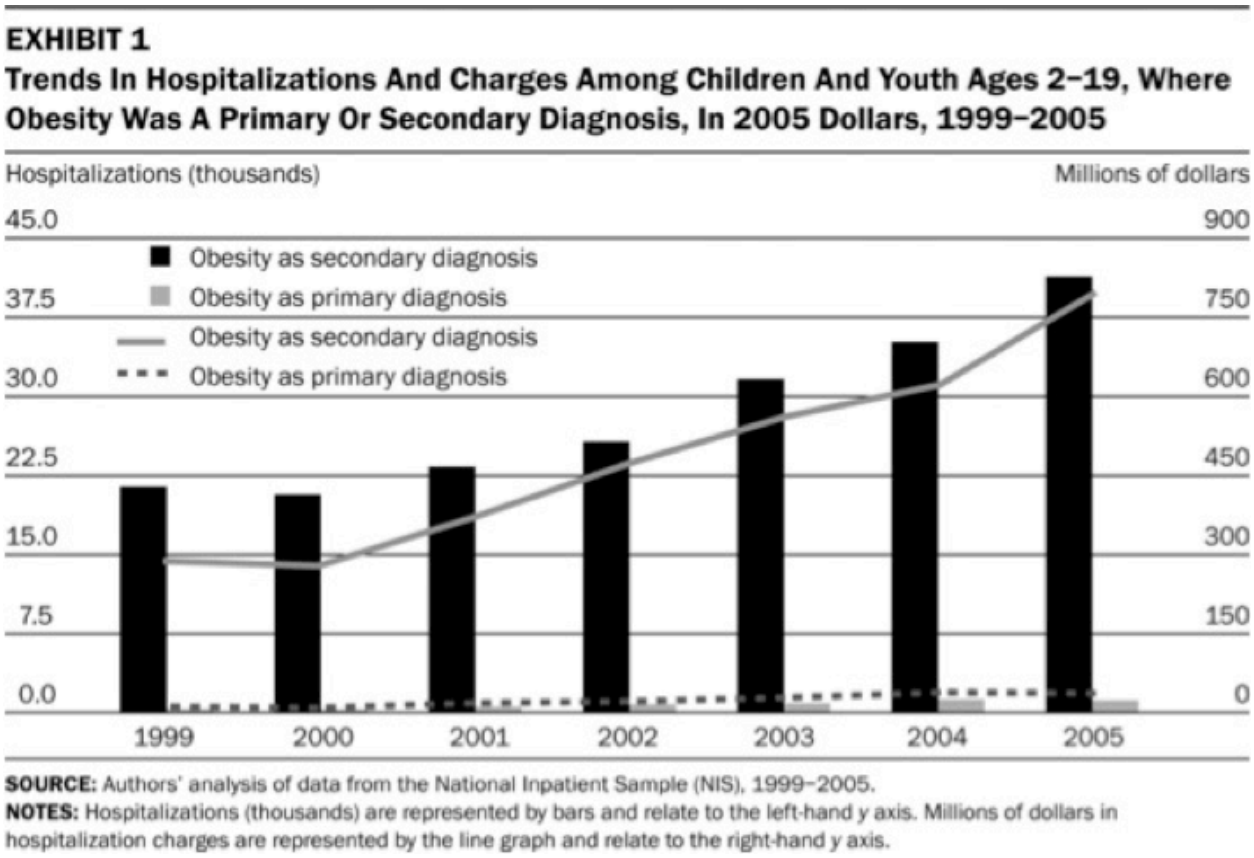
American Medical Association recently recognized obesity as a disease, ascribing it an unprecedented important issue (Fryhofer, 2013). In recent years, more and more attention has been drawn to overweight and obesity in children. Childhood and adolescence obesity not only increase the risk of adulthood obesity, but also accelerate the processes of some obesity-related diseases such as heart attack (Daniels, 2006)

The excessive body fat is generally the contributor to cardiovascular diseases such as hypertension and arteriosclerosis, respiratory diseases such as sleep apnea and asthma, endocrine, gastro esophageal reflux, as well as psychosocial problems such as low self-esteem and suicidal thought (Kyrou & Weickert, 2010), of which the reason is that overweight is generally regarded unaesthetic (Brownell, 2005). A study of body image dissatisfaction in obese women showed a vast majority of obese women demonstrated body image dissatisfaction related to their obesity, with almost half reporting the greatest dissatisfaction with their waist or abdomen. On average, they reported significantly more body image dissatisfaction than did of non-obese controls. It was indicated that image dissatisfaction correlated significantly with reports of depressive symptoms and lower self-esteem but was not correlated with body mass index (Sarwer, Wadden, & Foster, 1998).

What is more, severe obesity can even lead to disability in daily activities and increased risk of death (Daniels, 2006). In a study that examined the correlation of severe obesity and self-reported disability in performing daily life activities, nearly three-fourths of the participants reported disability of different levels. The prevalence of this degree of disability increased with increasing BMI and age, and it also correlated to type 2 diabetes, metabolic syndrome and clinical depression (Kyrou et al., 2011).

The increase in obesity-related diseases, especially the top four: heart disease, diabetes, some cancers, and high blood pressure result in increased health care cost. And it thus puts financial burden on the society (Daniels, 2006; Reilly & Kelly, 2011). It is estimated that obese adults' medical expenses are 36 percent higher than those of their non-obese peers (Sturm, 2002). A study using instrumental variables estimates that the causal impact of obesity on annual medical costs to be $2741 for men and women on average (Cawley & Meyerhoefer, 2012).

Figure 2.1 Trends In Hospitalizations And Charges Among Children And Youth Ages 2–19, Where Obesity Was A Primary Or Secondary Diagnosis, In 2005 Dollars, 1999–2005. (Trasande et al., 2009).



Food Labeling

In the United States, the Food and Drug Administration provides guidance and requirements for mandatory food labeling and making necessary claims as a health education intervention, with the aim of assisting consumers in interpreting information about the amount of a nutrient that is present in a food and in comparing nutrition values of food products (Cowburn, & Stockley, 2005). The regulatory base for such health education intervention is the Nutrition

Labeling and Education Act of 1990 (NLEA), which mandates that pre-packaged foods carry a nutrition label, and regulates serving size, health claims, and descriptor terms on food packages. Aims at improving consumer's welfare and the quality of voluntary communication of nutrient-content claims by providing nutrition information that will "assist consumers in maintaining healthy dietary practices" (FDA, 1994), this legislation standardized the types of claims and strictly defined the conditions under which they could be made (Caswell, Ning, Liu, & Mojduszka, 2003), and also provided for the development of a "Nutrition Facts panel," which serves not only as an important tool for improving the diets of Americans, but also the framework for nutrition label claims (Taylor & Wilkening, 2008). There are basically two sets of reference values for nutrition labeling that focus on different types of nutrients: Daily Reference Values (DRVs) and Reference Daily Intakes (RDIs), and usually Percent Daily Value (% DV) is used featuring both the DRVs and the RDIs (FDA, 2013). On a broader perspective, food labels are part of food claims, including health claims, nutrient claims, and structure/function claims (FDA, 2003).

Claims on food products are significant as they provide both objective and subjective consumption cues for people's food choice and dietary behavior. Objective consumption cues are information such as the serving-size that explicitly suggest an amount to eat on a single occasion; subjective consumption cues refer to those provided by endorsed nutrition claims or by relative nutrition claims such as "low fat" (Wansink, & Chandon, 2006).

Health Claims

Health claim is defined as a statement made on the label or in labeling of a food, including a dietary supplement, that expressly or by implication, including "third party" references, written statements (e.g., a brand name including a term such as "heart"), symbols (e.g., a heart symbol), or vignettes, characterizes the relationship of any substance to a disease (FDA, 2003). In other word, health claims are label statements that describe a nutrient's role in disease risk reduction (Agarwal, Hordvik, & Morar, 2006). It has been indicated that health claims have positive influence on consumers' knowledge of diet-disease link such as the fiber-cancer link (Mathios, & Ippolito, 1999). According to the FDA, health claims must be pre-approved based on either significant scientific agreement or authoritative statement, or other qualified health claims (2003).

Furthermore, the NLEA specifies that health claim authorizing regulations issued by the FDA shall (1) describe the substance/disease relationship of the health claim and the significance of the substance in affecting the disease; (2) require that the claim be stated in a manner that is an accurate representation of the substance/disease relationship; and (3) require that the claim be stated in a manner that enables the public to understand the relative significance of the information in the context of a total daily diet (FDA, 1995; Rowlands & Hoadley, 2006). Based on the hope that if consumers have reliable nutrition information available at the point of purchase and if they understand how diet affects risk of different diseases, they would make risk-reducing food choices, the NLEA was introduced with the ultimate goal that the change in consumers' behavior would reduce the costs to society of medical treatment (Balasubramanian & Cole, 2002). Nutrient label use has been shown to improve the intakes by consumers of the certain nutrients, and tends to reduce individuals' intakes of cholesterol, sodium, and calories from fat (Kim, Nagya, & Capps, 2000); meanwhile, greater use of nutrition labels has been reported to associate with healthier eating habits (Campos, Doxey, & Hammond, 2011). For example, a self-report research shows that patients who reported eating diets low in total fat were much more likely to look for fat information on food labels than those on high-fat diets (Kreuter, Scharff, Brennan, & Lukwago, 1997).

Nutrient Content Claims

The Nutrition Labeling and Education Act of 1990 (NLEA) permits the use of label claims that characterize the level of a nutrient in a food (i.e., nutrient content claims) made in accordance with FDA's authorizing regulations (FDA, 1994). Nutrient content claims are what describe the level of a nutrient or dietary substance in the product, using terms such as free, high, low, lean, extra lean, and good source, or in comparing the level of a nutrient in a food to that of another food, using terms such as more, less, reduced, fewer and lite, as well as synonyms for each of these terms (Taylor & Wilkening, 2008). To give a clearer picture for food industry about using such claims, the FDA specifies these nutrient content claims with quantitative definitions with regard to the nutrients required on food labels, such as calories, total fat, and sodium (FDA, 2009).

Nutrient content claims on food packages have been found to induce consumers to truncate their information search to the front of packages, leading to more positive, quick and in

some cases, misleading judgments of products (Roe, Levy, & Derby, 1999). Thus, how people use claims on food products to assist dietary choice and behavior depends largely on their perception, attitudes, and understanding toward certain claims. For a healthy person, an appropriate understanding of nutrition labels is helpful in keeping a healthy food choice, and for a patient, it is also important because it helps to follow a specific dietary guideline (Rothman et al., 2006). A review of literature shows that most consumers perceive nutrition labels as useful and are willing to use such information, while many believe the serving sizes and health claims to be misleading and skeptical.

Many food companies have developed lower-fat versions of their products such as mayo and peanut butter, and make claims of low fat or lower in fat than the original ones. Since low fat is considered as a significant attribute of a healthy diet, consumers may incorrectly assume that the products are healthy foods based on pragmatic implication (Hastak & Mazis, 2011). However, these products may still contain a significant amount of fat, and may be even higher in sodium or added sugar than the ordinary one for the sake of taste or texture.

"Whole Grain" is another common seen nutrient content claim as well as favorable claim used in food advertising. One of the important reasons is that whole grain consumption is highlighted by Dietary Guidelines for Americans by the U.S. Department of Agriculture and U.S. Department of Health and Human Services; and it is one of the recommendations that individuals "consume at least half of all grains as whole grains" and "increase whole-grain intake by replacing refined grains with whole grains" as part of a healthy eating pattern while staying within their calorie needs (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Intake of whole grains is recommended based on whole grains' health benefit. Whole grains, especially wheat, rice, and oats, provide iron, magnesium, selenium, B vitamins, protein and essential fatty acids and may have unique and beneficial combinations of many micronutrients, antioxidants, phytochemicals, and fiber, Moderate evidence indicates that whole-grain intake may reduce the risk of cardiovascular disease, type 2 diabetes, and some cancers; also the intake is associated with a lower body weight (Seal, 2006; Seal, Jones, & Whitney, 2006; Smith, Kuznesof, Richardson, & Seal, 2003). Besides being a source of carbohydrates, whole grain, in a 10-year study, was revealed to have a strong inverse association with risk of coronary heart disease (CHD) (Liu, et al, 1999); moreover, the American Heart

Association also suggests that replacing fats with carbohydrates may reduce risk of CHD by improving plasma lipids (1996).

According to the Dietary Guidelines for Americans (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010), whole grains should include entire grain seed, which is known as kernel, and should composed of three principal parts: the bran, germ and endosperm (Seal, 2006; Seal, Jones, & Whitney, 2006). However, foods labeled with the words "multi-grain," "stone-ground," "100% wheat," "cracked wheat," "seven-grain," or "bran" are usually not 100% whole-grain products, and may not contain any whole grains (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Research also found that bread and cereal were most often named as examples of whole-grain foods, in that study, respondents perceived whole grain as lack of processing and use of the entire grain and benefit mostly in contributing to fiber intake (Marquart, Pham, Lautenschlager, Croy, & Sobal, 2006). In such cases, consumers who lack of awareness or appropriate knowledge to read the nutrient content claims could be misled and regard these products as whole-grain products. Since education on whole grains has been complicated by the inherent difficulty in identifying whole versus refined grains (Ritchie, Whaley, Spector, Gomez, & Crawford, 2010).

Food Advertising

As advertising is an important tool for promotion and education, food advertising is as well, a favorable way of marketing by food companies. However, unlike mandated claims on food products that aim at educating consumers, food advertising focuses mostly on persuading consumer to purchase. It was found that in 2001 advertising spending of U.S. food companies was $3.5 billion on fast-food advertisements and $5.8 billion on the separate food, beverage, and confectionary category, including $785.5 million for the top 5 soda brands (Welch, 2003). There has always been a great investment in food advertising, because the consumption of advertised foods is higher than consumption of foods that are not advertised (Boynton-Jarrett et al., 2003), and advertising expenditures are generally greatest for the most highly processed and packaged foods (Gallo, 1999).

As the NLEA specified the approved use of nutrient content claims, using nutrient content claims as a tool for advertising has become prevalent (Andrews, Burton & Netemeyer, 2000). It has been found that general market food advertisements were more likely to make

broad claims around a product being light, lean, or diet (Henderson & Kelly, 2005). However, studies of consumer inferences suggest that when brand descriptions are incomplete, consumers may rely on correlation-based inferences to judge the brands on the omitted attributes, and their predictions are often naive and unfounded (Pechmann, 1996). It has been identified that consumers are likely to develop different kinds of bias, especially overgeneralization from the comparative items when exposed to nutrient content claims (Andrews, Burton, & Netemeyer, 2000), these bias include higher ratings based on single nutrient claim attributes and inappropriate perception about health benefit of the products (Roe, Levy, & Derby, 1999). Thus, from a consumers' perspective, it is of great importance to not only know how to use the regular claims on food products but also have an appropriate understanding of food advertisements, particularly those with health and nutrient content claims.

Nutrition Literacy and Communication Intervention

Literacy is the ability to read, write, and speak a language in the service of understanding and solving problems with sufficient proficiency to function at work and in society, achieve goals, and develop knowledge and individual potential (US Congress, National Literacy Act of 1991, Public Law 102-73, 1991); relatively, a literate person is one that can understand both read and write a short simple statement on his or her everyday life (United Nations Educational, Scientific and Cultural Organization, 1978). As one of the most important issues in health communication, health literacy is defined as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health" by the World Health Organization (Nutbeam, 1998), and to be more specific, it is "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Health and Human Services, 2000). In the United State, low health literacy is affecting all different age groups and ethnic backgrounds (Schiavo, 2007).

As part of the health literacy context, nutrition literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed in order to make appropriate nutrition decisions" (Gibbs, 2012; Zoellner, Connell, Bounds, Crook, & Yadrick, 2009). Nutrition literacy has been revealed as significantly associated with media use for nutrition information and levels of trust from nutrition sources

(Zoellner et al., 2009), and the extent to which an individual value a dietary guideline (Nagya, 2000). The level of nutrition literacy varies among ethnicity, education and income groups. For instance, a study shows that the number of label use are higher in younger respondents and among those with higher education levels, and frequent label use was associated with better understanding in general (Campos et al., 2011). Another study found that among adults (n=93), greater nutrition knowledge was positively correlated with motivation ($r=0.44$, $p<0.001$) for following a healthy diet (Miller, DeWitt, McCleeary, & O'Keefe, 2009).

Though in some of the cases people with higher education may still have difficulty understanding nutrition labels (Rothman et al., 2006). In a study that examines beliefs about whole-grain food, food and nutrition professionals provided more differentiated responses, whereas WIC/state fair participants had fewer and less elaborate responses. However, even with adequate nutrition literacy, individuals might not be able to put their knowledge into use. In the same study, researchers found that most respondents were aware of the term whole-grain foods, but less often reported that they use the term (Marquart, Pham, Lautenschlager, Croy, & Sobal, 2006).

Health communication, as part of public health literacy intervention, is an effective tool in breaking down barriers to the understanding of health-related issues using culturally relevant messages, materials, and activities that reflect the language capability and preferences of target audience. Health communication intervention also plays a role in building the skills needed to improve overall health literacy levels. For instance, it helps those in health care industry to understand and reach the needs of patients and the public in terms of their own (Schiavo, 2007). Communication, in advancing public health, can provide strategic persuasion such as adding value to health instead of disease; it can also develop opportune opinion leadership and involves a partnership between policymakers, the public health and the private sector (Ratzan, 2001).

Food Choice in a Behavioral Context

According to the Gallup's annual Consumption Habits survey, 68% of American consumers pay a fair amount of attention to nutritional labels on food packages, and those who reported paying a great deal of attention to the nutrition labels on food packaging are at least twice as likely as those who pay less attention to describe their diet as "very healthy." What is more, those who pay a lot of attention to nutrition information are somewhat less likely than

those who pay less attention to say they are overweight (Gallup, 2013). In fact, the differences in dietary behavior are related with gender and age. It has been shown that women are more health conscious and more aware of benefits of grain-based foods than men, while men describe themselves as paying less attention to a healthy diet but are conscious of possibly related health problems; older people concerned more about health and are more positive toward functional food (Shepherd, 2005)

Consumers are also largely influenced by nutrition claims and related inferences. Low-fat claim and consumers' individual characteristics can both lead to anticipated consumption pleasure and guilt, which together with serving-size inferences, result in different consumption volume (Wansink & Chandon, 2006). Another study showed that low-fat nutrition claims should lead consumers to eat more because it allows them to feel less guilty while enjoying their food (Wertenbroch, 1998)

Theoretical Framework

Dietary behavior, like other human behavior, is influenced by a variety of factors, among which attitude and social factors are indispensable influencers that affect food choice (Shepherd, 1999; Shepherd, 2005; Graham & Laska, 2012). Thus, dietary behavior needs to be understood with attitude and social context. The theoretical foundation of this study is made of the Elaboration Likelihood Model (ELM) and the Theory of Planned Behavior (TPB). The ELM offers a conceptual lens for investigating attitude and persuasion, and the TPB focuses on the attitude-behavior relationship (Angst & Agarwal, 2009). Wilson and Irvine (2013) showed that a combination of the ELM and TPB is effective in evaluating behavior change prompted by persuasive communication. In their study, a path diagram was presented to indicate how the variables from the two theories worked together to influence behavior – the shared dependent variable.

The Elaboration Likelihood Model (ELM)

The ELM is a model of persuasion that presents a dual-process approach to social information and an explanation of central and peripheral routes to persuasion. The ELM suggests that when elaboration is high, the recipient is experiencing a central route of persuasion; but when elaboration is low, a peripheral route is present; the extent to which individuals engage in cognitive information processing may depend on individual factors such as the need for

cognition and situational factors such as perceived source credibility (Petty & Cacioppo, 1986; Frewer, Howard, Hedderley, & Shepherd, 1997). It also suggests that when a message is presented to individuals in different contexts, the recipients will vary in how much cognitive energy they devote to the message, and both motivation and ability to process information may influence the mode of information processing (Petty & Cacioppo, 1986; Angst & Agarwal, 2009). Individuals who are in lack of the literacy (low ability) or uninvolved with the information (low motivation) will likely engage in peripheral processing of advertising or labeling information and thus may not encode detailed information embedded within these mediums (Hastak & Mazis, 2011).

Nutrition information, as persuasive content, has been found to increase complex cognitive processing (Frewer, Howard, Hedderley, & Shepherd, 1997). According to the ELM, elaboration ability can be affected by distraction and prior knowledge. Distraction, for instance, refers to the presence of some distracting stimulus or task accompanying a persuasive message. Distraction can enhance as well as reduce persuasion depending on the conditions. Prior knowledge, on the other hand, is positively related to the elaboration ability; a more extensive prior knowledge leads to a better ability to engage in the issue-relevant thinking (Petty & Cacioppo, 1986; O'Keefe, 2002). In terms of using nutrition labels, the claims on the same packages can be viewed as distractions, thus the persuasion outcome of nutrition labels may vary based on whether such advertisements help or mislead individuals in elaborating the nutrition information. Nutrition literacy, as the significant prior knowledge to the use of nutrition labels, determines the extent to which individuals elaborate nutrition information. It is also suggested that prior knowledge and expectations regarding the association between two attributes influences information processing when information about only one of the two attributes is provided (Andrews, Netemeyer, & Burton, 1998; Hastak & Mazis, 2011).

Perceived personal relevance is an important peripheral cue in the extent to which people internalize information. In this case, nutrition information that is perceived as being more personally relevant is more likely to be processed in depth than that which is believed to be irrelevant (Frewer, Howard, Hedderley, & Shepherd, 1997). Moreover, It has been proved that consumers may rely on a claim for one attribute (e.g., "Brand X is low in cholesterol") to infer a claim on another attribute (e.g., "Brand X is low in fat"). The inference occurs because consumers believe that the two attributes are correlated. Consumers can be misled when the

inferred claim is false (Hastak & Mazis, 2011). What is more, with the FTC's regulation on food advertisements (1994) that challenge advertisements that claim a food is superior on one attribute (e.g., high in fiber) and connect that attribute to disease prevention (e.g., obesity prevention) if the food has attributes that negate the implied prevention claim. Consumers are likely to be confused by the juxtaposition of the superiority (fiber) and non-superiority (obesity) claim and mistakenly think the food is superior on both aspects (Pechmann, 1996). Research also shows that compare with regular claims, low-fat claims increase snack-food consumption, and the increase is more significant among overweight consumers (Wansink & Chandon, 2006).

The Theory of Planned Behavior (TPB)

The TPB is one of the most implemented models for understanding and changing health beliefs and behaviors. It assumes that many of the influences on food choice are likely to be mediated by the beliefs and attitudes held by an individual (Shepherd, 1999). As an extended model of the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the TPB assumes that individuals are rational decision makers who consider options and implications of a behavior before engaging in it (Andrews, Silk, & Eneli, 2010). The basic components of this theory are attitude, subjective norms, perceived behavioral control, and behavioral intention. Among these components intention has the most direct and predictive connection to behavior, and is the result of the other three factors. Meanwhile, attitude, subjective norms, and planned behavior control are interrelated. Ajzen (1991) suggested that not all behavior is voluntary, thus as an implement of the Theory of Reasoned Action, the Theory of Planned Behavior involves the control component—perceived behavioral control, which works together with attitude and subjective norms in predicting intention, as well as directly leads to behavior (Ajzen, 1991). The Theory of Planned Behavior is an expectancy-value model of attitude-behavior relationships and is applied in understanding, predicting and changing human social behavior (Ajzen, 2008; Conner & Armitage, 1998); and it has been tested to be an effective framework of modeling food choice (Shepherd, 1999). According to Ajzen, the components of the Theory of Planned Behavior can be specified as follows.

Attitude

Attitude toward the behavior is a person's overall evaluation of the behavior. It is assumed to have two components which work together: beliefs about consequences of the

behavior and the corresponding outcome evaluations about each these features of the behavior. Attitude is one of the predictors of behavioral intentions, and in terms of dietary behavior, attitude toward certain food is related to food preferences, which are determined by taste. For example, taste stimuli perceived as more bitter are more strongly disliked (Drewnowski, 1997). In this study, attitudes that can significantly influence dietary behavior are attitude towards nutrition message and attitude towards healthy dietary choice.

Subjective norms

Subjective norms are a person's own estimate of the social pressure to perform or not perform the target behavior. Subjective norms are assumed to have two components which work in interaction: beliefs about how other people, who may be in some way important to the person, would like them to behave (normative beliefs) and the positive or negative judgments about each belief (outcome evaluations). In order to address subjective norms, participants were asked to rank how important families, peers, and other social influencers consider it to base healthy dietary choices on nutrition information.

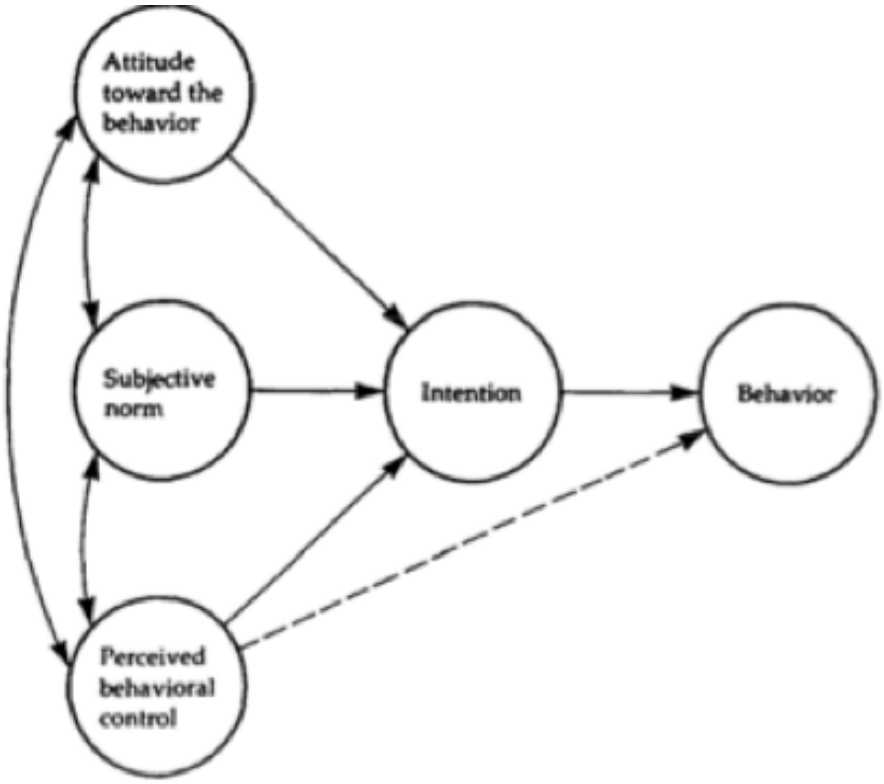
Perceived Behavioral Control

Perceived Behavioral Control is the individual's perception of the extent to which performance of the behavior is easy or difficult and it has two aspects: how much a person has control over the behavior and how confident a person feels about being able to perform or not perform the behavior (Ajzen, 1991). In other words, it is a combination of self-efficacy and controllability. It is determined by control beliefs about the power of both situational and internal factors to inhibit or facilitate the performing of the behavior. For instance, if individuals feel that their diet is already healthy and they are at less risk than the average person, they will be less likely to change their dietary choice or behavior (Shepherd, 1999). In this study, perceived behavioral control mainly refers to how individuals feel about their ability to manage their dietary behavior, especially when they are aware of the importance of eating healthy. Thus, participants were asked if they are able to perform healthy dietary behavior and how much control they have over such behavior of their own.

Behavioral Intention

Behavioral intention is the most important determinant of future behavior and represents a person's motivation in the sense of her or his conscious plan or decision to exert effort to enact the behavior (Dutta-Bergman, 2005). According to Ajzen (1991), behavior intention reflects how hard a person is willing to try, and how motivated he or she is, to perform the behavior. A basic behavioral intention (I intend to make healthy dietary choice) may be elaborated in terms of how, when, and other specifics (I intend make healthy dietary choice by reading nutrition labels before purchase).

Figure 2.2 Model of the Theory of Planned Behavior (Ajzen, 1991)



The Theory of Planned Behavior has been widely applied in analyzing the influence of attitude, subjective norms, and perceived behavioral control on dietary behavior. For example, Shepherd (1999) explained social determinants of with the TPB and suggested that the TPB can be used to determine the relative importance of different factors in influencing food choice. Armitage and Conner (2007) reviewed the TPB as a social cognition model that predicts health behavior. Andrews, Silk, and Eneli (2010) also examined the childhood obesity prevention using TPB by demonstrating the theory's predictive utility in the obesity prevention context with attitudes, subjective norms, perceived behavioral control, as well as behavioral intentions that predicted parents' tracking behavior of their children's food intake.

Thus, this study makes the following hypotheses based on the ELM and the TPB:

H_1: Individuals with higher nutrition literacy have higher involvement with reading nutrition labels.

H_2: People with lower nutrition literacy are more likely to overestimate the health benefits of products that have health claims.

H_3: Higher nutrition literacy is related to a more positive attitude towards reading nutrition label for dietary choices.

H_4: Individuals with higher motivation have better perceived behavioral control of reading nutrition labels.

H_5: Individual's motivation to read nutrition label and attitude towards reading nutrition label are positively related.

Chapter 3 - Methodology

This study examined the link between college-age population's nutrition literacy and nutrition label reading for dietary choices, as well as the association between motivation to read nutrition label and other predictors of such label-reading behavior. An online survey was used to get participants' self-reported information about their nutrition literacy and dietary behavior. This chapter introduced the research methods used in this study, including variables and measurements, sample selection, data collection, and data analysis procedures.

Scope of Study

The scope of this study is health communication with a focus on college-age population's nutrition literacy and their nutrition label reading for dietary choices. The study was conducted among random sampled students from a large Mid-western university. Due to the university's policies and regulations related to research involving human subjects, individuals younger than 18 were not included in the study.

Sample Selection

College students in the United States were selected because of the homogeneity in education levels, age and socioeconomic status, while is diverse in places of origin and races. In order to have a sample that can represent the general college student population, stratified random sampling was used as the sampling method. Stratified random sampling was used as the sampling method since it allows dividing the study population into strata, which are sub-populations that differ in certain characters being studied. As this study hypothesized that students from different majors might show significant differences in nutrition literacy levels, the sample was stratified by college. Moreover, random sampling eliminates the limitations and bias while maximize the variety within a sample, thus makes the result more likely to generalize to a larger college-age student population. A sample of 2000 students was obtained from the total 16278 undergraduate students of the selected university with the assistant of the university's information technology service system. According to the 12.3% sampling rate, there were 266 out of the 2163 students from the college of business administration; 278 out of the 2261 students from college of agriculture; 303 out of the 2465 students from college of engineering; 767 out of the 6241 students from college of arts and sciences; 135 out of the 1103 students from

college of education; 36 out of the 296 students from college of technology and aviation; 172 out of the 1393 students from college of human ecology; and 43 out of the 356 students from college of architecture, planning and design included in this sample.

Key Variables

In this study, the target behavior was food choice based on reading nutrition label. Since data was collected from respondents' self-report, respondents' behavior was not observed and recorded directly. Instead, this study asked subjects to report their behavior on reading nutrition labels and related food choice; meanwhile, this study also measured predictor factors as a means of estimating actual behavior and developing communication approaches for behavior change. Based on the theoretical framework of this research, involvement, ability to process, source credibility, and argument quality are key factors that influence individuals' behavior according to the ELM. In addition, attitude, subjective norms, and perceived behavioral control are also influencers on behavior according to the TPB. All variables were measured based on participants' self-reported data.

The questions were adapted from a questionnaire manual of the TPB (Francis et al., 2004) and a study that assessed nutrition information's impact on food choice (Vanderlee & Hammond, 2013). Types of questions were multiple choice and scaling questions using the Likert scale. As a psychometric scale, the Likert scale used in the questionnaire aims at measuring respondents' attitude toward given statements, and the scale includes five-level items: not at all agree, slightly agree, somewhat agree, agree, and strongly agree.

Independent Variables

Nutrition Literacy

The first independent variable was nutrition literacy, in other words, subjects responded to questions on certain nutrition information on food packages. Nutrition literacy was measured with selected questions from Nutrition Literacy Assessment Instrument (NLAI), which was developed from a study on nutrition literacy assessment (Gibbs, 2012). The algorithm of the NLAI suggested that different sets of nutrition literacy question should be chosen to use separately based on different needs for nutrition literacy assessment. To align with the scope of this study, a set of 6 macronutrient-based questions and another set of 6 nutrition label reading-

based questions from the NLAI are selected. As validated measurement tools for nutrition literacy, these 12 questions included assessment of basic literacy and numeracy skills, since responding to the questions required understanding words and numbers and basic calculation; meanwhile, these questions assess nutrition knowledge by identifying whether subjects can understand the given nutrition information appropriately. For instance, subjects were presented with numerical questions about certain nutrient quantity with given nutrition facts panels.

According to the NLAI (Gibbs, 2012), the criteria for assessing nutrition literacy are: for each set of questions, 0—1 correct answer suggests high likelihood of inadequate nutrition literacy, or very little understanding of nutrition, illiterate, or is non-literate in English; 2—3 correct answers suggest marginal nutrition literacy, which means some understanding of nutrition and ability to perform simple literacy tasks; 4—6 correct answers suggest adequate nutrition literacy, or a good understanding of nutrition and strong literacy skills. Since the NLAI provides guidance to only individual set-based measurement rather than multiple set-based, nutrition literacy was measured by calculating the mean of correct number of both sets of questions.

Motivation

Petty and Cacciopo (1986) suggested that in terms of health issues, providing people with plenty of health related information is an effective way to promote motivation of those who are highly involved and interested in health issues. Meanwhile, presenting other elements to attract attention is more efficient for people with low issue involvement (Park, 2012). Motivation encompasses the constructs of personal relevance, personal responsibility, and need for cognition (Petty & Cacioppo, 1986). Depending on the circumstance under investigation, motivation could be affected due to physical and practical difficulties, such as time limit to read the nutrition information, or the overly technical language used.

This study used Ryan and Conell's (1989) Treatment Self-Regulation Questionnaire (TSRQ), which had been applied in previous research (Park, 2012) to examine motivation. Eight items adopted from Park (2012) to measure autonomous motivation included: "I make food choice based on nutrition label reading because: 'I find it a personal challenge to do so', 'I personally believe that choosing food based on nutrition label reading will improve my health', 'It is exciting to try to keep balanced meal in a healthy range'. The reason I will make food choice based on nutrition label reading in the future is that 'I personally believe that it is

important in remaining healthy', 'I carefully thought about my dietary habit and believe it's the right thing to do', 'I feel personally that getting food while being aware of the nutrition information is the best things for me', 'Using nutrition label to guide my food selection is choices I really want to make', 'It's a challenge to learn how to read nutrition facts'." Answers to each question were based on a 5-point Likert scale ranging from "Not at all agree" to "Strongly agree."

Demographics

Since there are several objective factors such as environment and genetic that affect body weight (Caprio et al., 2008; Craig, 2010; Sallis & Glanz, 2006), it is necessary to examine if these demographic factors are related to individuals' nutrition literacy or their motivation to read nutrition labels. Meanwhile, academic backgrounds may also influence students' nutrition literacy and dietary choice; students from human nutrition major, for example, may have higher nutrition literacy levels and more frequent label use in food choice comparing to students from other majors. Thus, this study included race, gender, age, year of school, country of origin, and academic major as independent variables.

Dependent Variables

According to the ELM, involvement, ability to process, source credibility, and argument quality are key variables of behavior. Since the FDA regulates nutrition labeling on food package, source credibility and argument quality in this study have limited effect on the behavior. Thus, this study focused on measuring respondents' involvement and ability to process.

Involvement

Variations in people's issue involvement can affect how they process and respond to given information (Park, 2012; Petty & Cacioppo, 1986). The variable, "involvement," was measured on a 5-point scale of "never" (1) to "all of the time" (5) to determine subjects' frequency of using nutrition labels and their perception of a given claim from a food package. Items to measure involvement variable start with frequency of involvement in nutrition label: (1)

"How often do you read nutrition label before making dietary choices" and (2) "How often do you compare nutrition label information of different products to make purchase decisions"

In addition, as it was hypothesized that lower ability to process nutrition facts panel information is related to more likelihood of overestimating the health benefit given certain claims, this study examined participants' perception of the given claims with reference to the nutrition facts. Candy, as a typical food product with added sugar, was chosen as sample in this study. A picture of a candy product package with "a fat-free candy" claim was presented and participants were asked to evaluate the health claim. This evaluation was based on 7 items adopted from a study on consumers' perception of the claim (van Trijp & van der Lans, 2007). Measured on 5-point scale of "Not at all agree" to "Strongly agree," the items included: 1) "The health claim above was easy to understand," 2) "The health claim above was credible," 3) "The health claim above was interesting," 4) "The health claim above was important for me," 5) "The health claim above was new to me," 6) "The health claim above was likely to make me buy the product," 7) "I expect this candy to be better than one that does not have this claim," 8) "Regularly consuming this candy that claims "a fat-free candy" is healthy," 9) "Regularly consuming this candy would help me achieve/manage particular body functions," and 10) "Regularly consuming this candy would help me reduce the risk of particular diseases."

Since subjects' label reading behavior was not observed directly in this study, there were four additional items for variable "involvement" at the end of the questionnaire. These items were used to assess how well participants can recall the nutrition information that they were given previously, as a way to measure their involvement in the information. Participants were informed that the questions are based on the JUJUBES candy nutrition facts panel given in previous section, then they responded to: 1) "How many grams of sugar are there in each serving of the JUJUBES candy," 2) "The numbers on the nutrition facts panel indicate amount per package"; 3) "The percentages on nutrition facts panel are based on percent daily value"; and 4) "The amount of potassium is NOT labeled on the nutrition facts panel." Participants chose one from the four choices for the first question, and one from each of the "True" and "False" choices for the remaining three statements.

Attitude

Many studies in the nutrition literature have attempted to measure the degree of association between attitudes and consumption of foods (Shepherd, 1999). In the ELM, attitude

is formed and changed by one's motivation and ability to process; whereas in the TPB, attitude is the outcome of behavior belief and outcome evaluation. Generally, in a TPB-based survey, attitude can be measured both directly and indirectly (Francis et al., 2004). However, direct measurement of attitude has certain limitations. For instance, subjects may purposely make up their responses or try to present themselves favorably or giving a response that seems to meet with social approval rather than responding truthfully; while with indirect measurement, subjects are not aware at the time of measurement that their attitudes are being studied (Bohner & Wänke, 2002; Crowne & Marlowe, 1964). Thus, attitude towards reading nutrition labels for dietary choices was measured with indirect measurement, including questions on behavioral beliefs and outcome evaluations. Items to measure attitude variable included: 1) "For me, referring to nutrition labels for food choice is important," 2) "For me, referring to nutrition labels for food choice is beneficial," 3) "If I refer to nutrition labels for food choice, I will feel that I am being responsible for my health," 4) "Being responsible for my health is desirable." Responses to all items were based on 5-point Likert scale, which ran from "Not at all agree" (1) to "Strongly agree" (5).

Subjective Norms

As a variable of one's estimate of the social pressure to perform or not perform the target behavior, subjective norms in this study were measured with how subjects feels about the opinions of other people when their choices of food is based on related nutrition information they read. For instance, subjects responded to the following statements: 1) "Most people who are important to me think that I should read the nutrition label before making a purchase decision," 2) "I expect to refer to nutrition labels for food choice," and 3) "I feel under social pressure if not referring to nutrition labels for food choice." Responses were assessed on a 5-point Likert scale.

Perceived Behavioral Control

Perceived behavioral control is a reflection of people's confidence about their capabilities in performing the target behavior. Thus, perceived behavioral control can be measured by assessing one's self-efficacy and controllability of certain behavior (Francis et al., 2004). In this study, self-efficacy was measured by asking subjects to rate the extent of difficulty for them to understand nutrition labels and so forth, controllability was measured by presenting subjects statements as follows: 1) "I am confident that I can refer to nutrition labels for food choice if I

want to," 2) "It is easy for me to refer to nutrition labels for food choices," 3) "The decision to refer to nutrition labels for food choices is within my control," and 4) "Referring to nutrition labels on making food choice is entirely up to me." The items were measured based on a 5-point Likert scale 1 (Not at all agree) to 5 (Strongly agree).

Data Collection Procedure

A web-based survey with a self-administered questionnaire was conducted among selected students in a Midwestern university. The online questionnaire was developed using Qualtrics, an online survey software program that has been used in previous studies for subjects' characters and behavior (Hanson et al., 2011; Kim, Yoo‐Lee, & Joanna, 2011). This survey was sent to the participants with an anonymous link to the questionnaire via email.

At the beginning of the survey, subjects were asked to consent to participation in the study. Subjects who consented were directed to the questionnaire page. Those who did not consent were directed to exit the survey. By choosing to use a web-based survey, cost, time, and feasibility were the main reasons considered. Web-based survey allows the questionnaire to be sent to all respondents at the same time without printing and delivering hard copies, it also allows results to be collected and processed without separate data entry. Cost and time-efficient web survey is thus selected as the way of data collection in this study (Dillman, Tortora, & Bowker, 1998).

Although surveys of consumers' behavior are widely used, there are certain limitations in evaluating the ultimate impact of claim on consumer behavior and health outcomes. First of all, it has been observed that what consumers say in surveys and focus groups often do not translate into actual behavior at purchase (Williams, 2005). Second, as a survey with certain time constraints, it may encounter respondents' time limitation to respond. As Delva, Kirby, Knapper, and Birtwhistle (2002) have noted, respondents struggling with real or perceived time constraints are less likely to respond to surveys since they are not allowed enough time to. Third, as a survey composed mainly of closed-ended questions, this web-based survey may limit the range of response since it doesn't allow participants to interact directly with the researcher and tend to eliminate their answers within the given options. Besides, though respondents of this study are from a university, which means they are less likely to be illiterate in understanding the questionnaire and operating a computer, there is possible limitation that some respondents have

problem accessing or completing this survey due to objective reasons such as Internet connection (Dillman et al., 1998).

Data Analysis

Quantitative research methods, which use statistical data for systematic empirical investigation of social phenomena (Trochim & Donnelly, 2008), were applied in this study. Responses to questions designed to measure each theoretical variable were tested for whether they reliably measured the same concepts, which was conducted by using only question items that scored higher than 0.7 in Cronbach's alpha analysis (Cronbach, 1951), as a tool for testing the reliability of a psychometric test for subjects, a 0.7 or above Cronbach's alpha reflects good internal consistency. The majority of the data gathered was ordinal in nature, as the questionnaire was constructed with Likert scales.

Dependent variables were each recoded and measured by computing the mean of the measurement items. The variable "involvement" was recoded into frequency of involvement, perception-based involvement, and memory-based involvement.

Pearson's correlation coefficient, the covariance of the two variables divided by the product of their standard deviations, was used to examine the correlations between variables in this study. Meanwhile, a one-way analysis of variance (ANOVA) was used to analyze and compare "frequency of involvement," "perception-based involvement," and "memory-based involvement."

Chapter 4 - Results

This chapter provides findings and hypotheses testing of the study. A descriptive of demographics is introduced first, followed by result of the other independent variable – nutrition literacy. Hypotheses testing will review the measurement of each variables, data analysis results, and conclusions of hypotheses.

Descriptive

The survey was sent out to a randomized sample of 2000 potential participants. The sample was stratified by college within the university in order to prevent the oversampling of students who may have had strong backgrounds in food and nutrition studies (or allied fields). In all,171 individuals responded. Nearly one-third of the participants came from the College of Arts and Sciences (29.2%); 50.9% were juniors or seniors; 62.6% were females; 87.7% were non-Hispanic White. Table 4.1 displays demographic characteristics of the participants.

Table 4.1 Participants' Characteristics

Characteristics		N (%)
Gender	Male	64 (37.4%)
	Female	107 (62.6%)
Age (M=20.53, SD=1.72)	18-20	87 (50.9%)
	21-24	80 (46.8%)
	25 and above	3 (1.8%)
College	Arts and Sciences	50 (29.2%)
	Engineering	29 (17.0%)
	Agriculture	27 (15.8%)
	Human Ecology	27 (15.8%)
	Business Administration	21 (12.3%)
	Architecture, planning and design	8 (4.7%)
	Education	7 (4.1%)
Year of school	Freshman	38 (22.2%)
	Sophomore	45 (26.3%)
	Junior	39 (22.8%)
	Senior	48 (28.1%)
Ethnicities	Non-Hispanic White	150 (87.7%)
	Hispanic/Latino	8 (4.7%)
	Black or African American	7 (4.1%)
	Others	6 (3.6%)

Nutrition Literacy

As one of the independent variables, nutrition literacy was measured with selected questions from the NLAI (Gibbs, 2012). As the NLAI was designed with independent categories, we adopted a macronutrient questions category and a label reading questions category to align with the scope of this study. Two categories, with a total of 12 questions, were chosen in order to assess participants' basic literacy and numeracy skills, as well as their identification and understanding of nutrition label content. Each question was multiple choice with one correct

answer. Table 4.2 includes the questions used for assessing nutrition literacy, question categories, and frequencies of correct and incorrect answers for each question.

Table 4.2 Frequencies of Nutrition Literacy Questions

	Correct	Incorrect
Macronutrient		
Q1 The starch in a slice of bread is a type of carbohydrate.	166 (97.1%)	5 (2.9%)
Q2 Foods like oil and butter are often a source of fat.	164 (95.9%)	7 (4.1%)
Q3 The sugar found in orange juice is a type of carbohydrate.	106 (62%)	65 (38%)
Q4 A good source of protein is found in foods like eggs, chicken and fish.	168 (98.2%)	3 (1.8%)
Q5 Butter, lard, and cheddar cheese all provide high amounts of saturated fat.	123 (71.9%)	47 (27.5%)
Q6 Because they are a good source of protein, vegetarians might eat kidney beans.	151 (88.3%)	19 (11.1%)
Food label and numeracy		
Q7 How many calories will you eat if you eat the whole container?	164 (95.9%)	7 (4.1%)
Q8 If you are trying to eat fewer than 500 mg of sodium per meal, how many cups of this macaroni and cheese can you eat if you eat nothing else?	161 (94.2%)	10 (5.8%)
Q9 If your doctor has asked you to limit your fat intake to 60 grams per day, what percentage of your day's intake have you eaten in one serving of macaroni and cheese?	147 (86%)	24 (14%)
Q10 How many grams of carbohydrate would you eat in 2 cups of macaroni and cheese?	161 (94.2%)	10 (5.8%)
Q11 Which of the following nutrients is not found on this food label?	169 (98.8%)	1 (0.6%)
Q12 If you are advised to increase your fiber intake, is this food a good choice?	158 (92.4%)	13 (7.6%)

The summary of responses to the nutrition literacy questions indicates that question "Which of the following nutrients is not found on this food label?" had the highest correct rate (98.8%), while respondents failed most in question "The ___ found in orange juice is a type of carbohydrate," to which 38% of the respondents answered incorrectly, and more than half (53.8%) of the incorrect choices were made to the choice "Folate," which is a type of vitamin. It is also noteworthy that the question "Butter, lard, and cheddar cheese all provide high amounts of ___ fat" had a second-highest incorrect rate of 27.5%, within which 51.1% choices were given to "Trans saturated," which does not exist, as trans fat are a type of unsaturated fat.

Measures of the nutrition literacy were computed by summarizing the number of correct answers to the twelve nutrition literacy questions. Values of each question were recoded as 1 for correct choice and 0 for the 3 incorrect choices. The results showed a mean value of 10.78 for correct answers, a median value of 11, and a 1.244 standard deviation, with a range of 7; 34.5% (N=59) participants answered 100% nutrition literacy questions correctly, and only one participant scored 42% correctly, which was 5 out of the 12, representing the minimum score. Approximately 12.3% (N=21) of the participants answered 7 to 9 questions correctly, and 52.6% (N=90) of the participants answered 10 to 11 questions correctly. According to the scales of the original NLAI nutrition literacy questionnaire, majority of the participants in this study have adequate nutrition literacy, 98.2% (N=168), and the rest 1.8 % (N=3) participants have marginal nutrition literacy. None of the participants showed high likelihood of inadequate nutrition literacy.

Hypotheses Testing

H_1: Individuals with higher nutrition literacy have higher involvement with the nutrition labels.

The first hypothesis predicted that those with higher nutrition literacy would be more involved in reading nutrition labels. Involvement for label reading was measured in three different ways: Frequency or label reading, perception about labels, and the extent to which they remembered what they read on the labels.

Frequency of involvement was measured by two items, "How often do you read nutrition labels before making dietary choices" (M=3.37, SD=1.11), and "How often do you compare nutrition label information of different products to make purchase decisions"(M=3.25, SD=1.17). These measures were based on a 5-point scale of "Never" (1) to "All of the time" (5). The two

items yielded a combined mean of 3.31 (SD=1.09) and a Cronbach's alpha of 0.903, indicating high internal consistency between the items.

Perception-based involvement items included: " The health claim above was easy to understand" (M=3.89, SD=1.01), "The health claim above was credible" (M=3.09, SD=1.25), "The health claim above was interesting" (M=2.97, SD=1.16), "The health claim above was important for me" (M=2.16, SD=1.12), "The health claim above was new to me" (M=1.63, SD=1.03), " The health claim above was likely to make me buy the product" (M=1.67, SD=1.02), "I expect this candy to be better than one that does not have this claim" (M=1.77, SD=1.10), "Regularly consuming this candy that claims 'a fat free candy' is healthy" (M=1.20, SD=0.62), "Regularly consuming this candy would help me achieve/manage particular body functions" (M=1.20, SD=0.62), "Regularly consuming this candy would help me reduce the risk of particular diseases" (M=1.20, SD=0.69),. These items were based on 5-point scale "Not at all agree" to "Strongly agree." The ten items have a combined mean of 2.08 (SD=0.47) and a Cronbach's alpha of 0.632, indicating acceptable internal consistency within the items.

Memory-based involvement (M=3.16, SD=0.90), including the following four items "How many grams of sugar are there in each serving of the JUJUBES candy" (M=2.99, SD=1.01), "The numbers on the nutrition facts panel indicate amount per package" (M=1.65, SD=0.48), "The percentages on nutrition facts panel are based on percent daily value" (M=1.07, SD=0.25), and "The amount of potassium is NOT labeled on the nutrition facts panel" (M=1.32, SD=0.47). Participants chose one from the four choices for the first question, and one from each of the "True" and "False" choices for the rest three statements.

To test the relations between nutrition literacy and involvement, a one-way ANOVA was conducted to compare the differences of variance between the means of "nutrition literacy" and variables "frequency of involvement," "perception-based involvement," and "memory-based involvement." "Involvement" was recoded into two categories: "high involvement" and "low involvement." Results show that there was no significant differences of variance between the means of "nutrition literacy" and "involvement" at the $p < 0.05$ level [$F(1, 168) = 1.72$, $p = 0.19$]. Meanwhile, there was not a significant differences of variance between the means of "nutrition literacy" and "perception-based involvement" at the $p < 0.05$ level [$F(1, 166) = 1.41$, $p = 0.24$]. Neither was there any significant differences of variance between the means of "nutrition literacy" and "memory-based involvement" at the $p < 0.05$ level [$F(1, 169) = 0.04$, $p =$

0.85]. Taken together, these results suggest that there was no statistically significance between nutrition literacy and involvement at the $p < 0.05$ level. According to the result, Hypothesis 1 is not supported.

H_2: People with lower nutrition literacy are more likely to overestimate the health benefits of products that have health claims.

These second hypothesis examined the relationship between nutrition literacy and the likelihood of participants' overestimating health benefit from health claims. Likelihood of overestimating health benefit from health claims was measured using three items based on 5-point Likert scale" Not at all agree" (1) to "Strongly agree" (5): "Regularly consuming this candy that claims 'a fat free candy' is healthy" (M=1.20, SD=0.62), "Regularly consuming this candy would help me achieve/manage particular body functions" (M=1.20, SD=0.62), and "Regularly consuming this candy would help me reduce the risk of particular diseases" (M=1.20, SD=0.69). Analysis showed a strong inter-item correlation among the three items, and a good reliability indicated by a Cronbach's alpha of 0.791. Subjects have overall low likelihood of overestimating health benefit from health claims (M= 1.20, SD=0.54). To examine the relations between nutrition literacy and likelihood of overestimating health benefits of the given product based on its health claim, a Pearson's correlation was computed. Results showed that the two variables were not correlated, $r = 0.144$. According to this result, Hypothesis 2 was not supported.

H_3: Higher nutrition literacy is related to a more positive attitude towards reading nutrition label for dietary choices.

The third hypothesis examined the relationship between nutrition literacy and attitude towards reading nutrition label for dietary choices. Attitude towards reading nutrition label for dietary choices was examined by four items: "For me, referring to nutrition labels for food choice is important" (M=3.21, SD=1.30), "For me, referring to nutrition labels for food choice is beneficial" (M=3.64, SD=1.12), "If I refer to nutrition labels for food choice, I will feel that I am being responsible for my health" (M=3.67, SD=1.04), and "Being responsible for my health is desirable" (M=4.25, SD=0.86). A Cronbach's alpha of 0.825 showed a good internal consistency of the four items. The items have a combined mean of 3.7 (SD=0.88), which shows a relatively positive attitude towards reading nutrition label for dietary choices.

In order to examine the relations between nutrition literacy and attitude towards reading nutrition label for dietary choices, a Pearson's correlation was computed. The results showed that the two variables were not correlated, $r = -0.081$. According to this result, Hypothesis 3 was not supported. While attitude towards reading nutrition label for dietary choices has no significant relation with nutrition literacy, attitude towards reading nutrition label for dietary choices was strongly correlated with frequency of label reading ($r = 0.672$), indicating that individuals with more positive attitude towards reading nutrition label for dietary choices read nutrition labels more often.

H_4: Individuals with higher motivation to read nutrition labels have better perceived behavioral control of reading nutrition labels.

The fourth hypothesis examined the relationship between motivation to read nutrition labels and perceived behavioral control of reading nutrition labels. Motivation was measured by eight items, and each of them was based on a 5-point Likert scale from "Not at all agree" (1) to "Strongly agree" (5). The eight items included: "I make food choice based on nutrition label reading because: 'I find it a personal challenge to do so' (M=2.40, SD=1.29), 'I personally believe that choosing food based on nutrition label reading will improve my health' (M=3.56, SD=1.20), 'It is exciting to try to keep balanced meal in a healthy range' (M=2.91, SD=1.35), The reason I will make food choice based on nutrition label reading in the future is that 'I personally believe that it is important in remaining healthy' (M=3.96, SD=0.99), 'I carefully thought about my dietary habit and believe it's the right thing to do' (M=3.45, SD=1.14), 'I feel personally that getting food while being aware of the nutrition information is the best things for me' (M=3.76, SD=1.10), 'Using nutrition label to guide my food selection is choices I really want to make' (M=3.20, SD=1.31), and 'It's a challenge to learn how to read nutrition facts' (M=2.09, SD=1.21)." The items have a combined mean of 3.16 (SD=0.90), which shows a relatively high motivation towards reading nutrition label for dietary choices.

Perceived behavioral control was measured by computing the mean values of the original variable "I am confident that I can refer to nutrition labels for food choice if I want to" (M=4.04, SD=0.97), "It is easy for me to refer to nutrition labels for food choices" (M=3.92, SD=0.97), "The decision to refer to nutrition labels for food choices is within my control" (M=4.25, SD=0.80) and "Referring to nutrition labels on making food choice is entirely up to me" (M=4.33, SD=0.83). Subjects revealed high perceived behavioral control in general. The items

have a combined mean of 4.14 (SD=0.72), which shows a relatively high perceived control of reading nutrition label for dietary choices.

To examine the association between motivation to read nutrition labels and perceived behavioral control of reading nutrition labels, a Pearson's correlation was conducted. The result showed a significant correlation ($r = 0.246$) between motivation to read nutrition labels and perceived behavioral control of reading nutrition labels, indicating that motivation and perceived behavioral control of the label reading behavior are positively related. According to the result, Hypothesis 4 was supported.

H_5: An individual's motivation to read nutrition labels and attitude towards reading nutrition labels are positively related.

The fifth hypothesis examined the relationship between motivation to read nutrition labels and attitude towards reading nutrition labels.

Table 4.3 Correlations Between Motivation and Dependent Variables

	Motivation (Pearson's *r*)
Subjective Norms	.565*
Frequency of Involvement	.654*
Perceived Behavioral Control	.246*
Attitude	.731*

* Correlation is significant at the 0.01 level (2-tailed)

A Pearson's correlation showed motivation to read nutrition label for dietary behavior was significantly correlated with attitude towards reading nutrition label for dietary choices. ($r = 0.731$). Additionally, motivation was positively correlated to perceived behavioral control ($r = 0.246$), which likely means that those with higher motivation to read nutrition label are more likely to have better perceived control over reading nutrition label behavior.

Based on the results, Hypothesis 5 was supported, indicating that individuals with a higher motivation to read nutrition label are more likely to have positive attitude towards reading nutrition label.

Motivation was also positively associations with subjective norms ($r = 0.565$), and frequency of involving in reading nutrition labels ($r = 0.654$). In addition, the significant correlation showed that the more frequent individuals involve themselves in the label reading, the more likely they will have a high motivation, better subjective norms and perceived

behavioral control, and a positive attitude towards reading nutrition label. Meanwhile, it also indicated that individuals with better subjective norms have more positive attitude towards reading nutrition label, and that those with more positive attitude towards reading nutrition label have better perceived control over their label reading behavior.

Chapter 5 - Discussion, Implications, and Conclusion

This chapter included discussion based on the results, including what the findings suggests and how they relate with the theoretical framework and previous studies. Following the discussion will be the conclusion, limitations of this study, and theoretical and practical implications for future research.

The first hypothesis predicted that those with higher nutrition literacy would be more involved in reading nutrition labels. Nutrition literacy was measured by 12 questions, and results of testing nutrition literacy showed that the majority of the participants have adequate nutrition literacy. Involvement in label reading was measured in three different ways: frequency of subjects' reading nutrition label for dietary choices, evaluation of the food claim and the product based on subjective perception of the given food package information, and recall of the nutrition label information given previously. Results of testing the variable "frequency of involvement" revealed that participants sometimes read nutrition labels before making dietary choices and sometimes compare nutrition label information of different products to make purchase decisions on an average basis; meanwhile, results of testing the variable "perception-based involvement" showed that participants were familiar with the claim averagely, and had marginal evaluation of the claim's credibility. Meanwhile they were less likely to trust or to be persuaded by the claim's health benefit, which lined up with the results that participants have good nutrition literacy. Result of ANOVA indicated that there was no statistically significance of the relation between nutrition literacy and involvement, given limited variance in the data of variable "nutrition literacy". The finding that most participants in this study have adequate nutrition literacy was consistent with previous finding that the number of label use are higher in respondents with higher education levels, and frequent label use was associated with better understanding in general (Campos et al., 2011). The high involvement and adequate nutrition literacy among most participants showed consistency with implications from previous study and ELM, that variations in people's issue involvement can affect how they process and respond to given information (Park, 2012; Petty & Cacioppo, 1986).

These second hypothesis examined the relationship between nutrition literacy and the likelihood of participants' overestimating health benefit from health claims. Likelihood of overestimation was measured based on how subjects estimate the health-related effect from

consuming the product when they were presented with both the claim and nutrition label of this product. According to the results of testing variable "likelihood of overestimating health benefit from health claims", participants on average tend to give negative evaluation based on the measuring items. This finding did not line up with previous findings that consumers were likely to overgeneralize from the comparative items when exposed to nutrient content claims, the bias included higher ratings based on single nutrient claim attributes and inappropriate perception about health benefit of the products (Andrews, Burton, & Netemeyer, 2000; Roe, Levy, & Derby, 1999).

The third hypothesis examined the relationship between nutrition literacy and attitude towards reading nutrition label for dietary choices. Attitude towards reading nutrition label for dietary choices was examined by asking whether participants consider referring to nutrition labels for food choice as important, beneficial, and a sign of being responsible for health. There was a relatively positive attitude towards reading nutrition label for dietary choices.

The fourth hypothesis examined the relationship between motivation to read nutrition labels and perceived behavioral control of reading nutrition labels. Results of testing variable "motivation" showed a relatively high motivation towards reading nutrition label for dietary choices, and result of testing variable "perceived behavioral control" showed participants had high perceived control over nutrition label reading for dietary choice. There was a significant relation between motivation and perceived control of reading nutrition label for dietary choices, indicating individuals with higher motivation to read nutrition label for dietary choices tend to have better perceived control over this behavior, and those who are less motivated are likely to have less perceived control over reading nutrition label for dietary choices. Meanwhile, given the overall adequate nutrition literacy level, the finding of high motivation was consistent with previous research that found greater nutrition knowledge to be positively correlated with motivation for following a healthy diet among adults (Miller, DeWitt, McCleeary, & O'Keefe, 2009).

The fifth hypothesis examined the relationship between motivation to read nutrition labels and attitude towards reading nutrition labels. Significant correlation between motivation to read nutrition labels and attitude towards reading nutrition labels indicates that if one is more motivated to read nutrition labels for dietary choices, his/her attitude towards performing this behavior will likely to be more positive.

Additionally, unlike previous study that revealed people with more professional nutrition knowledge have better elaboration of food claims compared to those who do not (Marquart, Pham, Lautenschlager, Croy, & Sobal, 2006). This study did not find significant difference in terms of nutrition literacy between individuals from non-nutrition-related major and those from nutrition-related major (i.e. human nutrition, public health, kinesiology), who have relatively more nutrition knowledge at college level.

Limitations

College student participants in this study indicate but may not be best indicator of nutrition literacy and dietary behavior of the nationwide population who are in their emerging adulthood due to study sample's homogeneity in education levels. A solution to this limitation would be to expand the study to the population with more variant education levels. Additionally, the method to assess nutrition literacy was another limitation, since the questionnaire was adopted without cognitively testing among participants prior to the survey.

The nutrition literacy test questions were originally designed for general adult population, which may have more variance in nutrition literacy compared to college-age population. Each of the nutrition literacy questions was single-item measurement, to which the choices may not reflect participants' actual understanding and knowledge. Thus, it is important for future studies to conduct cognitive test for reviewing potential misunderstanding, so as to develop a questionnaire that fits better to the college-age population. Meanwhile, self-selection bias could have affected the result. The survey had an 8.55% response rate, while 98.2% of these respondents indicated adequate nutrition literacy. It is possible that survey recipients who chose to respond were nutrition-wise literate; while those with lower nutrition literacy opted not to take the survey since participation was voluntary. Besides nutrition literacy, this study did not assess subjects' BMI status, actual dietary behavior, as well as their use of nutrition label.

Another limitation of this study was although the Theory of Planned Behavior was used as part of the theoretical framework, this study did not include self-efficacy and behavioral intention, which are two components of the TPB model. Only parts of the theory's constructs that are relevant to this study were adopted.

Study Implications

Theoretical Implications

From a theoretical perspective, Significant association between motivation and attitude found in this study lined up well with the ELM which suggests that as one's motivation to read nutrition label information increases, the impact of such central route on label-reading attitudes should increase (Petty & Cacioppo, 1986). Meanwhile, the correlations between attitude and subjective norms, attitude and perceived control of reading nutrition label for dietary choice was consistent with the TPB model which suggests attitude, subjective norms, and perceived behavioral control are interrelated and work together in predicting behavior intention (Ajzen, 1991).

The sample in this study did not reveal any significance from the correlation between subjective norms and perceived control of reading nutrition label for dietary choice, thus future study is needed to examine how these two variables associate in contributing to dietary behavior. On the other hand, since the TPB doesn't have motivation content, it would be wise for future study to implement motivation as a predictor to behavior in addition to attitude, subjective norms, and perceived behavioral control in applying the TPB. In addition, future study may continue testing the association between motivation and variables from the TPB in order to see if any fixed relations exist. The results showed that improvement in attitude towards certain behavior relates to development in motivation and perception-based involvement, which gives a cue that connecting the Theory of Planned Behavior and the Elaboration Likelihood Model could be an effective way of persuasion for behavior change. Furthermore, since this study did not include self-efficacy and behavioral intention these two components from the Theory of Planned Behavior, it is important that future study to examine self-efficacy and behavioral intention together with other components of the model in an effective way.

Practical Implications

It is important for future study to implement additional measurements of college-age population's nutrition literacy, BMI status, and current label reading and dietary behavior. Observation in a real-life scenario should be considered as it better reflects subjects' actual behavior compared to their self-reported results. Interview including twenty-four hour dietary recall may also be a necessary method for future research. Subjects may be asked which part or

what information of the nutrition label do they pay most attention to, as a step forward measuring involvement in nutrition label information. Besides, extended study may be conducted by examining if individuals read and understand the ingredients list, and if they can relate the main contributing ingredients to each of the nutrient items on the nutrition facts panel.

FDA's recent proposed changes to nutrition facts label reflects nutrition label's public health significance. Aiming at minimized consumers' potential misunderstanding and give full play of the nutrition information, the proposed changes include updated serving size, Daily Values (DV), information of added sugars and potassium, etc. Once the revised label come into use, it would be wise for future study to remain the same nutrition literacy assessment tool with the new label. From the governmental perspective, future study may also examine college-age consumers' opinions and understanding by comparing the new label to the old version, especially the revised parts. For instance, subjects may be asked about the health benefit of potassium, or the reason why added sugar should be limited in one's diet, so as to further assess college-age population's nutrition literacy as well as the advantages and limitations of the new label.

Improving college-age population's dietary behavior to prevent obesity requires strategic health communication. This study revealed adequate nutrition literacy and awareness of nutrition-label reading of the college-age population, elucidating existing barriers between ability to identify healthy food and potential unhealthy dietary choices. As health communication is often employed in breaking down barriers to the understanding of health-related issues using culturally relevant messages, so as to advance public good. In this case, health communication can play a role in building the skills needed to improve college-age population's overall dietary behavior upon their adequate nutrition literacy. Meanwhile, health communication offers an approach that involves a partnership between policymakers, the public health and the private sector. This approach suggests that health communication professionals communicate college-age population's current nutrition literacy and dietary behavior to the policy maker, so as to explore ways to reduce limitations of college-age population's healthy dietary choice, such as improving the variety and accessibility of healthy foods. Continuous assessment of outcomes and strategy adjustment are also needed for health communication approach. It is also noteworthy that communication alone is not a simple solution to diet-related obesity given multiple contributors to this public health issue. It is important that strategic health communication effectively involve as many partnerships from public to private factors, to identify and apply

solutions to improve college-age population's dietary behavior so as to prevent and reduce the risk of obesity among this population.

Conclusion

This study examined the influence of nutrition literacy on college-age population's dietary behavior. As the results showed, most of the participants in this study have adequate nutrition literacy and overall high likelihood of nutrition label reading behavior. Although there was no variance in nutrition literacy and therefore no significant differences based on students' academic major or year in college, the study found strong relationships between their motivation and attitudes towards nutrition label-reading. There was also a strong relationship between motivation and perceived behavioral control on reading nutrition labels for dietary choices.

However, the results of overall good nutrition literacy of college students in this study can not explain disparity between high literacy and the obesity epidemic among emerging adulthood population, indicating that objective factors such as changes in living environment and personal budget management are possible barriers for college-age population's healthy dietary behavior. Findings of this study also suggests that improvement in individuals' motivation to read nutrition label may help improve attitude and perceived control of the label reading behavior.

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Appendix A - Survey Questionnaire

Opening Message

The purpose of this survey is to gather information about nutrition literacy and dietary behavior. This is an academic research study conducted by a graduate student of A.Q. Miller School of Journalism and Mass Communications at Kansas State University. Your anonymous responses will be kept strictly confidential. You can withdraw from the interview anytime.

Nutrition Literacy

Macronutrients

1. The starch in a slice of bread is a type of _____.
    a. Fat
    b. Vitamin
    c. Carbohydrate
    d. Protein
2. Foods like oil and butter are often a source of _____.
    a. Vitamin C
    b. Carbohydrate
    c. Iron
    d. Fat
3. The _____ found in orange juice is a type of carbohydrate.
    a. Sugar
    b. Calcium
    c. Protein
    d. Folate
4. A good source of _____ is found in foods like eggs, chicken and fish.
    a. Starch
    b. Protein
    c. Fiber
    d. Sugar
5. Butter, lard, and cheddar cheese all provide high amounts of _____ fat.

a. Polyunsaturated
b. Saturated
c. Monounsaturated
d. Trans saturated

6. Because they are a good source of _____, vegetarians might eat kidney beans.
a. Vitamin D
b. Vitamin B-12
c. Fat
d. Protein

Food Label and Numeracy

The food label below is taken from the back of a container of macaroni and cheese.

Figure A.1 Food Label

Macaroni and Cheese

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Cholesterol 30mg	**10%**
Sodium 470mg	**20%**
Total Carbohydrate 31g	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Protein 5g	
Vitamin A	**4%**
Vitamin C	**2%**
Calcium	**20%**
Iron	**4%**

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

	Calories:	2,000	2,500
Total Fat	Less than	65g	60g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

7. How many calories will you eat if you eat the whole container?

a. 250 calories
b. 500 calories
c. 700 calories
d. 750 calories

8. If you are trying to eat fewer than 500 mg of sodium per meal, how many cups of this macaroni and cheese can you eat if you eat nothing else?

a. 1 cup

b. 2 cups
c. 3 cups
d. 4 cups

9. If your doctor has asked you to limit your fat intake to 60 grams per day, what percentage of your day's intake have you eaten in one serving of macaroni and cheese?
   a. 10%
   b. 20%
   c. 30%
   d. 40%
10. How many grams of carbohydrate would you eat in 2 cups of macaroni and cheese?
   a. 31 grams
   b. 45 grams
   c. 62 grams
   d. 75 grams
11. Which of the following nutrients is not found on this food label?
   a. Total fat
   b. Sodium
   c. Thiamin
   d. Sugars
12. If you are advised to increase your fiber intake, is this food a good choice?
   a. Yes
   b. No

Variables from ELM and TPB

Involvement

13. How often do you read nutrition label before making dietary choices?

1) Never
2) Rarely
3) Sometimes
4) Often
5) All of the time

14. How often do you compare nutrition label information of different products to make purchase decisions?

1) Never
2) Rarely
3) Sometimes
4) Often
5) All of the time

15. Below is the package of JUJUBES candy and its nutrition facts.

Figure A.2 JUJUBES Candy Nutrition Facts

Figure A.3 JUJUBES Candy Package

Please indicate your perception of the claim “a fat free candy” on the package based on the questions:

15-1. The health claim above was easy to understand

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-2. The health claim above was credible

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-3. The health claim above was interesting

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-4. The health claim above was important for me

1) Not at all agree

2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-5. The health claim above was new to me

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-6. The health claim above was likely to make me buy the product

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-7. I expect this candy to be better than one that does not have this claim

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-8. Regularly consuming this candy is healthy

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-9. Regularly consuming this candy would help me achieve/manage particular body functions

1) Not at all agree
2) Slightly agree

3) Somewhat agree
4) Agree
5) Strongly agree

15-10. Regularly consuming this candy would help me reduce the risk of particular diseases.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

15-11. Regularly consuming this candy would help me with particular consumer benefits.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

Motivation

16. I make food choice based on nutrition label reading because:

16-1. I find it a personal challenge to do so.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

16-2. I personally believe that choosing food based on nutrition label reading will improve my health.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

16-3. It is exciting to try to keep balanced meal in a healthy range.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

17. The reason I will make food choice based on nutrition label reading in the future is that:

17-1. I personally believe that it is important in remaining healthy.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

17-2. I carefully thought about my dietary habit and believe it's the right thing to do.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

17-3. I feel personally that getting food while being aware of the nutrition information is the best things for me.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

17-4. Using nutrition label to guide my food selection is choices I really want to make.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

17-5. It's a challenge to learn how to read nutrition facts

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

Attitude

18-1. For me, referring to nutrition labels for food choice is important.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

18-2. For me, referring to nutrition labels for food choice is beneficial.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

18-3. If I refer to nutrition labels for food choice, I will feel that I am being responsible for my health.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

18-4. Being responsible for my health is desirable.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree

5) Strongly agree

Subjective Norms

19-1. People who are important to me think that I should refer to nutrition labels for food choice.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

19-2. I expect to refer to nutrition labels for food choice.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

19-3. I feel under social pressure if not referring to nutrition labels for food choice.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

Perceived Behavioral Control

20-1. I am confident that I can refer to nutrition labels for food choice if I want to.

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

20-2. For me to refer to nutrition labels for food choice is easy:

1) Not at all agree
2) Slightly agree

3) Somewhat agree
4) Agree
5) Strongly agree

20-3. The decision of refer to nutrition labels for food choice is within my control:

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

20-4. My referring to nutrition labels for food choice is entirely up to me

1) Not at all agree
2) Slightly agree
3) Somewhat agree
4) Agree
5) Strongly agree

Demographics

21-1. Please indicate your gender:

1) Female
2) Male

21-2. What is your age? _____

21-3. Please indicate your ethnicity:

1) Non-Hispanic White
2) Black or African American
3) Hispanic/Latino
4) Asian or Asian American
5) Alaska Native or American Indian
6) Hawaiian or Other Pacific Islander
7) Other _____

21-4. Please indicate your country of origin:

1) U.S.

2) Outside U.S.

21-5. Please specify your major: _____

21-6. Please indicate your year of school:

1) Freshman
2) Sophomore
3) Junior
4) Senior
5) Non-degree

Additional Question for the Variable "Involvement"

The following questions are based on the JUJUBES candy nutrition facts panel given in previous section.

22-1. How many grams of sugar are there in each serving of the JUJUBES candy?

1) 40g
2) 0g
3) 32g
4) 21g

22-2. The nutrition facts listed on the JUJUBES candy label are amount per package.

1) True
2) False

22-3. The percentages shown on the JUJUBES candy nutrition facts panel are based on percent daily value.

1) True
2) False

22-4. The amount of potassium is NOT labeled on the nutrition facts panel.

1) True
2) False

Appendix B - IRB Approval Letter

KANSAS STATE UNIVERSITY | University Research Compliance Office

TO: Nancy Muturi
Journalism & Mass Comm.
217A Kedzie

Proposal Number: 7066

FROM: Rick Scheidt, Chair
Committee on Research Involving Human Subjects

DATE: 03/03/2014

RE: Proposal Entitled, "Influence of Nutrition Literacy on College Students' Dietary Behavior"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

203 Fairchild Hall, Lower Mezzanine, Manhattan, KS 66506-1103 | 785-532-3224 | fax: 785-532-3278 | k-state.edu/research/comply