DISSERTATION

# THE IMPACT OF MESSAGE TYPE AND FORMAT ON CONSUMERS' FOOD QUALITY PERCEPTIONS AND DECISION MAKING IN ONLINE GROCERY PURCHASING

Submitted by

Elizabeth Frances Tilak

Department of Journalism and Media Communication

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Doctoral Committee:

Advisor: Katie Abrams

Ashley A. Anderson
Dan J. Graham
Marilee Long
Megan Mueller

ABSTRACT

THE IMPACT OF MESSAGE TYPE AND FORMAT ON CONSUMERS' FOOD QUALITY PERCEPTIONS AND DECISION-MAKING IN ONLINE GROCERY PURCHASING

According to the Total Food Quality Model (TFQM), consumers evaluate many food messages and cues in order to assess food quality during the food purchase decision-making process. Consumers couple food cues with their own knowledge, interests, skills, memories, and values in an iterative process as they assess food quality. The presentations of food cues and messages are important in this food quality assessment process for a number of reasons. First of all, the type of food messages can impact this process. Sensory messages elicit a different impact on food quality decisions than do health-related food messages. Secondly, the presentation format of food messages can impact consumer attention to messages, in addition to the resulting attitude and willingness-to-purchase products in online purchasing decisions. When products are presented in an online format, consumers are restricted in their abilities to fully assess a product's physical, general, and abstract characteristics compared to when shopping in a brick-and-mortar store. These product characteristics of tangibility are limited in the online format; minimal tangibility can negatively increase consumer uncertainty, increase perceived risk, and decrease willingness-to-purchase online products. Presentation formats that enhance media richness, including increasing vividness and interactivity, have been shown to support tangibility and minimize consumer uncertainty and perceived risk, and strengthen attitudes. In the online grocery purchasing environment, low levels of media richness are employed; food product presentation is limited to static photos, price, size, and minimal ingredient and nutrition information. Finally, online food messages and presentation format may impact food quality

decision-making. This could impact evaluations of healthful foods in the online venue in order to support increased positive attitude and willingness-to-purchase these foods.

The following research experiment is an online within-subject design study in which factors of message type and message format are manipulated in six different treatment conditions. A total of 242 subjects participated in the study from a sample population of undergraduate college students. A one-way repeated measures analysis model was used to measure main effects of the message treatment conditions. Potential interactive effects of health interest and knowledge were included in the model. Results showed that no main effects were observed among any of the message treatment conditions. No interactive effects were observed from any of the potential covariates, including health interest and knowledge. It is concluded that the message type and message formats displayed in this study were not effective in impacting variations in participant attitude and willingness-to-purchase the food products in the online grocery simulation. Future research should investigate aspects of online food specific message types and degrees of media rich presentations that may positively impact participant food quality choice factors, particularly for foods that are encouraged for public health benefit.

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# DEDICATION

I dedicate this work to my three children: Lucas, Kyra, and Kaeden. In so many ways you provide motivation for me to be all that I can be and to reach for the stars. Thank you to their father, Juergen, for providing for the family during this journey. Without that support, my time, energy, and focus on this work would not have been possible.

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# CHAPTER 1. INTRODUCTION

## 1.1 Overview and Rationale

In the United States (U.S.), traditional brick-and-mortar grocery stores have undergone dynamic shifts since the country's beginnings. In his book The American Grocery Store: The Business Evolution of an Architectural Space, (Mayo, 1993) documented the history of the business of food market and grocery store business within the U.S. In colonial times, early designs of food product emporiums began as public markets in the centers of cities. Grocery stores within the larger cities provided mostly specialty products and were interspersed throughout the larger cities. Smaller cities gave birth to the general store concepts in the seventeenth century, as these cities did not have the demand for larger public markets. Often, these stores dealt with all aspects of trade, and merchants were considered all-purpose businessmen. The prevalence of these general stores grew in the eighteenth century. As technological advances were made, mass distribution and communication were vital to the expansion of the general grocery store.

Mass retailers emerged within the late 1800s. The Great Atlantic and Pacific Tea Company, with its beginnings in wholesale tea purchases, began to expand to other food items. To avoid wholesalers, the Kroger's company developed the first direct grocery trade company beginning in the 1880s. Expanding food stores helped lessen food costs per units as volumes increased. Large self-serve grocery stores were introduced in Los Angeles in the 1920s. And, the even larger highly decentralized retail supermarket opened in 1933. This new supermarket opened a path to further self-service grocery and, in turn, the invention of the grocery cart in 1937. The post-war boom and urban sprawl led the way to increased grocery markets in suburban areas. Technological and industrial advancements birthed innovative equipment;

greater refrigerated and frozen product selections, centralized meat processing, and further efficiencies resulted.

Grocery store design has continued to evolve in the latter half of the twentieth century. Grocery management realized the importance to market not only food items, but also the architecture, design, and displays throughout the stores, which encouraged customer attraction and patronage. The 1970s brought warehouse and club markets to the scene. The concept of generic brands supported consumer discount mentality, which had begun in the 1960s. The hypermarket concept, beginning in France in 1960s (Carrefoure), was brought to the United States in the early 1980s (Bigg Company) combining supermarket, discount shopping, and shopping mall for a 'one stop shopping' locale. Other companies, such as Wal-Mart, soon followed creating a more ubiquitous one-stop shopping grocery retail environment (Mayo, 1993). With the introduction of the internet and e-commerce in the 1990s, grocery food purchasing has moved into the online realm and continued to evolve. Since the turn of the century, grocers have begun to offer online grocery purchasing options. As this venue gains more interest, online grocery food choice decision-making is taking the grocery shopping experience into new territory.

Regardless of the structure, design, or history, grocery stores provide an environment filled with an abundance of communication about food. Packaged food contains food messages in forms of text, graphics, color, logos, brand, and pricing. Besides overt messaging and package design, product placement within the store, within the aisle or on the shelf, food displays, brand availability, and even store layout, all provide additional cues that can impact the inferences consumers make about those products. Food quality factors, both objective and subjective, are factors consumers use in formulation of a perceived food quality value when making food

purchase decisions (Brunso et al., 2002). Consumers use these many cues to assess a product's quality, which ultimately impacts their food choice (Brunso et al., 2002).

The American Marketing Association (AMA) defines marketing as *"..the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners and society at large"* (American Marketing Association, 2019). Marketing activities, often referred to as the marketing mix, involves the following four components: the product (i.e., goods and services), the promotion (i.e., communication), the placement (i.e., delivering), and the price (i.e., the exchange) (University of Minnesota, 2015). Food marketing activities operate to enhance consumer attention toward specific product information while persuading consumers to positively assess food quality, ultimately choosing to act on those decisions and make a purchase. Various food marketing messages, including persuasive food messages, encourage product purchases. Dual-processing models provide theoretical understanding of consumer mental processing of persuasive information (Chen et al., 1999). A consumer processes food quality information using varying degrees of cognitive effort. Some food message techniques can support consumer cognitive effort and elaboration of the food messages as well as attention to food cues connecting memories or previous judgments. Nutrition interest or knowledge can also impacts how consumers attend to and process persuasive food information (Turner et al., 2014). In order to positively market grocery food products, it is vital to understand specific message factors that impact mental processing and judgment formation in the process of food decision-making.

Food marketing aims to persuade consumers toward specific food choices. Some of these communications are federally regulated. Regulating food messages has been important in the aim to increase truth and transparency in food information marketing. Examples of these regulations

include nutritional content information, the Nutrition Facts Panel design and placement, health claim language, allergen information, ingredient listings, and some growing and manufacturing practices (e.g. organic) (U.S. Food and Drug Administration, 2018) There is a large body of research suggesting approximately 75% of consumers use regulated food information when making food quality decisions, particularly when consumers have a strong interest in health (Campos et al., 2011). In the online grocery environment, research suggests the number of consumers who use regulated nutrition information while making food choices is less than in traditional brick-and-mortar grocery (Ardolino & Lewin-Zwerdling, 2018).

Programs focused on public health have sought to market foods in order to encourage consumers to make healthful food choices within traditional brick-and-mortar grocery store environments (Escaron et al., 2013; Wang & Hu, 2017; Wansink, 2017). Many of these programs have focused on increasing consumer attention with point-of-purchase, in-store signage, and product placement while also focusing on education aspects. There is some evidence that food marketing that encourages consumer attention and processing of information can help support healthy food choices within traditional grocery environments (Escaron et al., 2013; Glanz et al., 2012; Wansink, 2017). However, further research is warranted to guide best practices for grocery food marketing toward healthful food purchases. Beyond the traditional brick-and-mortar grocery, such as online grocery, grocery intervention, and healthful food choice, data is sparse.

The United States Dietary Guidelines for Americans (2015) encourages healthful food choices in order to enhance health and well-being. Recent scientific evidence shows a strong correlation between consumption of whole grain foods and human health. Therefore, U.S. Dietary Guidelines recommend Americans consume one-half of dietary grain servings from

whole grains (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Yet, most Americans consume far less than the recommended amounts (McGill et al., 2015). Sensory experiments suggest consumers may avoid whole grain foods due to unfamiliarity and/or unfavorable sensory factors, among other reasons (Magalis et al., 2016). In contrast, consumers were more likely to accept whole grains when they had previously consumed whole grains and had positive perceptions of the whole grain foods (Magalis et al., 2016). Ideal public health programs aiming to increase whole grain consumption should identify specific sensory factors of food messages that facilitate positive food quality perceptions, in addition to increasing knowledge and familiarity.

Although interest in health can drive consumers to seek nutrition information when choosing foods, taste is one of the largest drivers of food choice (Luomala et al., 2015). Sensory descriptive messages of a food can impact the quality expectations of that food (Piqueras-Fiszman & Spence, 2015). Research shows that healthful foods are often perceived as less tasty than non-healthful food products. Health-related messages may result in lower expected quality, particularly taste expectations, for healthful foods. In fact, studies have shown that taste-based messages can impact food quality expectations when compared to health messages for the same food (Raghunathan et al., 2006). Using sensory descriptor messages for healthful foods, including whole grain foods, may lead to more positive quality expectations, which may affect food decision-making, but further research is needed.

The manner in which consumers purchase foods is changing drastically and the grocery store is at the center of this change (Phillips-Connolly & Connolly, 2017). The prime delivery global vendor behemoth, Amazon, purchased Whole Foods Markets in 2017. Branded as AmazonFresh, it promises to bring grocery into the widely accepted home delivery market.

Within the past year, more and more grocers, including Amazon, have placed higher priorities on improving their online shopping options for consumers. A recent survey in the U.S. reveals that 29% of consumers purchase groceries online most of the time (Ardolino & Lewin-Zwerdling, 2018). The percentage of consumers purchasing online groceries has greatly increased during the past year with the presence of the COVID-19 pandemic{Food Marketing Institute, 2020 #1013}. With a consumer-centric focus, many grocery stores today offer online grocery purchase options in addition to their traditional brick-and-mortar stores. Examples of these companies include regional grocers such as Krogers, King Soopers, Publix, Safeway, Hy-Vee, in addition to nationally represented grocers such as Walmart. Newer players in the online grocer space, like AmazonFresh, include those online stores established without a traditional brick-and-mortar grocery store. Examples of these online-only grocers include FreshDirect and Instacart.

The online shopping trend has often been attributed to the millennial generation—individuals born between the 1980s and 2000s. These consumers grew up with computers, cell phones, and other mobile devices (Lenhart et al., 2010; Valentine & Powers, 2013). Millennials are, by far, leading the online grocery shopping trend (Ardolino & Lewin-Zwerdling, 2018; GutCheck, 2017). A recent survey of U.S. adults (representative of U.S. population) reveals that women are more likely than men to shop for groceries online, with those under the age of 45 more likely than older consumers to purchase groceries consistently online. The most popular types of foods purchased online are familiar snacks, cereals, breakfast foods, and canned goods; perishable foods are less likely to be purchased online (GutCheck, 2017).

Consumers cite both advantages and disadvantages of online grocery shopping. Consumers list convenience, time saving, promotional opportunities, and bundled purchases as benefits while added costs, delivery fees, lack of availability and inability to pick own produce,

and lack of available brands are cited as barriers to online grocery purchasing (GutCheck, 2017). Researchers have defined an inability to sense the physical, general, and abstract characteristics of online goods as a decreased degree of product tangibility (Laroche et al., 2001). Low levels of product tangibility lead to greater uncertainty, increased perceived risk, and difficulty in decision-making for online products, particularly for unfamiliar or perishable foods (Laroche et al., 2005; Nepomuceno et al., 2014; Verhagen et al., 2016). Current online grocery web designs offer little more than product name, product static photo, nutrition facts panel information, and ingredient listing (Figure 1.1). Sparse information in this online shopping setting impacts consumer perceived general tangibility of the product.

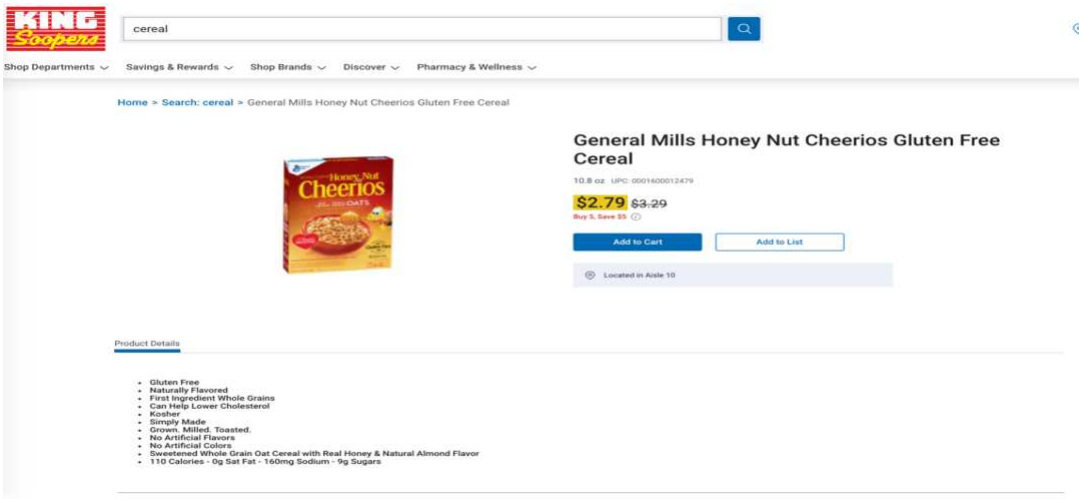



**Figure 1.1 Screen View of Current Online Grocery Product Page; (KingSoopers, 2019)**

Media richness, which is presenting information in media formats that effect the vividness and interactivity of the presentation, can impact the perceived tangibility, strengthen attitudes, and support the efficiency of communication (Brunelle & Lapierre, 2008; Jiang & Benbasat, 2007a, 2007b; Verhagen et al., 2016). Vividness of presentation format has to do with how the information is presented to the consumer's various senses, while interactivity addresses the degree in which participants are able to work with the form and content of the medium in real

time (Steuer, 1992). Particularly for e-commerce, vividness and interactivity within product presentation can enhance and facilitate cognitive elaboration of product review (Jiang & Benbasat, 2007a, 2007b). Media richness facilitates the perceived tangibility of a product, which, according to Verhagen et al. (2016), can impact how that product information is processed (Verhagen et al., 2016). Therefore, designing a media rich web page can increase a consumer's ability to clearly assess aspects of that product, potentially aiding quality judgments in food decision-making.

### 1.2 Goal and Research Question

The online grocery purchasing environment is a relatively novel format for consumer food decision-making. As a novel format, online grocery purchasing provides an additional venue for consumers to make food decisions that can impact the healthfulness of their overall diet. To date, there is limited evidence regarding consumer food decision-making in the online retail setting and whether the communication opportunities available in these settings could be optimized to enhance consumers' acceptance and willingness-to-purchase healthful foods. This dissertation aims to understand the impact of online food message types and formats, particularly for healthful foods, and add to theoretical understanding of the process of consumers' evaluations of food quality in the online grocery environment. The long-term goal of this dissertation is to add to the knowledge base around the impact of food message type and format presentations on consumer evaluations of food quality and to inform the creation of future healthful food campaigns and programs. The overarching research question this study examines is: How do different presentations of information affect consumers' evaluations and decision-making for healthful food products in the online grocery-shopping environment?

This research question is addressed in an online within-subject design using both message type and message format in variations of six different conditions. The following hypotheses have guided the data analysis and are further elaborated in the next chapter:

$H_1$: Those exposed to sensory food messages will have a greater attitude toward whole grain foods compared to health-related food messages.

$H_2$: Those exposed to sensory food messages will have a greater willingness-to-purchase whole grain foods compared to health-related food messages.

$H_3$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater attitude toward whole grain foods compared to those exposed to a presentation with less media richness.

$H_4$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater willingness-to-purchase whole grain foods compared to those exposed to a presentation with less media richness.

$H_5$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting with have a greater attitude toward whole grain foods compared to those exposed to a presentation with less media richness and a health message.

$H_6$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting with have a greater willingness-to-purchase whole grain foods compared to those exposed to a presentation with less media richness and a health message.

$H_7$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the attitude toward whole grain food products.

$H_8$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the willingness-to-purchase whole grain food products.

$H_9$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the attitude toward whole grain food products.
$H_{10}$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the willingness-to-purchase whole grain food products.

$H_{11}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the attitude toward whole grain food products.

$H_{12}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the willingness-to-purchase whole grain food products.

$H_{13}$: Knowledge will moderate the relationship between food message format and the attitude toward whole grain food products.

$H_{14}$: Knowledge will moderate the relationship between food message format and the willingness-to-purchase whole grain food products.

## 1.3 Organization of Dissertation

This dissertation document begins with a literature review (Chapter 2), which lends insight and supporting research of the theoretical model within food decision-making. Additional research describes the current landscape of online grocery formats, food decision-making, and aspects of media richness in the computer-mediated purchasing format. Chapter 3 covers the research methodology in addition to current research explaining the choice of whole grains as the study food within this research. Chapter 3 also describes the message development into the online research tool used in the fully fielded study. Chapter 4 reviews the analyses conducted and results of the research. Chapter 5 provides a full discussion of the observed results, limitations and strengths of the research, applications and inferences of the findings, and future research recommendations.

# CHAPTER 2. LITERATURE REVIEW

## 2.1 Defining Healthy Food Choices

Diet and nutrition are important components in health and well-being. Diet has been implicated in the prevention of disease, particularly chronic diseases such as heart disease, diabetes, and obesity. Both availability and accessibility to appropriate foods can have a large impact on one's diet. However, even when appropriate nutritional foods are available and accessible, it is one's food purchase and consumption decisions that have the ultimate impact in determining healthfulness of the diet.

Since 1980, governmental dietary guidance in the form of the Dietary Guidelines for Americans (DGA) has existed and been promoted. The development of these guidelines is a joint effort between the Departments of Health and Human Services (HHS) and the Department of Agriculture (USDA). An expert panel of scientists is appointed and convenes every five years to review new scientific evidence and formulate dietary recommendations based on this evidence (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). The resulting guidance creates the foundation for policy recommendations, which is used for federal nutrition programs and as a basis for dietary education programs. Other federal agencies that use the guidelines include the Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), the Food Safety and Inspection Service (FSIS) and the Center for Nutrition Policy and Promotion (CNPP), among others.

The most recent U.S. dietary guidance (2015-2020) has placed focus on dietary intake patterns, rather than simply nutrient or food group recommendations. Emphasis centered on the totality of the diet and the potential synergistic effects of foods consumed, providing support for overall health. In their review of the evidence, the Dietary Guidelines Advisory Committee

found strong consistency of evidence and support for a dietary pattern that included more vegetables, fruits, whole grains, legumes, nuts, seafood, low-fat or non-fat dairy, was moderate in alcohol, low in red and processed meats, and low in sugars and refined grains (Dietary Guidelines Advisory Committee, 2015). Dietary patterns that included the above, with limited saturated fat and sugars, were associated with a reduced risk of certain diseases including cardiovascular disease (CVD) and obesity. This type of dietary pattern aligns with recommendations from other national organizations such as the American Heart Association (AHA) and the National Cancer Institute (NCI). Dietary guidance aims to encourage Americans to consume appropriate diets that promote health based on substantial scientific evidence. Communications that endorse appropriate food decisions are necessary factors as they encourage Americans to choose appropriate foods and help to achieve compliance with the U.S. Dietary Guidelines.

### 2.1.1 Food decision-making and the total food quality model.

Just as nutrition science supports consideration of the totality of people's diets and synergistic relations among foods, social science research theorizes food decision-making and judgments of food quality are equally, if not more, multi-dimensional. Consumer perception of quality in food products has long been a driver in food choice and purchasing (Ophuis & Van Trijp, 1995). The multi-dimensional aspects of food quality include both objective and subjective product attributes.

In the development of their consumer-oriented food quality model, (see Figure 2.1), Brunso, Fjord, and Grunert (2002) defined food quality as encompassing four key components: 1) product-oriented quality, 2) process-oriented quality, 3) quality control components, and 4) user-oriented quality. A consumer assesses these four product quality components as they make food purchase decisions. Product-oriented quality components are those physical characteristics

of the product such as color, size, fat content, and calorie content, for example. The second quality component, process-oriented quality, is associated with product production, which includes farming methods (e.g., non-genetically modified seeds) and processing inputs (e.g., nitrates). Quality control components, the third type of food quality, are those related to the specific pre-determined standards or certifications of the product type such as the grade and size of eggs (e.g. grade A or AA and large or jumbo size) or the regulated identity of butter. These components are determined and regulated by a governing body. These three quality components are specific and objective forms of quality. The fourth quality component is user-oriented quality and relies on consumer subjectivity including assessments such as taste, convenience, richness, texture, and feasibility, among others. All four forms of quality are interrelated, can influence one another, and overlap.

When assessing user-oriented food quality, there are three types of product attributes that consumers recognize—search attributes, experiential attributes, and credence attributes (Brunso et al., 2002; Grunert, 2002). Color, brand name, or a product's physical characteristics are examples of search attributes; search attributes influence food quality perceptions prior to food purchase (Brunso et al., 2002). Experiential attributes, such as taste, are those attributes determined while experiencing the food product, such as taste, texture, in addition to preparation. Experiential attributes are more often formed after a food purchase during food preparation and consumption. Finally, credence attributes, such as health-related information or the use of biotechnology, are attributes that require empirical data or expert knowledge in relation to food products (Brunso et al., 2002). Consumers use these three product quality attributes when assessing product quality in food decision-making.

In addition to cues of product quality, consumers draw from their own cognitive categories, which are aspects of memory, skills, experiences, values, beliefs, and attitudes, when processing food messages (Grunert, 1995). According to Grunert (1995), these categories are based on factual knowledge, procedural knowledge (e.g., skills, training) and self-relevant consequences of food consumption (e.g., previous experience, time available), and are related to the food consumption situation. For example, if the consumption situation is a busy weekday night or a relaxing weekend evening, the values, skills required, and time available will vary and influence food decision-making differently (Grunert, 1995). Both food messages and personal cognitive categories aid consumers in determining the overall quality of food products (Brunso et al., 2002).

Once food quality assessments are made, consumers determine whether the quality meets their personal purchasing motives. Grunert et al. (2000) define purchase motives as "…abstract entities which motivate consumer behavior across a wide range of products" (p. 575). The food product characteristics are used to assess a product's quality, form a judgment about the usefulness of the product, and then determine whether it meets purchase motives, ultimately supporting food purchase behaviors.

According to the research, these consumer purchase motives fall within four distinct dimensions, which include hedonic, convenience, process, and health-related quality (Brunso et al., 2002; Grunert et al., 2000). Hedonic quality refers to the pleasurable attributes of a product, including factors such as sensory and aesthetic aspects such as taste, smell, color, and appearance. Convenience-related quality includes characteristics associated with time and effort such as buying, storing, and preparation. Process-related characteristics include aspects of how the product is grown and manufactured. Finally, the health-related quality dimension concerns

the relation of consumption of the food product to consumer health. These quality dimensions are interrelated, overlap, and can vary by product and by consumer. As a consumer assesses food product quality based within these four dimensions, both a perceived and expected product quality judgment results—motivating a purchase decision.

The Total Food Quality Model (TFQM; Figure 2.1) initially proposed in 1995 by Grunert, Sorensen, Johansen, and Nielsen, is a theoretical model aimed at illustrating the factors associated with development of consumer food quality perception. The TFQM is a means-end chain model: it illustrates subjective meaning of links or associations between product attributes to more abstract consumer cognitive structures. These links can support motivation and interest for specific product characteristics (Grunert, 1995). The TFQM model incorporates both aspects of multi-attribute models of product quality and hierarchical value maps of consumer cognitive categories (Brunso et al., 2002). The TFQM divides food quality aspects into those assessed prior to food purchase and after food purchase (Brunso et al., 2002). It is important to note that the buying channel (e.g., grocery store type, food stand, etc.) can also impact the food quality assessment. As an example of the quality attributes used in food decision-making, a consumer selecting food in a grocery store setting will assess the intrinsic and extrinsic aspects of food such as color, size, feel, weight, nutrition, packaging in addition to brand, price, assortment, display, among others. Without actually sampling foods, consumers' quality assessment will be determined based on associations of these product characteristics to one another, rather than experiential attributes. In addition, a consumer will draw from their own cognitive categories (e.g. values, memory, beliefs, and attitudes) while assessing food quality and making food decisions (Grunert, 1995). Once a food is purchased, there are perceived quality factors that will facilitate further quality assessment; these quality factors are based on the experiential aspects

such as taste, flavor, cooking, and convenience (Brunso et al., 2002). The discrepancies between a perceived quality expectation of a food product and the actual quality experience add to their cognitive categories and can motivate future product purchases (Brunso et al., 2002).

The TFQM illustrates that product characteristics, food situation, and cognitive categories are inter-related and influence each quality assessment of food decision-making (Brunso et al., 2002; Grunert, 1995). Grunert (1995) suggests a likely sequence of these associations to include concrete product attribute, abstract product attribute, functional consequence, psychosocial consequence, instrumental value, and terminal value. A consumer considering *low fat foods*, for example, could link that attribute to an abstract attribute such as *fewer calories*. Choosing foods that have *fewer calories* might link to consequences of consumption such as *weight loss* and *social-acceptance*. These could also link to consumer values such as *self-esteem* and *self-confidence* (Grunert, 1995). According to Grunert (1995), the interaction of objective and subjective product attributes, in addition to consumer cognitive categories, create greater consumer interest and positive attitude toward the product. These associations can impact behavioral intentions in purchasing (Grunert, 1995). The level at which these links are established is thought to be related to the degree of consumer involvement with the product (Grunert, 1995).The TFQM is illustrated in Figure 2.1 (Brunso et al., 2002; Grunert, 2002).

The TFQM has been used as a framework in consumer research to investigate and describe consumer quality perception of food products within the different dimensions of user-oriented food quality perceptions and expectations (Brunso et al., 2002). Hedonic quality has to do with pleasurable search and experiential attributes of products, including sensory factors, as opposed to functional or utilitarian attributes. Based on these hedonic cues, perceived and expected quality judgments can be formed (Brunso et al., 2002). Consumer food product

research has shown that taste is a dominant motivator in food decision-making (Clark, 1998; Li et al., 2015; Roininen & Tuorila, 1999).

The health-related food quality dimension also drives much consumer research. Consumers view the health-related dimension in two distinct manners—eating healthy foods (e.g. inclusion) and not eating unhealthy foods (e.g. avoidance) (Brunso et al., 2002). Perceived health attributes of food products are inferred from a variety of cues including nutrition facts panel, health claims, graphics, color, etc. Health attributes have been linked to consumer attitude and purchase motivation (Brunso et al., 2002). However, research suggests that product health messages may have a negative effect on taste expectations as consumers infer that healthful food would not meet hedonic expectations (Hieke & Grunert, 2018; Lähteenmäki et al., 2010). While taste is a very strong driver of product acceptance, a Belgium survey conducted in 2001 revealed that a belief in a product's health benefit was the strongest predictor of willingness to compromise on taste (Verbeke, 2006). Although not as strong as taste attributes and with mixed results of product acceptance, health-related product attributes influence perception and expectation of product quality (Grunert et al., 2014).

Food messages and communications can influence food quality assessments, impacting consumer food quality perception, expectation, and ultimately, food decision-making.

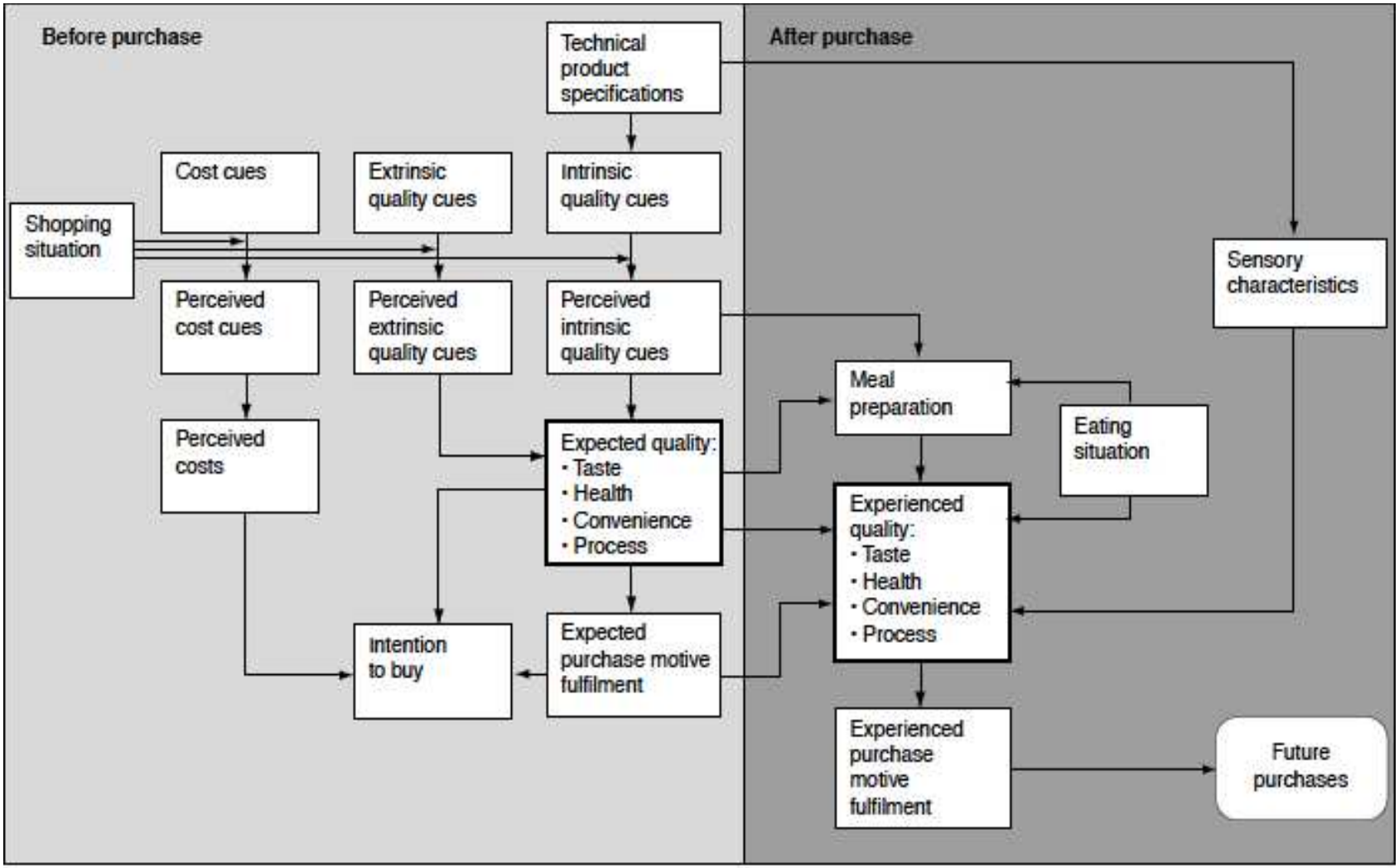



**Figure 2.1 Total Food Quality Model; (Brunso et al., 2002)**

## 2.2 Persuasive Message Processing and Dual-Processing Theories

The TFQM illustrates how product quality, personal experience, individual values, and perceived and expected quality are intricately involved in a hierarchical relationship, prompting food decision-making. Food messages relay information that can influence perception and expectations of product quality, and ultimately, food decisions. In social psychology, dual-processing theories, such as the Elaboration Likelihood Model (ELM) or the Heuristic Systematic Model (HSM), illustrate how individuals mentally process these food messages to determine product quality judgments.

Dual-processing theories provide a theoretical understanding of how consumers process persuasive food and nutrition messages contributing to food decisions. These theories suggest two distinct routes of mental processing; one is more deliberate and cognitively effortful and the other utilizes heuristic cues, minimizing cognitive effort (Chen & Chaiken, 1999; Eagly & Chaiken, 1993a; Petty & Wegener, 1999). Heuristics processing, according to Chen and Chaiken (1999) "…entails the activation and application of judgmental rules or 'heuristics' that, like other knowledge structures, are presumed to be learned and stored in memory" (Chen & Chaiken, 1999, p. 74). Heuristics are processing short-cuts based on several knowledge principles in social psychology including availability, accessibility, and applicability. These principles state that processing short-cuts must be stored in memory (available), able to be retrieved from memory (accessible), and be appropriate for the situation (applicable) (Chen & Chaiken, 1999). Within the ELM, the more elaborate processing mode is termed *central processing;* the less cognitively elaborate processing mode is termed *peripheral processing.* The HSM designates these processing modes as *systematic* and *heuristic* processing, respectively.

Motivation to process and the ability to process largely impact the manner in which an individual will process persuasive information (Chen & Chaiken, 1999) According to Petty and

Cacioppo (1986) when conditions are present that facilitate both motivation and ability to engage in issue-relevant thinking, there is a high likelihood that the person will utilize greater elaborative processing in order to formulate an evaluative judgment of the issue or attitude object (Petty & Cacioppo, 1986). According to the theory, the degree of elaborative processing is a continuum of low to high; as an individual's motivation and ability to process persuasive information is high, the likelihood that greater elaborative processing is also high. With greater motivation and ability, an individual will use all issue-relevant information available in order to formulate judgments (Petty & Wegener, 1999). Factors that can impact one's motivation to process information include personal interest and issue-relevance. The ability an individual possesses to process information is impacted by their knowledge as well as the presence of distractions or opportunities that may support or hinder message elaboration (Petty & Wegener, 1999). Because the degree of elaborative or systematic processing is on a continuum, the level of both motivation and ability would impact the degree of elaboration. For example, if motivation to process is high but the ability to process is low, the likelihood of elaborate processing will be hindered. The same is true if ability is high but an individual's motivation is low (Chen & Chaiken, 1999; Eagly & Chaiken, 1993a).

The variables that can motivate deliberate processing include personal relevance, task importance, responsibility, accountability, and need for cognition. These factors add to the degree an individual will be involved with the persuasive message, thus increasing the likelihood of elaborate processing (Petty et al., 1983). In addition, dual-process theories such as the ELM and HSM assume that people are motivated by a desire to hold an attitude or judgment that they perceive as correct and accurate. Although the motivation to seek a correct attitude or judgment is present, this does not necessarily mean that the attitude or judgment is objective or without

bias. Additional motivations include using the least amount of cognitive effort necessary (i.e. cognitive misers) and balancing this with an acceptable level of confidence in one's judgment (Chen & Chaiken, 1999; Eagly & Chaiken, 1993a).

The HSM posits that motivation may not only be due to accurate knowledge seeking. The HSM extends motivation to include defense motivation and impression motivation, in addition to accuracy motivation (Chen et al., 1999). Defense motivation is a desire to form a judgment that aligns with one's material interests or self-definitional needs. Impression motivation is the desire to form judgments that help to satisfy the current social goals or that show consideration of the social consequences of sharing a particular judgment within the social context. Both of these motivations selectively access heuristics but also systematically process, particularly under high motivation (Chen et al., 1999). Recognizing that not all judgments are an outcome of accurate knowledge, these three motivations help to better explain an individual's approach to a certain persuasive argument or condition.

According to the HSM, both types of mental processing are not mutually exclusive. In fact, the HSM posits that both of these processing modes work in tandem—they are utilized concurrently (Chen & Chaiken, 1999; Eagly & Chaiken, 1993a). Because they can function together, the processes most likely can have interdependent effects, which can be elicited in one of three ways: additive effects, attenuating effects, and/or bias effects (Chaiken & Maheswaran, 1994).

The intent of a persuasive message is to influence an individual's judgment or attitude about an issue or argument. In their work on attitudes, Eagly and Chaiken (1993b) define attitude as "…a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (p. 1). As such, an attitude is personal to an individual and is based

on their own evaluation response. Dual-processing research has shown that when attitudes are formed based on thoughtful and careful consideration of the argument, they are stronger and more lasting (Petty & Wegener, 1999). These stronger attitudes are also more predictive of behaviors than attitudes that are formed based on heuristic or peripheral cues (Rhodes & Ewoldsen, 2013).

According to the Theory of Reasoned Action (Fishbein & Ajzen, 2010), attitudes precede and indirectly influence actual behavior because of the impact of attitudes on behavioral intent. Behavioral intent, or the resolve to act in a particular manner, also precedes and influences the actual behavior, according to the theory. The Theory of Reasoned Action (TRA), and its extension the Theory of Planned Behavior (TPB), have been a theoretical foundation in food choice research (Conner & Armitage, 2006). Within consumer food choice research, attitudes are defined as the sum of the beliefs – both positive and negative – surrounding a specific food. Many factors, such as price, convenience, familiarity, intrinsic aspects, to name a few, play a role in food product attitude formation. As an example, in their review of consumer behavior surrounding organic foods, Rana and Paul (2017) emphasize many attributes of organic foods that contribute to consumer attitude formation. In addition to factors associated with most foods (e.g., price, availability, ease of purchase, visual aesthetics), environmental concerns, animal welfare, health concerns, food quality (e.g. certifications), and ethical factors can also impact consumer attitude toward organic foods. When the sum of these attributes is positive, consumer willingness to purchase organic foods (e.g. the behavioral intent) would also be positive (Rana & Paul, 2017). In consumer food choice research, attitude toward the food has been shown to be a strong predictor of behavioral intent.

Attitude indirectly affects consumer behavior by impacting behavioral intent. Within consumer food choice research, attitude toward a specific food is a strong predictor of willingness-to-purchase that food, (i.e., behavioral intent) (Aschemann Witzel et al., 2013; Grunert, 2002; Grunert et al., 2000). Willingness-to-purchase measures the degree in which a consumer is likely to purchase a product. This purchase intent extends beyond simple liking or acceptance of a product—it sheds a light on the likelihood of the actual behavior of food purchase. Willingness-to-purchase a specific food is often a measured outcome in consumer research of food products, messages, and behaviors (Aschemann Witzel & Grunert, 2015; Aschemann Witzel et al., 2013; Grunert, 2002; Grunert et al., 2000). The stronger the intent, the more likely the actual behavior will result.

Measures of an actual behavior are highly desirable in assessing persuasive message effects. However, research designs measuring actual behavior can be difficult and costly. Self-reported measurements, such as attitude and behavioral intent, are more easily accessible and less costly than actual behavior outcome measures. Further, it is understood that self-reported measures of behavior can yield lower reliability due to participant bias (i.e., social desirability bias, social approval bias), in addition to memory inaccuracies or recall bias (Howlett et al., 2014; Rhodes & Ewoldsen, 2013). Proxies of behavior, such as attitude and behavioral intent, have shown strong likelihood of predictability of the behavior while being efficient and cost-effective.

Dual processing models such as the ELM and the HSM have been used to provide theoretical understanding of consumer processing of nutrition and food marketing information in the formation of attitudes. Both the TRA and TPB illustrate how attitude formation precedes and is a predictor of behavior intent and actual behavior. In consumer food choice research, attitude

and behavior intent have been used as measures to predict future food purchasing behavior. When investigating messages, modes of communication, attitude formation, and purchase intent, dual-processing theories provide insight into the processing of these food and nutrition messages as attitude toward foods are formed. The theories of reasoned action and planned behavior provide an understanding of how that attitude formed through information processing may impact future food purchase behaviors.

### 2.3 Communication Effects on Food Decision-making

Consumers make more than 200 food decisions every day (Wansink & Sobal, 2007). Food messages, environment, and cues all work to enable and/or bias those decisions. Food messages can focus on engaging consumers in cognitive processing. Central or systematic processing of food messages requires careful and thoughtful effort in weighing the costs and benefits of food quality decisions; whereas heuristic processing is less effortful and utilizes environmental cues. When making food decisions, many factors can act as heuristic cues such as pricing, sensory attributes, convenience qualities, and familiarity. A review of the literature by Cohen and Babey (2012) discusses many of the food environment cues that can impact food decisions. For example, the placement of healthy foods on a restaurant menu is a heuristic that can impact food decisions. When healthy items are placed on the back of a menu, study participants were less likely to choose the healthy items. Likewise, when items are placed in the middle of a grouping of items verses at the beginning or end of that grouping, they are less likely to be chosen (Dayan & Bar-Hillel, 2011; Downs et al., 2009). The display of calorie levels of menu food items, portion sizes served, variety of foods, price, the environmental ambiance, and even characteristics of the wait staff can all exhibit heuristic cues that impact food decisions (Cohen & Babey, 2012).

Encouraging consumers to make food decisions that are healthy and nutritionally appropriate is an important objective of the Dietary Guidelines for America. Communication efforts can have a profound effect in supporting these goals. Communications of food messages are a ubiquitous component of modern life and can play a role in inspiring food decisions. Attending to food messages is a necessary factor in receiving a message communication. Bialkova and van Trijp (2010) define attention as having both psychological and neural mechanisms that influence selectivity for cognitive action. In competition for attention, food marketing uses various aspects to attract attention and shift how messages are processed. Likewise, motivation and ability are key aspects in processing (Chen & Chaiken, 1999; Eagly & Chaiken, 1993a). Attention, interest, knowledge, and familiarity of nutrition and health information are important components in motivation and ability of food message processing, and ultimately, impact decisions of food quality.

### 2.3.1 Food product label & packaging communication.

Attributes of food products including search, experiential, and credence attributes are communicated in a variety of means. Color, logos, symbols, as well as text can add inferences to the processing of food messages and perception of food quality. Color, for instance, can affect attention, emotions, beliefs, and potentially behaviors (Muller & Prevost, 2016). The color red can indicate avoidance or STOP, as in a traffic light symbol; with this inference, the color red on a food label could discourage the consumption of that food (Wasowicz et al., 2015). In another example, research conducted comparing use of the colors green and red on the food label reflected a greater sense of healthfulness toward the green-labeled product, even though the text information provided on products were identical (Schuldt, 2013). Other means of communication including branding, packaging type, and price have all been shown to be associated with specific product attributes (Mueller & Szolnoki, 2010).

One of the foremost designs required on all U.S. manufactured food and beverage products is the Nutrition Facts Panel (NFP). As a result of the Nutrition Labeling and Education Act (NLEA) enacted in 1990 and amended in 2006 and 2016, all food and beverage products for sale within the United States are mandated to include nutrition information on their products in the form of the Nutrition Facts Panel; guidance was then provided to inform manufacturers and consumers of these changes (U.S. Food and Drug Administration, 2018). This black and white table format was initiated to provide accurate information that is informative, educational, and helpful to consumers in their food purchase decisions. Of importance, observational studies have discovered a positive correlation between reading the NFP with food decision-making and consumption of a healthy diet (Campos et al., 2011). The NFP includes information about amounts of specific nutrients in foods, the percentage of nutrients in relation to recommended daily amounts, the amounts of nutrients per serving sizes, and helps consumers evaluate specific nutrients and decide the overall nutritive value of a product (Cowburn & Stockley, 2007). As a credence attribute indicating intrinsic product quality, the NFP has been shown to be helpful in assessing a food product's quality while making food decisions.

The federal government also mandates nutrition label messages outside of the NFP. Whether on packages, within advertisements, or on company websites, this mandated information includes nutrient content claims, structure function claims, and health claims. Health claims consist of either qualified or authorized health claim. An authorized health claim is one in which there is significant scientific agreement (SSA) supporting the claim. This is the strongest level of scientific support. Qualified health claims have a 4-level grading system of scientific strength, indicating less scientific justification than the authorized health claims (U.S. Food and

Drug Administration, 2018). These regulations are enforced to ensure that food marketing information maintains truth and transparency in advertising.

Simply placing information on a food label does not ensure that the communication is attended to or processed by consumers. Consumer attention is defined as the degree in which a consumer focuses on and allocates processing capacity to a specific stimulus in which they are exposed (Solomon et al., 2006). Attention to food label information can be goal-directed (also defined as top-down information), such as when a consumer seeks out nutrition information due to their specific dietary needs. Attention to food label information can also be stimulus-driven (also defined as bottom-up information), which is more dependent upon the salience of the information (Bialkova & van Trijp, 2010).

Salience, which refers to the prominence or ability to activate memory, can influence attention and processing (Solomon et al., 2006). As salience increases, the likelihood a consumer will attend to that information also increases (Bialkova & van Trijp, 2010; Graham et al., 2012). Changing specific features of a food label can influence the degree of salience of that label. Data collected using eye-tracking measures have shown that there are key features of a food label that promote consumer visual fixation and attention to the different aspects of that label (Graham et al., 2012). One example designates placement of information as an importance for greater attention; the center of the package label is the prime locale for prominent information. Likewise, the top of the NFP draws greater attention than the bottom of the panel. Less attention is paid to the middle and bottom of the nutrition panel (Graham & Jeffery, 2011). Colors, contrasting colors, product design, size of information, graphic or logo, and specific features drawing attention to certain aspects within a design, such as call-outs, can all help to increase consumer attention to food messages (Lähteenmäki, 2013; Nocella & Kennedy, 2012).

Certain factors can also minimize attention and processing of food and nutrition messages. For example, clutter and large amounts of information can reduce a consumer's ability to attend to the information (Graham et al., 2012). As the number of symbols increase, so can the consumer's cognitive effort; likewise, as the amount of information increases, so does the cognitive effort and time needed to process (Muller & Prevost, 2016). Minimizing clutter and amount of information can support a consumer's attention toward information and facilitate the processing of that information (Graham et al., 2012; Muller & Prevost, 2016). Consumers prefer simple nutrition information over complex nutrition information (van Kleef & Dagevos, 2014). The use of numbers, as an example, involves more complex processing (Muller & Prevost, 2016). Processing numbers requires a consumer to recognize the representation of the number and then attribute meaning that is connected to that representation. Once its meaning is determined, one must be able to manipulate that meaning to relativity (e.g. higher or lower); this is a multi-step process and requires greater cognitive demand. Processing color requires less cognitive demand. Color is already seen as an automatic process and the associations to color itself creates the meaning. The associations with color are all that have to be cognitively accessed (Muller & Prevost, 2016). Lessening the cognitive demand eases a consumer's burden of processing information.

Health-related information on food labels is a credence attribute of the food product; it is a subjective characteristic that relies on trust and credibility when determining quality (Brunso et al., 2002). Chang et al. (2013) define trust as "…the psychological state that allows a person to accept vulnerability based upon positive expectations of the intentions or behavior of others" (Chang et al., 2013, p. 440). Unlike hedonic attributes, a consumer is not able to accurately ascertain a product's healthfulness attributes accurately prior to purchase nor experientially.

They have few cues to assess a product's ability to support their health. Therefore, the consumer must rely on the source of that information—trust and credibility of the source of the information become more important. In order to minimize subjectivity and substantiate health claims, the FDA requires that manufacturers use qualifying scientific wording on their food labels that contain health claims (U.S. Food and Drug Administration, 2018). This can create clumsy and difficult communications for the non-scientific consumer. Large amounts of scientific wording can hinder information processing (Aschemann Witzel & Grunert, 2015; Lähteenmäki, 2013; Nocella & Kennedy, 2012).

Presence of health claims on food products can impact consumer perception and attitude of that food. Food factors that impact consumer attitude can be either product-related factors or consumer-related factors (Wills et al., 2012). Product-related variables have to do with the type of product, the format and wording of the health claim, the claimed benefit, and the sensory attributes of the product. Research suggests that health claims on product categories that already hold a healthy image yield a positive attitude of the product (Hieke & Grunert, 2018). For example, a health claim on yogurt products would be easily accepted compared to a health claim on lunchmeats. As a category, yogurt products are seen as more healthful than lunchmeats. Secondly, the wording of the health claim (e.g. whether the claim is a general health claim, supports health function, or minimizes disease risk, is framed positively or negatively), can vary impact on consumer attitude (Lähteenmäki, 2013). Generally, consumers prefer short, concise claims which generate positive attitude toward the product when compared to longer scientific claims (Wansink et al., 2004). Visual aids and graphics tend to be better received and understood by consumers in place of long-worded scientific jargon (Lähteenmäki, 2013; Nocella & Kennedy, 2012). Finally, the sensory attributes of products with health claims also impact

consumer attitude with most consumers expecting lower taste quality on products with health claims (Raghunathan et al., 2006; Wills et al., 2012).

Consumer-related factors associated with the potential impact of health claims on a consumer attitude and perceptions include consumer nutrition knowledge, health and nutrition beliefs, familiarity of food and nutrition, and personal experience and relevance (Wills et al., 2012). Familiarity of health claim information is closely linked to previously attained knowledge (Lähteenmäki, 2013). Familiarity and knowledge of health, nutrition, and food information can influence the processing of the health claim. However, even though motivation may be high, a lack of knowledge or familiarity of that information may impede consumers' understanding.

Not all consumers are motivated to read the nutrition information presented on food and beverage products. Roughly 75% of U.S. consumers state, via self-report, that they read the NFP; observational data suggests this number is much less (Campos et al., 2011). In a review of the data, the majority of consumers who read the NFP are middle-aged, Caucasian, and female. They also tended to have higher socioeconomic status (SES) and education levels as well as a greater interest in diet and health. The grocery habits of NFP users involve more frequent trips to grocers, more meal planning habits, and less price sensitivity (Campos et al., 2011; Cowburn & Stockley, 2007; Nocella & Kennedy, 2012). The frequent use of NFP information has been associated with an increased general understanding of nutrition information (Campos et al., 2011). Of those not seeking the NFP information, consumers cite lack of time, lack of understanding of terms, small print size of information, and questioning accuracy of information as hindrances (Cowburn & Stockley, 2007).

Food messages can mean different things to different consumers. The manner in which an individual processes health claims is dependent upon their available and accessible information

(e.g., memory) in addition to personal factors that interact with and impact the memory links to draw from the accessible information (Nocella & Kennedy, 2012). As an example, the term "natural" on food labels has been used extensively in marketing, yet it has no specified regulatory definition. The industry standard implication of this term is that the product has undergone minimal processing and remains in a form close to its natural state. However, in a panel survey by Skubisz (2017), participants were asked for their interpretation of products whose label contained the term "natural" compared to products without the "natural" term. This resulted in a variety of meanings for the word "natural." Results showed that "natural" was associated with "healthfulness," a vague term as well. Participants further inferred falsely that products labeled "natural" were lower in calories and less likely to cause weight gain than products without the "natural" claim (Skubisz, 2017).

Other individual differences, including socio-demographic factors, previous knowledge and experience, personal attitudes, familiarity, and motivation, impact information processing and message interpretations (Chen & Chaiken, 1999). These components outlined in dual-processing models affect what a person attends to when processing information, how much cognitive energy is used in processing, how they interpret the information, and ultimately, their food decisions (Chen & Chaiken, 1999). Research has shown that when a person is motivated to attend to information, they are more likely to use more effortful energy in processing the information (Chen et al., 1999). As some food and nutrition label research has shown, situational motivations can be important in cognitive effortful processing of the information (Jung et al., 2016; Miller & Cassady, 2012; van Herpen & Trijp, 2011). For example, dietary restrictions or goals can motivate a consumer to read food labels (Miller & Cassady, 2012). However, when motivation is low, such as when a person is not interested in health information, an individual is

less likely to use effort to process that health information. Consumers' interest in nutrition information has been associated with attending to nutrition information presented on food labels (Lähteenmäki, 2013; Nocella & Kennedy, 2012; Turner et al., 2014).

### 2.3.2 Model of consumer processing of food information.

The Total Quality Food Model depicts many of the factors influencing consumer food decision-making (Brunso et al., 2002). As a consumer is presented with this information, attention to and processing of information is necessary to form judgments. The subsequent dual-processing model of consumer processing of on-pack information is presented below in Figure 2.2 (Grunert, 2016). Once a consumer is exposed and attends to the food information presented, mental processing will ensue in one of two specific patterns. Path 1 depicts a cognitively effortful path in which both motivation and ability play a role in encouraging the degree of involvement. Motivation in reading food label information reflects consumer interest in nutrition and health. Ability is reflective of the degree of nutrition and health knowledge (Grunert, 2015, 2016). Higher involvement in cognitive processing influences formation of perceptions, inferences, and understanding so that meaning-making can result. The second path depicted in the Figure 2.2 concerns less involved mental processing, drawing from label cues of salient features to encourage affective reactions resulting in food decisions. According to the HSM, both types of processing paths can occur simultaneously and at varying degrees as consumers engage in food decision-making activities.

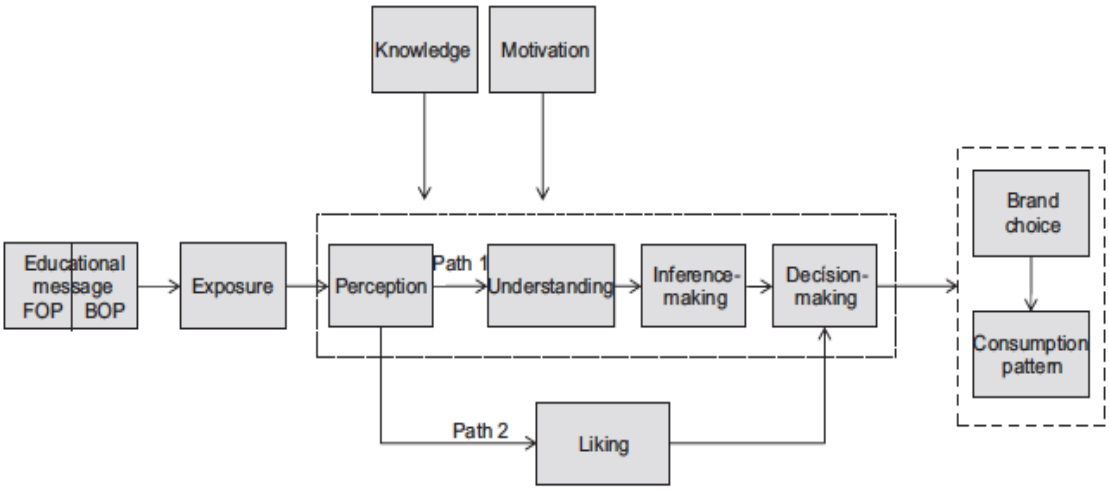



**Figure 2.2 Model of consumer processing of food label information; (Grunert, 2016)**

### 2.3.3 Perceived expected quality and sensory attributes.

The TFQM illustrates the fact that food messages concerning sensory attributes can influence food decision-making. Sensory attributes fall within the hedonic quality dimension and include factors such as taste, smell, texture, and flavor. As experiential qualities, these quality factors help to meet the expected quality and encourage repeat purchases (Li et al., 2015). Prior to purchasing a food product, a consumer is not able to assess these experiential qualities and must rely on other product attributes and attitudes in order to formulate expected quality judgments (Grunert et al., 2000). In those cases, communication messages about a product's sensory attributes add cues to facilitate these attitudes and judgments.

Product sensory attributes are communicated in a variety of ways and influence quality perceptions and expectations. As an example, the color red, a search attribute, can impact the perception of the flavor or juiciness in an apple. According to Piqueras-Fiszman and Spence (2015), a food's descriptive message can draw one's attention to the ingredient, the flavor, or other sensory attribute of the food, thereby making those aspects more salient. Sensory research has shown that manipulating the product description, or other extrinsic information, can impact

the liking and acceptability of those products once they are tasted. This has been termed "sensation transfer" and defined as the occurrence of product attributes being transferred to the sensory expectations and experiences of the product (Skaczkowski et al., 2016). Brunelle and Lapierre (2008) examined children aged 4-6 years and their sugared cereal consumption. The children were found to have a greater liking of the sugared cereal when a cartoon character was placed on the package display panel (Brunelle & Lapierre, 2008). Other extrinsic information such as branding, packaging materials, descriptive wording, and labeling have all been shown to impact sensory expectations and experiences (Piqueras-Fiszman & Spence, 2015; Skaczkowski et al., 2016). Furthermore, research has suggested that multi-sensory messaging can impact taste perceptions more so than simply taste messages alone (Elder & Krishna, 2009b). When consumer attention is focused on the attributes evoked in the messaging, less attention is given to other product attributes. The sensory food message stimulates sensory expectations and a product's perceived and expected quality (Piqueras-Fiszman & Spence, 2015).

Messages describing health or processing aspects can also be associated with beliefs about a product's sensory attributes and have been shown to influence food choice and consumption (Piqueras-Fiszman & Spence, 2015). Research on sensory quality of organic-labeled products, for example, has shown significantly greater expected and perceived sensory quality compared to the conventional product counterparts. Yet when organic products have been tasted in a blind comparison to conventional products this significant difference did not remain (Piqueras-Fiszman & Spence, 2015). Labeling products as healthy or low in fat has resulted in mixed results of sensory expectations. Some of the discrepancies may be related to the health interest of the consumer and the product type. Foods that are considered indulgent (such as chocolate, milkshakes, cakes, or cookies) can be perceived as less tasty when labeled healthful or

low in fat. However, participant interest in health or dieting has been shown to moderate this effect (Skaczkowski et al., 2016). The majority of the research suggests that while health-related sensory labeling influences the expected quality of a particular food, these expectations are moderated by the type of food, the differences of nutrients compared to what is normally consumed, the consumer's attitudes and beliefs toward the food, and the individual's health interest (Piqueras-Fiszman & Spence, 2015).

Some research suggests that there is an implicit perception that healthy food is less tasty, less enjoyable, and less preferred than a more indulgent counterpart (Raghunathan et al., 2006). Raghunathan et al. presented four studies in which food descriptors included either healthy or sensory wording. Their results showed that healthiness and tastiness are perceived as inversely related to each other, that this belief impacts sensory expectations, and that these expectations are confirmed when a food is actually sampled. Additionally, when primed with a hedonic goal, the food considered unhealthy is significantly more often chosen because it is perceived to be tastier. Based on their results, the authors state that the perception of healthy foods being less tasty operates at an implicit level (Raghunathan et al., 2006). Although a consumer may be more willing to compromise on taste for functional foods when health interests are the goal, taste remains as a strong sensory driver of food acceptance. An often accepted conclusion within food consumption research is that there is an inverse relationship to consumers' perceived food product healthfulness and taste (Luomala et al., 2015). This 'healthy is not tasty' expectation presents a key obstacle when encouraging healthy food decision-making behaviors. Health-related marketing communications are often used to appeal to a consumers' health interest and knowledge regarding nutrition verses their taste buds. This, along with the complexity and

confusion of health claim information, may further decrease the appeal of healthy food (Aschemann Witzel & Grunert, 2015; Nocella & Kennedy, 2012).

Consumer associations of healthful food with inferior tastes are not limited to packaged goods. This may be, in part, to how healthful foods are marketed. A recent practice in restaurant chains is to designate specific healthy items on menus to entice the more health-conscious consumer. But, these menu items are often marketed differently than less-healthful items (Turnwald, Jurafsky, et al., 2017). An examination of U.S. casual dining restaurant menus compared the marketing descriptions of items identified as 'healthy' to other menu items. Results revealed that the descriptors used for healthy menu items had themes that involved fresh, simple, macronutrient, deprivation, thinness, or nutritious wording. While less-healthy food items had descriptive themes surrounding fun, exciting, familiar, spicy, artisanal, tasty, and indulgent (Turnwald, Jurafsky, et al., 2017). Terms indicative of "exciting" were most lacking in the healthy menu item descriptions, which is also a highly valued emotional state in American culture (Tsai et al., 2006). Although the authors did not investigate whether a description difference in menu items influenced purchase behavior, they suggested that describing the healthful menu items in an exciting and familiar manner, similarly to non-health labeled menu items, could promote healthy foods and lead to increased positive sensory expectations.

The desire for sensory indulgent foods may extend beyond cognitive processing and perceived quality expectations. An experiment measuring the hormone ghrelin, a biomarker of hunger, revealed that ghrelin levels can be affected simply by noting the food description prior to consumption of that food (Crum et al., 2011). Participants were offered a chocolate shake, but the descriptions and labeling of the shake varied between groups. In one group, the shake was described as a healthy supplement; the other group received the shake with a description of

sensory indulgent. Both shakes were nutritionally identical, and only the food descriptions and labeling varied. Ghrelin levels were measured at baseline, prior to the presentation of the shake and post-consumption. Results revealed that when participants were anticipating the indulgent drink, ghrelin levels reflected moderate cravings followed by substantial decrease in levels post-consumption, indicating physiological satiety. Conversely, when anticipating a healthy shake, participants' ghrelin levels remained flat or only slightly elevated without the large decrease post-consumption, indicating a lack of physiological satiety (Crum et al., 2011). Crum et al. (2011) noted that the results indicate that food messages alone can impact physiological hunger and satiety. Persuasive food messages may be able to impact both cognitive and physiological desire for foods. Descriptive sensory messages may also act as heuristic cues for physiological changes, further supporting cognitive message processing and food decision-making.

## 2.4 Retail Channel Communication Opportunities of Food Messaging

As a component within the TFQM, the shopping situation impacts consumer perceived food quality prior to purchase (Brunso et al., 2002). Cues related to costs of foods and services can vary by shopping situation. Likewise, the shopping situation can influence both intrinsic and extrinsic product quality cues. These cues can influence the food quality decision-making process. For example, a shopping environment at a farmer's market is very different than one at a local supermarket. The expectations of food labels, packaging, or nutrition information vary between the two locations. Likewise, the expectations of the farmer's market vendors may differ than those of a grocery manager. All such factors add information and cues to consumer processing impacting perceived expectations, and ultimately, food decisions.

### 2.4.1 Brick-and-Mortar Grocery.

Food messages are abundant in traditional brick-and-mortar grocery. Aside from messages on all of the product packaging, there are numerous banners, signs, and displays that

provide further color, size, graphics, and images that relay messages. There are many cues that infer food messages. For example, foods placed at consumer eye level draw greater attention than foods placed at the extremes of the grocery shelves (Campo & Gijsbrechts, 2005). Products placed at the beginning of grocery aisles yield a primacy effect increasing consumer attention compared to products placed in the center of the aisles. Proximity and sequencing of products also relay message cues and encourage consumer attention (Breugelmans et al., 2007). Other examples of brick-and-mortar grocery food messages include product-sampling, media presence, product promotions, variety and assortment of products, environment temperatures, music, and/or scents, which provide further messaging cues. The brick-and-mortar grocery store environmental message factors incite attention, exposure, memory, priming, and conditioning as means to support specific messages aimed at consumers (Cohen & Babey, 2012).

Traditional brick-and-mortar grocery stores may nudge consumers toward healthful food purchases by using marketing strategies such as interventions in price, promotions, placement, and actual products (Glanz et al., 2012). A systematic review of grocery store-based interventions conducted in 2013 assessed design, theoretical support, intervention type, outcomes, and effectiveness of the interventions (Escaron et al., 2013). Among the 33 studies in this review, interventions (or a combination of interventions) included: point-of-purchase, promotion, advertising, increased availability of healthful foods, and pricing. Some were directed solely at the consumer, while others involved both the consumer and supply chain aspects (availability / accessibility), with the most common intervention including point-of-purchase coupled with advertising and promotion ($n$ =15). Outcomes comprised various combinations of awareness, use, knowledge, beliefs, purchase behavior, and sales data. While researchers found limited evidence of consumer purchase behavior for healthful items, in 8 of the 13 studies that

collected sales data information, there was slight evidence of increased purchases of the targeted food items. Although none of the interventions showed strong evidence of effectiveness, there were some promising results and support for further investigation (Escaron et al., 2013).

In an effort to develop an organizing framework that incorporates marketing nutrition, psychology, public health, and behavioral economics, Wansink (2017) describes a retail intervention matrix consisting of interventions communicating convenience, attractiveness, and behavioral norms of healthful food selection. These research-supported suggestions include food quality cues and messages using in-store signage, structure and design, and customer service. In-store interventions that focus on convenience, attractiveness, salience, and norm reinforcement are suggested for further healthful food choice research. While more research is warranted, brick-and-mortar grocery interventions have potential for promoting healthful food purchases as consumers make food quality decisions.

**2.4.2 Online Grocery.**

According to the USDA Economic Research Service survey (Ver Ploeg et al., 2015) Americans acquire the majority of their food from traditional brick-and-mortar groceries. For 89% of American households, primary grocery purchases are made at grocery supercenters and supermarkets. This requires consumers to travel roughly two to four miles distances to their primary grocery stores (Ver Ploeg et al., 2015). Additionally, it necessitates access to vehicles, travel time, and time away from other household activities.

While still considered in its infancy, online grocery shopping is becoming increasingly popular among American consumers. A recent survey of 1,000 respondents, reported to be nationally representative of the population, revealed that female consumers under 45 years of age are more likely than those older than 45 years to shop for groceries online, most of the time (Ardolino & Lewin-Zwerdling, 2018). Another study conducted in October 2017 found that most

consumers (67%) had only initiated online grocery purchases within the past year (GutCheck, 2017). Non-perishable items (e.g. canned and dried foods, staples) are the foods most often purchased online. Millennials, consumers living in urban areas, and those with children purchase the greatest variety of grocery categories (GutCheck, 2017). Though it may be lagging behind in the online retail space, online grocery shopping has shown a 25% increase in interest and activity growth between 2015 and 2016, with growth expectations to rise to 5.5% of total sales by 2022 (Del Buono, 2017).

Online grocery commerce presents both similarities and differences when compared to traditional brick-and-mortar grocery stores. An obvious difference is that the physical locale of a traditional brick-and-mortar store is replaced by an online digitally-based store design. While very different, the structure and layout of the online space can similarly impact a consumer's experience and ultimately the success of the e-commerce site (Vrechopoulos et al., 2004). Vrechopoulos et al. (2004) described the three following common brick-and-mortar store layouts: 1) the grid layout, facilitating identifying pre-selected products, 2) the free-form layout, which is an asymmetric arrangement of displays encouraging browsing, and 3) the racetrack or boutique store design, which leads a consumer along a path within a specific food area while a larger inner-aisle helps to direct toward in-store movement. Entertainment is a greater focus within the racetrack design. In the virtual world, all three of these designs, and their various combinations, are seen (Vrechopoulos et al., 2004). Hyperlinks, navigation, and search aspects of the virtual space facilitates movement throughout the virtual store and greatly enhances the user experience in areas of perceived usefulness, ease of use, entertainment, and time (Cheema & Papatla, 2010; Vrechopoulos et al., 2004). The online and offline environments also vary in assortment of products, number of brand offerings, available sizes, pricing and promotions.

A primary goal in designing an e-commerce site is to encourage consumer attention to the product information, ultimately increasing preference for the product. While a consumer's attention is motivated by their knowledge and familiarity to the subject matter, attention can also be encouraged by the visual display and salience of features on the product page such as color, shape, and size (traditional features) in addition to motion and spatial arrangement (Hong et al., 2004). Research suggests that in-store promotions (i.e. samplings, coupons, price reductions, etc.) often increase attention and trigger greater purchase trials in brick-and-mortar stores. However, in the online setting, consumers are less sensitive to online promotions (Suri et al., 2003).

The design of product pages in a virtual store has an impact on consumer attention, shopper experience, and ultimately consumer purchases. In fact, the design of the virtual store and product pages can explain a majority of the variance in monthly sales (Hong et al., 2004). Stimulus-driven attention (i.e., bottom-up) can be directed by a variety of stimuli including use of color, shape, size, and placement (Yantis, 1993). In virtual product pages, the product attribute information and how it is displayed can act as stimuli and greatly impact attention and user experience. Examples of product information displays are visual images, text information, or a combination of both (Hong et al., 2004). In a 2004 study of online space, Hong et al. compared text-only information to image-only information of products arranged by either listing them on a page (top to bottom lists) or displayed in an array (products placed side by side on a web page). Outcomes measured included user search time, recall information, and user attitude. Participants found listing of products to be more efficiently navigated than products displayed in an array format. Additionally, visual images of products significantly enhanced recall and search time more than text-only displays of product information. The authors suggested that less cognitive

energy is utilized in a listing vs. array product display format and while using images vs. text information. Therefore, for ease of searching and minimal use of cognitive factors, product images and listing of products was more desirable (Hong et al., 2004).

Ease of navigation in a virtual grocery store can lessen cognitive processing load and support a positive user experience. Using eye-tracking measurements of online grocery decisions, Benn et al. (2015)assessed activities of 40 online shoppers and their search tactics. Consumers were more likely to use navigation (e.g. hyperlinks and scrolling) in place of search fields while information seeking. During the time participants were viewing specific product pages, they most often looked at images; only a third of the participants sought further product comparison or text information. These researchers suggest that ease of use and familiarity, in addition to less cognitive effort and lower involvement, may be driving the use of navigation procedures over search activities (Benn et al., 2015).

A recent online survey of 1,000 participants (representative of the U.S. population) indicated that less than half (42%) of consumers reported reading nutrition information online prior to making a food purchase, compared to 66% that state they read nutrition information within a traditional brick-and-mortar shopping experience (Ardolino & Lewin-Zwerdling, 2018). The researchers did not offer reasons why consumers stated that they read nutrition labels less in the online setting. However, a similar survey in October 2017 noted that participants' current online purchases and expected future online purchases were relatively the same (GutCheck, 2017). Therefore, food purchases in online grocery may consist of already familiar food items, lessening the need to seek nutrition information. Similar to the brick-and-mortar grocery experience, motivation and ability play a role in processing food label information in the online grocery setting. In the previous study, Benn et al. (2015) found no significant correlation of

dietary restriction and nutrition information seeking; in their study, motivation (i.e., nutrition interest) did not seem to encourage further online nutrition information seeking (Benn et al., 2015).

Other studies have shown dietary goals to be a motivating factor encouraging nutrition information seeking (Miller & Cassady, 2012). In a 2008 study, researchers attempted to assess the consumer value on the amount of information and accessibility of information while participants sought foods in an online grocery setting. Results revealed that consumers placed greater value in products that had larger amounts of nutrition information in which they could actively seek (i.e., hyperlink to) compared to small amounts of nutrition information that was provided as read-only. In the read-only setting, consumers valued a moderate amount of information. Greater information was valued when a consumer was able to actively seek that information. However, if too much information was provided, a consumer may become overwhelmed (Kimura et al., 2008). Benn et al. (2015) have suggested that lack of seeking nutrition information may be due to an already high cognitive load, confusion with nutrition information, or that participants were familiar with the product and did not require further knowledge. Further research could help to increase understanding of consumer motivation to seek nutrition information in an online grocery setting.

Although purchase behaviors can vary from grocery category and across channels, the online grocery consumer is motivated by the convenience and familiarity of online purchasing (Campo & Breugelmans, 2015; Chu et al., 2010; Chu et al., 2008; Degeratu et al., 2000) and less effected by price (Breugelmans et al., 2007). As consumers become more constrained with multiple priorities, time becomes more valued and online purchasing increases. In addition, as the familiarity of the online purchasing experience increases, perceived risk of making online

purchases is lessened. The value of time (convenience) is thought to be related to the fact that online grocery consumers tend to be less sensitive to price (Chu et al., 2008). While convenience and familiarity can be motivations to support online grocery purchasing, research suggests that a barriers to online purchasing are cost, availability of products (brands, sizes), availability, and perceived quality (GutCheck, 2017). Perishable products, such as grocery produce products, are purchased less often online (GutCheck, 2017).

Online grocery services may be helpful in promoting healthful food choices for the home food environment. In an investigation of purchase channel variances, research of online grocery verses traditional brick-and-mortar stores suggests that online shopping results in fewer "vice" type (i.e., unhealthy) foods purchased (Huyghe et al., 2017). Similarly, a small study in 2007 investigated the use of online grocery shopping in conjunction with behavioral modification therapy in the treatment of weight loss (Gorin et al., 2007). Results showed significant improvements in the home food environment with decreased overall amounts of food and reduction of foods high in fat. Other research has suggested that the format of the online grocery store decreases a consumer's purchase of "vice" and healthy foods because of the 2-dimensional environment (Huyghe et al., 2017). Within the virtual world, foods are represented symbolically instead of physically. The authors suggest that, with this symbolic presence, vividness is diminished, thus minimizing any desire for immediate gratification of vice products. While some research supports the online grocery experience as a means to support a healthful diet, one study comparing online purchases of fresh vegetables to pre-packaged grain products revealed that consumers perception of food quality was hindered in the online setting which led to decreased purchases, particularly for fresh vegetables (Kang et al., 2016). Limiting fresh vegetables in the diet is counter to dietary recommendations and advancing nutritional health. Although more

research is needed, online grocery shopping may be a setting conducive to supporting healthful food purchases.

**2.5 Media Richness: importance in online grocery consumer experience.**

Media Richness Theory (MRT) provides a theoretical understanding of the importance and effects of product display in the online space. Daft and Lengel (1986) developed the theory, describing richness as the ability to bridge various frames of reference making information less ambiguous and impacting understanding within a given amount of time. Media richness could further communicate messages with more social and non-verbal cues and with a higher level of complexity. Originating within organizational communications, the theory distinguishes media richness along a continuum within four criteria; these criteria include the ability to transmit multiple cues, to provide immediate feedback, to support a variety of language, and the degree of immediacy of feedback (Daft & Lengel, 1986; Trevino et al., 1987). Within this continuum, face-to-face communication is the richest medium with telephone and email mediums following as less rich forms. According to the theory, it is necessary to choose the medium that best fits the level of complexity of the task to be performed. If the medium channel is inappropriate, the message will be inefficiently communicated.

As online communication technologies were later established, Steuer (1992) further explained media richness as including two dimensions, vividness and interactivity, which contributed to the richness of media. Vividness includes the sensory-richness that the technology can produce; this can be done by increasing the number of senses engaged (i.e., breadth of vividness) or by closely mimicking parts of human senses (i.e. depth of vividness) (Steuer, 1992). Variety of formal features with technological media (e.g. structure, stylistic aspects including graphics, audio-visual, and colorful content) can be used to present information to the senses and impact the level of vividness in the online space. Vividness has been shown to

increase attention to specific information. Vividness creates a more interesting presentation and can enhance cognitive elaboration by increasing imagery and a more thorough review of a product (Jiang & Benbasat, 2007a). The second dimension, interactivity, is defined as the degree in which the user can influence the form or the content within the medium. As interactivity of technology increases, users gain increased autonomy, flexibility, and ultimately control in their viewing manner and speed in which they view information (Jiang & Benbasat, 2007b). Both vividness and interactivity are independent constructs of one another, yet each operates simultaneously to create the online experience. Within the online space, media richness continuum can be defined with text only as limited richness and the addition of larger screens, images, audio, video, and interactivity options increasing the level of richness (Brunelle & Lapierre, 2008; Jiang & Benbasat, 2007a; Maity et al., 2018; Yoo & Kim, 2014).

Interactivity and vividness are important components within e-commerce (Cheung & Lee, 2005). Interactivity with products allows consumers direct interaction with virtual products and their features. Vividness in online product presentation provides increased representation of the product quality by presenting cues that stimulate aspects of consumer senses. Often, multi-media formats are used in order to increase vividness. Lim et al. (2000) claim that use of multimedia brings together various symbolic and processing forms of communication which complements and enriches – not weakens – the symbolic system of the communication (Lim et al., 2000). Vividness has been shown to increase mental imagery of virtual products' uses, which in turn has an impact on consumer attitudes and purchase intentions (Jiang & Benbasat, 2007b).

Vividness can be enhanced in the online setting through clarity of product presentation. Consumer research has suggested the use of imagery to enhance vividness. The use of descriptive and sensory words, photos, video, or graphics that evoke a mental picture is drawing

on imagery. Imagery is defined as the "…process by which sensory information is represented in working memory" (MacInnis & Price, 1987, p. 474). Different from discursive processing, which is an abstract and less concrete sensory processing, imagery processing pulls nonverbal concrete sensory experiences such as ideas, feelings, and emotions from working memory (MacInnis & Price, 1987). Consumer research supports the use of imagery can be a powerful component in advertising, improving ability to assess product quality and willingness-to-purchase the products (Bone & Ellen, 1992; Petrova & Cialdini, 2008; Yoo & Kim, 2014). Evoking mental imagery can use multi-sensory (visual, audio, or haptics) or single sensory components (MacInnis & Price, 1987). In advertising, both visual messages and verbal messages can enhance imagery (Bone & Ellen, 1992).

The e-commerce consumer goods company, Zappos, is an example of an online-only business with highly successful customer service and satisfaction. Known for excellent and quirky personality of customer-focused servicing, Zappos has used vividness and interactivity of products by providing many variations of product images, highly informative product text information, customer reviews, instant message assistance, in addition to product specific videos depicting product specifications and product usage (Cowles et al., 2013). Increasing media richness through interactivity and vividness has theoretically played a large role in the success of their e-commerce business.

Use of media richness techniques can aid in improving the tangibility of products presented in the online format. General tangibility refers to the ability to specifically define the product and its features. Without the ability to touch, taste, feel, smell, or hold a food product, the product becomes less physically tangible. If an online presentation of a product has minimal information and lacks visual stimuli, tangibility is difficult to attain. Because of the nature of the

online venue, physical tangibility can be a difficult construct to assess (Poon & Joseph, 2000). Compared to online services, online goods tend to yield higher degrees of tangibility than do services; although this depends on the specific product (Verhagen et al., 2010). Low product tangibility in online retail results in greater cognitive effort in processing information, increases in risk perceptions, and lower customer involvement (Laroche et al., 2005; Nepomuceno et al., 2014; Verhagen et al., 2016). However, research has shown that increasing the richness of media with the addition of detailed photos, video, and three-dimensional interactive features, physical tangibility can be enhanced in the online space (Verhagen et al., 2010).

In the digital-mediated commerce environment, businesses have experimented successfully with rich and often interactive formats providing cues to products' functionality to aid in increasing customer perceived tangibility of the products (Brunelle & Lapierre, 2008; Jiang & Benbasat, 2007a; Nepomuceno et al., 2014; Verhagen et al., 2016). Formats that help to inform 1) the physical parameters of a product, 2) the specific characteristics of a product, and 3) the clearer mental representations of the product add to the richness of media. Formats such as increased product images, videos, virtual mirrors, or 360-spin image rotations have helped to improve attributes of tangibility more so than simple graphics and product text information (Verhagen et al., 2016). Studies suggest that increased media richness in the online setting encourages positive consumer attitude and increased purchase intent (Jiang & Benbasat, 2007b).

Although convenience and familiarity are positive motivators in the promotion of online grocery purchasing, lack of product knowledge and vividness of the product presentation may hinder a consumer's ability to assess food quality, particularly for unfamiliar foods. Online grocery product displays most often consist of static images of product, with little additional information. Some, but not all online food product displays include nutrition facts information

and ingredient listings. A lack of product tangibility has been described as a barrier to purchasing goods online (Verhagen et al., 2016). Online grocery business may benefit from increasing product media richness within product displays. To date, there is a void in research investigating whether media richness in the online grocery space supports consumers' positive review of product quality for healthful foods, such as whole grains.

**2.6 Conceptual framework and aim of study.**

The framework developed for this research draws from the Total Food Quality Model (TFQM), dual-processing models (HSM and ELM), and Media Richness Theory (MRT). The TFQM illustrates that consumers formulate food decisions based on associations and iterations between product quality cues and their own cognitive categories (Grunert, 1995). Product quality cues can be search attributes, experiential attributes, or credence attributes (Brunso et al., 2002). Associations of product quality are linked with cognitive categories (e.g. values, memory, etc.) when formulating food quality decisions (Brunso et al., 2002; Grunert, 1995). As food quality is assessed, these associations of intrinsic and extrinsic product characteristics are linked to consumer cognitive categories such as abstract values of health, food enjoyment, or pricing. As a means-end chain model, a consumer will assess these quality factors and link them during this process, ultimately formulating a judgment of expected quality and purchase intent. Food marketing can impact a variety of aspects within the TFQM during the food decision-making process, including food purchasing venue, product characteristics, expected product quality, and experiential product quality. Likewise, the TFQM designates four dimensions of user-oriented food quality classifications including convenience, process, hedonic, and credence qualities (Brunso et al., 2002).

For the present study, I focused on communication elements that influence the consumer's perceived and expected product quality assessment in a comparison of the hedonic

(sensory) and credence (health-related) quality dimensions of the study food product. Dual processing models provide theoretical understanding of the process that consumers use in judgment formation when exposed to food messages. Specifically, this research focused on both consumer motivation and ability in processing food quality messages. A figure of the conceptual model is provided below in Figure 2.3, adapted from Grunert (2016). Finally, the online grocery venue offers a unique and virtually untapped environment to explore food product presentations that impact healthful food decisions.

The following research project investigated the impact of varied food product message types and format presentations in online grocery simulation on consumer food quality decision-making in an online grocery simulation. Food messages can vary by type and format, which can impact consumers' processing of messages (Brunso et al., 2002). A consumer may draw from different cognitive factors and cues dependent upon the type of food message (i.e., sensory or health-related). Likewise, the variations of the message format richness can impact consumer processing and interpretations of the message (Daft & Lengel, 1986; Trevino et al., 1987). In the online space, media richness of product presentation impacts tangibility, uncertainty, perceived risk, and ultimately, willingness-to-purchase online products (Poon & Joseph, 2000). Consumer characteristics, such as motivation and ability, impact message processing. As food messages are processed, a consumer determines the product's quality (Brunso et al., 2002; Grunert, 1995). High quality products are perceived more favorably, enhancing consumers' positive attitude and increasing willingness-to-purchase those products.

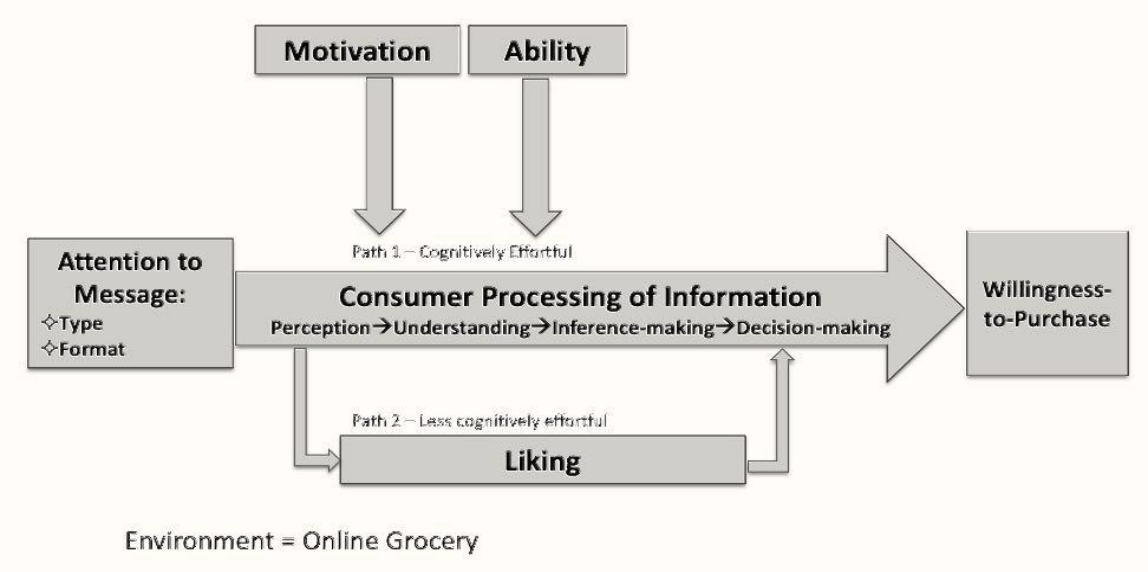



**Figure 2.3 Conceptual Framework Adapted from Grunert, (2016) "Consumer reactions to on-pack educational messages."**

### 2.6.1 Sensory Messages verses Health Messages.

Food marketing can help support and encourage food choices. Food messages can be manipulated to target consumer attention, knowledge, familiarity, and motivation in order to facilitate cognitive processing (Bialkova & van Trijp, 2010; Graham et al., 2012). Encouraging consumers to choose healthful foods is a key goal suggested by the US Dietary Guidance Committee's 2015 report (Dietary Guidelines Advisory Committee, 2015).

Marketing of food products draws upon the unique product attributes. Salience of these attributes can attract consumer attention and facilitate mental processing of information (Bialkova & van Trijp, 2010; Graham et al., 2012). A food product's sensory attributes appeal to consumer concepts of flavor, texture, aroma, sound, and vision. Sensory attributes fall within the hedonic dimension of food quality (Brunso et al., 2002). While there are certain intrinsic and extrinsic product characteristics that can cue sensory attributes prior to purchase, sensory attributes are primarily experiential attributes (Grunert, 1995; Piqueras-Fiszman & Spence, 2015). Sensory attributes are used in consumer marketing with either multi-sensory or single-

sensory factors (MacInnis & Price, 1987). Noting that taste is one of the strongest drivers of food product acceptance (Luomala et al., 2015), Elder and Krishna (2010) investigated the use of multi-sensory advertising and its outcome on taste perceptions. Their research showed that using multi-sensorial advertising statements resulted in higher taste perceptions than did the single-sense (taste) verbiage (Elder & Krishna, 2009b). Their study adds to the literature supporting the notion that sensory communications can impact consumer perception of products.

Healthful foods are often marketed using the product health attributes rather than a taste appeal. Health claim language is highly regulated by the U.S. Food and Drug Administration to better ensure truth in advertising. However, using health messages may backfire as consumers often equate adverse taste with healthful food products (Raghunathan et al., 2006). Additionally, research has suggested a physiological effect of positive taste expectations when considering tasteful foods with the opposite true when considering healthful foods (Crum et al., 2011). When making food decisions, healthful foods often yield lower quality because the taste expectation is low (Luomala et al., 2015). Yet, when foods are marketed using greater sensory descriptors, consumer perception of those foods is more positive and more appealing than food marketed without sensory descriptors (Okamoto et al., 2009; Wansink et al., 2005, 2017). Therefore, it is expected that food messages for healthful foods that target sensory attributes, such as taste, may have higher quality expectations when compared to credence attributes, such as health.

> $H_1$: Those exposed to sensory food messages will have a greater attitude toward whole grain foods compared to health-related food messages.
>
> $H_2$: Those exposed to sensory food messages will have a greater willingness-to-purchase whole grain foods compared to health-related food messages.

### 2.6.2 Online Grocery, Media Richness and Food Decision-making.

According to the TFQM, perceived product quality is also influenced by the shopping situation (Brunso et al., 2002). Thus, both brick-and-mortar grocery and online grocery shopping situations influence consumers' perceived quality of food assessments, though perhaps not similarly. As a novel form of food selection, interest in the online grocery format continues to increase year after year (GutCheck, 2017). While healthful food decision interventions have been conducted in brick-and-mortar stores in the past, little research has been done to investigate effectiveness of healthful food decision-making interventions in online grocery realms. Most evidence of brick-and-mortar store interventions have included point-of-purchase, promotion, advertising, and pricing focuses (Escaron et al., 2013). The online grocery consumer is motivated differently than the brick-and-mortar patron. The online consumer is motivated by convenience and familiarity and less so by price and promotion (Breugelmans et al., 2007; Campo & Breugelmans, 2015; Chu et al., 2010; Chu et al., 2008; Degeratu et al., 2000; Kang et al., 2016). However, further research is warranted to best understand food message effects and consumer food quality assessments in the online grocery space.

In the online grocery space, assessment of certain product attributes may be hindered by the two-dimensional aspect and lack of media richness of product presentations (Poon & Joseph, 2000). Particularly for food products, a consumer barrier to acceptance of the online grocery channel is uncertainty and a perceived risk of poor quality of products chosen by a grocery employee rather than themselves (Anckar et al., 2002). A deficit of rich media may decrease online product acceptance and limit the online grocery purchasing process.

The degree of media richness can improve the tangibility of online product presentations. Poor tangibility of food products in the online setting may limit the ability to accurately assess product's physical characteristics, thus potentially increasing perceived risk in food quality

assessments, particularly for perishable food products (Verhagen et al., 2016). Some research has shown that online consumers rely more on product brand names, which help to remove risk when tangibility is lacking, particularly for those product categories that are associated with a higher need for touch (Gonzalez-Benito et al., 2015; Nepomuceno et al., 2014).

To date, most online grocery businesses offer only 2-dimensional images of product, product label, the nutrition facts panel, and ingredient declaration. Attempts to enhance non-food product tangibility in research have included product presentation manipulations such as greater number of photos and interactive tools (Verhagen et al., 2016). Research has also shown that the use of imagery in product presentation can enhance vividness, cognitive elaboration, impacting product evaluations and willingness-to-purchase (Bone & Ellen, 1992; Petrova & Cialdini, 2008; Yoo & Kim, 2014).

The impact of variations of online food product presentation on consumer attitudes and willingness-to-purchase has not been examined to date. Manipulating media richness by enhancing visual and verbal depictions of healthful foods may support consumer ability to process product attributes and facilitate food quality decisions.

> $H_3$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater attitude toward whole grain foods compared to those exposed to a presentation with less media richness.

> $H_4$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater willingness-to-purchase whole grain foods compared to those exposed to a presentation with less media richness.

Both message type and message format presentations can impact consumer food decision-making. As such, message type and message format could yield a potential interactive or accumulative effect on consumer processing information and ultimately in food decisions.

> $H_5$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater attitude toward whole

grain foods compared to those exposed to a presentation with less media richness and a health message.

$H_6$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater willingness-to-purchase whole grain foods compared to those exposed to a presentation with less media richness and a health message.

**2.6.3 Motivation and Ability.**

Dual-processing theories emphasize motivation and ability as key factors influencing how consumers' process information (Chen & Chaiken, 1999). Grunert (2016) depicts both motivation and ability as factors that influence processing food information in his model of processing food label information. Motivation to process information includes interest in health; nutrition and health knowledge influence consumer ability to process the information. When motivations and ability are high, consumers will seek nutrition information on food labels in order to process the information (Grunert, 2016; Jung et al., 2016; Miller & Cassady, 2012; van Herpen & Trijp, 2011).

Food messages provide cues that consumers use as they assess quality expectations of food products. Both intrinsic and extrinsic aspects of food products can provide cues to sensory and health attributes of foods. Color, as an example, can signify taste aspects of a food and / or it may signify the healthfulness of a food (Piqueras-Fiszman & Spence, 2015; Schuldt, 2013; Wasowicz et al., 2015). When food product messages require more elaborate cognitive effort, motivation and ability are important to facilitate the degree in which that will ensure. When nutrition interest is high, a consumer will have greater motivation to review product nutrition information. The ability to process health information relies on consumer's factual knowledge of nutrition and health information (Grunert, 2016; Lähteenmäki, 2013). For most consumers, their knowledge base can be minimal. Efforts to communicate clearly the functional attributes or specific product health benefits can be helpful in minimizing the knowledge gap and improving

ability to process (Grunert, 2002). Therefore, it is hypothesized that processing food messages will be moderated by nutrition interest and nutrition knowledge. (See Table 2.1 for a summary of all hypotheses).

> $H_7$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the attitude toward whole grain food products.
>
> $H_8$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the willingness-to-purchase whole grain food products.
>
> $H_9$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the attitude toward whole grain food products.
>
> $H_{10}$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the willingness-to-purchase whole grain food products.
>
> $H_{11}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the attitude toward whole grain food products.
>
> $H_{12}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the willingness-to-purchase whole grain food products.
>
> $H_{13}$: Knowledge will moderate the relationship between food message format and the attitude toward whole grain food products.
>
> $H_{14}$: Knowledge will moderate the relationship between food message format and the willingness-to-purchase whole grain food products.

**Table 2.1 Summary of Research Hypotheses**

| Variable | Hypotheses |
|---|---|
| IV: Food Message Type | $H_1$: Those exposed to sensory food messages will have a greater attitude toward whole grain foods compared to health-related food messages.<br><br>$H_2$: Those exposed to sensory food messages will have a greater willingness-to-purchase whole grain foods compared to health-related food messages. |
| IV: Food Message Format | $H_3$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater attitude toward whole grain foods compared to those exposed to a presentation with less media richness. |

| | |
|---|---|
| | $H_4$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater willingness-to-purchase whole grain foods compared to those exposed to a presentation with less media richness. |
| Interaction of Message Type and Message Format | $H_5$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater attitude toward whole grain foods compared to those exposed to a presentation with less media richness and a health message.<br><br>$H_6$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater willingness-to-purchase whole grain foods compared to those exposed to a presentation with less media richness and a health message. |
| Motivation (Moderating Variable) | $H_7$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the attitude toward whole grain food products.<br><br>$H_8$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the willingness-to-purchase whole grain food products.<br><br>$H_9$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the attitude toward whole grain food products.<br><br>$H_{10}$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the willingness-to-purchase whole grain food products. |
| Ability (Moderating Variable) | $H_{11}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the attitude toward whole grain food products.<br><br>$H_{12}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the willingness-to-purchase whole grain food products.<br><br>$H_{13}$: Knowledge will moderate the relationship between food message format and the attitude toward whole grain food products.<br><br>$H_{14}$: Knowledge will moderate the relationship between food message format and the willingness-to-purchase whole grain food products. |

# CHAPTER 3. METHODOLOGY

## 3.1 Introduction and Study Food: Whole Grains

The 2015 dietary guidance advisory committee concluded that cereal whole grains are an important component of healthy dietary patterns (Dietary Guidelines Advisory Committee, 2015). The U.S. Food and Drug Administration (FDA) defines whole grain foods as cereal grain foods "…that consist of the intact, ground, cracked or flaked fruit of the grains whose principal components – the starchy endosperm, germ and bran – are present in the same relative proportions as they exist in the intact grain" and that cereal grain foods include "…amaranth, barley, buckwheat, bulgur, corn (including popcorn), millet, quinoa, rice, rye, oats, sorghum, teff, triticale, wheat, and wild rice" (Center for Food Safety and Applied Nutrition, 2006). Research has shown that diets higher in whole grains not only improve diet quality, but also are associated with reducing risk of diabetes, cardiovascular disease, obesity, and certain cancers (McKeown et al., 2013).

Although U.S. dietary guidance and substantive data support the health benefits of incorporating whole grains in the diet, most Americans do not consume adequate amounts of this important food group. Of the recommended 6 serving equivalents of grains in a healthy 2,000-calorie diet, it is recommended that at least half come from whole grain products, or 48g per day. Less than 1% of the population consume the recommended amounts with a median intake in adults at only 8g per day (O'Neil et al., 2011). According to U.S. food consumption data, adults consume roughly 6.8 ounce equivalents of grain servings per day. Of those grains, only 0.97 ounce equivalents were from whole grains per day, which is well below the recommended amount (Albertson et al., 2016).

U.S. adults may recognize the importance of whole grains in a healthy diet, yet research has uncovered perceived barriers to greater whole grain consumption. Americans cite low sensory quality, limited availability, perceived cost, and unfamiliarity with preparation as key barriers to inclusion of dietary whole grains (Kuznesof et al., 2012). It is the bran portion of the grain that adds phenolic compounds to a food. These phenolic compounds have been noted to exhibit a bitter flavor, particularly among consumers who are more sensitive to bitter flavors (Bakke & Vickers, 2007; Magalis et al., 2016). Consensus from the Grains for Health Foundation Whole Grains Summit has recognized that in order to encourage greater consumer acceptance of whole grains, the food industry should strive to create products that meet consumers' sensory acceptance in addition to providing necessary education and promotion of whole grains foods (McKeown et al., 2013).

In promoting and marketing foods with health information, there are three main types of claim language that the Food and Drug Administration (FDA) allow. The first type of claim is the authorized health claim. Under the Food and Drug Modernization Act (U.S. Food and Drug Administration, 1997), the FDA allows this health claim, which states that consumption of the whole grain may help reduce the risk of heart disease or certain cancers. An authorized health claim also requires that certain clarification language be included on the product package. Examples of the clarifying language include:

> "Diets rich in whole grain foods and other plant foods and low in total fat, saturated fat and cholesterol may reduce the risk of heart disease and some cancers. This product contains X grams of whole grains"(U.S. Food and Drug Administration, 2018)

Because limited area available among food packaging is coveted marketing space, many manufacturers may choose not to use an authorized health claim for whole grain foods.

A second type of claim language is referred to as a structure-function claim. This claim language refers to the manner in which whole grains support a structure or function of the human body. An example could include the statement: 'contains fiber to support regularity.' The third claim type, nutrient content claims, indicate the nutritional components within the product, such as 'contains X grams of whole grains' or '100% whole grain food.' Nutrient content claims require less regulatory supportive language than health claims yet can still convey health benefits to the consumer. Finally, in addition to claim language, dietary guidance language may also be added to products. An example of dietary guidance language for whole grain products could be "Consuming at least 3 or more ounce-equivalents of whole grains per day can reduce the risk of several chronic diseases" (U.S. Food and Drug Administration, 2018)This is strictly dietary guidance with no specific statements about the product. The overarching requirement for product claims is that they be truthful and not mislead the consumer.

Drawing from U.S. consumption data, the study food in the present research project consists of six different commonly consumed whole grain food products. McGill et al. (2015) have shown that major dietary sources of whole grains for U.S. adults include breads and rolls, ready-to-eat cereals, as well as pasta, cooked cereals, and rice. These whole grain foods comprise 71% of total whole grain consumption between 2001-2010 (McGill et al., 2015). Further, the aforementioned whole grain foods have familiar and commonly consumed refined-grain product counterparts in the U.S. Therefore, it is expected that the whole grain foods used in this study – and their refined grain counterparts – will be familiar to study participants. The foods used in this study include: whole grain bread, whole-wheat pasta, brown rice, whole grain ready-to-eat cereal, whole grain crackers, and whole grain pancakes. Familiar whole grain foods were chosen to minimize participant uncertainty in the online shopping environment.

Whole grain foods have long been a staple in the diet of most cultures. For example, bread has historically been a common accompaniment to most meals in Europe (Goyan Kittler et al., 2017). Yet, each European region has a signature process for bread-making and the ingredients used—resulting in a wide variety of breads throughout European regions. The crusty and airy baguettes known as a symbolic component of French cuisine vary greatly compared to the hearty, dense rye grain breads found in Germany. The historical and cultural significance of the whole grain study foods are listed in Table 3.1 below.

**Table 3.1 Historical Significance of Study Foods**

| Study Food | Historical Significance of Grain Products |
|---|---|
| Whole Grain Bread | Bread has many varieties, shapes, and sizes and a history dating back 30,000 years. Without leavening, bread is flat and can be denser than leavened breads. Examples of unleavened breads include flatbread, pita, naan, and tortillas. Ancient breads used coarsely ground whole grain flours resulting in a heavy, dark, and course texture. As milling processes improved, the grains were ground into uniform and fine flours, often with the bran and germ removed. The flour was often bleached creating and even 'whiter' color of the flour. Most grains can be ground into flour and used in bread baking. The flours used were often selected based on what is available, accessible, and culturally significant (Lohman, 2012). |
| Whole-wheat Pasta | Pasta, a mixture made from wheat flour and egg, has a history dating back to ancient Greece with examples of baking a lasagna-like noodle. By the 5th century AD, references to noodle dishes were more common. References to ancient China, dating 5,000 years ago are also noted. In early 16th century Italy, pasta was considered a versatile dish for the wealthy. It was often cooked and baked with fresh butter, grated cheese, sugar, and cinnamon. Other dishes consisted of pasta, boiled meats, cheeses, sugar, herbs, spices, and raisins. In the United States, colonial times make references to pasta, and it is noted that macaroni and cheese was a common dish during the Civil War. Later, seasonings added to pasta have changed; savory flavors have replaced sweet flavors. And, in 1844, the first recipe of pasta with tomatoes was noted. Using the same ingredients to make the pasta dough, pasta can be formed into a variety of shapes and sizes (Lopez, 2019). |
| Brown Rice | Rice is one of the oldest cultivated foods dating back 12,000-15,000 years and thought to be first domesticated in China. It is a staple food for many cultures with 470 million tons of milled rice produced annually. Milling rice removes the husk and leaves the edible portion of the grain. If the rice grain undergoes more milling or polishing, the result is white rice with the bran portion of the grain removed (2019). |
| Whole Grain Ready-to-eat Cereal | Ancient cereal was known as porridge or gruel and made by cooking grains in water or milk. Early processed cereals stemmed from an American desire to provide vegetarian foods that were high in fiber. Early varieties were made with a whole grain dough rolled in thin sheets, baked, and then broken into bite size pieces. In 1877, Kellogg created its version of this 'granola;' the first flaked cereal followed in 1899. Most cereals were created with whole grains. The addition of sugar, flavorings, and refined grains followed throughout the 1900s (2006; 2019) |

| | |
|---|---|
| Whole Grain Crackers | In early America, early forms of crackers – or hard tack – were created with simply water and wheat flour. These were originally produced for soldiers use in the War of 1812; hard tack was long-lasting and could provide some food for soldiers in the field. Later, the implementation of leavening, baking, and drying led to the more common cracker of today (Demby, 2013; 2019). |
| Whole-wheat Pancakes | Pancakes are an ancient food with origins in Greece, dating back to the 5th century BC. They were made with wheat flour, olive oil, honey, and curdled milk. Pancakes are thought to have been created by accident by dropping gruel on a hot rock near the cooking fire. Medieval pancakes were made of rye or barley. Native Americans taught colonial settlers to use maize for hot griddlecakes, which soon became a staple, also known as "johnnycakes." There are many cultural varieties of pancakes; some are used with savory foods and eaten with stews or salads such as Ethiopian flatbread, while others are made for sweet flavorings such as French crepes (Rupp, 2018; Yumivore, 2011). |

Cultures that have historically accepted whole grain foods have transitioned to diets with greater refined foods as they acculturate to the United States (Goyan Kittler et al., 2017) Historically, as immigrants acculturate to a new environment, traditional food habits slowly fade and newer habits often emerge. Many of the historically accepted foods are replaced with newer, more available and easily accessible foods. Acculturation to the United States has influenced many non-native cultures to consume fewer traditional whole grain foods, while increasing consumption of refined grain food products (Goyan Kittler et al., 2017).

In order for a whole grain food to be accepted by consumers of all cultures, sensory attributes need to be positively recognized. Research has shown that the greatest sensory barriers to achieving whole grain product acceptance include flavor, texture, and color (Heiniö et al., 2016). Research addressing how sensory food messages may impact the quality perception and of wholegrain foods is lacking. Perceived sensory attributes for the whole grain study product foods are listed below in Table 3.2. This study will aim to bridge the gap in assessing the impact of sensory messages on the perceived quality of whole grain foods.

**Table 3.2 Whole Grain Study Food and Sensory Issues; (Heiniö et al., 2016)**

| Study Food | Refined Grain Counterpart | Sensory Attributes and Barriers Of Whole Grain Product |
|---|---|---|

| | | |
|---|---|---|
| Whole Grain Bread | White, refined-flour bread | Dark color, speckled appearance, coarse, hard texture, nutty odor, bitter and sour taste, grain-like, seedy flavor, malted notes, musty |
| Whole-wheat Pasta | Refined Semolina pasta | Low firmness and overall stickiness, bitter, and branny flavor |
| Brown Rice | White rice | Brown, grainy/starchy, cooked cereal, and corn/popcorn/buttery flavor |
| Whole Grain Ready-to-eat Cereal | Refined grain ready-to-eat cereals | Depending on the grain, extruded products can impact size, texture, color, and flavor |
| Whole Grain Crackers | Refined flour crackers | Astringent, high wheat, toasted, and earthy notes |
| Whole-wheat Pancakes | Pancakes made with refined flour | No information available regarding whole grain pancakes |

## 3.2 Theoretical Framework of the Method

According to Gliner et al. (2009) experimental research offers the researcher the opportunity to compare two or more groups while actively manipulating the independent variable. Participants are randomly assigned to treatment interventions where the independent variable is manipulated. Results are compared to the group that did not receive the intervention. Experimental research addresses questions of potential impact or difference the independent variable has on the treatment group. When two or more independent variables are manipulated, the researcher can compare not only the effects of the independent variables but also the potential interaction of exposure to both independent variables (Gliner et al., 2009). Experimental research in which each participant receives all of the treatments is a within-subject design. A strength of this design is that subjects act as their own control (De Winter & Dodou, 2017). When participants are consistent in the treatments with respect to themselves, statistical power is greater. The present study employs an experimental within-subject design with two independent variables (food message type and food message format). The protocol was approved

through Colorado State University Institutional Review Board in September, 2019 (submitted research number 19-9339H).

This study used an online grocery simulation within an experimental design in which the message type and message format were manipulated to investigate impacts on consumers' perceptions of food quality and willingness-to-purchase whole grain food products. The experimental methodological approach was a within-subject study design in which participants received six different treatment manipulations. Primary measured outcomes were participant attitude toward and willingness-to-purchase the study food. Within-subject design allowed participants to receive all treatment variations and to act as their own control. The order of treatments participants received were randomly assigned. The interventions consisted of variations of message type (hedonic vs. credence quality dimension message) and message format (text + photo vs. video + audio) of whole grain food products (i.e., study food) as shown in Table 3.3 below. In addition, a fifth treatment type included a refined grain counterpart photo with the nutrition facts panel (Refined Food with NO treatment + NFP). A sixth treatment included the whole grain food product photo with a nutrition facts panel (Baseline - Whole Grain food with NO treatment + NFP).

**Table 3.3 Message Type and Message Format treatment manipulations**

| | Text + Photo Format | Video / Audio Format |
|---|---|---|
| Sensory Message (Hedonic) | Sensory Message + Text/Photo | Sensory Message + Video/Audio |
| Health-related Message (Credence) | Health-related Message + Text/Photo | Health-related Message + Video/Audio |

**3.3** Instruments and Variables

Data collection included an online question and response format. Using an experimental design software program known as Qualtrics Survey Software (2018), a web-based experiment

was developed and used to collect participant data. Questions were developed to assess several variables to gain insight into potential relationships and effects among the variable characteristics. These variables are listed and described below in Tables 3.4 and 3.5.

### 3.4 Independent Variables and Message Development

The two independent variables within this research project include message type and message format. These variables were presented to participants via a simulated online grocery web page design. In addition to message type and formats, simulated web pages consisted of product images of whole grain products. The brand design, product image, and web page development were created using graphic design principles (Hagen & Golombisky, 2017; Landa, 2019). The specific design parameters are listed in Appendix E.

Both health and sensory messages were developed and tested to ensure effectiveness in relaying acceptability among participants for each study food. A convenience sample of undergraduate college-aged adults were recruited and managed through Sona Systems, a research management software tool (Sona Systems Ltd., 2019). Extra credit was offered as an incentive to study participants; all participants remained anonymous to the researcher. A sample size of 48 students participated within the message development research. Photos of each study food product were displayed on a computer screen aside various sensory and health-related messages. Participants were asked to determine the degree to which they agreed with the message statement (Likert-type 7-point scale). Health-related messages included FDA regulated claims (U.S. Food and Drug Administration, 2018). Sensory messages included the use of sensory descriptors relating to visual, texture, and flavor of whole grain food. Means of responses were analyzed to determine best fit message with greatest degree of acceptability.

Based on this testing, one health message and one sensory message were chosen to be used for the full study. A listing of these health and sensory variations of messages tested for the

intervention treatment and the results are provided below (see also Appendix B). Based on these results, it was determined that the health message (M=4.94) and sensory message (M=4.31) with the greatest degree of acceptability used within this research would include the following:

Health message: *Good source of whole grain fiber to support regularity*

Sensory message: *Rich, brown, and golden perfection*

### 3.5 Cognitive Interviews

In order to minimize potential limitations of an asynchronous self-administered experiment, cognitive interviews were conducted prior to the actual fielding of both the pilot test and the online experiment. Cognitive interviews helped to assess a participant's comprehension of the study questions, understanding and relevance of specific health and sensory messages, specific phrases or wording necessary to formulate a response, retrieval strategies of relevant information, and insight of the decision and response processes (Willis, 1999). Cognitive interviews also shed light on any vague, confusing, or poorly written questions (which were then revised).

A convenience sample of undergraduate students attending a Western U.S. university were recruited to participate in 1:1 face-to-face cognitive interviews. Participants were 18 years of age or older, lived within the US, and were enrolled in introductory communication courses at the university. Participants were incentivized to participate in the interviews with extra credit. They remained anonymous to the researcher and immediately received credit for their participation (a best practice as noted by Dillman et al., 2014).

A total of 10 interviews were conducted by the researcher. Participants used a laptop to access the research study questions. Participants read aloud each question and response within the study format; their comments and questions were recorded in real time during each interview. Any functional issues within the online format were noted and addressed. Any typos or poorly

worded questions and responses that participants had noted during the interviews were changed after four interviews. Subsequent comments and findings were noted and deemed similar. Therefore, it was determined that more participant interviews would not be necessary given a point of saturation in further comments had been met. Participant comments were aggregated for a complete review of the survey based on all findings. An annotated survey was drafted based on all comments and used to fully develop the pilot test. Participant comments are provided in appendix K. The resulting pilot study and fully fielded study are found in Appendices L and M.

### 3.6 Pilot Study and Manipulation Tests

Following cognitive interviews, a pilot test of the online experiment was conducted to ensure ideal format, flow, software functioning, and minimization of respondent burden prior to fielding the full study (Dillman et al., 2014). The pilot study also addressed appropriateness of the treatment manipulations and tangibility of online study food products.

A convenience sample of undergraduate college-aged adults were recruited through the Sona Systems program, a research participant management program for the pilot study. To ensure that any potential problems were observed, an adequate sample size was important. Sample size for the pilot study was determined based on the variations of current guidance. This included recommendations of 12 participants per group (Julious, 2005), at least 9% of the fully fielded sample size (Cocks & Torgerson, 2013), a range of 10 to 40 participants dependent upon certain parameters (Hertzog, 2008; Johanson & Brooks, 2009), and a calculation based on confidence level and expected probability of observing a problem (Viechtbauer et al., 2015). In using the calculation with a confidence of .95 and probability of .15, the sample size for the pilot study was determined to include at least 19 participants. A total of 45 students participated in the pilot test.

***Manipulation checks: Message type.***

Questions asked of participants within the message development component of the experiment assessed the appropriateness of the acceptance of the message type for whole grain food products used within this study. Messages used within this study were those that elicited the greatest degree of acceptability. Within the pilot study, participants were asked if they were able to determine if the messages were health-focused or sensory-focused messages. This was to assess whether participant perception of the messages were appropriately health- and/or sensory-focused. Results showed that participants correctly distinguished the health message and the sensory message with a high degree of accuracy, 100% and 97%, respectively.

***Manipulation checks: Message presentation format: vividness and tangibility.***

Vividness is an aspect of media richness. Vividness can be manipulated within the different message format treatments by adding photos, text information, videos, and audio to a baseline food presentation of product image and ingredient information. Within this study, vividness was manipulated into two different levels. The first level enhanced vividness by including a photo of the whole grain food and additional text of information about the food (photo + text). The second and greater level enhanced vividness by including a video of the whole grain food with audio of the product information (video + audio). Static photos and text provided lower levels of vividness; multi-media formats increased cues aimed to help enhance stimulation of consumer senses, thus increasing vividness. Manipulation checks of the format presentations were conducted during the pilot testing phase of the research in order to ensure the different levels of vividness were noted by participants.

Questions following each food presentation format included: 1) In addition to product image, this product presentation included sound; 2) In addition to product image, this product presentation format included video information of the whole grain food; 3) In addition to product

image, this product presentation included information in text format of the whole grain food; and 4) In addition to the product image, this product presentation included a photo image of the whole grain food (Coyle & Thorson, 2001). Each question included a true, false, or don't know response option. Participants correctly noted the presence or absence of video / audio manipulation treatment 79% and 88% of the time, respectively. Additionally, they indicated the presence of photo / text manipulation treatment with 92% accuracy. Difficulty was noted in stating whether photo / text were absent. Because of the other accuracy in detecting presence and absence of video / audio and presence of photo / text, it is thought that participants may have been confused and did not consider a photo or text in addition to the product image that was included in all treatments. Because of this, a question regarding format manipulation was added to the final study in an effort to ensure participant awareness of manipulation.

Tangibility was also tested as a manipulation check during the pilot study. Tangibility is described as a three-dimensional construct that has physical, general, and mental dimensions (Laroche et al., 2001). The physical aspect pertains to the ability to see and touch factors of a good or service. The mental aspect of tangibility accounts for the degree to which a person has a clear mental picture of the product or service. The generality aspect concerns the features and uses of the product or service. The more specific and concrete a good or service is, the greater the generality aspect of tangibility (Laroche et al., 2001). In the 9-point Likert-type scale (strongly disagree to strongly agree), each aspect of tangibility had three separate questions with reliability scores (i.e. Cronbach's alpha scores) of .96, .91, and .80, respectively (Laroche et al., 2005). In online retail, research suggests that most goods have a greater tangibility than do services. Familiarity with the product strengthens the relationship of perceived tangibility with that product (Laroche et al., 2005; Verhagen et al., 2010). Because the food products used in this

study included whole-grain counterparts of very familiar food products, it was expected that overall tangibility would be high. Therefore, this study investigated generality aspects of tangibility as part of the manipulation check of the online food presentation. This includes a 3 item 7-point Likert-type scale. Questions include: 1) *It is easy to describe the many features related to this food*; 2) *I could easily explain the many features associated with this food*; and 3) *It is not difficult to give a precise description of this food item.* Convergent and discriminant validity among this scale were tested with samples of college students. The AVE (Average Variance Extracted) for generality aspects was .47, which marginally established convergent validity; each of the 3 areas of tangibility were shown to be unique (discriminant validity).

Results from the pilot testing revealed that the total perceived tangibility of all food products and treatment manipulations was statistically greater than neutral (M=5.33, SD=.93); t(35)=8.59, p=.001. In analyzing for the various treatment groups, this remained true for the perceived tangibility for each condition:

- Health + Video Messages: (M=5.46, SD 0.93), t(17)=6.68, p=.001
- Health + Photo Messages: (M=5.92, SD 1.04), t(16)=7.59, p=.001
- Sensory + Video Messages: (M=5.02, SD 1.23), t(16)=3.41, p=.004
- Sensory + Photo Messages: (M=4.96, SD 1.20), t(16)=1.30, p=.066
- Baseline – Whole grain food + NFP: (M=5.67, SD 1.25), t(16)= 5.51, p=.001
- Refined – Refined food + NFP: (M=5.06, SD 1.47), t(16)=2.97, p=.01

As was expected, the tangibility of study food products was shown to be high in the online grocery simulation. A high tangibility supports the idea that commonly consumed foods are familiar to participants.

**Table 3.4 Independent Variables and Manipulation Checks**

| Variables | Defined | Manipulation Check | When Measured |
|---|---|---|---|
| IV: Message Type | **Manipulation**: Sensory message vs. Health-related message<br><br>Health-related messages tested included FDA-approved health claims. | 1. Perceived Agreement of Message<br>2. Ability to distinguish a health-focused and a sensory focused message | Separate message development prior to cognitive interviews to determine acceptability of messages |

| | | | |
|---|---|---|---|
| | Sensory messages tested included use of research defined and culturally appropriate sensory descriptors relating to color, texture, visual, and flavor. | | Assessed ability to distinguish health- and sensory-focused message with questions in pilot study |
| IV: Message Format | **Manipulation**: Text + Photo information vs. Video + Audio of information<br><br>Media richness was manipulated within message format. The two dimensions of media richness included vividness and interactivity. Vividness included the sensory richness that the technology can produce. Variety of formal features with technological media (e.g. structure, stylistic aspects including graphics, audio-visual, and colorful content), can be used to present information to the senses and impact the level of vividness in the online space. The use of descriptive and sensory words, photos, video or graphics that evoke a mental picture draws on imagery.<br><br>Media richness can also impact perceived tangibility. Tangibility is a three-dimensional construct of that includes a consumer's perception of the product's physical characteristics, the mental (or abstract) factors, and generality (specific or concreteness) aspects of the goods features and uses. Product goods generally yield greater overall perceived tangibility than services. This is particularly true for familiar products. | Tangibility & Vividness<br><br>Questions were asked after each food presentation during the pilot study to ensure that participants noticed the format attributes manipulated to enhance vividness on each of the food presentations. These included 4 items and a 7-point Likert scale of agreement or disagreement (Coyle & Thorson, 2001).<br><br>Tangibility: This project used the scale for generality of tangibility. This is a 3 item Likert-type scale. This scale, along with the physical and mental tangibility components, have been tested in both online and offline presentations.<br><br>(Laroche et al., 2001; Laroche et al., 2005) | Pilot study after each food presentation |

## 3.7 Measures.

A series of measurement scales and tools were used to measure participants' characteristics, attitude, knowledge, interest, and willingness-to-purchase whole grain foods. These dependent, moderating, and potentially confounding variables are listed in Table 3.5 below. Descriptions of the measurement tools are as follows:

***Health Interest.***

In assessing a consumer's interest in health, it is important to have the health concept be related to diet and its relation to one's overall health. Roininen et al. (1999) developed a scale that measures consumer attitudes toward health and taste in relation to foods. The *General Health Interest* scale consists of 9 questions with a 7-point Likert-type scale response (1=strongly disagree to 7=strongly agree). These questions relate to a general assessment of the role of food choice in relation to overall health. The reliability is reflected as a .80-.89 Cronbach's alpha score in studies of Finnish, English, and Dutch participants (Roininen, 2001;

Roininen et al., 1999; Roininen & Tuorila, 1999). The General Health Interest (GHI) scale has been validated for its predictive validity in reported and actual behavior of "pleasant-not healthy" and "healthy" food choices in sample populations of Finnish, English and Dutch adults.. (Roininen, 2001; Roininen et al., 1999; Roininen & Tuorila, 1999; Roininen et al., 2001).

***Knowledge of whole grain foods.***

Several studies have used self-report questionnaire tools to assess knowledge of whole grain foods for a variety of audiences (Ellis et al., 2005; Williams & Mazier, 2013). Consumer ability to process whole grain food marketing communications needs to address the recognition of whole grain foods from marketing messages in addition to the underlying meaning of these communications in relation to health. Therefore, this Knowledge Scale addresses definitions of whole grain foods, health benefits of whole grains food consumption, U.S. dietary guidance recommendations, and the identification of whole grain foods from marketing materials. This Knowledge Scale is adapted from survey questions developed for the elderly population (Ellis et al., 2005) and its modifications for college students (Williams & Mazier, 2013).The scale consists of a 5-item multiple choice response scale adaptation.

***Willingness-to-consume whole grain foods.***

According to the transtheoretical model of health behavior change, readiness or willingness to adopt a new behavior (e.g. consume foods) is considered an important and foundational necessity to behavior change (Prochaska & Velicer, 1997). Prior to presentation of entire food message manipulations (a pre-test), participants completed questions of willingness to consume each study food. Responses consist of a 5-point scale of *Never Eaten, Always Unwilling, Sometimes Unwilling, Sometimes Willing, and Always Willing.*

***Willingness-to-consume and willingness-to-purchase.***

Research often measures food product quality using willingness-to-purchase as a proxy for product acceptance and liking (Aschemann Witzel & Grunert, 2015; Grunert, 2002; Grunert

et al., 2000). Participants were also asked how willing they would be to consume the study food after presentation of the study food, in addition to their willingness to purchase to assess any differences between these two responses within this sample population. Each of these items is a 5-point Likert-type scale of agreement (as in the pre-test willing-to-consume responses).

***Attitude toward Study Food.***

A key aspect in food purchase decision-making is the judgment of food quality. The Total Food Quality Model (TFQM) has incorporated multi-attribute attitude characteristics into the model and provides a theoretical understanding of the strength of attitudes in food-quality judgments (Brunso et al., 2002). Attitude plays a role in food-quality judgments and purchase intentions. Attitude influences food choice and precedes behavioral intent and actual behavior (Fishbein & Ajzen, 2010; Tuuri et al., 2016).

With this in mind, attitude toward each specific study food was also assessed. Before and after each study food presentation, participants were asked to complete a 4-item semantic differential scale measuring general attitude toward the study food (Crites et al., 2016). General term pairs included positive / negative, like / dislike, good / bad, and desirable / undesirable. Responses consisted of a 7-point bipolar continuum with a range of -3 to 3; negative numbers represent a negative evaluation of the study food. This scale has been tested among numerous studies and yielded a Cronbach's alpha of .95 in addition to strong discriminant and convergent validity.

***Other Variables: Socio-Demographics.***

Socio-demographic questions were also included within the study design to assess any mediating impact on dependent variables. These include nominal questions of ethnicity and race, gender, education level, age, and marital status.

***Consumption of Whole Grains.***

Participants' current consumption of whole grain foods was identified as a potential confounding factor. Greater consumption of whole grain foods recognizes an acceptance of dietary whole grain foods. Therefore, it was important to measure consumption amounts prior to testing to discover any confounding impacts. Food Frequency Questionnaires (FFQ) are used to assess food intake over a given period. When a food item is questioned, a portion size is listed alongside the food item and the question asks how often, during a specified time, does one consume that food item. The 9-interval item scale used in this study was adapted from the Harvard University semi-quantitative dietary assessment using whole grain foods. These food frequencies have been validated for many nutrients in various groups (Rimm et al., 1992; Willett et al., 1985). Within the adapted scale used for both older adult and college-aged participant populations, portion sizes were removed from the questionnaire because the focus was on frequency of whole grain exposure verses specific consumption amounts (Ellis et al., 2005; Williams & Mazier, 2013). Consumption frequency includes the following whole grain foods: oatmeal, brown rice, whole grain ready-to-eat cereal, whole grain bread, whole grain bagels, whole grain pasta, whole grain crackers, and popcorn. The large majority of cereal grain products consumed in the U.S. are refined grains and not whole grain products (Albertson et al., 2016). With a college-aged population, it was also important to understand consumption of refined grains in comparison to whole grain food consumption. Therefore, the food frequency questions also included those refined grain counterparts of the whole grain study foods. As an example, questions about bread consumption included one question about whole grain breads and an additional question about refined-grain breads.

***Perceived Cooking Skills.***

The TFQM illustrates that personal factors, such as knowledge, memory, or beliefs, are taken into consideration when assessing food quality and processing information. Perceived cooking skills have also been correlated with dietary intake (Metcalfe & Leonard, 2018; Utter et al., 2018). Cooking skills are defined as skills surrounding mechanical, planning, knowledge, food chemistry, and food safety; and are abilities that support persons to cook foods from scratch (Short, 2003). A greater degree of cooking ability has also been associated with improved diet quality (Larson, Perry, et al., 2006; Larson, Story, et al., 2006; McLaughlin et al., 2003). Likewise, limited cooking skills are associated with limiting food choices and food selection (Metcalfe & Leonard, 2018). Perceived cooking skills were assessed as a 5 item 5-point Likert type scale asking level of agreement (DeLong Bailey et al., 2018). Responses included: *Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree and Strongly Agree.* The five items included: *I believe I am talented at preparing health food; I do pretty well preparing healthy food compared with other people my age; I feel pretty confident about my food preparation skills; I am satisfied with my ability to prepare healthy foods; and I am pretty skilled at preparing healthy foods.* This scale was developed with a sample population of college students; and it was drawn from a previously validated scale developed within an adolescent population. Reliability was acceptable with Cronbach's score of 0.94, and test-retest correlations of 0.79.

**Table 3.5 Dependent, Moderating, and Potential Confounding Variables and Measurements**

| Variables | Defined | Data Measurement Instrument | When Measured |
|---|---|---|---|
| Willingness-to-purchase whole grain foods (Dependent Variable) | This tool measured the degree to which participants were willing to purchase specific study foods. | 5-point Likert-type scale used to determine any potential effect of manipulations. | Post-manipulations |
| Attitude (Dependent Variable) | Attitudes defined as the sum of the beliefs – both positive and negative – surrounding a specific food. | 4-item semantic differential scale. Responses consisted of a 7-point bipolar continuum with a range of -3 to 3.<br><br>(Crites et al., 2016). | Pre- and Post-manipulation |

| | | | |
|---|---|---|---|
| Willingness-to-consume whole grain foods (dependent variable – though included as an area of interest and not among the stated hypotheses) | This tool measured the degree to which participants were willing to consume specific study foods. | 5-point Likert-type scale. | Pre-and Post-manipulations |
| | | | |
| Health Interest (Moderating Variable) | The level of personal interest and belief in the relationship of food choice and general health. Personal interest in health has been shown to be associated with motivation to read food labels. | 9-item Likert-type scale.<br><br>(Roininen, 2001; Roininen et al., 1999; Roininen & Tuorila, 1999; Roininen et al., 2001) | Pre-manipulation |
| Knowledge (Moderating Variable) | This measured the participants' knowledge of whole grain foods, the relationship of whole grain foods to health, and the capacity to detect whole grain retail foods within the grocery store environment. | 5-item multiple choice scale. | Pre-manipulation |
| | | | |
| Socio-Demographics (Potential Confounding Variable) | Various socio-demographic variables were tested as potential confounding variables including age, gender, ethnicity, first generation immigrant, college major, in addition to grocery purchasing experiences. | Various Questions | Post-manipulation |
| Consumption of whole grains (Potential Confounding Variable) | The food frequency questionnaire assessed the number of times/week that participants consumed various whole grain foods and the prevalence of whole grain foods in their diet, which is a factor of familiarity and acceptance. | Food Frequency<br><br>(Ellis et al., 2005; Williams & Mazier, 2013) | Pre-manipulation |
| Perceived Cooking Skills (Potential Confounding Variable) | The participants' perception of their cooking skills and abilities. | 5 item Likert-type scale.<br><br>(DeLong Bailey et al., 2018). | Post-manipulation |

### 3.8 Stimulus Materials.

To assess the impact of food message type and format on participants' evaluation of food quality, this study used computer-generated mock product pages of online grocery food products. Six varied manipulations were studied. The two variant factors included two message type options coupled with two format type options. There was also a baseline whole grain food with NO treatment+ Nutrition Facts Panel and a presentation of a refined grain counterpart food with

NO treatment + NFP was also included (further explained below). Participants received all treatment options. Product image graphics and study food presentation webpage simulations were developed based on industry best practices and current guidance (Hagen & Golombisky, 2017; Landa, 2019). See Appendix E.

### 3.9 Message Type.

The intervention treatments consisted of variants of message type. The whole grain food was described with either a hedonic (sensory) type of description or a credence (health-related) descriptive message.

### 3.10 Message Format.

Intervention treatments were variants of message formats that manipulate media richness. Vividness, one of the factors of media richness, includes the sensory richness that technology can produce. Manipulating formal features with technological media can be used to present information to the senses and impact the level of vividness in the online space. Examples of technological features include the structure, stylistic aspects including graphics, audio-visual, and colorful content in addition to the use of descriptive and sensory photos, video, or graphics that evoke a mental picture and draw on imagery.

The two variations of format consisted of 1) text + photo and 2) video + audio. The photo and video included study food product imagery. Information provided within the text consisted of specific product use information including versatility, preparation, and ease of addition in the diet. This information reinforces the message type—consisting of sensory or health-related information appropriately. The exact content of the text or audio was finalized based on results of cognitive interviews and pilot testing. The text information was the exact verbiage used in the voice over audio within the video. Each of these formats attempted to impact the degree of richness and vividness of the media (Laroche et al., 2001; Laroche et al., 2005). A static photo

and text-only information provided a minimal level of media richness; video and audio were added to increase richness. Examples of these two formats are shown in Appendix F.

Two other manipulation conditions were incorporated into the experiment. One of these, the fifth format treatment manipulation, provided a baseline of the whole grain study food. This presentation included a product photo, the ingredient information, and the nutrition facts panel (NFP). The sixth and final manipulation condition consisted of a photo of the refined food product counterpart of the study food, ingredient information, and the Nutrition Facts Panel (NFP). As the majority of grain food products consumed in the United States are refined food products (Albertson et al., 2016; McGill et al., 2015), testing a refined grain product allowed for comparison of whole grain food quality acceptance. These two additional manipulations were included to resemble currently trending marketplace displays and provide further insight about differences, if any, between whole grain and refined grain food presentations.

Further, testing for impact of the nutrition facts panel outside of the message manipulation variants was important for two reasons. First, not including the NFP in the message treatments eliminated any confounding impact that this nutrition information may have on participant food decision-making. Secondly, from a practical standpoint, the NFP information is often included in online grocery product displays. However, research suggests that the NFP is not often viewed while online grocery shopping; consumers state using the NFP less online than in traditional brick-and-mortar grocery stores (Ardolino & Lewin-Zwerdling, 2018; Campos et al., 2011). Therefore, it was important to assess any influence the NFP may have and compare it to other product display simulations within this experiment.

**3.11 Presentation Order.**

All 6 treatment options were present in the study design and coordinated with each of the 6 study foods for a total of 36 different combination possibilities (see Tables 3.6 and 3.7 below).

A 6 x 6 Latin Square design was used to distribute the treatments to the 6 treatment subsets. Participants were randomized to one of the six treatment subsets facilitated with the survey software program (Qualtrics Survey Software, 2018). Additionally, the order or presentation within those six subsets was randomized. As a within-subjects design, all participants were presented with each of the six treatments and each of the six study foods.

**Table 3.6 Treatment Manipulations and Study Food Codes for Latin Square**

| **TREATMENTS** | **Video + Sensory**<br><br>**A** | **Video + Health**<br><br>**B** | **Photo + Sensory**<br><br>**C** | **Photo + Health**<br><br>**D** | **Baseline WG + NFP**<br><br>**E** | **Baseline refined grain food + NFP**<br><br>**F** |
|---|---|---|---|---|---|---|
| **FOOD VARIANTS** | **WG Bread**<br><br>**1** | **WW Pasta**<br><br>**2** | **Brown Rice**<br>**3** | **RTE Cereals**<br><br>**4** | **WG Crackers**<br>**5** | **WG Pancakes**<br><br>**6** |

WG = Whole Grain; WW = Whole Wheat; NFP = Nutrition Facts Panel; RTE = Ready-to-Eat

**Table 3.7 Latin Square Displaying Orders/Groupings of Manipulations**

| Groups | TESTING CONDITIONS | | | | | |
|---|---|---|---|---|---|---|
| 1 | A1 | B3 | F6 | C2 | E5 | D4 |
| 2 | B2 | C6 | A5 | D1 | F3 | E4 |
| 3 | C5 | D3 | B6 | E1 | A4 | F2 |
| 4 | D2 | E3 | C4 | F5 | B1 | A6 |
| 5 | E6 | F1 | D5 | A2 | C3 | B4 |
| 6 | F4 | A3 | E2 | B5 | D6 | C1 |

### 3.12 Study Food – Whole Grains.

Six different study foods (whole grains) were used to allow for the numerous treatment presentation options. These foods were chosen based on McGill et al. (2015) U.S. consumption data and included whole-wheat pasta, brown rice, whole grain bread, ready-to-eat whole grain cereal, whole grain crackers, and whole grain pancakes. U.S. whole grain consumption data has shown that whole grain breads are most commonly consumed (27% of all whole grains

consumed), followed by ready-to-eat cereals (23%), next brown rice and whole-wheat pasta (21%), whole grain crackers (17%) and lastly, whole-wheat pancakes (3%) (McGill et al., 2015).

Commonly consumed foods were chosen to help ensure familiarity of the whole grain foods. Likewise, it was also important to choose six different whole grain foods. Six different foods allowed each participant to view the six message treatment presentations without repetition of any of the study foods. Providing a new food for each treatment presentation helped to minimize participant fatigue or carryover effects from viewing the same food. However, while using six different foods seems more practical, it could potentially create an additive effect in the outcomes. Therefore, food type was analyzed as a potential covariate to assess for any added effect.

### 3.13 Experimental Conditions.

Each of the six foods were used for the six varied treatment interventions. In addition to the message type and format treatments, two other groups were included: a) baseline WG + NFP and b) baseline refined grain food + NFP. Table 3.8 (below) depicts all treatment options within each of the six foods.

**Table 3.8 Experimental Conditions**

| Message type 1: (Static product photo of product, Ingredient deck +) | Message type 2: (Static product photo of product, Ingredient deck +) | Message type 3: ((Static product photo of product, Ingredient deck +) | Message type 4: (Static product photo of product, Ingredient deck +) | Message type 5: WG Baseline food+ NFP | Message Type 6: Baseline refined food + NFP |
|---|---|---|---|---|---|
| (Sensory Message) | (Sensory Message) | (Health Message) | (Health Message) | Static product photo of product, Ingredient deck, + NFP | Static photo of refined food product, Ingredient deck and NFP |
| Text + Photo | Video + Audio | Text + Photo | Video + Audio | | |

Both brand and price are product search attributes that consumers use to assess food quality (Brunso et al., 2002; Mueller & Szolnoki, 2010). In the online space, research suggests that consumers rely less on product price or promotion and more on branding (Breugelmans et al., 2007; Chu et al., 2008; Gonzalez-Benito et al., 2015; Nepomuceno et al., 2014; Suri et al.,

2003). To minimize any confounding factors that may impact food quality decision-making, familiar branding and pricing was not part of this research project. However, there were questions included within the experiment that addressed the importance of brand and price in participants' food decision-making purchases. In the future, it would be important to understand how specific branding and pricing may add to online food decision-making with the message and format variants. Future research projects should encompass these search attributes.

**3.14 Data Collection.**

Choosing an online experiment to investigate aspects of online grocery shopping through experimental means was a sound choice. An online experiment offers an environment that is most similar to a real-world simulation. The online survey software program from Qualtrics Survey Software (2018) was used to design the online experiment. Pre-intervention questions included the following variables: knowledge and health interest (moderating variables). The interventions consisted of online simulation graphic with message type and format variations. The two variations of message types included hedonic vs. credence type; and the two variations of format type included text + photo vs. video + audio. Outcomes measured included participant willingness-to-purchase and attitude toward product (dependent variables). Socio-demographic data, perceived cooking skills, and current consumption of whole grain foods was also requested from each participant as potential confounding variables. To understand sample population characteristics, questions about grocery food purchases, cooking, and dietary habits were also included in the survey.

**3.15 Sample and Recruitment.**

College-aged students enrolled at Colorado State University (Fort Collins, CO) were recruited for participation in this research experiment. Statistical demographics of this population include the following characteristics: roughly 34,000 (33,877) students enrolled in the 2018-2019

school year; 24,380 students enrolled as undergraduates. In the 2017-18 freshman class, 71% were White, 17% Hispanic/Latino, 3% Asian, 5% multi-racial and 2% Black (Colorado State University, 2019).

Approximately 75% of undergraduate college students in the U.S. are aged 18-24 years (Husar & Bailey, 2014). "Millennials," "Gen Y," or "Gen Z" as this group is often referred, is the generational cohort born between the mid 1990s thru the early 2000s (Bump, 2014; Dimock, 2019). Whether defined as Gen Y, Millennials, or the newest generation, Gen Z, this group has grown up with computer technology and the internet from a very early age. These individuals tend to value a wide variety of media, including the internet, and have had access and availability to computers, mobile devices, and the internet throughout their formative years (Valentine & Powers, 2013) They are the first generation that is globally connected by the internet (Ordun, 2015). Moreover, they are leaders in technological innovation acceptance and advancement. As a result, they may have a varied evaluative skillset compared to that of older generations.

As offspring of the Baby Boomers (born 1945-1963), millennials make up the largest cohort of consumers (Belleau & Summers, 2007). Millennials are a very vocal and influential consumer group which uses the internet and social media technology often; additionally, they account for 21% of total annual consumer spending (Peregrin, 2015). This cohort varies from previous generations. Parment's (2013) research reveals that the millennial shopper enjoys the plethora of availability of products and product channels, is comfortable with large amounts of data, makes purchases based in emotion yet is not necessarily loyal to brand, is attracted by innovation and image-makers, and is highly influenced by social networks (Parment, p. 192)

Food purchasing is often aligned with food movements such as 'buying local' and 'seeking organic' foods, in addition to food trends (Peregrin, 2015). Highly tech-savvy,

millennials use smart phones and apps to seek recipes and nutrition information in addition to shopping. The U.S. 2017 Grocery Shopper Trends Report from the Food Industry Association revealed that online-only grocery stores, such as Instacart or AmazonFresh, increased by 15% to 48% in 2017, with most of this growth was driven by millennials (Food Marketing Institute, 2019). While they are easily enamored with technology and online purchasing, home cooking may be limited. The United States Department of Agriculture (USDA) Economic Research Service data shows that little of millennials at-home food budget is spent on grains, poultry, or red meat; with the majority spent on prepared foods, pasta, sugar, and candy categories (Kuhns & Saksena, 2017).

As a large group making up 21% of total annual consumer spending and helping drive technology and online purchasing, the target population for this experiment included individuals born between 1990s and early 2000s. Therefore, college-aged adults were recruited for this research.

To recruit a sample of the population, Sona Systems Ltd. (2019) research management software was used to generate a listing of eligible participants. Eligibility requirements included participation in an undergraduate writing course at a Western U.S. university, Colorado State University (CSU). As this is a course offered to all enrolled CSU undergraduate students as a fulfillment of their core course requirements. All enrolled students were invited to take the survey.

Participants were required to be at least 18 years of age (or older) and reside within the United States. Online grocery food experience was not an inclusion criterion. However, participants were asked about their food purchasing, online grocery experiences, and food preparation habits. To ensure that participants could feasibly consider purchasing whole grain

foods, participants were screened and excluded from the study if they avoided dietary grains for whatever reason (e.g., celiac disease; Keto-friendly, Paleo, low carbohydrate, or low grain diet). Consent was requested at the beginning of the online experiment.

Sample size power analysis was based on expected results of a small effect size (d = 0.2, Cohen's d) (Cohen, 1988). Using Cohen's power tables with a two-tailed alpha at $p \leq 0.05$ and a power of 0.8, the estimated number of participants required for this within-subjects design was 197 participants ($n$ = 393/2) (Cohen, 1988).

**3.16 Data Collection Procedures.**

Sona Systems research management program (Sona Systems Ltd., 2019) was employed to assist in generating eligible student participants within this project. Eligible students were pre-registered through SONA as part of their course requirements. Email information regarding timing and links to online experiment was managed with the SONA software. Participants were sent a link to the Qualtrics software online location of the experiment. Informed consent was provided to all student participants as they initiated the research experiment. A debriefing statement was included at the end of the online experiment. Extra credit was offered to all participants who completed the experiment, per the course instructor's agreement. Participants remained anonymous to researcher.

In efforts to maximize experiment response rate and build positive relationship with participants, multiple contacts were sent to the sample population with varied messages, as best practices of survey methods (Dillman et al., 2014) This was to encourage respondents and keep survey top of mind.

**3.17 Analyses.**

Primary research questions were analyzed using Repeated Measures ANOVA in order to compare six different message and format treatment options. Within this model, the analyses also

addressed potential moderating effects by including other variables (health interest and knowledge) as covariates. In order to assess any confounding effects of demographic variables, whole grain consumption, pre-attitude of whole grain foods, pre-willingness to consume whole grains, and perceived cooking skills, the analyses included these variables as covariates as well.

**3.18 Validity and Reliability.**

A convenience sample of college students has often used in both social psychology and consumer behavior research over the years. However, it is often argued that results from this study population cannot be generalized to a non-student population (Peterson & Merunka, 2014). Arguments exist whether college students can represent the larger population. However, there is some consensus that the appropriateness of the college student population occurs when they represent the population of interest. As college students are a sample of the millennial generation, which is driving much of the technological advances of the online consumer and is the target audience of this research, use of college student sampling within this research is appropriate (Megehee, 2009; Parment, 2013). Likewise, this population is expected to be living independently as young adults after graduation. As such, they may be managing the food and grocery purchases within their independence. Additionally, college students are a relatively homogenous population, particularly with age and education level, among others. Age and education level, in addition to generational factors, have potential to influence attitude (Parment, 2013; Peterson & Merunka, 2014). Homogeneity of the population sample is desirable to maintain equality among the groups (Gliner et al., 2009).

Validity of the study can be impacted when random sampling is not utilized in the sampling of the population. The population of this study was students enrolled in an introductory communications course offered to all university students. In addition, the within-subject design created an experiment in which each participant received all treatments and could act as their

own control, which proved to be a strength of the design. To minimize any carryover effects, the order of treatment manipulations was randomized. Finally, participants were able to engage with the study in the privacy of their own lifestyle and at the convenience of their own schedule during the open fielding time of the research experiment.

***Internal Validity.***

There are definite advantages to a within-subjects research design (De Winter & Dodou, 2017). Because all subjects are presented with each treatment and act as their own control, any potential variations between groups or group differences is not a factor. This can also increase the power of the experiment thus minimizing the total number of total participants necessary. This design can be particularly helpful to avoid very large participant numbers if small effects sizes are expected (De Winter & Dodou, 2017).

Nonetheless, there are weaknesses associated with this type of research design, which can impact its validity and reliability. Because a participant undergoes all treatments within the experiment, carryover effects are more likely. Examples of these effects include primacy / recency effect, practice effect, fatigue effect, and context effect (Gliner et al., 2009). Using counterbalancing techniques, such as the Latin-square for treatment type and randomization of order, has helped to minimize confounding effects of order (De Winter & Dodou, 2017). Additionally, as this was an even-numbered treatment, a completely balanced Latin square design was created (De Winter & Dodou, 2017). Likewise, using six different study foods minimized further carryover, as each food was new to the participants. Therefore, the context of information was different with each treatment intervention. This helped to support the reliability and validity of the research design.

Moreover, a self-reported online study may pose validity problems. Because of the nature of an online experiment, participants do not have direct oversight of the researcher. This could

influence participants to answer differently than they might in a different research setting, though it could minimize social desirability bias (Dillman et al., 2014). The use of standardized scales to measure constructs aids in minimizing self-report effects.

***External Validity.***

External validity questions the representativeness of the sample population. The college student sample population is a representative subset of the population of millennials. However, this is not a strongly diverse population. Therefore, findings cannot be extrapolated to the entire population of U.S. college-aged online consumers. Additionally, findings are not representative of all U.S. online consumers. However, the millennial consumer carries a strong percentage of annual consumer spending. Likewise, research suggests that as educational level increases, consumer spending also increases (Bureau of Labor Statistics, 2019). Therefore, the college millennial is expected to only add to future consumer spending. Insight into the college millennial in the online shopping space could be interesting and help to drive further research with varied populations of the online food consumer.

***Ecological Validity.***

Data collection for the college student participants within the online setting was a strong choice. The college student population is highly familiar with online offerings in addition to interactive tasks of an online process, due to their familiarity with computers and online interactivity during their formative years (Valentine & Powers, 2013). This study capitalized on millennial tech savviness and familiarity with online shopping by offering an online environmental simulation. This maintains the ecological validity of the research environment. Familiarity of online food purchasing habits within this population was assessed to record any potential confounding factor or bias within this population. Initial questions were added to characterize and quantify frequency of grocery food purchase behaviors. The results were

analyzed as a potential covariate interacting with the other variables, which helped to better assess ecological validity.

***Reliability.***

Within this experiment, the designated measurement tool included scales that are supported statistically with reliability measures. These scales have been shown to measure the variable constructs reliably within the study population. Reliability can also be enhanced by ensuring best practices in question design to support quality data collection. Quality question design helps by promoting understanding and providing meaning to the participants, can help to support high quality data collection (Dillman et al., 2014; Paolacci & Chandler, 2014). Question quality design was assessed for maximum understanding and clarity during the cognitive interview procedures.

**3.19 Summary.**

Assessing food quality is an important factor in food decision-making. Using the online setting to make food-purchasing decisions is a novel approach that is gaining more momentum with both consumers and food retailers alike. Research examining how consumers assess food quality in the online setting, particularly for healthful foods, is currently lacking. An online experimental design with treatments that manipulate message type and message format of whole grain food products can provide insights of best practices for online grocery presentation practices. The present study serves as a building block for this growing area of research.

# CHAPTER 4. RESULTS

The following research question was the overarching question that drove this study:

> *How do different presentations of information affect consumers' evaluations and decision-making for healthful food products in the online grocery-shopping environment?*

This study used a within-subject design in an online experiment. The data was collected using an online non-probability sample of college students at a Western U.S. university (CSU). The Qualtrics online survey software program facilitated the design of the questionnaire format (Qualtrics Survey Software, 2018). The study food used six variants of whole grain food products (i.e., a type of healthful food product): whole grain bread, whole-wheat pasta, brown rice, whole grain ready-to-eat cereal, whole grain crackers and whole-wheat pancakes. These foods represent whole grain foods that are more commonly consumed among American consumers (McGill et al., 2015). Additionally, these foods have familiar similar refined grain counterparts that are not considered as healthy (e.g. white bread, semolina pasta, white rice, refined ready-to-eat cereals, refined flour crackers, and refined flour pancakes).

The experimental interventions consisted of two message types and two format designs. The message types described the study food with either a sensory-related or health-related message (see Table 4.1). The format designs were a text + photo format or a video + audio format. The information provided within this text and audio included study food attributes in addition to either the health or sensory attributes, dependent upon which message manipulation was being presented. Exact verbiage is listed within the appendix D. Two additional food presentations included 1) the whole grain food pictured alongside the Nutrition Facts Panel and 2) the refined food counterpart pictured alongside the Nutrition Facts Panel.

**Table 4.1 Manipulation Factors – Message Type and Message Format**

| Message Type | Message Format | |
|---|---|---|
| | Text + Photo | Video + Audio |
| Sensory Message: "Rich, brown and golden perfection" | Sensory message with photo + text. | Sensory message with video + audio. |
| Health-related Message: "Good source of whole grain fiber to support regularity" | Health-related message with photo + text. | Health-related message with video + audio. |

### 4.1 Data Collection

The online experiment was fielded in March 2020. Students enrolled in introductory communication courses were invited to participate in the research via the SONA research management software program (Sona Systems Ltd., 2019). The experiment was fielded until a quota of 225 participants was met. However, at the end of the recruitment period only 178 students had participated. Therefore, the experiment was fielded again in summer 2020 (May - July), during which an additional 124 students participated. Participant data was removed if 90% or more of the responses were unanswered; this removed 12 participants from the spring cohort and 5 participants from the summer cohort. As per study protocol, participants were excluded from the study if they stated that they were either following a low carbohydrate, gluten-free, paleo, ketogenic or grain-free diet. This excluded an additional 23 participants from the spring cohort (13% of total spring participants) and 25 participants from the summer cohort (20% of total summer participants). Resulting viable data consisted of 143 participants from the spring cohort and 99 participants from the summer cohort.

The demographic variables were then compared between the two cohort groups to assess differences. A chi-square statistical analyses was conducted to assess any statistically significant differences between the two group samples (i.e., spring and summer 2020). To create a nominal

variable, the age variable was grouped into two groups: those born before 1995 and those born 1996 and later. This was to identify millennials and non-millennials. There were no statistically significant associations observed between the groups and each of the demographic variables. Therefore, the data from each data set was combined providing usable data from a total of 242 viable participants. Descriptive statistics were then collected/gathered on all variable responses. See Table 4.2 below for an overview of demographic information of study participants.

An independent *t*-test was conducted comparing duration of time spent participating within experiment between the spring and the summer cohorts. There was homogeneity of variances for duration of time scores for both the spring and summer cohort groups as assessed by Levene's test for equality of variances ($p$=.986). There were 143 Spring participants ($M$=80.1, $SD$=518.9) and 99 summer participants ($M$=81.6, $SD$=457.16). There was no statistically significant difference between mean duration of time scores between the two cohorts $t(240)$=-.024,($p$=.981). Further analyses comparing the percentages of grouped time duration indicate that 25% of total participants completed the experimental survey in < 10:00 minutes, 35% completed the experiment in 10:01-20:00 minutes, 16% completed in 20:01-30:00 minutes, and 24% completed the experimental survey in > 30:00 minutes.

**Table 4.2 Frequencies of Demographics Among the Spring and Summer Samples**

| Demographics | Sample | |
|---|---|---|
| | Spring 2020 Sample (*N* = 136) | Summer 2020 Sample (*N* = 97) |
| Gender | | |
| Male | 49 | 43 |
| Female | 86 | 54 |
| Other | 1 | 0 |
| Ages | | |
| Born 1995 and before | 11 | 9 |
| Born 1996 and after | 126 | 88 |
| Ethnicity / Race | | |
| White / Caucasian | 113 | 79 |

| | | |
|---|---|---|
| Black / African American | 7 | 3 |
| Spanish | 1 | 0 |
| Hispanic | 15 | 7 |
| Latino | 7 | 4 |
| American Indian or Alaska Native | 2 | 1 |
| Asian | 13 | 9 |
| Other | | |
| Education Level | | |
| High School / GED | 13 | 11 |
| Some College | 90 | 61 |
| 2-year College Degree | 19 | 13 |
| 4-year College Degree | 15 | 12 |
| Marital Status | | |
| Single | 133 | 96 |
| Married | 3 | 1 |
| Divorced | 1 | 0 |
| Children in the Home | | |
| Yes | 0 | 1 |
| No | 136 | 95 |

## 4.2 Demographics

Descriptive characteristics of the sample population are listed in Table 4.3 below. The majority of participants were female, white, and born after 1996, with only some college experience. Further, the majority of participants were single and living without children in the home. Racial statistics in this population are similar to those recorded in the 2017-18 freshman class at CSU: 71% White, 17% Hispanic/Latino, 3% Asian, 5% multi-racial and 2% Black (Colorado State University, 2019). This population majority is considered the millennial / Gen Y generation, as expected.

**Table 4.3 Descriptive Characteristics of All Participants: Frequencies and Percentages**

| Characteristic | Total ($N$ = 234) | Percentages |
|---|---|---|
| Year of birth | | |
| $\leq$ 1995 | 20 | 9% |
| $\geq$ 1996 | 214 | 91% |
| Gender | | |

| | | |
|---|---|---|
| Male | 92 | 39% |
| Female | 140 | 59% |
| Other | 1 | 0.1% |
| Ethnicity / Race | | |
| Spanish, Hispanic or Latino | 24 | 11% |
| White | 192 | 86% |
| Black/African American | 10 | 4% |
| American Indian or Alaska Native | 3 | 1% |
| Asian | 22 | 9% |
| Hawaiian or Pacific Islander | 1 | 0.1% |
| Other | 17 | 0.2% |
| School | | |
| High School / GED | 24 | 10% |
| Some College | 151 | 65% |
| 2-year College Degree | 32 | 14% |
| 4-year College Degree | 27 | 12% |
| Master's Degree | 0 | 0.0% |
| Children living at home | | |
| Yes | 1 | 0.1% |
| No | 231 | 13% |
| Marital Status | | |
| Single | 229 | 98% |
| Married | 4 | 2% |
| Divorced | 1 | 0.1% |

### 4.3 Grocery and Food Habits

Data revealed that most participants (67%) had experience with purchasing products (including but not limited to food products) in the online format at least one time per month, while only 15% of participants had never purchased anything online. The majority of students did not have a campus meal plan (75%) and relied on preparing their own meals 1x/day or more (67%). The majority of participants shopped for themselves (97%) and purchased groceries only for themselves (58%). Most participants were single (98%) without children living in the household (99%).

Supermarkets, such as King Soopers, were most often used for grocery purchases; 85% shop supermarkets at least several times a month with 52% visiting a supermarket 1x/week or more. Participants stated that they purchased grocery items at other retail establishments at least several times a month or more including superstores (41%), discount clubs (11%), drug stores (7%), farmers' markets (8%), natural food stores (23%) and convenience stores (18%).

Participants also chose other options for grocery purchases via an online format, though this was not as popular. Only 24% of participants ordered groceries online to be delivered and 20% ordered groceries online for store pick-up. A total of 15% of participants ordered meal kits in the past, while 24% of participants ordered from a prepared meal service, such as a take-out or delivery restaurant.

Our participants included both price and brand are very important factors when making food quality decisions. A large majority (96%) stated somewhat agreement that food pricing was important and more than 84% stated 'agree' or 'strongly agree' that price was important. With regards to food brands, 66% of participants reported "somewhat agree' that brand was an important factor in food quality decisions, and 35% 'agree' or 'strongly agree' in the importance of brand when purchasing food products. Although food price and brand were not a part of the online grocery simulation, the majority of participants stated that both of these food attributes are important factors when making food quality decisions.

### 4.4 Perceived Cooking Skills

Perceived cooking skills were measured on a 5-point Likert scale indicating perception of one's ability and confidence in skills required for simple cooking and food preparation. Specific areas of questions included a) talent in preparing healthy foods; b) comparison of skills to peers; c) self-confidence in food preparation; d) self-satisfaction in ability to prepare healthy foods; and e) thoughts of one's skill level of preparing healthy foods. Of this sample population ($N = 234$)

the mean composite score was $M = 3.63$ ($SD = 1.01$), indicating a perception of cooking skill ability overall as slightly higher than the mid-point.

### 4.5 Health Interest

Health interest was measured on a 5-point Likert scale indicating area of interest in diet in relation to health. This was an 8-item scale in which three of the questions were recoded. The mean composite score for this sample population ($N = 240$) was $M = 3.35$ ($SD = .039$), indicating an interest in one's health (i.e., diet-related) slightly greater than neutral.

### 4.6 Knowledge of Whole Grain Foods

To test participants' knowledge of whole grain foods, a scale consisting of five multiple-choice questions was used. Of the five questions, total correct responses included a) knowledge of current health recommendations, 63%; b) knowledge of health benefits, 81%; c) knowledge of definition of whole grains, 41%; d) knowledge of multi-grain in whole grain foods, 50%; and e) knowledge of examples of whole grain foods, 57%. The mean composite score for this sample population ($N = 239$) was $M = 0.59$ ($SD = .25$), (0.00 - 1.00 range) indicating knowledge of whole grain foods of at 59% overall.

### 4.7 Consumption of Whole Grain Foods

Participants were asked how often they consumed specific whole grain foods. Foods included oatmeal, brown rice, whole grain ready-to-eat (RTE) cereal, whole grain pasta, whole grain bread, whole grain bagels, whole grain crackers, whole grain corn tortillas, and whole grain pancakes. Consumption information was also requested for the refined counterparts to these whole grain foods including cream of wheat/rice cereal, white rice, RTE cereal, white bread, bagels, crackers, flour tortillas, and pancakes. Mean consumption amounts for each food are listed in Table 4.4. Total mean consumption for whole grains and the refined grains was $M = 1.55$ ($SD = 1.02$), and $M = 2.16$ ($SD = 1.11$), respectively. The reported consumption equated to roughly one or less whole grain items per week and one to two of the refined grain counterparts

per week. For whole grain consumption, the sample population reported far less than that of American population aged 19-50, which was 0.61 oz. equivalent/day (Albertson et al., 2016; McGill et al., 2015). Mean values for whole grain food consumption and the refined grain counterparts are shown in Table 4.4.

**Table 4.4 Mean Intake of Whole Grain Foods and Refined Grain Counterparts**

| Whole Grain (WG) Food Item | *M* | *SD* | Refined Food Item | *M* | *SD* |
|---|---|---|---|---|---|
| Oatmeal | 1.88 | 1.88 | Cream of Wheat / Rice hot Cereal | .76 | 1.32 |
| Brown Rice | 1.71 | 1.80 | White Rice | 2.81 | 1.94 |
| WG RTE Cereal | 1.42 | 1.68 | RTE Cereal | 2.44 | 2.09 |
| WG Pasta | 1.34 | 1.59 | Pasta | 3.05 | 1.85 |
| Whole Grain Bread | 2.20 | 2.27 | White Bread | 3.09 | 2.26 |
| WG Bagels | 0.84 | 1.12 | Bagels | 2.19 | 2.10 |
| WG Crackers | 1.37 | 1.66 | Crackers | 2.21 | 1.92 |
| WG Corn Tortillas | 1.51 | 1.77 | Flour Tortillas | 2.31 | 1.91 |
| WG Pancakes | 0.85 | 1.30 | Pancakes | 1.44 | 1.52 |
| Total WG Foods | 1.55 | 1.02 | Total Refined Foods | 2.16 | 1.11 |

### 4.8 Attitude and Willingness-to-Consume PRE-interventions

Attitude toward whole grain foods was measured on a 4-item 7-point Likert semantic differential scale indicating level of relation of specific terms toward the study food. However, to better compare this attitude with Willingness-to-Consume (WTC), attitude toward whole grain

foods was re-configured to a 5-point Likert type scale. Semantic pairs included positive / negative, like / dislike, good / bad, and desirable / undesirable. The attitude questions had a larger portion of missing data points from the study participants (*N* = 205). The manner in which these questions were presented may have confused some of the participants. The attitude questions were presented in a single table that included all four bipolar responses. The Willingness-to Consume question was immediately below the attitude question presented on the same page, though did not yield the same missing data. Many participants seemed to simply skip the attitude question yet completed the Willingness-to-Consume question. The presentation format may explain why these questions were not answered by a larger number of participants. However, the sample size is still larger than the necessary quota sampling of 197 participants for statistical power. A composite score combining results from all pairs was calculated and results are shown below in Table 4.5.

Willingness-to-consume each study food was measured using a 5-point Likert type scale. Participants were asked how willing they would be to consume each study food. Results for each study food item and a total whole grain food composite score is shown in Table 4.5.

**Table 4.5 Attitude and Willingness-to-Consume Study Foods PRE-Interventions**

| | Pre-Attitude | | | Pre-Willingness-to-Consume | | |
|---|---|---|---|---|---|---|
| Study Food | *N* | *M* | *SD* | *N* | *M* | *SD* |
| **WG Bread** | 209 | 4.10 | 0.81 | 242 | 4.29 | 0.96 |
| **Brown Rice** | 208 | 3.93 | 1.02 | 242 | 4.03 | 1.54 |
| **WG RTE Cereal** | 207 | 3.80 | 0.99 | 242 | 3.82 | 1.10 |
| **WG Crackers** | 207 | 3.78 | 0.99 | 242 | 3.76 | 1.10 |
| **WG Pancakes** | 207 | 3.44 | 1.15 | 242 | 3.45 | 1.25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **WW Pasta** | 207 | 3.79 | 1.07 | 242 | 3.84 | 1.14 |
| **Total WG Study Foods** | 212 | 3.79 | 0.72 | 242 | 3.87 | 0.78 |

*Note:* Data was measured on 5-point scales

### 4.9 Manipulation Testing

In the full study, participants were asked a question regarding the presence or absence of video / audio after viewing each of the website treatments. Participants responded correctly 64% of the time. In the manipulation test data from the pilot test, participants correctly identified the presence or absence of the video / audio 79% and 88%, respectively.

### 4.10 Data Preparation for Hypotheses Testing

The data set of each variable was prepared for inferential statistical analyses and hypotheses testing. The procedures for this are explained in Table 4.6 below.

**Table 4.6 Total Number for Each Variable and Preparation Steps for Analyses**

| Variables | Total Number of Data Points | Preparation Steps for Each Variable |
|---|---|---|
| Covariate Variables | | |
| Pre-Manipulations Attitude | 212 | In order to provide a comparison of values to the willingness-to-purchase and willingness-to-consume values of a 5-point scale, the attitude 7-point scale was reconfigured to provide values of 1.0 – 5.0. In other words, the values from the whole numbered 7-point scale were reconfigured to the following values: 1.0, 1.66, 2.33, 3.0, 3.66, 4.33, and 5.0. After this was configured, a new variable mean was computed using means of each of the 4 item 7- point semantic differential questions. This provided one total mean of the combined 4-item scale. This computation resulted in a new composite mean value. |
| Pre-Manipulations Willingness-to-Consume | 242 | A new variable mean was computed from the one item 5-point scale. |

| | | |
|---|---|---|
| Health Interest | 242 | A new variable was computed using the 9 item 7-point health interest scale. This computation resulted in a new composite mean value for health interest. |
| Knowledge of Whole Grains | 242 | A new variable was computed using the 5 item knowledge questions. This computation resulted in a new composite mean value for knowledge of whole grains. |
| Consumption of Whole Grain Foods | 241 | A new variable using total mean score of whole grain food consumption was computed using the 9 whole grain food items listed in the food consumption questionnaire. This computation resulted in a new composite mean value. |
| Perceived Cooking Skills | 234 | A new variable mean was computed using the 5 item 5-point scale for a composite mean value. |
| Dependent Variables | | |
| Attitude (post-manipulation) | | In order to provide a comparison of values to the willingness-to-purchase and willingness-to-consume values of a 5-point scale, the attitude 7-point scale was reconfigured to provide values of 1.0 – 5.0. In other words, the values from the whole numbered 7-point scale were reconfigured to the following values: 1.0, 1.66, 2.33, 3.0, 3.66, 4.33, and 5.0. After this was configured, each of the following variables were computed. |
| Health Message with Video – Whole Grain | 217 | For all of the responses of a health message with video treatments, a variable mean was computed from the 4 item 7-point scale. This provided one total composite mean of the combined 4-item scale. |
| Sensory Message with Video – Whole Grain | 217 | For all of the responses of a sensory message with video treatments, a variable mean was computed from the 4 item 7-point scale. This provided one total composite mean of the combined 4-item scale. |
| Health Message with Photo – Whole Grains | 216 | For all the responses of a health message with photo treatments, a variable mean was computed from the 4 item 7-point scale. This |

| | | |
|---|---|---|
| | | provided one total composite mean of the combined 4-item scale. |
| Sensory Message with Photo – Whole Grains | 216 | For all the responses of a sensory message with photo treatments, a variable mean was computed from the 4 item 7-point scale. This provided one total composite mean of the combined 4-item scale. |
| Baseline – Whole Grain | 216 | For all the responses of a baseline whole grain variable treatment, a variable mean was computed from the 4 item 7-point scale. This provided one total composite mean of the combined 4-item scale. |
| Baseline - Refined | 217 | For all the responses of a baseline refined grain treatment, a variable mean was computed from the 4 item 7-point scale. This provided one total composite mean of the combined 4-item scale. |
| Willingness-to-Purchase | | |
| Health Message with Video – Whole Grain | 234 | For all the responses of a health message with video treatments, a variable mean was computed from the one item 5-point scale. |
| Sensory Message with Video – Whole Grain | 234 | For all the responses of a sensory message with video treatments, a variable mean was computed from the one item 5-point scale. |
| Health Message with Photo – Whole Grains | 234 | For all the responses of a health message with photo treatments, a variable mean was computed from the one item 5-point scale. |
| Sensory Message with Photo – Whole Grains | 234 | For all the responses of a sensory message with photo treatments, a variable mean was computed from the one item 5-point scale. |
| Baseline – Whole Grain | 235 | For all the responses of a baseline whole grain variable treatment, a mean was computed from the one item 5-point scale. |
| Baseline - Refined | 233 | For all the responses of a baseline refined grain treatment, a variable mean was computed from the one item 5-point scale. |
| Willingness-to-Consume | | |

| | | |
|---|---|---|
| Health Message with Video – Whole Grain | 235 | For all the responses of a health message with video treatments, a variable mean was computed from the one item 5-point scale. |
| Sensory Message with Video – Whole Grain | 234 | For all the responses of a sensory message with video treatments, a variable mean was computed from the one item 5-point scale. |
| Health Message with Photo – Whole Grains | 234 | For all the responses of a health message with photo treatments, a variable mean was computed from the one item 5-point scale. |
| Sensory Message with Photo – Whole Grains | 234 | For all the responses of a sensory message with photo treatments, a variable mean was computed from the one item 5-point scale. |
| Baseline – Whole Grain | 235 | For all the responses of a baseline whole grain treatments, a variable mean was computed from the one item 5-point scale. |
| Baseline - Refined | 234 | For all the responses of a baseline refined grain treatments, a variable mean was computed from the one item 5-point scale. |

### 4.11 Hypothesis Testing

The following hypotheses were tested across the collected data. Analyses were conducted using Statistical Package and Service Solutions software package version 26 (IBM Corp., 2019).

$H_1$: Those exposed to sensory food messages will have a greater positive attitude toward whole grain foods compared to health-related food messages.

$H_2$: Those exposed to sensory food messages will have a greater willingness to purchase whole grain foods compared to health-related food messages.

$H_3$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater positive attitude toward whole grain foods compared to those exposed to a presentation with less media richness.

$H_4$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater willingness to purchase whole grain foods compared to those exposed to a presentation with less media richness.

$H_5$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater positive attitude

toward whole grain foods compared to those exposed to a presentation with less media richness and a health message.

$H_6$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater willingness to purchase whole grain foods compared to those exposed to a presentation with less media richness and a health message.

$H_7$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the attitude toward whole grain food products.

$H_8$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the willingness to purchase whole grain food products.

$H_9$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the attitude toward whole grain food products.

$H_{10}$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the willingness to purchase whole grain food products.

$H_{11}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the attitude toward whole grain food products.

$H_{12}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the willingness to purchase whole grain food products.

$H_{13}$: Knowledge will moderate the relationship between food message format and the attitude toward whole grain food products.

$H_{14}$: Knowledge will moderate the relationship between food message format and the willingness to purchase whole grain food products.

The primary research question was analyzed using one-way repeated measures ANOVA of the six conditions plus interactions of factors. The primary research question for each factor analyzed the main effect of the six different manipulation conditions on attitude and Willingness-to-Purchase (WTP). Each main effect was further analyzed to assess any interaction of the covariates (health interest or knowledge).

The analytic model consisted of Repeated Measures ANOVA. The factors listed within the analyses included all six different treatment conditions, (which are Health message + Video,

Health message + Photo/text, Sensory message + Video, Sensory message + Photo/text, Baseline Whole Grain Food, and Baseline Refined Grain Food). Potential covariates including Health Interest and Knowledge of Whole Grains were added to this model to measure any interactions. Additional covariates were also added for potential interaction effects including Consumption of Whole Grains, pre-treatment Attitude of whole grains, pre-treatment Willingness-to-Consume whole grains, perceived cooking skills, gender, and ethnicity/race. Due to the very limited variations in education level, marital status, and children in household, these variables were not included as potential covariates. This research design was a within-subject design in which each participant received each of the treatment messages; therefore, there were no between-subjects factors. Outcome measures included the variables of Attitude toward and Willingness-to-Purchase whole grain foods following each presentation of the study food. For exploratory purposes, additional analyses included Willingness-to-Consume whole grain food. This was included to assess any significant differences in Willingness-to-Purchase and Willingness-to-Consume among this sample population.

Assumptions were met. The dependent variables were measured on a continuous scale. The covariates were also measured on a continuous scale. The independent variable (treatment) consisted of six different levels. These included Health Message with Video, Health Message with Photo, Sensory Message with Video, Sensory Message with Photo, Whole Grain Food with NO additional treatment, and Refined Grain Food with NO additional treatment.

Among the measured outcomes, data were assessed for outliers. There were no outliers beyond the 1.5 box lengths within the Attitude measure. There were few outliers for Willingness-to-Purchase (3 for Refined Food, 4 for Health Message with Video, 4 for Sensory Message with Video, and 3 for Sensory Message with Photo); and Willingness-to-Consume (3 for Baseline

condition and 3 for Health Message with Photo condition). All data points within the model were maintained as the Repeated Measures ANOVA is a robust test that accounts for outliers more easily than other tests. Additionally, when analyzing data with or without the outliers within the model, there was no noted difference. Finally, based on approximate normality of Q-Q plots for the dependent variables, the approximate population sample normality was observed and evenly distributed.

Sphericity, a condition where the variances of the differences between the combinations of the condition levels, was assessed. For all three of the dependent variables measured, Mauchly's Test of Sphericity indicated that the assumption of sphericity had not been violated: Attitude $\chi^2(14) = 14.51$, $p = .413$, Willingness-to-Purchase $\chi^2(14) = 14.51$, $p = .412$, and Willingness-to-Consume $\chi^2(14) = 13.39$, $p = .495$.

**4.11.1 Main Effects of Message on Attitude and Willingness-to-Purchase.**

The first four hypotheses address the direct effect of a singular factor (message type or message format) on the measured outcomes of Attitude and Willingness-to-Purchase. These hypotheses are:

> $H_1$: Those exposed to sensory food messages will have a greater positive attitude toward whole grain foods compared to health-related food messages.
>
> $H_2$: Those exposed to sensory food messages will have a greater willingness to purchase whole grain foods compared to health-related food messages.
>
> $H_3$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater positive attitude toward whole grain foods compared to those exposed to a presentation with less media richness.
>
> $H_4$: Those exposed to a food product presented with greater media richness in an online grocery store setting will have a greater Willingness-to-Purchase whole grain foods compared to those exposed to a presentation with less media richness.

Mean values and standard deviations are presented in Figure 4.1 below. Results of the analyses model shows that there was no observed main effect of message treatment type for participant Attitude toward whole grain foods [$F(5, 960) = .146$, $p = .981$]. Likewise, there was no observed effect of message treatment type on participant Willingness-to-Purchase [$F(5, 965) = .321$, $p = .901$]. Therefore, hypotheses 1 thru 4 are rejected.

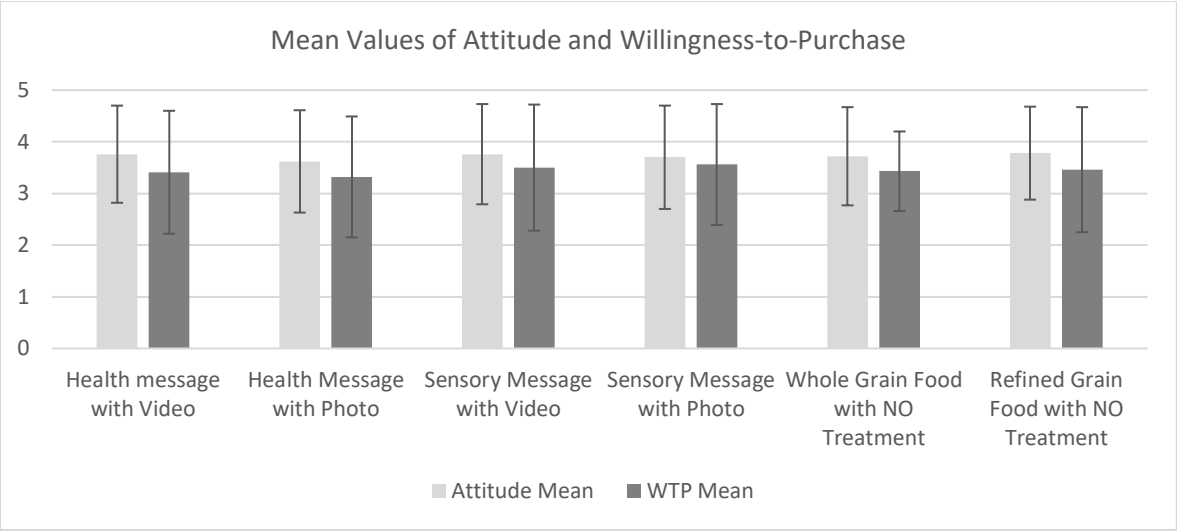



**Figure 4.1 Mean Values of Attitude and Willingness-to-Purchase Within Message Variations**

Finally, hypotheses 5 and 6 reflected an interaction effect of message type and message format (listed below). As the model revealed no main effects of treatment type (statistical results of main effects listed above), these hypotheses are also rejected.

> $H_5$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater positive attitude toward whole grain foods compared to those exposed to a presentation with less media richness and a health message.
>
> $H_6$: Those exposed to a food product presented with a sensory food message AND greater media richness in an online grocery store setting will have a greater willingness to purchase whole grain foods compared to those exposed to a presentation with less media richness and a health message.

In other words, these results show that participants' decision-making about whole grain food products was the same regardless of the message type being sensory- or health-focused or

the message format being photo or video. While there were no statistically significant findings for main message effects in either model, post hoc pairwise comparison tests using the Bonferroni correction were conducted with both the Attitude and the Willingness-to-Purchase models. As expected, no additional statistically significant findings existed among the pairwise comparisons.

### 4.11.2 Health Interest, Message Type, and Message Format.

Hypotheses 7 through 10 considered the interaction of *Health Interest* and the various message treatments on the dependent values of *Attitude* and *Willingness-to-Purchase.* These are listed again here:

> $H_7$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the attitude toward whole grain food products.
>
> $H_8$: Health interest will moderate the relationship between food message type (sensory vs. health-related) and the willingness to purchase whole grain food products.
>
> $H_9$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the attitude toward whole grain food products.
>
> $H_{10}$: Health interest will moderate the relationship between food message format (photo + text and video + audio) and the willingness to purchase whole grain food products.

Health Interest [$M$ = 3.35, ($SD$ = .390)] had no statistically significant interaction effect for *Attitude* toward whole grain foods [$F(5, 960) = 1.09$, $p = .365$)] or Willingness-to-Purchase whole grain foods [$F(5, 965) = .475$, $p = .795$] whole grain foods. Therefore, hypotheses 7 through 10 are rejected.

### 4.11.3 Knowledge, Message Type and Message Format.

Hypotheses 11 through 14 considered the interaction of Knowledge and the various message treatments on the dependent values of Attitude and Willingness-to-Purchase. These are listed again here:

$H_{11}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the attitude toward whole grain food products.

$H_{12}$: Knowledge will moderate the relationship between food message type (sensory v. health-related) and the Willingness-to-Purchase whole grain food products.

$H_{13}$: Knowledge will moderate the relationship between food message format and the attitude toward whole grain food products.

$H_{14}$: Knowledge will moderate the relationship between food message format and the Willingness-to-Consume whole grain food products.

Participants' knowledge of whole grain foods [$M$ = .59, ($SD$ = .250)] had no statistically significant interaction effect on *Attitude* toward whole grain foods ($F(5, 960) = .698$, $p = .625$) nor on *Willingness-to-Purchase* whole grain foods ($F(5, 965) = 1.452$, $p = .203$). Therefore, hypotheses 11 through 14 are also rejected.

### 4.12 Other Potential Covariates / Exploratory Analyses

Other potential covariates were entered into the one-way repeated measures ANOVA model to assess for any interaction effects with the message types on the dependent variables. These covariates included *Pre-Attitude* toward whole grain foods, *Consumption of Whole Grain foods*, *Willingness-to-Consume* whole grain foods (pre-manipulations), *Perceived Cooking Skills*, *Gender* and *Ethnicity / Race*. No statistically significant interaction effect was noted among any of these potential covariates (see Table 4.7).

**Table 4.7 Covariates – Interaction Effects on Dependent Variables**

| Potential Covariate | *N* | *M* | *SD* | Attitude | Willingness-To-Purchase |
|---|---|---|---|---|---|
| Pre-Attitude | 212 | 3.79 | .719 | $F(5, 960)=.563$, $p = .729$ | $F(5, 965) = 1.327$, $p = .250$ |
| Willingness-to-Consume (pre-) | 242 | 3.87 | .784 | $F(5, 960) = .556$, $p = .734$ | $F(5, 965) = 1.292$, $p = .265$ |
| Consumption of WG Foods | 241 | 1.55 | 1.02 | $F(5, 960) = 1.66$, $p = .142$ | $F(5, 965) = 1.209$, $p = .303$ |

| | | | | | |
|---|---|---|---|---|---|
| Perceived Cooking Skills | 234 | 3.63 | 1.001 | $F(5, 960) = 1.21$, $p = .304$ | $F(5, 965) = 1.256$, $p = .281$ |
| Gender | 233 | 1.61 | .498 | $F(5, 960) = .714$, $p = .613$ | $F(5, 965) = .613$, $p = .690$ |
| Ethnicity / Race | 235 | 1.77 | 1.165 | $F(5, 960) = .450$, $p = .813$ | $F(5, 965)=.642$, $p = .668$ |

**4.12.1 Willingness-to-Consume**

An area of interest in designing this research proposal was the potential differences in assessment of Willingness-to-Purchase a food and Willingness-to-Consume a food. Heuristic cues that play a role in a consumer's Willingness-to-Purchase a food product are the cue related to price and brand (Grunert, 2002). The Total Food Quality Model (Grunert, 2002) shows that costs and brand quality are extrinsic cues that help a consumer assess product quality. Both brand and cost perceptions were outside of the scope of this research. In this study, indications of brand and pricing were intentionally removed from the simulation. Exploratively, participants were asked the degree to which they were willing to consume a whole grain food product. By removing cues related to brand and pricing, differences regarding Willingness-to-Purchase and Willingness-to-Consume differences could be assessed. There were no significant differences between treatment conditions on participants' Willingness-to-Consume whole grain food as an interaction effect ($F(5, 970) = .157$, $p = .978$).

While there was no interaction effect of the message treatments on Willingness-to-Consume the whole grain foods, there was an observed statistically significant interaction effect of knowledge of whole grains on participant Willingness-to-Consume whole grains ($F(5, 985) = 2.637$, $p = .022$). Upon further analyses of parameter estimates, there were inconsistencies noted in the direction of the relationship in relation to knowledge and its interaction with the six

manipulation conditions; some of the resulting slopes were positive and some were negative. It is difficult to ascertain why these results were statistically significant.

An additional paired-t test was conducted to assess for any statistically significant differences between Willingness-to-Purchase and Willingness-to-Consume mean results per message treatment type. Results are shown below in Table 4.8. Results revealed statistically significant greater Willingness-to-Consume within all message treatment types. While these differences were significant, the effects size (Cohen's d) were all less than 0.60, which is considered a small effect.

**Table 4.8 Paired-t Comparisons of Willingness-to-Consume vs. Willingness-to-Purchase**

| Message Treatment | Willingness-to-Consume | | | Willingness-to-Purchase | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *N* | *Mean* | *SD* | *N* | *Mean* | *SD* | *t score* | *df* | *Significance* |
| Health message + Video | 234 | 3.77 | 1.08 | 234 | 3.41 | 1.19 | 8.147 | 233 | <.001 |
| Health Message + Photo | 234 | 3.67 | 1.10 | 234 | 3.32 | 1.17 | 8.044 | 233 | <.001 |
| Sensory Message + Video | 234 | 3.76 | 1.14 | 234 | 3.50 | 1.22 | 6.021 | 233 | <.001 |
| Sensory Message + Photo | 234 | 3.78 | 1.10 | 234 | 3.56 | 1.17 | 3.78 | 233 | <.001 |
| Baseline – WG Foods | 233 | 3.67 | 1.13 | 233 | 3.33 | 1.17 | 7.80 | 232 | <.001 |
| Baseline – Refined Foods | 233 | 3.77 | 1.14 | 233 | 3.46 | 1.21 | 6.837 | 232 | <.001 |

### 4.12.2 Attitude and Willingness-to-Consume in Relation to the Six Study Foods

While it does not explicitly address the research question on specific message treatment types, an exploratory analysis was conducted for Attitude and Willingness-to-Consume of each food type measured before and after the experimental treatments (pretest/posttest). Paired sample *t*-tests were conducted to assess for possible differences between the pretest and posttest means for each food type in the experiment. Because normality was violated as assessed by Shapiro-Wilk's test, a Wilcoxon Signed Rank non-parametric test was conducted for each of the pairs. Although there was some statistical significance among some of the pairs of both Attitude and Willingness-to-Consume (shown in Table 4.9 below), often the post-test means were lower than the pretest means. This could suggest that the message presentation participants saw for those specific food types (i.e. whole grain bread, brown rice) elicited more negative attitudes. Similarly, the message presentations for whole grain pancakes elicited more positive attitudes, resulting in a more positive attitude post-treatment. Further research is necessary to examine these findings more closely.

**Table 4.9 Attitude and Willingness-to-Consume: Pre-, Post-Manipulation Difference Comparisons**

| Study Food | Pre-Test | | | Post-Test | | | *t-score* | *Significance* | *Effect size* |
|---|---|---|---|---|---|---|---|---|---|
| Attitude | *N* | *Mean* | *SD* | *N* | *Mean* | *SD* | | | |
| WG Bread | 201 | 4.14 | 0.79 | 201 | 3.72 | 0.99 | -5.32 | 0.001** | .375 |
| WG Rice | 202 | 3.94 | 1.02 | 202 | 3.65 | 0.91 | -3.28 | 0.001** | .245 |
| WG Pasta | 202 | 3.81 | 1.06 | 202 | 3.8 | 0.87 | -0.11 | 0.92 | |
| WG Pancakes | 202 | 3.45 | 1.14 | 202 | 3.78 | 0.97 | 3.42 | 0.001** | -.241 |
| WG Crackers | 202 | 3.81 | 0.96 | 202 | 3.65 | 1.01 | -1.83 | 0.068 | |
| WG Cereal | 201 | 3.82 | 0.98 | 201 | 3.69 | 1.04 | -1.46 | 0.15 | |
| Total WG Foods | 205 | 3.82 | 0.71 | 205 | 3.73 | 0.62 | -1.92 | 0.56 | |

| Willingness-to-Consume | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| WG Bread | 195 | 4.31 | 0.90 | 195 | 3.78 | 1.13 | -5.93 | 0.001** | .424 |
| WG Rice | 194 | 4.04 | 1.14 | 194 | 3.65 | 1.05 | -4.01 | 0.001** | .423 |
| WG Pasta | 196 | 3.92 | 1.10 | 196 | 3.80 | 1.00 | -1.37 | 0.17 | |
| WG Pancakes | 197 | 3.40 | 1.26 | 197 | 3.73 | 1.15 | 2.90 | 0.04* | -.206 |
| WG Crackers | 195 | 3.81 | 1.08 | 195 | 3.73 | 1.11 | -0.77 | 0.440 | |
| WG Cereal | 193 | 3.85 | 1.08 | 193 | 3.67 | 1.21 | -1.76 | 0.08 | |
| Total WG Foods | 235 | 3.88 | 0.77 | 235 | 3.73 | 0.72 | -3.09 | 0.002* | .202 |

*Significance $p \leq 0.05$
**Significance $p \leq 0.001$

Finally, mean comparisons were also analyzed for pairs of whole grain foods and refined foods on Attitude, Willingness-to-Purchase, and Willingness-to-Consume (post-treatments). No statistical significance was observed (see Table 4.10).

**Table 4.10 Whole Grain Food and Refined Food Acceptance Comparisons**

| Dependent Variable Measure | Whole Grains | | | Refined Foods | | | | |
|---|---|---|---|---|---|---|---|---|
| | *N* | *Mean* | *SD* | *N* | *Mean* | *SD* | *t-score* | *Significance* |
| Attitude | 217 | 3.71 | 0.63 | 217 | 3.78 | 0.90 | -1.30 | .196 |
| WTP | 233 | 3.43 | 0.77 | 233 | 3.46 | 1.21 | -.395 | .693 |
| WTC | 231 | 3.73 | 0.72 | 234 | 3.77 | 1.13 | -.559 | .577 |

# CHAPTER 5. DISCUSSION AND CONCLUSIONS

This study investigated whether message types and formats in an online grocery environment simulation would affect consumers' whole grain food quality judgments. Outcome measures included participants' attitude toward specific whole grain foods and willingness-to-purchase these whole grain foods. The results did not show any statistically significant main effect differences among the experiment conditions. Observed interaction effects of covariates *Knowledge* and *Health Interest* showed no statistical significance. This chapter will summarize this study's results as they relate to the literature and evidence for the hypotheses to further contextualize the findings.

## 5.1 Food Quality Presentation and Key Findings of this Study

### 5.1.1 Main Effects of Food Message Presentations

This research attempted to address 14 hypotheses. This summary addresses the first six hypotheses, which refer to the effects of the various message presentations on *Attitude* and *Willingness-to-Purchase.* We expected participants would have a more positive attitude toward and willingness to purchase whole grain foods when presented with a sensory message and formatted with greater media richness. However, findings showed the message presentation did not influence *Attitude* or *Willingness-to-purchase* the whole grain foods.

### 5.1.2 Potential Interaction Effects of Health Interest and Knowledge

In addition to the analyses of main effects, the models also looked at how *Health Interest and Knowledge* would moderate *Attitude* and *Willingness to Purchase.* These interaction effect expectations were identified in hypotheses 7-14. The expected outcomes were that greater *Health Interest* and *Knowledge* would moderate *Attitude* and *Willingness-to-Purchase.* However, these factors did not yield any moderation of the dependent variable outcome measures.

### 5.1.3 Food Message Presentation Format – Media Richness

This research attempted to provide message presentation formats that varied in media richness (i.e., vividness and interactivity) in the online grocery simulation. Media richness theory proposes that increasing media richness in the online setting can better communicate to the consumer, particularly for products / services with high levels of complexity thus minimizing consumer uncertainty and perceived risk, in addition to increasing tangibility of product (Jiang & Benbasat, 2007a; Poon & Joseph, 2000; Steuer, 1992). This theory supported hypotheses 3, 4, 9, 10, 13 and 14. In this research, a video / audio presentation, in addition to the food graphic, was the highest level of media richness, followed by a static photo of product plus text, and lastly no addition to packaged product graphic, ingredient declaration, and nutrition facts panel (i.e. the lowest level of media richness). Unexpectedly, media richness did not impact participants' attitude toward nor willingness-to-purchase the whole grain foods.

In the present study, variations of product presentations did not show any effect. Perhaps a future study using a focused approach of specific whole grain product attributes presented in an online video and targeted to meet audience interests would yield positive findings. Commercial advertisements often use rich media components to convey positive product attributes and evoke positive consumer perceptions with both non-food and food products. Two techniques used to enhance media richness in the online environment include vividness and imagery. Vividness can impact the sensory breadth and depth of technology through the use of structure, graphics, audio-visual and color aspects (Steuer, 1992). Imagery, which is the representation of sensory information, encourages a mental processing that pulls the nonverbal concrete sensory experiences from working memory to evoke the senses (MacInnis & Price, 1987). Previous research has shown that increasing vividness in the online setting can positively impact both attitude and willingness to purchase non-food items (Flavián et al., 2017). Additionally,

presenting food in a manner that increases vividness and imagery has been shown to have a profound impact on attention, arousal, product perceptions (such as freshness, taste, value), purchase intentions, and physiological markers (Toet et al., 2019). It is possible that vividness and imagery used within this research was less than adequate to convey greater positive whole grain food attributes than the presentations with either only static photo and text or no media rich additives. Because increasing vividness and imagery has been shown to positively impact consumer perception, further research to develop more impactful media using vividness and imagery techniques that are specific to each whole grain food would be important, particularly for this target audience.

### 5.1.4 Food Message Presentation Types – Health verses Sensory

Food messages can draw attention to certain intrinsic and extrinsic attributes of a food product. Research has shown that consumers often believe that a healthful food is compromised in taste and that tasty food cannot be healthful (Raghunathan et al., 2006; Turnwald, Jurafsky, et al., 2017). Some research has shown that describing sensory aspects of healthful foods creates greater acceptance of those foods (Piqueras-Fiszman & Spence, 2015; Wansink et al., 2012, 2018). This health and sensory message research supported the hypotheses 1, 2, 5, 6, 7, 8, 11 and 12. Differences in participant attitude and willingness to purchase whole grain foods were assessed by varying the food product message type – health verses sensory messages. These messages were displayed in the online grocery simulation with a large colored banner above the packaged product static photo. The messages were also included in the text and the voiceover of the different media rich formats. Results showed that there were no differences observed with the different message types.

The lack of impact observed between the health messages and the sensory messages may be due to the weakness of the messages. While messages were tested for accuracy and

believability prior to the study, the differences between the messages were minimal (see Appendix B). Therefore, the specific sensory and health messages used may have been only weakly accepted by the participants. Additionally, the implicit quality judgments for whole grain foods may have been neutral or less than positive. The Total Food Quality model recognizes that both implicit and explicit information is considered as cognitive processing occurs when making food choice decision (Grunert, 2002). This is true for both in-store and online food purchases (Grunert & Ramus, 2005). Research has shown that participants believe health foods compromise positive sensory characteristics (Hieke & Grunert, 2018; Lähteenmäki et al., 2010). This has also been shown to be implicit when health claims are present on food products (Orquin & Scholderer, 2015). Participants were likely using their previous attitudes, beliefs, and memories of whole grain foods, as dictated by the Total Food Quality Model (TFQM). This implicit information may have been too strong to allow for change under the research conditions.

### 5.1.5 Food Message Covariates – Health Interest and Knowledge

Knowledge of whole grain foods likely played a role in the processing of value judgments in our research, though no interactive effect of knowledge was observed. Participants recognized the health benefits of whole grain foods though the knowledge of the definition of whole grain foods and multi-grain foods, and the ability to identify specific examples of whole grains, was limited. Difficulty defining whole grain foods is somewhat understandable as the specific definitions (and subsequent recommendations) can be vague and have yet to be fully defined by varying organizations (Korczak et al., 2016; Mathews & Chu, 2020).

Health interest also likely played a role in food quality judgments in this experiment, even though no impact was noted. While an interaction effect between health interest and *Attitude* and *Willingness-to-purchase* was expected, health may have not been an area of great interest among participants. Although health interest for participants was greater than neutral, it

may have not played much of a role in participants' food choices. Arroyo Pilar et al. (2020) have shown that food choice values vary per different generational cohorts, which in turn, influences healthy food decisions. In their research, health attributes of foods are valued differently in relation to age, health consciousness, and psychological health risk. They found that health-conscious older consumers tend to value health attributes of foods more so than younger consumers. This may help to explain why health interest was not a significant motivational factor in the present study.

Because the foods were familiar to participants which meant they likely had memories of these foods, sensory expectations were likely preformed and strong. Results of pre- and post-measures of attitude and willingness-to-consume whole grains showed few differences. Post-measures were lower for whole grain bread, brown rice, and whole grain pancakes. These results are difficult to explain. The fact that participants were able to recognize whole grain foods as a health food may indicate their specific expectations about whole grain foods, particularly regarding poor taste and other sensory expectations.

Other research has shown a positive impact in healthful food choices when labeling with indulgent descriptors in place of health descriptors. Turnwald, Boles, et al. (2017) examined cafeteria vegetable purchases when marketed with varied descriptors including indulgent, basic, health restrictive and health positive terminology. Their results showed that indulgent descriptors yielded greater numbers of consumer purchases overall; mass amounts of vegetables purchased were also increased in all but the health positive descriptor. Sensory marketing researchers Krishna and Elder (2010) have discussed how taste perceptions involve all senses, not simply taste. Their research has shown that advertisements targeting multiple senses yield heightened taste perceptions by influencing several sensory expectations (Elder & Krishna,

2009a). Unlike a cafeteria setting, an online grocery simulation can be limiting in the ability to target multiple senses with product communications. This limitation in targeting multiple senses may help to explain the lack of impact observed between the varied messages in this experiment. Future research to better understand the use of multiple sensory marketing techniques in the online grocery environment may provide greater observable differences between sensory messages and health messages and their impact on attitude toward product taste expectations.

Research has shown that consumers expect foods with health claims to have poor taste and sensory quality (Raghunathan et al., 2006; Wills et al., 2012) and that there is an inverse relationship of consumers' perceptions of product healthfulness and taste (Luomala et al., 2015). Participants reported consumption of whole grain foods was reported as lower than the average U.S adult. This low consumption of whole grain foods may have been due to previous less-than-positive experiences with whole grains, particularly regarding sensory factors. The whole grain foods used within this study were chosen because they were more frequently consumed within the U.S. and had commonly consumed refined grain counterparts (McGill et al., 2015). These foods were familiar to study participants. As such, they have likely had previous experiential involvement and memories of consuming these foods. These past experiences and memories would have contributed to previously formed attitudes toward these whole grain foods. According to the TFQM and dual-processing theories, these past experiences and formed attitudes would have assisted in processing decisions of attitude and willingness-to-purchase as asked within this research (Ajzen & Sexton, 1999; Brunso et al., 2002; Eagly & Chaiken, 1993b). Participants' strongly held beliefs of whole grains as health foods and low expectations of sensory aspects could help to explain the results of limited effects of the message variations within this experiment.

## 5.2 Theoretical Implications

To increase consumption of whole grain foods, consumers must first make positive decisions regarding food quality and acceptance of whole grain foods. The TFQM illustrates that consumers formulate food decisions based on associations and iterations between product quality cues and their own cognitive categories (Grunert, 1995). Product quality cues can be search attributes, experiential attributes, or credence attributes (Brunso et al., 2002). Food marketing factors can impact a variety of factors within the TFQM during the food decision-making process, including food purchasing venue, product characteristics, expected product quality, and experiential product quality. Consumers are inundated with food messages throughout the grocery store environment. It is the messages that are most salient that facilitate consumer attention. This research attempted to increase participant attention to the different messages (i.e., health vs. sensory). Based in web-page development marketing guidance, the two different messages were placed on the product page in large font with colorful banner above the product image. Participants were able to discern between health and sensory messages, as measured in the pilot study.

Results of this research showed that no main effects of the message presentations on *Attitude* and *Willingness-to-Purchase* were observed. This could be explained through several theoretical factors. As discussed previously, consumers pull from cognitive categories, such as memory or values, in processing food quality evaluations. Previous research has shown that whole grain foods and health foods have sensory quality hurdles that hinder consumer acceptance (Arvola et al., 2007; Bakke & Vickers, 2007; Heiniö et al., 2016). This can be due to texture, taste, color, flavors, and more. In the present study, the whole grain food products were familiar to participants. Therefore, participants may have been pulling from their less than

positive memories and previous experiences with whole grain foods, rather than relying on the message presentations.

Moreover, the strength of previously held judgments may have played a role in participants' quality judgments of whole grain foods. Dual-processing theories discuss the power of previously held attitudes and beliefs in decision-making. If a previous judgement was determined with more cognitive effort and elaboration, it is likely a strongly held belief. Because of its strength, it would be more difficult to change (Ajzen & Sexton, 1999; Eagly & Chaiken, 1993b). If participants' previous judgements about whole grain foods were formed with more cognitive effort, it would be more difficult to change these judgements. This could be another explanation of why no effects were observed in this research.

Knowledge, as a form of ability, and health interest, as a form of motivation, were expected to moderate the relationship between message presentation and attitude and willingness-to-purchase whole grains. However, there were no differences observed pertaining to knowledge or health interest. Knowledge that whole grains are an important component in a healthful diet may not have been a strong interest for participants. The number one driver for food product liking is taste (Clark, 1998; Li et al., 2015; Roininen & Tuorila, 1999). As noted, consumers often associate healthful foods with a compromise in taste (Hieke & Grunert, 2018; Lähteenmäki et al., 2010). In the present study, this association and previously held beliefs could have been stronger than the potential moderating factors of knowledge and health interest.

Reliance on one's ability to incorporate whole grain foods into the diet could have played a role in acceptance and willingness-to-purchase whole grain foods. The theory of planned behavior posits that behavior change is more likely to be supported when someone believes that they can successfully perform that behavior (i.e., construct of perceived behavioral control). The

whole grain foods within this research were familiar and supposedly commonly consumed. Nonetheless, a fourth factor impacting food evaluations could have been reluctance among participants to incorporate these foods into their diets because of a lack of experience with preparing whole grain foods. A qualitative study in 2016 examined college-age students culinary skills, knowledge, and confidence in meal planning and production (Murray, 2016). While students had strong ideas about healthful foods and cooking habits, themes emerged that revealed lack of knowledge and skill in planning and preparing healthful meals (Murray, 2016). In addition to perceived cooking skills, it would have been beneficial to ask specific questions surrounding participant ability to purchase and prepare whole grain foods. This would have shed light on participants' perceived relationships with specific whole grain foods.

Health interest was expected to be a motivational factor encouraging willingness-to-purchase and positive attitude toward whole grain foods within this research. However, in the online setting, interest in health as a motivational factor may be less impactful than was expected. In a review of online grocery research, Jilcott Pitts et al. (2018) found that non-perishable and bulk items were most often purchased. They reported many shoppers stated they relied on their personal grocery lists and the 'favorites' lists online, emphasizing the reliance on habitual purchases instead of opting for novel or unfamiliar foods.

When food products are unfamiliar and knowledge and motivation are low, consumers will rely more often on heuristics to make food purchase decisions (Chaiken & Maheswaran, 1994; Eagly & Chaiken, 1993b; Petty & Cacioppo, 1986; Petty et al., 1983). In an online grocery web page, some of these heuristics would consist of web page content and design, font and font size, graphics, logos, color, branding and price, as well as familiarity of food products. In this experiment, additional information from the text and video formats communicating health and

sensory benefits of the whole grain products may have been counter to the habit of online grocery shopping for participants and thus encouraged greater reliance on heuristics. Participants may have relied on the familiarity of products and the online format presentations rather than engaging in greater involvement of processing the message arguments in order to minimize cognitive load. Similar observations have been noted in research of online grocery purchasing habits. In their review, Jilcott Pitts et al. (2018) discussed primary motivational aspects of online grocery purchasing practices including convenience and time-saving practices. A few of the studies focused on promotion of healthful foods within the online grocery setting. Results showed that most participants relied on first screen views and rarely sought to view additional nutrition information, also suggesting a focus on minimizing cognitive load and reliance on heuristics and familiarity in the online grocery setting.

Media Richness Theory posits that the degree of richness of media in which a message is conveyed will moderate the ability of message exchange. The increased development of technology since the origin of the theory has furthered research to encompass the advancing technologies. Originating in the field of organizational communication, Daft and Lengel (1986) recognized that there is also a level of subjectivity involved in the perception of richness of media. Each form of media could also provide a symbol for a specific form of communication. As an example, texting may symbolize less-formal means of communicating compared to an email or a letter sent using company letterhead (Maity et al., 2018; Trevino et al., 1987). This subjectivity could yield varied perceptions of richness of media. Lipowski and Bondos (2018) examined this perception of media richness in developing a model with varied forms of media including online, offline, and phone. They also grouped participants into three different generational groups: baby boomers, generation X and generation Y. Not only did the results

show differences in perceptions of richness of media, but that these were different among the different generations. Considering that millennials have grown up with internet technologies and varying mobile devices, media rich perceptions may vary greatly compared to other generations.

Instead of a reliance on familiar heuristics, media richness has also been shown to minimize cognitive load for the mobile-device millennial consumer. In a series of experiments Maity et al. (2018) examined consumer information searching patterns with varying levels of media richness using mobile devices. For two of the three studies, the average age of participants was 20.6 years. Their findings showed that greater media rich presentations helped to minimize cognitive load by discouraging reliance on memory-based information and focusing more on stimulus-based information. Research has shown that there are generational differences with technology use and online purchasing (Parment, 2013; Peregrin, 2015). Future research should aim to understand the specific factors that yield perceptions of high media richness and facilitate minimizing cognitive load in the online grocery format for the millennial generations.

### 5.3 Practical Implications

Based on this research, the inferences of online health and sensory message presentations with variations of media richness indicate no differences among these presentations in a population sample of young adults enrolled in an undergraduate program at a western U.S. university. In addition, health interest and knowledge factors did not show any interaction effects in the relationship between message presentations and dependent outcomes. Results did not match the expected findings.

This study's findings conflict with a large body of prior research. According to the TFQM (Brunso et al., 2002; Grunert et al., 1995), it is the interaction of objective and subjective product attributes, in addition to cognitive categories, that lead to the level of consumer interest

and attitude toward the product (i.e., consumer involvement) and ultimately food quality decisions (Brunso et al., 2002; Grunert, 1995, 2002).

Consumer food product research has shown that taste is the dominant motivator in food-decision-making (Clark, 1998; Li et al., 2015; Roininen & Tuorila, 1999). Health attributes of foods, on the other hand, have been linked to consumer attitude and purchase intentions when interest in health is high (Brunso et al., 2002). However, research has also shown that health messages of food products are linked to compromised taste expectations (Hieke & Grunert, 2018; Lähteenmäki et al., 2010). Because of the large body of evidence on consumer food quality decision-making, health-related food product messages, and sensory food product messages, caution is recommended in extrapolating these findings to scenarios or populations outside of this research experiment.

One important factor to consider is the quality of participant data collected in this online experiment; the reliability and validity of the data may have been of issue. This online survey was initially fielded in mid-March 2020. This was the same time that the COVID-19 pandemic was gaining societal impact causing businesses, schools, organizations, and commerce to transfer from in-person operations to greater online presence and interactions. The concept of "Zoom Fatigue" has emerged over the months to characterize the cognitive exhaustion society is experiencing due to greater promotion and necessity of online interactions. Nadler (2020) theorizes that Zoom Fatigue is a common negative experience of the larger computer-mediated communication (CMC) exhaustion through the prolonged use of computer-mediated communication platforms. Based in Actor Network Theory, he suggests a framework of this very real pandemic-initiated phenomenon to be rooted in interactions between participant, technology, interstitial space, and what he terms "third skin" (i.e., the uninfluential flattened reciprocal

interactions with the computer). He suggests that CMC flattens the interactions with others due to the spatial shifts between physical spaces and virtual spaces. Because of this, much greater cognitive energy is demanded; therefore, CMC can be more challenging and can lead to mental exhaustion.

Coupling the potential of CMC fatigue with a request for additional computer survey work may have added to further stress of the online-pandemic lifestyle for participants of this survey. As such, their motivation—even though incentivized with class credit—may have been reduced, yielding greater satisficing of responses. Satisficing, according to Simon (1956) theory of satisficing, is the tendency to quickly answer questions with perceived 'good enough' responses in order to avoid larger investments in resources (i.e., time, cognitive energy, etc.). This type of short-cut response can lead to poorer quality of data. Research has shown that satisficing can be more prevalent with greater task difficulty, which could tax attentiveness and other cognitive abilities adding to cognitive fatigue (Krosnick, 1991). Likewise, self-reports with anonymity could also lend to increased incidents of satisficing (Lelkes et al., 2012). Great efforts were used to minimize participant demand and discourage satisficing. Requests for additional online work during this pandemic-era may have discouraged optimization of quality responses. The mean of time to take the experiment was 80.7 minutes. Percentages of grouped time duration indicate that 25% of total participants completed the experimental survey in < 10:00 minutes, 35% completed the experiment in 10:01-20:00 minutes, 16% completed in 20:01-30:00 minutes, and 24% completed the experimental survey in > 30:00 minutes. This indicates a wide range of variability in the amount of time to participate within the experimental survey.

### 5.4 Critical Analysis of Project

The goal of this research project was to investigate the impact of online product presentation on consumer food quality assessment in the online grocery food-purchasing

environment with six different food presentation condition manipulations. A strength of this design is that participants received all six conditions and act as their own control, thus increasing the statistical power (De Winter & Dodou, 2017). Product presentations were divided into six different groups via a 6 x 6 Latin Square. Each participant was randomized to one of the six different group presentations. Additional randomization of order of product presentation was further randomized within each of the six groups. The population sample was a convenience sampling of college students currently enrolled in introduction communication courses in a western U. S. university.

**5.4.1 Strengths and Limitations.**

Strengths and limitations of the study instrument have been addressed and minimized to the extent possible. One strength of the instrument used in this research is that the measurement scales have been previously validated and tested for reliability within this population. Another strength of this instrument was that subjects participated asynchronously and in the online format. This created a real-world field testing of the environment being studied. While that is a strength, it is recognized that participants online actions were not able to be observed. In order to minimize any risk of participants not fully viewing the experimental food message presentations, the ability to advance questions was hindered until participants clicked onto the experimental presentation link. Additional questions were also added to test whether presentations were viewed.

It is noted that six different experimental study foods were used for the six different presentation conditions, which is not ideal. Limiting the study foods to only one food for each of the different treatments was considered. However, for a within-subject design in which each subject receives each treatment (a strength of the design), presenting one food for each of the experimental message presentations could have greatly increased carryover effects (De Winter &

Dodou, 2017; Gliner et al., 2009). Therefore, to minimize potential carryover effects, six different whole grain foods were chosen.

Although the instrument used validated and reliable scales, a limitation of this study would be a lack of strong differentiation of the messages for this audience. Health messages used were those that are appropriately defined and allowable for food products regulated by the Food and Drug Administration (FDA). Sensory messages were chosen to adhere to taste and visual parameters of the food products. A survey study was conducted to assess those messages deemed most believable by the target audience. However, more robust message testing, including further development of the specific messages for each food, might have allowed for stronger variations of the health and sensory messages.

The length of the health message and the sensory messages may have been inadequate to illicit any viable argument processing. Dual-processing theories posit that persuasive messages need to be high quality, attended to, and processed with greater elaboration if they are to be judged in an evaluative manner. {Petty, 1986 #928@@author-year}define high-quality, strong messages as those that present arguments that encourage the receivers to consider the message resulting in thoughts that are predominantly favorable. They continue that in order to encourage positive attitude change as a result of evaluative message processing, the thoughts elicited by message processing should be more favorable than those held prior to exposure to the message. Other important message characteristics defined by {Petty, 1986 #928@@author-year}include believability, credibility, comprehensibility, complexity, and familiarity. Without these characteristics, a persuasive message may not adequately engage the targeted receiver to evaluatively process the message. While the health and sensory messages within this research were tested for believability among this target audience, this research was limited in scope of

comprehensive message development. Additionally, the health message was only nine words while the sensory message was only five words in length. Although these messages provide some believability and familiarity for this audience as evidenced by the level of agreement results in the message testing, the length of each message offers limited capability in creating a credible, complex, and comprehensive approach to a depth of persuasion. A message without these additional characteristics could have easily been perceived as a weak argument. Without evidence of message credibility, comprehensibility, complexity and familiarity of whole grain food sensory and health aspects, the findings of this research is limited.

Lastly, the manipulations added to the grocery web page simulations may not have been adequately attended to by the participants. During the pilot testing and fully fielded study, manipulation measures revealed that participants failed to consistently assess the presence or absence of the video / audio message format. Although participants would not be able to move forward with the study questions until they had viewed each web page, the lack of accuracy in identifying the presence or absence of the video questions the quality of the level of degree and levels of media richness in the message format presentation. Without viable manipulations of message formats, any impact from the message format independent variable is greatly limited. Future research would benefit by creating open-ended questions in which participants identify specific aspects of each web page simulation through recall and memory. This would identify which characteristics of the message presentation are attended to and captured within participants' short-term memory. These types of responses could also help ensure participants attend to purposeful characteristics of the web page simulations, such as message types and formats.

### 5.4.2 Data Sampling Strengths and Limitations.

The population sampled was a convenience sample drawn from students currently enrolled in an introductory communication course at a large western U. S. university. A limitation of this study is the fact that this is not a strongly diverse population and therefore not likely representative of the entire U.S. college-aged population. This limits external validity and any research inferences to other groups. However, a large portion of this population sample (91%) was born after 1995. Often referred to as "Millennials," "Gen Y," or "Gen Z", this generational cohort born between the mid 1990s thru the early 2000s (Bump, 2014; Dimock, 2019) Within this research, the term "Millennials" is used noting that the majority of the participants were born after 1995. This cohort has grown up with computer technology and the internet from a very early age, tend to value a wide variety of media, and have had availability to computers, mobile devices, and the internet throughout their formative years (Valentine & Powers, 2013) They are the first generation that is globally connected by the internet (Ordun, 2015). Moreover, they are leaders in technological innovation acceptance and advancement. As a result, they may have a varied evaluative skillset compared to that of older generations. Millennials make up 21% of total annual consumer spending and are credited in helping to drive technology and online purchasing (Peregrin, 2015). The convenience sample in this research provides a representation of the younger millennial generation.

Recruitment for the sample population was not specific to online grocery shoppers. Research has shown that online shoppers may not seek nutrition information as often as brick-and-mortar grocery shoppers {Ardolino, 2018 #755@@author-year}. Because of the potential for variations in information seeking behaviors, the findings are not able to be extrapolated specific to online shoppers.

The population was not sampled randomly, which is a limitation of the experimental design. However, the entire population of students enrolled in an intro-level communication course was offered access to participate in the research experiment. To provide some randomization within the experiment, the food message presentations were divided into six groups via a Latin Square calculation. Each participant was randomized to one of these six different experimental groups. Further, the order of presentation within each of the six groups was randomized. These randomizations helped to minimize any potential order effects of the treatment manipulations.

**5.4.3 Inference Limitations.**

As stated previously, this research population sampling was specifically aimed at millennials attending a western U.S. university as undergraduates. Focusing on this specific population limits the ability to infer any findings to other population groups. As such, the message presentation variations may impact other populations in either a similar or a varied manner.

While purposefully choosing whole grain foods that were more commonly consumed within the U.S. to increase familiarity and reduce any uncertainty among participants, the consumption rates of these foods is still rather small (McGill et al., 2015). Further, their refined counterpart foods are also commonly consumed refined grains within the U.S. Consequently, the sensory expectations of the whole grain foods—regardless of the food message presentation provided—may have already been implicit knowledge and held within participant memory. Sensory expectations for whole grain foods have been noted as a hurdle to consumer acceptance of whole grain foods (Heiniö et al., 2016), particularly in the areas of flavor, texture, and color. These implicit expectations may help to explain why sensory messages yielded no differences in attitude and willingness-to-purchase whole grain foods. Without any implicit expectation,

message presentation may have yielded different results. Without exploration of participant expectations of whole grain foods, any inferences of results might be limited.

This online experiment was fielded initially in March 2020 and data collection continued through July 2020. At that time, the COVID-19 pandemic in the U.S. was gaining impact on society. As communities shut down and opted to quarantine, simple daily behaviors and activities had to shift online. The Food Industry Association conducted surveys of Americans during this time and tracked many of the grocery habit changes exhibited as a result of the pandemic. Their results show that 78% of total shoppers have made dramatic changes in where they shop with 40% shopping at fewer brick-and-mortar stores, 10% no longer shopping brick-and-mortar all-together, and an increase of 28% of respondents increasing their online grocery shopping activities (Food Marketing Institute, 2020). Reviewing grocery habit data of participants in the spring of the pandemic compared to those summer 2020 participants, there were no statistically significant differences between online grocery habits among the two groups [not shown in this document]. Compared to the larger U.S. survey conducted by the Food Marketing Institute, the number of online grocery purchases from study participants was lower, with only 20-24% of participants active in online grocery shopping. However, the realization that this unprecedented pandemic has greatly impacted society, including grocery habits, makes it difficult to infer any findings of this work to the greater population, including other college student generations of previous non-pandemic times.

### 5.5 Recommendations for Future Research

This research did not show any differences in the message presentations on participant attitudes and willingness to purchase whole grain foods. However, future research for this millennial cohort within online grocery should be strongly considered. Millennials have grown up with technology and are known to drive a lot of the new movements, including use of

technology for everyday activities (Valentine & Powers, 2013). While this cohort is comfortable with technology and online purchases, they may have a varied value system when it comes to food quality assessments. There are many values that consumers can attribute to foods, including convenience, appearance, tradition, environmental impact, taste, price, and nutrition, just to name a few. According to Arroyo Pilar et al. (2020), age can play a role within the food value consumer choices. Older age, in addition to increased health consciousness and increased perception of health risks, is more often to be associated with a preference for health-related aspects of foods.

In addition to healthy food attribute values, millennials may view foods attributes differently than other generational cohorts. Kuster et al. (2019) reviewed aspects of healthy lifestyle among older and younger millennials and the association between healthy lifestyle and their level of food involvement, (including interest and food-related activities). Their research revealed that some healthy lifestyle behaviors, such as rest and sleep, were associated with the degree of food involvement. Food involvement, in turn, was associated with participants affinity toward various food packaging cues. Kuster et al. (2019) also found some variance with older and younger millennials, with older millennials showing a stronger relationship with food involvement and product packaging information. While this research incorporated health interest as a potential motivational factor, this millennial cohort may have been motivated by other food messages, such as their food involvement and specific food packaging information and cues. Further research is necessary to investigate the relationships these factors may play within this cohort in the online grocery environment.

In addition to food involvement, research has suggested various factors that millennials seek when evaluating food purchases. Shipman (2020) has suggested six dimensions of food

choice including mood, health, convenience, ethical concerns, weight control and price. For the millennial cohort, mood was the highest priority dimension of food choice. Participants stated that choosing foods based on mood was for purposes of relieving stress, supporting happiness, tasting good, and offering value. Even though millennials pay attention to issues regarding their health and weight control / looking good, results showed that choosing foods based on health is not the highest priority for this generation. Health was not a strong motivational driver to incorporate specific types of dietary practices (Corvi et al., 2007; Schewe & Meredity, 2004). Equally for the millennial population within the present study, the health and sensory messages were likely not a high priority dimension of food choice. Investigating messages that address positive aspects of mood and other priority dimensions for this population may yield significant results.

Consumer behavior research to better understand how a consumer shops online, motivations for online food purchases, and best practices in imparting information of healthful foods, such as whole grains, is important area of research. As discussed previously, Jilcott Pitts et al. (2018) found that produce and other perishable food products were not purchased online as often as non-perishable and bulk items. Additionally, consumers relied on their own personal grocery lists and the 'favorites' lists online making repeat purchases, emphasizing the reliance on habitual purchases instead of opting for novel or unfamiliar foods.

Investigating the pertinent online communication (heuristic and other) ideal for the millennial consumer, would be beneficial in designing and crafting effective message presentations. In the online grocery setting, the videos and photos of food imagery as presented in this study, may not be the appropriate communication style for the millennial online grocery consumer. If habitual purchasing is most often done in the online setting, limited desire for

information-seeking would have hindered participants. The videos and imagery photos used may have been too cognitively taxing for the participants, leading to a less than positive experience. Motivation for online grocery purchases is most often due to convenience and ease of the shopping experience (Jilcott Pitts et al., 2018). While some online grocery offerings are food pairing suggestions, food preparation suggestions, and food preparation videos, these services may create too taxing a cognitive load for the consumer seeking simple completion of a habitual chore. However, these types of services can add to increased customer experience and satisfaction as a benefit for loyal and repeat customers (Singh & Soderlund, 2020). Further research could lend support to optimizing a balance of cognitive effort toward positive online grocery experiences while also providing health product promotional communications.

Millennials tend to form and shape their values of food choice through social media search and engagement activities (Leslie, 2016). Often, these connections surround social media influencers, such as opinion leaders, celebrity endorsers and other social leaders. Research has shown that social media influencers have significant effects on millennials' attitudes, purchase behaviors, and eating behaviors (Abreu, 2019; Hanifawati et al., 2019; McCormick, 2016; Saboia et al., 2018). Research suggests that the characteristics most important to encourage influencer following are influencer's personality and their ability to present information in an original, authentic, inspirational, and educational manner. It is this presentation of content, rather than influencer's experiential involvement in products, that has the most influence for the millennial follower (Leslie, 2016). As a form of media richness, the specific content of the social media influencer may be a better format to encourage positive attitude and purchase intent of whole grain foods.

Although branding was outside the scope of this research, perception of brand quality certainly adds to the online communications platforms and is incorporated into consumer food quality decision-making, according to the TFQM. Key constructs of branding products include ownership/market power, trust/promise, image/meaning, contact, negotiation/collaboration, and valuation (Krugman & Hayes, 2012). It would be important to understand the impact of brand loyalty in participant decision-making when presented with health messages versus sensory messages. The impact of price on food quality decisions was also outside the scope of this project. Yet, participants stated that both brand and price were important components in their food purchasing decisions. Research is lacking on the evidence of health and sensory message impact in online grocery when brand and price are also part of the quality decisions.

This research project was conducted during the first 6 months of the COVID-19 pandemic experience. There are relatively few, if any, human experiences that the pandemic has not impacted; consumer grocery trends are no exception. A business industry research study revealed that demand for online grocery has almost doubled to 43% of consumers, with curbside and home delivery services replacing in-store pickup as the preferred mode (Mercatus, 2020). Further, consumers are purchasing more online groceries, shopping less frequently, buying more per purchase event, and buying from other food categories than before 2020. Although all food categories have seen online purchase growth, non-perishable foods, bulk, and household items are still the larger purchase categories. Most online consumers state that they will continue to purchase groceries online after the pandemic subsides (Mercatus, 2020).

While grocery purchasing behaviors have increased to an online format, some research is reporting changes in grocery purchases. The Food Marketing Institute research shows that consumers are cooking / baking more and reaching for more ‘comfort foods’ (Food Marketing

Institute, 2020). Millennial consumer grocery habits have also changed with increased spending on groceries (40%), alcohol (13%), and restaurants (8%) (Peck, 2020). Further, millennials report that cooking, baking, and trying new recipes are new yet comforting activities they can manage safely (Peck, 2020). Some research also states that Americans are looking for more health and wellness product options (Repko, 2020). With consumer demand greatly increased, online grocery purchasing was forced to provide greater efficiency and options for the consumer. Given these increases in consumer demand, consumer behavior research in this realm is valuable as it provides insight for developing targeted communication for public health initiatives (e.g., increased consumption of healthful and whole grain products).

This research project investigated the impact of online food presentations within the millennial generation. Although no differences were noted among any of the message presentations, other research has observed positive results in similar research. A large online grocery simulation experiment investigated the presence of point-of-purchase health messaging to observe any effects in grain food choices. Participants were shown an infographic displaying the benefits of dietary fiber prior to their online grain food choices. Researchers found that the positive health message significantly influenced participants to choose the products with greater amounts of fiber compared to the control group (Arslain et al., 2020). This research supports the use of health messages in online grocery food presentations to encourage consumers' healthful food choices.

With expanding use of online grocery format and demand, it is important to continue studying food quality decision-making across multiple generations. Older generations, according to Kuster et al. (2019), have increased interest in healthy lifestyle and psychological health risk. Therefore, it is more likely that they will also have greater food involvement. This would have to

be examined in the online grocery setting. With a greater health interest, online research could see an interaction effect with the older generations between their motivation (e.g., health interest) and their food preferences. Investigating the message type and format that would resonate in this generational cohort may yield different and significant results than what was observed with the millennial cohort.

An important consideration in online participant research is to recognize the potential cognitive demand and differences that may be present. In their review of the potential effects of frequent and consistent use of online interactivity, Firth et al. (2019) noted that increased uses can differentially impact the brain and cognition, particularly for younger and still developing brains. They state that much of the research has examined effects on attention, memory & knowledge, as well as social cognition. The underlying design and presentation of the online space, in addition to the quality of media content work in tandem to draw participant attention. Constant pushing of attention-grabbing techniques has led to the promotion of high levels of habitual engagement, (e.g., scrolling, clicking, and 'checking' behaviors), reinforced from an information reward system that may also impact neuronal and dopamine circuitry. Research has found that task switching while using only one device occurs as frequently as every 19 seconds, with 75% of online tasks being viewed for less than one minute (Yeykelis et al., 2014). Rosen et al. (2013) observed students ages 12-24 years during a 15-minute study session in which students used their own actual study materials and means. The researchers noted that, on average, students switched tasks to various available technologies every 5-6 minutes. Those who chose to task switch were more likely to have a lower attention span and included more distracting, emotionally engaging activities during their observed study session. The authors suggested that

for those participants that were easily distracted, their intention to task switch was likely high because of the available technologies they had included in their study sessions.

The consequences of this habitual attention-grabbing nature of the online environment can create a heavily distracted participant using a behavioral pattern which includes constant clicks of hyperlinks, notifications, prompts and limitless streams of digital media termed "media multi-tasking" (Firth et al., 2019). Heavy digital media users performed worse in task-switching tests than did low digital media users, due to heavy users' increased susceptibility to distraction within the online environment.

While some imaging research shows neural changes and structural effects due to heavy online task-switching, research also has investigated acute effects on cognitive capacities. A meta-analysis investigating cognitive capabilities when multi-tasking concluded poor overall cognitive performance with heavy online multi-tasking (Firth et al., 2019). Additionally, research on short-term multi-tasking in highly hyperlinked environment, such as while online shopping, found a sustained deficit of attention even after the online task was completed (Peng et al., 2018). The overall research strongly indicates that online multi-tasking yields lessened cognitive capacities by reducing the ability to ignore other distractions (Firth et al., 2019). Research in online grocery purchasing behaviors has shown that this task is often habitual, and purchases are most often routine (Food Marketing Institute, 2020). Future research should investigate the role that multi-tasking or task switching during online grocery shopping may have on attention toward and ability to process new and media rich message presentations.

## 5.6 Applications for Practice

### 5.6.1 Recommendations for Marketing / Manufacturing

Research in the U.S. has shown that consumers cite low sensory quality as one of the key barriers to increasing intake of whole grains, likely due to the bitter notes of bran elements

(Bakke & Vickers, 2007; Kuznesof et al., 2012; Magalis et al., 2016). Food science technologists can play a large role in creating whole grain foods that are nutritious, nutrient dense, and sensorily acceptable to consumers (Schaffer-Lequart et al., 2015). Although this research showed that pre-attitude toward whole grain foods was slightly positive, the reported consumption of whole grain foods was low, even lower than what has been reported in the literature (McGill et al., 2015). Therefore, millennials may be more apprehensive than the larger population to including whole grain foods in their diets. Consensus from the Grains for Health Foundation Whole Grains Summit has recognized that in order to encourage greater consumer acceptance of whole grains, the food manufacturing industry should strive to create products that meet consumer sensory acceptance in addition to providing necessary education and promotion of whole grains foods (McKeown et al., 2013). Based on this research, efforts should be made to segment consumers based on age in addressing specific criteria of product liking and acceptance of whole grain foods.

The present study results revealed a difference in participant willingness to consume and attitude toward three of the six study foods. Unexpectedly, results showed that most of the whole grains had less positive attitudes and willingness to consume after viewing the message presentations than prior to the presentations, which is difficult to explain (although, whole grain pancakes resulted in a more positive and statistically significant attitude and willingness to consume after viewing the message presentations). Although recommended for their health benefit, whole grain foods as a food category have seen limited consumption (McGill et al., 2015). A large barrier to consumption is thought to be their perceived and actual sensory attributes (Heiniö et al., 2016). As a study food, whole grain pancakes may have been more positively accepted due to the perception of a comfort and/or an indulgent type of food rather

than a healthy food. Research has shown that consumers attribute an inverse relationship of healthful food and tastiness (Raghunathan et al., 2006). As observed in this study, whole grain pancakes may have been perceived as a less healthful indulgent food, resulting in a perceived positive sensory expectation.

Within the past few decades, there has been a growing consumer demand for foods that taste good *and* are good-for-you. Food marketers have categorized these foods as 'Healthy Indulgence' or 'Functional Foods' (Diplock et al., 1999; Palmer, 2008). Manufacturers recognize that taste is a priority for consumers; encouraging more healthful food choices without compromising on taste will continue to be important for consumer. More research is being done focused on creating indulgent grain products with added nutritional values (Martinez & Gomez, 2019). Whole grain foods that offer 'healthy indulgence' may be more easily accepted by consumers and could begin to move the needle toward greater whole grain consumption.

Interestingly, there was a statistically significant difference between participants' willingness to consume and willingness to purchase whole grain foods with greater positivity toward consumption of whole grains across all message presentations. The TFQM illustrates that price is a contributing factor in the evaluation of the quality of a food (Brunso et al., 2002). Although some research suggests that price is less impactful in the online scenario, (Chu et al., 2008), the uncertainty of price within this research may have discouraged willingness to purchase while not impacting willingness to consume. Although the whole grains were familiar to participants, research shows that unfamiliarity can be a barrier to purchase intent. Research has also shown that the unwillingness to purchase foods may be compounded by unfamiliarity, (e.g. insect proteins), and foods with a higher price premium, such as organic foods (Eyinade et al., 2021; Huang et al., 2019; Wassmann et al., 2021). Without the economic risk of monetary

investment, millennials—and perhaps other generations—may consistently be more positive toward consuming than toward purchasing whole grain foods. For example, offering whole grain food samplings or coupons for whole grain foods in exchange for participation in health programs, research, or educational events could encourage a positive acceptance of whole grain food trials without a monetary investment. Future marketing practice and research in food acceptance should consider this potential difference in the outcomes willingness to consume and willingness to purchase foods and the impact these differences may yield.

### 5.6.2 Recommendations for Communication Professionals

This research did not show any impact on the varied food presentations or effect of health interest or knowledge of whole grain foods. Yet, other research has shown that food messages and presentations do significantly impact food quality decision-making (Brunso et al., 2002). To communicate the presence of whole grain foods in products, the Whole Grains Council has developed a communication campaign surrounding a Whole Grain logo. Manufacturers can use this graphic logo on food products that qualify as containing certain amounts of whole grains. Some research has shown consumers trust the logo to help identify foods containing whole grains (Oldways Whole Grains Council, 2020). Yet, in other research, viewers were less accurate in identifying whole grain foods (Wilde et al., 2020). To date, at least some consumers continue to struggle to accurately identify whole grain foods.

While participants had a more positive interest in health and fair understanding of whole grain foods, the whole grain message types and message formats did not produce any differences in participant attitude and willingness-to-purchase. Future consumer research should be conducted to better understand this specific audience in relation to whole grain food products. Additionally, future efforts in message development would be beneficial in crafting an ideal

message type and format for whole grain foods communication campaigns that would address specific needs and expectations for the online millennial consumer.

### 5.6.3 Recommendations for Nutrition Professionals

Research interventions at brick-and-mortar grocery stores have been conducted over the years aimed at promoting healthful food product decisions (Davydenko & Peetz, 2020; Escaron et al., 2013; Glanz et al., 2012; Wansink, 2017). Online grocery research has shown that list-making may minimize spending and impulse buying (Davydenko & Peetz, 2020). The present study attempted to ascertain a difference among food message communications that would support positive food quality decisions of whole grain foods in online grocery. Continuing to develop and research other practical efforts and programs focused on online grocery communications is important in supporting consumers' healthful food quality decisions.

Registered dietitians and nutrition professionals play a large role in assisting consumers in creating healthful diets. The impact of the pandemic has increased desire for more healthful foods with 36% of consumers reporting healthier habits since the pandemic (Food Marketing Institute, 2020). Likewise, online grocery shopping has increased to 49% of shoppers with 21% of shoppers trying online grocery shopping for the first time. Some research suggests that online shopping for groceries can decrease impulse purchases, avoiding unhealthy 'vice' products, and encourage desires for more healthful foods (Campo & Breugelmans, 2015; Davydenko & Peetz, 2020; Elms et al., 2016; Gorin et al., 2007; Harris et al., 2017; Huyghe et al., 2017).

This research did not show any differences of the message presentations on *Attitude* and *Willingness-to-Purchase* the whole grain foods. As such, nutrition professionals should assist with relaying educating about whole grain foods, the importance in a healthful diet, and understand consumers' barriers to consumption. Effort should also be made to target education materials so they are specific for the audience while also addressing their internal sources of

motivation, (such as convenience and cost, in addition to flavor, taste, texture, nutrition, and life stage health expectations). Further research on motivations for consuming whole grains and educational messaging that increases understanding would be necessary to develop these more focused messages.

### 5.6.4 Recommendations for Grocery Retailers

The online grocery simulation attempted to generate a real-life experience. It is within this online retail environment that food quality purchasing decisions are made. Retailers need to play a large role in providing products and communicating product benefits with their customers. As stated previously, the online grocery usage has greatly increased in the past 12 months due to the COVID-19 pandemic. Because of that increased use, consumer expectations of the online shopping experience have changed. A report from Bazaarvoice stated:

> "The future of online grocery shopping will be determined by customer experience, with technology being the key decider in terms of which company will win. Now more than ever retailers need to understand customer sentiment, the emotion that customers feel towards their brand, and to do that they need mechanisms with which they can listen to their customers, gauge that sentiment and feed it back to management." (Bazaarvoice, 2020).

This report explains that shoppers are hungry for information about products and brands they are presented with—they are making choices online based on the available information. The report encourages grocery retailers to build a robust feedback loop with their customers, building strong brand-retailer relationships with solid data, and to communicate with customers in personalized ways (Bazaarvoice, 2020). Because results of the present study were not significant, further efforts should be made to identify the ideal use of media richness (i.e., vivid and interactive presentation) for the millennial consumer. Engaging the consumer with media-rich communications could help to increase consumer involvement and trust, while also decrease intangibility (Brunelle & Lapierre, 2008; Laroche et al., 2005; Nepomuceno et al., 2014).

Specific media rich criteria could help to meet the needs of the consumer, support healthful purchases, and strengthen retailer-consumer relationships. These insights provide an actionable approach for future successful marketing campaigns.

### 5.7 Conclusions

Consumers use food product communications, in addition to drawing from their own memories, motivations, interests, knowledge, and experiences to inform and assess a food's quality aspects in making food choices. Founded in the TFQM and supported with dual-processing theories, this research attempted to show differences of food message type and format on whole grain food product attitudes and willingness-to-purchase. Results did not yield any significant effects from the varied food presentations. Likewise, there was no significant interaction effect of health interest or knowledge of whole grain foods on participant *Attitude* and *Willingness-to-Purchase* whole grains.

The online format for grocery purchasing is a relatively new venue and understanding how to express food messages within this space would greatly benefit food product communication campaigns. Millennials, who have grown up with digital online computer technology, were an important and relevant group to study. Raising online media richness levels through interactivity and vividness has been associated with increased tangibility and lowered perceived risk in online purchasing. For the online grocery environment simulated in this experiment, the additional food imagery and video may not have met the millennial expectations for media richness. Motivation for online grocery purchasing is often convenience and ease, with many consumers relying on heuristics of familiarity and habit. Therefore, additional media richness may not have been received well.

The messages chosen for variations of message type within this format may not have been adequately robust for participants to attend to and to cognitively consider. Although we

attempted to ensure the messages were credible, the taste and visual descriptors used within the sensory messages and the regulatory requirement parameters used for the health messages may have resulted in weak arguments for consideration. Kuznesof et al. (2012) have shown that the bitter sensory aspects of whole grain foods create a hurdle for consumers to overcome in order to include more whole grain food products in their diets. Likewise, the health messages for the whole grain food products may not have addressed motivational criteria for this younger group of millennials when making food quality decisions. Future research can help to define specific message type and format that would support more positive whole grain food quality decisions in the online grocery environment.

# REFERENCES


Abreu, R. (2019). Social media micro-influencer marketing and purchasing intention of Millennials: The role of perceived authentiticy and trust Dublin, IR.

Ajzen, I., & Sexton, J. (1999). Depth of processing, belief congruence, and attitude-behavior correspondence. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 117-140). The Guilford Press.

Albertson, A. M., Reicks, M., Joshi, N., & Gugger, C. K. (2016, January). Whole grain consumption trends and associations with body weight measures in the United States: results from the cross sectional National Health and Nutrition Examination Survey 2001-2012. *Nutrition Journal, 15*, 8. https://doi.org/10.1186/s12937-016-0126-4

American Marketing Association. (2019). *Definitions of Marketing*. American Marketing Association. Retrieved March 2019 from https://www.ama.org/the-definition-of-marketing/

Anckar, B., Walden, P., & Jelassi, T. (2002). Creating customer value in online grocery shopping. *International Journal of Retail & Distribution Management, 30*(4), 211-220. https://doi.org/10.1108/09590550210423681

Ardolino, A., & Lewin-Zwerdling, A. (2018). *Food Insight: Evaluating Online Grocery Shopping Trends*. International Food Information Council. Retrieved March from https://foodinsight.org/new-research-evaluating-online-grocery-shopping-trends/

Arroyo Pilar, E., Liñan, J., & Vera Martínez, J. (2020, October). Who really values healthy food? *British Food Journal, 123*(2), 720-738. https://doi.org/10.1108/BFJ-04-2020-0328

Arslain, K., Gustafson, C. R., & DRose, D. J. (2020, November). Point-of-Decision Prompts Increase Dietary Fiber Content of Consumers' Food Choices inan Onlien Grocery Shopping Simulation. *Nutrients, 12*(11). https://doi.org/https://doi.org/10.3390/nu12113487

Arvola, A., Lähteenmäki, L., Dean, M., Vassallo, M., Winkelmann, M., Claupein, E., Saba, A., & Shepherd, R. (2007, November). Consumers' beliefs about whole and refined grain products in the UK, Italy and Finland. *Journal of Cereal Science, 46*(3), 197-206. https://doi.org/10.1016/j.jcs.2007.06.001

Aschemann Witzel, J., & Grunert, K. G. (2015, June). Influence of 'soft' versus 'scientific' health information framing and contradictory information on consumers' health inferences and attitudes towards a food supplement. *Food Quality and Preference, 42*, 90-99. https://doi.org/10.1016/j.foodqual.2015.01.008

Aschemann Witzel, J., Grunert, K. G., van Trijp, H. C., Bialkova, S., Raats, M. M., Hodgkins, C., Wasowicz-Kirylo, G., & Koenigstorfer, J. (2013, Dec). Effects of nutrition label format and product assortment on the healthfulness of food choice. *Appetite, 71*, 63-74. https://doi.org/10.1016/j.appet.2013.07.004

Bakke, A., & Vickers, Z. (2007, August). Consumer liking of refined and whole wheat breads. *Journal of food science, 72*(7), S473-480. https://doi.org/10.1111/j.1750-3841.2007.00440.x

Bazaarvoice. (2020). *Research Report: Supermarkets 2025*. Bazaarvoice. https://www.bazaarvoice.com/resources/supermarkets-2025-research-report/

Belleau, B. D., & Summers, T. A. (2007, July). Theory of reasoned action: Purchase intention of young consumers. *Clothing & Textiles REsearch Journal, 25*(3), 244-257. https://doi.org/https://doi.org/10.1177/0887302X07302768

Benn, Y., Webb, T. L., Chang, B. P., & Reidy, J. (2015, Jun). What information do consumers consider, and how do they look for it, when shopping for groceries online? *Appetite, 89*, 265-273. https://doi.org/10.1016/j.appet.2015.01.025

Bialkova, S., & van Trijp, H. (2010, July). What determines consumer attention to nutrition labels? *Food Quality and Preference, 21*(8), 1042-1051. https://doi.org/10.1016/j.foodqual.2010.07.001

Bone, P. F., & Ellen, P. S. (1992). The generation and consequences of communication-evoked imagery. *Journal of Consumer Research, 19*(1). https://doi.org/10.1086/209289

Breugelmans, E., Campo, K., & Gijsbrechts, E. (2007, August). Shelf sequence and proximity effects on online grocery choices. *Marketing Letters, 18*(1-2), 117-133. https://doi.org/https://doi.org/10.1007/s11002-006-9002-x

Brunelle, E., & Lapierre, J. (2008, August 19-22). Testing media richness theory to explain consumers' intentions of buying online. Proceedings of the 10th international conference on Electronic commerce, Innsbruck, Austria.

Brunso, K., Fjord, T. A., & Grunert, K. G. (2002). *Consumers' food choice and quality perception* [Report No. 77]. The MAPP Centre. https://EconPapers.repec.org/RePEc:hhb:aarmap:0077

Bump, P. (2014). Here is when each generation begins and ends, according to facts. *The Atlantic*. Retrieved August 2019, from https://www.theatlantic.com/national/archive/2014/03/here-is-when-each-generation-begins-and-ends-according-to-facts/359589/

Bureau of Labor Statistics. (2019). *Consumer Expenditure Surveys*. U.S. Department of Labor,. Retrieved February 2019 from https://www.bls.gov/cex/twoyear/200607/csxtwoyr.htm

Campo, K., & Breugelmans, E. (2015, April). Buying groceries in brick and click stores: category allocation decisions and the moderating effect of online buying experience. *Journal of Interactive Marketing, 31*, 63-78. https://doi.org/10.1016/j.intmar.2015.04.001

Campo, K., & Gijsbrechts, E. (2005, July). Retail assortment, shelf and stockout management: issues, interplay and future challenges. *Applied Stochastic Models in Business and Industry, 21*(3), 383-392. https://doi.org/10.1002/asmb.574

Campos, S., Doxey, J., & Hammond, D. (2011, Aug). Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutr, 14*(8), 1496-1506. https://doi.org/10.1017/S1368980010003290

Center for Food Safety and Applied Nutrition. (2006). *Draft Guidance for industry and FDA staff: whole grain label statements*. U.S. Food and Drug Administration. Retrieved july 2019 from https://www.fda.gov/regulatory-information/search-fda-guidance-documents/draft-guidance-industry-and-fda-staff-whole-grain-label-statements

CGIAR. (2019). *Ricepedia: The online authority on rice*. CGIAR. Retrieved March 2019 from http://ricepedia.org/rice-as-a-crop/what-happens-after-harvest

Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: effects of source credibility, arbumnet ambiguity, and task Importance on Attitude judgment. *Journal of Personality and Social Psychology, 66*(3), 460-473. https://doi.org/https://doi.org/10.1037/0022-3514.66.3.460

Chang, M. K., Cheung, W., & Tank, M. (2013, November). Building trust online: Interactions among trust building mechanisms. *Information & Management, 50*, 439-445. https://doi.org/https://doi.org/10.1016/j.im.2013.06.003

Cheema, A., & Papatla, P. (2010, Sept-Oct). Relative importance of online versus offline information for Internet purchases: Product category and Internet experience effects. *Journal of Business Research, 63*(9-10), 979-985. https://doi.org/https://doi.org/10.1016/j.jbusres.2009.01.021

Chen, S., & Chaiken, S. (1999). The heuristic-systematic model in its broader context. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 73-96). The Guilford Press.

Chen, S., Duckworth, K., & Chaiken, S. (1999, November). Motivated heuristic and systematic processing. *Psychological Inquiry, 10*(1), 44-49. https://doi.org/10.1207/s15327965pli1001_6

Cheung, C. M. K., & Lee, M. K. O. (2005, August ). *Consumer satisfaction with internet shopping* Proceedings of the 7th international conference on Electronic commerce, Xian, China.

Chu, J., Arce-Urriza, M., Cebollada-Calvo, J.-J., & Chintagunta, P. K. (2010, November). An empirical analysis of shopping behavior across online and offline channels for grocery products: the moderating effects of household and product characteristics. *Journal of Interactive Marketing, 24*(4), 251-268. https://doi.org/10.1016/j.intmar.2010.07.004

Chu, J., Chintagunta, P., & Cebollada, J. (2008, March). Research note—a comparison of within-household price sensitivity across online and offline channels. *Marketing Science, 27*(2), 283-299. https://doi.org/10.1287/mksc.1070.0288

Clark, J. E. (1998, April). Taste and flavour: their importance in food choice and acceptance. *Proceedings of the Nutrition Society, 57*, 639-643. https://doi.org/https://doi.org/10.1079/PNS19980093

Cocks, K., & Torgerson, D. J. (2013, Feb). Sample size calculations for pilot randomized trials: a confidence interval approach. *J Clin Epidemiol, 66*(2), 197-201. https://www.ncbi.nlm.nih.gov/pubmed/23195919

Cohen, D. A., & Babey, S. H. (2012, Sep). Contextual influences on eating behaviours: heuristic processing and dietary choices. *Obesity Reviews, 13*(9), 766-779. https://doi.org/10.1111/j.1467-789X.2012.01001.x

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Colorado State University. (2019). *Demographics*. Institutional Research, Planning and Effectiveness. Retrieved February from https://diversity.colostate.edu/demographics/

Conner, M., & Armitage, C. J. (2006). Social psychological models of food choice. In R. Shepherd & M. Raas (Eds.), *The psychology of food choice* (pp. 41-57). Cabi.

Corvi, E., Bigi, A., & Ng, G. (2007). The European Millennials versus the US Millennials: similarties and differences. *Quarto Convegno Annuale della Societa Italiana Marketing*.

Cowburn, G., & Stockley, L. (2007, January). Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutr, 8*(01). https://doi.org/10.1079/phn2004666

Cowles, D. L., Owens, J. E., & Walker, K. L. (2013). Ensuring a good fit: fortifying Zappos' customer service and user experience. *International Journal of Integrated Marketing Communications, 5*(2), 57-66.

Coyle, J. R., & Thorson, E. (2001, May). The effects of progressive levels of interactivity and vividness in web marketing sites. *Journal of Advertising, 30*(3), 65-77. https://doi.org/10.1080/00913367.2001.10673646

Crites, S. L., Fabrigar, L. R., & Petty, R. E. (2016, December). Measuring the Affective and Cognitive Properties of Attitudes: Conceptual and Methodological Issues. *Personality and Social Psychology Bulletin, 20*(6), 619-634. https://doi.org/10.1177/0146167294206001

Crum, A. J., Corbin, W. R., Brownell, K. D., & Salovey, P. (2011, Jul). Mind over milkshakes: mindsets, not just nutrients, determine ghrelin response. *Health Psychology, 30*(4), 424-429; discussion 430-421. https://doi.org/10.1037/a0023467

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management science, 32*(5), 554-571.

Davydenko, M., & Peetz, j. (2020, February). Shopping less with shopping lists: planning individual expenses ahead of time affects purchasing behavior when online grocery shopping. *Journal of Consumer Behaviour, 19*(3), 240-251. https://doi.org/https://doi.org/10.1002/cb.1812

Dayan, E., & Bar-Hillel, M. (2011, June). Nudge to nobesity II: menu positions influence food orders. *Judgment and Decision Making, 6*(4), 333-342.

De Winter, J. C., & Dodou, D. (2017). *Human subject research for engineers: a practical guide*. New York, NY: Springer. https://doi.org/DOI:10.1007/978-3-319-56964-2

Degeratu, A. M., Rangaswamy, A., & Wu, J. (2000, March). Consumer choice behavior in online and traditional supermarkets: the effects of brand name, price, and other search attributes. *International Journal of Research in Marketing, 17*, 55-78. https://doi.org/https://doi.org/10.1016/S0167-8116(00)00005-7

Del Buono, A. (2017, December). The rise of 'e-tailers': consumables e-commerce making gains. *Beverage Industry*, 32-33.

DeLong Bailey, A., Cater, M., O'Neil, C. E., Miketinas, D., & Tuuri, G. (2018, Sep 19). Psychometric analyses of the motivation to prepare healthy foods questionnaire used with adult college students. *J Nutr Educ Behav*. https://doi.org/10.1016/j.jneb.2018.08.001

Demby, G. (2013). *The secret history of the word 'cracker'*. National Public Radio. Retrieved March from https://www.npr.org/sections/codeswitch/2013/07/01/197644761/word-watch-on-crackers

Dietary Guidelines Advisory Committee. (2015). *Scientific report of the 2015 dietary guidelines advisory committee: Advisory Report to the Secretary of Health and Human Services and the Secretary of Agriculture.* USDA Agricultural Research Service.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys. The tailored design method* (4th ed.). John Wiley & Sons, Inc.

Dimock, M. (2019). Defining generations: Where Millennials end and Generation Z begins. Retrieved August 2019, from https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/

Diplock, A. T., Aggett, P. J., Ashwell, M., Bornet, F., Fern, E. B., & Roberfroid, M. B. (1999). Scientific concepts of functional foods in Europe: Consensus document. *British Journal of Nutrition, 81*(4), S1-S27. https://doi.org/https://doi.org/10.1017/S0007114599000471

Downs, J. S., Loewenstein, G., & Wisdom, J. (2009, May). Strategies for promoting healthier food choices. *American Economic Review: Papers & Proceedings, 99*(2), 159-164. https://doi.org/10.1257/aer

Eagly, A. H., & Chaiken, S. (1993a). Process theories of attitude formation and change: the elaboration likelihood and heuristic-systematic models. In *The psychology of attitudes* (pp. 303-350). Harcourt Brace Jovanovich College.

Eagly, A. H., & Chaiken, S. (1993b). *The Psychology of Attitudes*. Harcourt Brace Jovanovich College Publishers.

Elder, R. S., & Krishna, A. (2009a, June). The Effect of Advertising Copy on Sensory Stimulation and Perceived Taste",. NA - Advances in Consumer Research, Duluth, MN.

Elder, R. S., & Krishna, A. (2009b, June). The effects of advertising copy on sensory thoughts and perceived taste. *Journal of Consumer Research, 36*(5), 748-756. https://doi.org/https://doi.org/10.1086/605327

Ellis, J., Johnson, M. A., Fischer, J. G., & Hargrove, J. L. (2005, September). Nutrition and health education intervention for whole grain foods in the Georgia older Americans nutrition program. *Journal of Nutrition for the Elderly, 24*(3), 67-83. https://doi.org/https://doi.org/10.1300/J052v24n03_06

Elms, J., de Kervenoael, R., & Hallsworth, A. (2016, September). Internet or store? An ethnographic study of consumers' internet and store-based grocery shopping practices. *Journal of Retailing and Consumer Services, 32*, 234-243. https://doi.org/10.1016/j.jretconser.2016.07.002

Erdelyi, M. H., & Appelbaum, A. G. (1973). Cognitive maksing: The disruptive effect of an emotional stimulus upon the perception of contguous neutral items. *Bulletin of the Psychonomic Society, 1*(1), 59-61.

Escaron, A. L., Meinen, A. M., Nitzke, S. A., & Martinez-Donate, A. P. (2013, April). Supermarket and grocery store-based interventions to promote healthful food choices and eating practices: a systematic review. *Prev Chronic Dis, 10*, E50. https://doi.org/http://dx.doi.org/10.5888/pcd10.120156

Eyinade, G. A., Mushunje, A., & Yusuf, S. F. G. (2021). The willingess to consume organi food: A review. *Food and Agricultural Immunology, 32*(1), 78-104.

Firth, J., Torous, J., Stubbs, B., Firth, J., Steiner, G. Z., Smith, L., Alvarez-Jimenez, M., Gleeson, J., Vancampfort, D., Armitage, C. J., & Sarris, J. (2019). The "online brain": how the Internet may be changing our cognition. *World Psychiatry, 18*(2), 119-129.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. Psychology Press.

Flavián, C., Gurrea, R., & Orús, C. (2017, December). The influence of online product presentation videos on persuasion and purchase channel preference: The role of imagery fluency and need for touch. *Telematics and Informatics, 34*(8), 1544-1556. https://doi.org/10.1016/j.tele.2017.07.002

Food History. (2006). *History of Breakfast Cereal*. World Food History,. Retrieved March from https://www.world-foodhistory.com/2006/09/breakfast-cereal.html

Food Marketing Institute. (2019). *Retailer Contributions to health and wellness*. Food Marketing Institute. https://www.fmi.org/forms/store/ProductFormPublic/2019-report-on-retailer-contributions-to-health-wellness

Food Marketing Institute. (2020). *U.S. Grocery Shopper Trends: The Impact of COVID-19*. The Food Industry Association.

Glanz, K., Bader, M. D., & Iyer, S. (2012, May). Retail grocery store marketing strategies and obesity: an integrative review. *American Journal of Preventive Medicine, 42*(5), 503-512. https://doi.org/10.1016/j.amepre.2012.01.013

Gliner, J. A., Morgan, G. A., & Leech, N. L. (2009). *Research methods in applied settings an integrated approach to design and analysis* (2 ed.). Routledge Taylor & Francis Group.

Gonzalez-Benito, O., Martos-Partal, M., & San Martin, S. (2015, November). Brands as substitutes for the need for touch in online shopping. *Journal of Retailing & Consumer Services, 27*, 121-125. https://doi.org/https://doi.org/10.1016/j.jretconser.2015.07.015

Gorin, A. A., Raynor, H. A., Niemeier, H. M., & Wing, R. R. (2007, November). Home grocery delivery improves the household food environments of behavioral weight loss participants: Results of an 8-week pilot study. *International Journal of Behavioral Nutrition and Physical Activity, 4*(58). https://doi.org/10.1186/1479-

Goyan Kittler, P., Sucher, K. P., & Nahikian-Nelms, M. (2017). *Food and Culture* (7th ed.). Cengage Learning.

Graham, D. J., & Jeffery, R. W. (2011, Nov). Location, location, location: eye-tracking evidence that consumers preferentially view prominently positioned nutrition information. *J Am Diet Assoc, 111*(11), 1704-1711. https://doi.org/10.1016/j.jada.2011.08.005

Graham, D. J., Orquin, J. L., & Visschers, V. H. M. (2012, August). Eye tracking and nutrition label use: A review of the literature and recommendations for label enhancement. *Food Policy, 37*(4), 378-382. https://doi.org/https://doi.org/10.1016/j.foodpol.2012.03.004

Grunert, K. G. (1995). Food Quality: A means-end perspective. *Food Quality and Preference*, 171-176.

Grunert, K. G. (2002, August). Current issues in the understanding of consumer food choice. *Trends in Food Scientce & Technology, 13*, 275-285. https://doi.org/https://doi.org/10.1016/S0924-2244(02)00137-1

Grunert, K. G. (2015, June). The common ground between sensory and consumer science. *Current Opinion in Food Science, 3*, 19-22. https://doi.org/10.1016/j.cofs.2014.11.003

Grunert, K. G. (2016). Consumer reactions to on-pack educational messages. In P. Burgess (Ed.), *Integrating the Packaging and Product Experience in Food and Beverages* (pp. 23-35). Woodhead Publishing.

Grunert, K. G., Bech-Larsen, T., & Bredahl, L. (2000). Three issues in consumer quality perception and acceptance of dairy products. *International Dairy Journal, 10*, 575-584. https://doi.org/https://doi.org/10.1016/S0958-6946(00)00085-6

Grunert, K. G., Hieke, S., & Wills, J. M. (2014, February). Sustainability labels on food products: consumer motivation understanding and use. *Food Policy, 44*, 177-189. https://doi.org/https://doi.org/10.1016/j.foodpol.2013.12.001

Grunert, K. G., & Ramus, K. (2005, June). Consumers' willingness to buy food through the internet. *British Food Journal, 107*(6), 381-403. https://doi.org/10.1108/00070700510602174

Grunert, K. G., Sorensen, E., Johansen, L. B., & Nielsen, N. A. (1995). Analysing food choice from a means-end perspective. In F. Hansen (Ed.), *European Advances in Consumer Research* (2 ed., pp. 366-371). Association for Consumer Research.

GutCheck. (2017). *Gutcheck: Grocery E-Commerce Consumers Agile Attitudes and Usage Study*. https://www.gutcheckit.com/blog/who-are-grocery-ecommerce-consumers/

Hagen, R., & Golombisky, K. (2017). *White speace is not your enemy: A beginner's guide to communicating visually through graphic, web, & multimedia design* (Third ed.). Taylor & Francis / CRC Press.

Hanifawati, T., Dewanti, V. W., & Spaputri, G. D. (2019). The role of social media influencer on brand switching of millennial and Gen Z: A study of food-beverage products. *Journal of Applied Management, 17*(4), 625-638.

Harris, P., Robinson, H., Riley, F. D. O., & Hand, C. (2017, April). Consumers' Multi-Channel Shopping Experiences in the UK Grocery Sector: Purchase Behaviour, Motivations and Perceptions: An Extended Abstract. 103-107. https://doi.org/10.1007/978-3-319-47331-4_19

Haynes, J. D. (2009). The Neural Basis of Perceptual Awareness. In W. P. Banks (Ed.), *Encyclopedia of Consciousness* (Vol. 1, pp. 75-86). Academic Press.

Heiniö, R. L., Noort, M. W. J., Katina, K., Alam, S. A., Sozer, N., de Kock, H. L., Hersleth, M., & Poutanen, K. (2016, January). Sensory characteristics of wholegrain and bran-rich cereal foods – A review. *Trends in Food Science & Technology, 47*, 25-38. https://doi.org/10.1016/j.tifs.2015.11.002

Hertzog, M. A. (2008, Apr). Conderations in determining sample size for pilot studies. *Res Nurs Health, 31*(2), 180-191. https://doi.org/10.1002/nur.20247

Hieke, S., & Grunert, K. G. (2018). Consumers and health claims. In *Foods, Nutrients and Food Ingredients with Authorised EU Health Claims* (pp. 19-32). https://doi.org/10.1016/b978-0-08-100922-2.00002-4

History of Cereals. (2019). *History of cereals and breakfast cereal industry*. History of Cereals. Retrieved March 2019 from http://www.historyofcereals.com/

Hong, W., Thong, J. Y. L., & Tam, K. Y. (2004, October). Designing product listing pages on e-commerce websites: an examination of presentation mode and information format. *International Journal of Human-Computer Studies, 61*(4), 481-503. https://doi.org/10.1016/j.ijhcs.2004.01.006

Howlett, B., Rogo, E. J., & Shelton, T. G. (2014). *Evidence-based practice for health professionals: an interprofessional approach*. Jones & Bartlette Publishers.

Huang, L., Bai, L., Zhang, X., & Gong, S. (2019). Re-understanding the antecedents of functional foods purchase: Mediatign effect of purchase attitude and moderating effect of food neophobia. *Food Quality and Preference, 73*, 266-275.

Husar, W. J., & Bailey, T. M. (2014). *Projections of education statistics to 2022*. National Center for Education Statistics.

Huyghe, E., Verstraeten, J., Geuens, M., & Van Kerckhove, A. (2017, February). Clicks as a healthy alternative to bricks: how online grocery shopping reduces vice purchases. *Journal of Marketing Research, 54*(1), 61-74. https://doi.org/10.1509/jmr.14.0490

IBM Corp. (2019). *IBM SPSS Statitstics for MacIntosh.* In *IBM SPSS Statistics for MacIntosh* (Version 26) Armonk NY: IBM Corp.

Jiang, Z., & Benbasat, I. (2007a, September). The effects of presentation formats and task complexity on online consumers' product understanding. *MIS Quarterly, 31*(3), 475-500. https://doi.org/https://doi.org/10.2307/25148804

Jiang, Z., & Benbasat, I. (2007b, December). Investigating the influence of the functional mechanisms of online product presentations. *Information Systems Research, 18*(4), 454-470. https://doi.org/10.1287/isre.l070.0124

Jilcott Pitts, S. B., Ng, S. W., Blitstein, J. L., Gustafson, A., & Niculescu, M. (2018, Dec). Online grocery shopping: promise and pitfalls for healthier food and beverage purchases. *Public Health Nutr, 21*(18), 3360-3376. https://doi.org/10.1017/S1368980018002409

Johanson, G. A., & Brooks, G. P. (2009, December). Initial Scale Development: Sample Size for Pilot Studies. *Educational and Psychological measurement, 70*(3), 394-400. https://doi.org/10.1177/0013164409355692

Julious, S. A. (2005, November). Sample size of 12 per group rule of thumb for a pilot study. *Pharmaceutical Statistics, 4*(4), 287-291. https://doi.org/10.1002/pst.185

Jung, E. H., Walsh-Childers, K., & Kim, H.-S. (2016, May). Factors influencing the perceived credibility of diet-nutrition information web sites. *Computers in Human Behavior, 58*, 37-47. https://doi.org/10.1016/j.chb.2015.11.044

Kang, C., Moon, J., Kim, T., & Choe, Y. (2016, January 5-8). *Why consumers go to online Grocery: comparing vegetables with grains* 49th Hawaii International Conference on System Sciences (HICSS), Kauai, Hawaii.

Kimura, A., Wada, Y., Tsuzuki, D., Goto, S., & Cai, D. (2008, Nov). Consumer valuation of packaged foods. Interactive effects of amount and accessibility of information. *Appetite, 51*(3), 628-634. https://doi.org/10.1016/j.appet.2008.05.054

KingSoopers. (2019). *King Soopers Fresh for Everyone,*. Kroger. Retrieved February 2019 from https://www.kingsoopers.com/

Korczak, R., Marquart, L., Slavin, J. L., Ringling, K., Chu, Y., O'Shea, M., Harriman, C., Toups, K., de Vries, J., Jacques, P., Klurfeld, D. M., Camire, M. E., & Unnevehr, L. (2016, Dec). Thinking critically about whole-grain definitions: summary report of an interdisciplinary roundtable discussion at the 2015 Whole Grains Summit. *Am J Clin Nutr, 104*(6), 1508-1514. https://doi.org/10.3945/ajcn.115.126672

Krishna, A., & Elder, R. S. (2010). The Gist of Gustation. In A. Krishna (Ed.), *Sensory Marketing Research on the Sensuality of Products* (pp. 281-301). Taylor & Francis Group.

Krosnick, J. A. (1991, May/June). Response strategies for coping with the cognitive demands of attitude measures in surveys. *Applied Cognitive Psychology, 5*(3), 213-236. https://doi.org/ttps://doi.org/10.1002/acp.2350050305

Krugman, D. M., & Hayes, J. L. (2012). Brand Concepts and Advertising. In S. Rodgers & E. Thorson (Eds.), *Advertising Theory* (pp. 434-438). Routledge.

Kuhns, A., & Saksena, M. (2017). *Millennials devote larger shares of their grocery spending to prepared foods, pasta, and sugar and sweets than other generations*. USDA Economic Research Service. Retrieved March 2019 from https://www.ers.usda.gov/AMBER-WAVES/2017/DECEMBER/MILLENNIALS-DEVOTE-LARGER-SHARES-OF-THEIR-GROCERY-SPENDING-TO-PREPARED-FOODS-PASTA-AND-SUGAR-AND-SWEETS-THAN-OTHER-GENERATIONS/

Kuster, I., Vila, N., & Sarabia, F. (2019, May). Food packaging cues as vehicles of healthy information: Visions of millennials (early adults and adolescents). *Food Research International, 119*, 170-176. https://doi.org/https://doi.org/10.1016/j.foodres.2019.01.051

Kuznesof, S., Brownlee, I. A., Moore, C., Richardson, D. P., Jebb, S. A., & Seal, C. J. (2012, Aug). WHOLEheart study participant acceptance of wholegrain foods. *Appetite, 59*(1), 187-193. https://doi.org/10.1016/j.appet.2012.04.014

Lähteenmäki, L. (2013). Claiming health in food products. *Food Quality and Preference, 27*(2), 196-201. https://doi.org/10.1016/j.foodqual.2012.03.006

Lähteenmäki, L., Lampila, P., Grunert, K., Boztug, Y., Ueland, Ø., Åström, A., & Martinsdóttir, E. (2010, June). Impact of health-related claims on the perception of other product attributes. *Food Policy, 35*(3), 230-239. https://doi.org/10.1016/j.foodpol.2009.12.007

Landa, R. (2019). *Graphic design solutions* (Sixth ed.). Cengage Learning.

Laroche, M., Bergeron, J., & Goutaland, C. (2001, August). A three-dimensional scale of intangibility. *Journal of Service Research, 4*(1), 26-38. https://doi.org/https://doi.org/10.1177/109467050141003

Laroche, M., Yang, Z., McDougall, G. H. G., & Bergeron, J. (2005). Internet versus bricks-and-mortar retailers: An investigation into intangibility and its consequences. *Journal of Retailing, 81*(4), 251-267. https://doi.org/10.1016/j.jretai.2004.11.002

Larson, N. I., Perry, C. L., Story, M., & Neumark-Sztainer, D. (2006, Dec). Food preparation by young adults is associated with better diet quality. *J Am Diet Assoc, 106*(12), 2001-2007. https://doi.org/10.1016/j.jada.2006.09.008

Larson, N. I., Story, M., Eisenberg, M. E., & Neumark-Sztainer, D. (2006, Feb). Food preparation and purchasing roles among adolescents: associations with sociodemographic characteristics and diet quality. *J Am Diet Assoc, 106*(2), 211-218. https://doi.org/10.1016/j.jada.2005.10.029

Lelkes, Y., Krosnick, J. A., Marx, D. M., Judd, C. M., & Park, B. (2012, November). Complete anonymity compromises the accuracy of self-reports. *Journal of Experimental Social Psychology, 48*(6), 1291-1299. https://doi.org/https://doi.org/10.1016/j.jesp.2012.07.002

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). *Social media & mobile internet use among teens and young adults. Millennials* (Pew internet & American life project, Issue. http://samaritanbehavioralhealth.net/files/social-media-young-adults.pdf

Leslie, J. (2016). The sugar conspiracy. *The Guardian*.

Li, X. E., Jervis, S. M., & Drake, M. A. (2015, May). Examining extrinsic factors that influence product acceptance: a review. *Journal of food science 80*(5). https://doi.org/https://doi.org/10.1111/1750-3841.12852

Lim, K. H., Benbasat, I., & Ward, L. M. (2000, June). The role of multimedia in changing first impression bias. *Information Systems Research, 11*(2), 115-136. https://doi.org/10.1287/isre.11.2.115.11776

Lipowski, M., & Bondos, I. (2018, April). The influence of perceived media richness of marketing channels on online channel usage. *Baltic Journal of Management, 13*(2), 169-190. https://doi.org/10.1108/bjm-04-2017-0127

Lohman, S. (2012). *A brief history of bread*. History Magazine. Retrieved March 2019 from https://www.history.com/news/a-brief-history-of-bread

Lopez, A. (2019). *The twisted history of pasta*. National Geographic. Retrieved March 2019 from https://www.nationalgeographic.com/history/history-magazine/article/daily-life-pasta-italy-neapolitan-diet

Luomala, H., Jokitalo, M., Karhu, H., Hietaranta-Luoma, H.-L., & Hopia, A. (2015, June). Perceived health and taste ambivalence in food consumption. *Journal of Consumer Marketing, 32*(4), 290-301. https://doi.org/10.1108/jcm-11-2014-1233

MacInnis, D. J., & Price, L. L. (1987, March). The role of imagery in information processing: review and extensions. *Journal of Consumer Research, 13*(4). https://doi.org/10.1086/209082

Magalis, R. M., Giovanni, M., & Silliman, K. (2016, July). Whole grain foods: is sensory liking related to knowledge, attitude, or intake? *Nutrition & Food Science, 46*(4), 488-503. https://doi.org/10.1108/nfs-09-2015-0101

Maity, M., Dass, M., & Kumar, P. (2018, June). The impact of media richness on consumer information search and choice. *Journal of Business Research, 87*, 36-45. https://doi.org/10.1016/j.jbusres.2018.02.003

Martinez, M. M., & Gomez, M. (2019). Current Trends in the Realm of Baking: When Indulgent Consumers Demand Healthy Sustainable Foods. *Foods, 8*, 518.

Mathews, R., & Chu, Y. (2020, Aug 1). Global review of whole grain definitions and health claims. *Nutr Rev, 78*(Supplement_1), 98-106. https://doi.org/10.1093/nutrit/nuz055

Mayo, J. M. (1993). *The American Grocery Store: The business evolution of an architectural space*. Greenwood Press.

McCormick, K. (2016). Celebrity endorsements: Influence of a product-endorser match on Millennials attitudes and purchase intentions. *Journal of Retailing and Consumer Services, 32*, 39-45.

McGill, C. R., Fulgoni, V. L., & Devareddy, L. (2015, February). Ten-year trends in fiber and whole grain intakes and food sources for the United States population: National health and nutrition examination survey 2001–2010. *Nutrients, 7*(2), 1119–1130. https://doi.org/http://doi.org/10.3390/nu7021119

McKeown, N. M., Jacques, P. F., Seal, C. J., de Vries, J., Jonnalagadda, S. S., Clemens, R., Webb, D., Murphy, L. A., van Klinken, J. W., Topping, D., Murray, R., Degeneffe, D., & Marquart, L. F. (2013, May). Whole grains and health: from theory to practice--highlights of The Grains for Health Foundation's Whole Grains Summit 2012. *Journal of Nutrition 143*(5), 744S-758S. https://doi.org/10.3945/jn.112.172536

McLaughlin, C., Tarasuk, V., & Kreiger, N. (2003, November). An examination of at-home food preparation activity among low-income, food-insecure women. *J Am Diet Assoc, 103*(11), 1506-1512. https://doi.org/10.1016/j.jada.2003.08.022

Megehee, C. M. (2009, April). Advertising time expansion, compression, and cognitive processing influences on consumer acceptance of message and brand. *Journal of Business Research, 62*(4), 420-431. https://doi.org/10.1016/j.jbusres.2008.01.019

Mercatus. (2020). *eGrocery's new Reality: The Pandemic's lasting Impact on U.S. Grocery Shopper Behavior*. Mercatus. Retrieved March 2021 from https://www.mercatus.com/blog/grocery-retail-innovation/

Metcalfe, J. J., & Leonard, D. (2018, Jul 1). The relationship between culinary skills and eating behaviors: Challenges and opportunities for parents and families. *Physiol Behav, 191*, 95-99. https://doi.org/10.1016/j.physbeh.2018.04.013

Miller, L. M., & Cassady, D. L. (2012, Aug). Making healthy food choices using nutrition facts panels. The roles of knowledge, motivation, dietary modifications goals, and age. *Appetite, 59*(1), 129-139. https://doi.org/10.1016/j.appet.2012.04.009

Mueller, S., & Szolnoki, G. (2010, October). The relative influence of packaging, labelling, branding and sensory attributes on liking and purchase intent: Consumers differ in their responsiveness. *Food Quality and Preference, 21*(7), 774-783. https://doi.org/10.1016/j.foodqual.2010.07.011

Muller, L., & Prevost, M. (2016, August). What cognitive sciences have to say about the impacts of nutritional labelling formats. *Journal of Economic Psychology, 55*, 17-29. https://doi.org/10.1016/j.joep.2016.01.005

Murray, D. W., Mahadevan, M., Gatto, K., O'Connor, K., Fissinger, A., Bailey, D., & Cassara, E. (2016, September). Culinary efficacy: an exploratory study of skills, confidence, and healthy cooking competencies among university students. *Perspect Public Health, 3*(136), 143-151. https://doi.org/https://doi.org/10.1177/1757913915600195

Nadler, R. (2020, December). Understanding "Zoom fatigue": Theorizing spatial dynamics as third skins in computer-mediated communications. *Computers and Composition, 58*, Article 102613. https://doi.org/10.1016/j.compcom.2020.102613

Nepomuceno, M. V., Laroche, M., & Richard, M.-O. (2014, July). How to reduce perceived risk when buying online: The interactions between intangibility, product knowledge, brand familiarity, privacy and security concerns. *Journal of Retailing and Consumer Services, 21*(4), 619-629. https://doi.org/10.1016/j.jretconser.2013.11.006

New England Historical Society. (2019). *Cracking the history of the uncommon common cracker*. New England Historical Society. Retrieved March 2019 from http://www.newenglandhistoricalsociety.com/cracking-history-uncommon-common-cracker/

Nocella, G., & Kennedy, O. (2012, October). Food health claims – What consumers understand. *Food Policy, 37*(5), 571-580. https://doi.org/10.1016/j.foodpol.2012.06.001

O'Neil, C. E., Nicklas, T. A., Zanovec, M., Cho, S. S., & Kleinman, R. (2011, Feb). Consumption of whole grains is associated with improved diet quality and nutrient intake in children and adolescents: the National Health and Nutrition Examination Survey 1999-2004. *Public Health Nutr, 14*(2), 347-355. https://doi.org/10.1017/S1368980010002466

Okamoto, M., Wada, Y., Yamaguchi, Y., Kimura, A., Dan, H., Masuda, T., Singh, A. K., Clowney, L., & Dan, I. (2009, Mar). Influences of food-name labels on perceived tastes. *Chemical Senses, 34*(3), 187-194. https://doi.org/10.1093/chemse/bjn075

Oldways Whole Grains Council. (2020). *Whole Grain Council*. Oldways. Retrieved March 2020 from https://wholegrainscouncil.org/

Ophuis, P. A. O., & Van Trijp, H. C. (1995). Perceived quality: A market driven and consumer oriented approach. . *Food Quality and Preference, 6*(3), 177-183. https://doi.org/https://doi.org/10.1016/0950-3293(94)00028-T

Ordun, G. (2015). Millennial (Gen Y) consumer behavior, their shopping preferences and perceptual maps associated with brand loyalty. *Canadian Social Science, 11*(4), 40-55. https://doi.org/10.3968/6697

Orquin, J. L., & Scholderer, J. (2015, February). Consumer judgments of explicit and implied health claims on foods: Misguided but not misled. *Food Policy, 51*, 144-157. https://doi.org/10.1016/j.foodpol.2015.01.001

Palmer, S. (2008). Healthy Indulgence: A Best of Both Worlds Approach to Eating. *Today's Dietitian, 10*(9), 62.

Paolacci, G., & Chandler, J. (2014, June). Inside the Turk. *Current Directions in Psychological Science, 23*(3), 184-188. https://doi.org/10.1177/0963721414531598

Parment, A. (2013, March). Generation Y vs. Baby Boomers: Shopping behavior, buyer involvement and implications for retailing. *Journal of Retailing and Consumer Services, 20*(2), 189-199. https://doi.org/10.1016/j.jretconser.2012.12.001

Peck, A. (2020). *How Millennial spending habits changed due to teh Coronavirus Pandemic*. Clutch. Retrieved April 2021 from https://clutch.co/accounting/resources/millennial-spending-habits-covid-19

Peng, M., Chen, X., & Zhao, Q. (2018). Attentional scope is reduced by internet use: A behavior and ERP study. *PLoS One, 13*(6), e0198543.

Peregrin, T. (2015, Sep). Understanding millennial grocery shoppers' behavior and the role of the registered dietitian nutritionist. *J Acad Nutr Diet, 115*(9), 1380-1383. https://doi.org/10.1016/j.jand.2015.03.022

Peterson, R. A., & Merunka, D. R. (2014, May). Convenience samples of college students and research reproducibility. *Journal of Business Research, 67*(5), 1035-1041. https://doi.org/10.1016/j.jbusres.2013.08.010

Petrova, P. K., & Cialdini, R. B. (2008). Evoking the imagination as a strategy of influence. In *Handbook of Consumer Psychology* (pp. 505-524).

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123-205). Academic Press.

Petty, R. E., Cacioppo, J. T., & Schumann, D. (1983, September). Central and peripheral routes to advertising effectiveness: the moderating role of involvement. *Journal of Consumer Research, 10*(2), 135-146. https://doi.org/https://doi.org/10.1086/208954

Petty, R. E., & Wegener, D. T. (1999). The elaboration likelihood model: current status and controversies. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 41-72). The Guilford Press.

Phillips-Connolly, K., & Connolly, A. J. (2017, August). When Amazon ate Whole Foods: big changes for Big Food. *International Food and Agribusiness Management Review, 20*(5), 615-622. https://doi.org/10.22434/ifamr2017.0074

Piqueras-Fiszman, B., & Spence, C. (2015, March). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality and Preference, 40*, 165-179. https://doi.org/10.1016/j.foodqual.2014.09.013

Poon, S., & Joseph, M. (2000, February). Product characteristics and internet commerce benefit among small businesses. *Journal of Product and Brand Management, 9*(1), 21-34. https://doi.org/https://doi.org/10.1108/10610420010316311

Prochaska, J. O., & Velicer, W. F. (1997, September). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48. https://doi.org/https://doi.org/10.4278/0890-1171-12.1.38

Qualtrics Survey Software. (2018). Provo, UT. http://www.qualtrics.com.

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006, October). The unhealthy = tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing, 70*(4), 170-184. https://doi.org/https://doi.org/10.1509/jmkg.70.4.170

Rana, J., & Paul, J. (2017, September). Consumer behavior and purchase intention for organic food: A review and research agenda. *Journal of Retailing and Consumer Services, 38*, 157-165. https://doi.org/10.1016/j.jretconser.2017.06.004

Repko, M. (2020, December 29, 2020). *The pandemic's new chefs and foodies: how the health crisis shaped what we cook and crave*. CNBC, LLC. https://www.cnbc.com/2020/12/29/even-after-pandemic-companies-may-have-to-cater-to-a-nation-of-aspiring-chefs-foodies.html

Rhodes, N., & Ewoldsen, D. R. (2013). Outcomes of persuasion. In J. P. Dillard & L. Shen (Eds.), *The SAGE handbook of persuasion: Developments in theory and practice* (2 ed., pp. 53-69). SAGE Publications, Inc.

Rimm, E., E, G., MJ, S., GA, C., L., L., & W., W. (1992, May). Reproducibility and validity of a self-administered semi-quantitative food frequency questionnaire, and diet records in US men. *American Journal of Epidemiology, 135*, 1114-1136. https://doi.org/https://doi.org/10.1093/oxfordjournals.aje.a116211

Roininen, K. (2001). *Evaluation of food choice behavior: development and validation of health and taste attitude scales* [Doctoral Dissertation, University of Helsinki]. Helsinki, Finland. https://helda.helsinki.fi/bitstream/handle/10138/20892/evaluati.pdf?...2

Roininen, K., Lahteenmaki, L., & Tuorila, H. (1999, August). Quantification of consumer attitudes to health and hedonic characteristics of foods. *Appetite, 33*(1), 71-88. https://doi.org/https://doi.org/10.1006/appe.1999.0232

Roininen, K., & Tuorila, H. (1999, July). Health and taste attitudes in the prediction of use frequency and choice between less healthy and more healthy snacks. *Food Quality and Preference, 4-5*(10), 357-365. https://doi.org/https://doi.org/10.1016/S0950-3293(98)00057-3

Roininen, K., Tuorila, H., Zandstra, E. H., de Graaf, C., Vehkalahti, K., Stubenitsky, K., & Mela, D. J. (2001, Aug). Differences in health and taste attitudes and reported behaviour among Finnish, Dutch and British consumers: a cross-national validation of the Health and Taste Attitude Scales (HTAS). *Appetite, 37*(1), 33-45. https://doi.org/10.1006/appe.2001.0414

Rosen, L. D., Carrier, L. M., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior, 29*, 948-958.

Rupp, R. (2018). *Hot off the Griddle, Here's the History of Pancakes*. National Geographic Society. Retrieved March 2019 from https://www.nationalgeographic.com/people-and-culture/food/the-plate/2014/05/21/hot-off-the-griddle-heres-the-history-of-pancakes/

Saboia, I., Pisco Almeida, A. M., Sousa, P., & Pernencar, C. (2018). I am with you: a netnographic analysis of the Instagram opinion leaders on eating behavior change. *Procedia Computer Science, 138*, 97-104.

Schaffer-Lequart, C., Lehmann, U., Ross, A. B., Roger, O., Eldridge, A. L., Ananta, E., Bietry, M.-F., King, L. R., Moroni, A. V., Srichuwong, S., Wavreille, A.-S., Redgwell, R., Labat, E., & Robin, F. (2015, March). Whole grain in manufactured foods: Current use, challenges and the way forward. *Crit Rev Food Sci Nutr, 57*(8), 1562-1568. https://doi.org/10.1080/10408398.2013.781012

Schewe, C. D., & Meredity, G. (2004). Segmenting global markets by generational cohorts: determining motivations by age. *Journal of Consumer Behavior: An International Research Review, 4*(1), 51-63.

Schuldt, J. P. (2013, February). Does green mean healthy: Nutrition label color affects perceptions of healthfulness. *Health Communication, 28*, 814-821. https://doi.org/https://doi.org/10.1080/10410236.2012.725270

Shipman, Z. D. (2020). Factors Affecting Food Choices of Millennials: How they Decide what to Eat? *Journal of Tourismology, 6*(1), 49-62.

Short, F. (2003). Domestic cooking skills-what are they? *Journal of Home Economics Institute of Australia, 10*(3), 13-22.

Simon, H. A. (1956). Rational choice and the structure of the environment. *Psychological Review, 63*. https://doi.org/doi:10.1037/h0042769

Singh, R., & Soderlund, M. (2020, November). Extending the experience construct: an examination of online grocery shopping. *European Journal of Marketing, 54*(10), 2419-2446. https://doi.org/https://doi.org/10.1108/EJM-06-2019-0536

Skaczkowski, G., Durkin, S., Kashima, Y., & Wakefield, M. (2016, April). The effect of packaging, branding and labeling on the experience of unhealthy food and drink: A review. *Appetite, 99*, 219-234. https://doi.org/10.1016/j.appet.2016.01.022

Skubisz, C. (2017, January). Naturally good: Front-of-package claims as message cues. *Appetite, 108*, 506-511. https://doi.org/10.1016/j.appet.2016.10.030

Solomon, M., Bamossy, G., Askegaard, S., & Hogg, M. K. (2006). *Consumer Behaviour: A European Perspective* (Third ed.). Pearson Education Ltd.

Sona Systems Ltd. (2019). Provo, UT. https://www.sona-systems.com

Steuer, J. (1992, December). Defining virtual reality: Dimensions determining telepresence. *Journal of Communication, 42*(4), 73-93. https://doi.org/ https://doi.org/10.1111/j.1460-2466.1992.tb00812.x

Suri, R., Long, M., & Monroe, K. B. (2003, May). The impact of the internet and consumer motivation on evaluation of prices. *Journal of Business Research, 56*, 379-390. https://doi.org/https://doi.org/10.1016/S0148-2963(01)00228-4

Toet, A., van Schaik, M. G., Kaneko, D., & van Erp, J. B. F. (2019, April). Do food cinemagraphs evoke stronger appetitive responses than stills? *International Journal of Food Design, 4*(1), 63-83. https://doi.org/10.1386/ijfd.4.1.63_1

Trevino, L. K., Lengel, R. H., & Daft, R. L. (1987, October). Media symbolism, media richness, and media choice in organizations. *Communication Research, 14*(5), 553-574. https://doi.org/https://doi.org/10.1177/009365087014005006

Tsai, J. L., Knutson, B., & Fung, H. H. (2006). Cultural variation in affect valuation. *Journal of Personality and Social Psychology, 90*, 288-307. https://doi.org/https://doi.org/10.1037/0022-3514.90.2.288

Turner, M. M., Skubisz, C., Pandya, S. P., Silverman, M., & Austin, L. L. (2014, Sep). Predicting visual attention to nutrition information on food products: the influence of motivation and ability. *J Health Commun, 19*(9), 1017-1029. https://doi.org/10.1080/10810730.2013.864726

Turnwald, B. P., Boles, D. Z., & Crum, A. J. (2017, Aug 1). Association Between Indulgent Descriptions and Vegetable Consumption: Twisted Carrots and Dynamite Beets. *JAMA Intern Med, 177*(8), 1216-1218. https://doi.org/10.1001/jamainternmed.2017.1637

Turnwald, B. P., Jurafsky, D., Conner, A., & Crum, A. J. (2017, Nov). Reading between the menu lines: Are restaurants' descriptions of "healthy" foods unappealing? *Health Psychol, 36*(11), 1034-1037. https://doi.org/10.1037/hea0000501

Tuuri, G., Cater, M., Craft, B., Bailey, A., & Miketinas, D. (2016, Oct 1). Exploratory and confirmatory factory analysis of the Willingness to Eat Whole Grains Questionnaire: A measure of young adults' attitudes toward consuming whole grain foods. *Appetite, 105*, 460-467. https://doi.org/10.1016/j.appet.2016.06.023

U.S. Department of Health and Human Services and U.S. Department of Agriculture. (2015). *2015-2020 Dietary Guidelines for Americans* (8th ed.). US Department of Health and Human Services and US Department of Agriculture,. https://doi.org/https://health.gov/our-work/food-nutrition/previous-dietary-guidelines/2015.

U.S. Food and Drug Administration. (1997). *Food and Drug Administration Modernization Act of 1997*. U.S. Food and Drug Administration. Retrieved March 2019 from https://www.fda.gov/RegulatoryInformation/LawsEnforcedbyFDA/SignificantAmendmentstotheFDCAct/FDAMA/default.htm

U.S. Food and Drug Administration. (2018, 2017). *Guidance for Industry: Food Labeling Guide*. United States Department of Health and Human Services. Retrieved November 2020 from https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm2006828.htm

University of Minnesota. (2015). *Principles of Marketing*. University of Minnesota Libraries Publishing. https://dx.doi.org/10.24926/8

Utter, J., Larson, N., Laska, M. N., Winkler, M., & Neumark-Sztainer, D. (2018, May). Self-perceived cooking skills in emerging adulthood predict better dietary behaviors and intake 10 years later: A longitudinal study. *Journal of Nutrition Education & Behavior, 50*(5), 494-500. https://doi.org/10.1016/j.jneb.2018.01.021

Valentine, D. B., & Powers, T. L. (2013, October). Generation Y values and lifestyle segments. *Journal of Consumer Marketing, 30*(7), 597-606. https://doi.org/https://doi.org/10.1108/JCM-07-2013-0650

van Herpen, E., & Trijp, H. C. (2011, Aug). Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. *Appetite, 57*(1), 148-160. https://doi.org/10.1016/j.appet.2011.04.011

van Kleef, E., & Dagevos, H. (2014, September). The growing role of front-of-pack nutrition profile labeling: A consumer perspective on key issues and controversies. *Crit Rev Food Sci Nutr, 55*(3), 291-303. https://doi.org/https://doi.org/10.1080/10408398.2011.653018

Ver Ploeg, M., Mancino, L., Todd, J. E., Clay, D. M., & Scharadin, B. (2015). *Where do Amercians usually shop for food and how do they travel to get there? Initial Findings from the national household food acquisition and purchase survey*. Economic Research Service.

Verbeke, W. (2006, January-March). Functional foods: Consumer willingness to compromise on taste for health? *Food Quality and Preference, 17*(1-2), 126-131. https://doi.org/10.1016/j.foodqual.2005.03.003

Verhagen, T., Boter, J., & Adelaar, T. (2010, October). The effect of product type on consumer preferences for website content elements: An empirical study. *Journal of Computer-Mediated Communication, 16*(1), 139-170. https://doi.org/10.1111/j.1083-6101.2010.01536.x

Verhagen, T., Vonkeman, C., & van Dolen, W. (2016, July). Making online products more tangible: The effect of product presentation formats on product evaluations. *Cyberpsychology, Behavior, and Social Networking, 19*(7), 460-464. https://doi.org/10.1089/cyber.2015.0520

Viechtbauer, W., Smits, L., Kotz, D., Bude, L., Spigt, M., Serroyen, J., & Crutzen, R. (2015, June). A simple formula for the calculation of sample size in pilot studies. *J Clin Epidemiol, 68*(11), 1375-1379. https://doi.org/10.1016/j.jclinepi.2015.04.014

Vrechopoulos, A. P., O'Keefe, R. M., Doukidis, G. I., & Siomkos, G. J. (2004, January). Virtual store layout: an experimental comparison in the context of grocery retail. *Journal of Retailing, 80*(1), 13-22. https://doi.org/10.1016/j.jretai.2004.01.006

Wang, D. D., & Hu, F. B. (2017, Aug 21). Dietary fat and risk of cardiovascular disease: Recent controversies and advances. *Annu Rev Nutr, 37*, 423-446. https://doi.org/10.1146/annurev-nutr-071816-064614

Wansink, B. (2017, March). Healthy profits: An interdisciplinary retail framework that Increases the sales of healthy foods. *Journal of Retailing, 93*(1), 65-78. https://doi.org/10.1016/j.jretai.2016.12.007

Wansink, B., Just, D. R., Payne, C. R., & Klinger, M. Z. (2012, Oct). Attractive names sustain increased vegetable intake in schools. *Prev Med, 55*(4), 330-332. https://doi.org/10.1016/j.ypmed.2012.07.012

Wansink, B., Just, D. R., Payne, C. R., & Klinger, M. Z. (2018, Feb). Corrigendum to "Attractive names sustain increased vegetable intake in schools" [Prev. Med. 55 (4) (2012) 330-332]. *Prev Med, 107*, 114-115. https://doi.org/10.1016/j.ypmed.2017.11.032

Wansink, B., & Sobal, J. (2007, January). Mindless eating: The 200 Daily food Decisions We Overlook. *Environment and Behavior, 39*(1), 106-123. https://doi.org/https://doi.org/10.1177/0013916506295573

Wansink, B., Sonka, S., & Hasler, C. (2004, December). Front-label health claims: when less is more. *Food Policy, 29*, 659-667. https://doi.org/https://doi.org/10.1016/j.foodpol.2004.10.004

Wansink, B., van Ittersum, K., & Painter, J. E. (2005, July). How descriptive food names bias sensory perceptions in restaurants. *Food Quality and Preference, 16*(5), 393-400. https://doi.org/10.1016/j.foodqual.2004.06.005

Wansink, B., van Ittersum, K., & Painter, J. E. (2017, December). Corrigendum to "How descriptive food names bias sensory perceptions in restaurants" [Food Qual. Preference 16 (2005) 393–400]. *Food Quality and Preference, 62*. https://doi.org/10.1016/j.foodqual.2017.05.017

Wasowicz, G., Stysko-Kunkowska, M., & Grunert, K. G. (2015, Jun). The meaning of colours in nutrition labelling in the context of expert and consumer criteria of evaluating food product healthfulness. *Journal of Health Psychology, 20*(6), 907-920. https://doi.org/10.1177/1359105315580251

Wassmann, B., Siegrist, M., & Hartmann, C. (2021). Correlates of the willingness to consume insects: a meta-analysis. *Journal of Insects as Food and Feed*, 1-14.

Wilde, P., Pomeranz, J. L., Lizewski, L. J., & Zhang, F. F. (2020, Aug 10). Consumer confusion about wholegrain content and healthfulness in product labels: a discrete choice experiment and comprehension assessment. *Public Health Nutr*, 1-8. https://doi.org/10.1017/S1368980020001688

Willett, W., Sampson, L., Stampfer, M., Rosner, B., Bain, C., Witschi, J., Hennekens, C., & Speizer, F. (1985, July). Reproducibility and validity of a semiquantitative food frequency questionnaire. *American Journal of Epidemiology, 122*, 51-65. https://doi.org/https://doi.org/10.1093/oxfordjournals.aje.a114086

Williams, B., A., & Mazier, M. J. P. (2013, May). Knowledge, perceptions, and consumption of whole grains among university students. *Canadian Journal of Dietetic Practice and Research, 74*(2), 92-95. https://doi.org/ https://doi.org/10.3148/74.2.2013.92

Willis, G. B. (1999). Cognitive interviewing: a "How To" Guide. Meeting of the American Statistical Association, Research Triangle Park, NC.

Wills, J. M., Storcksdieck genannt Bonsmann, S., Kolka, M., & Grunert, K. G. (2012, May). European consumers and health claims: attitudes, understanding and purchasing behaviour. *Proceedings of the Nutrition Society 71*(2), 229-236. https://doi.org/10.1017/S0029665112000043

Yantis, S. (1993). Stimulus-Driven Attentional Capture and Attentional Control Settings. *Journal of Experimental Psychology: Human Perception and Performance, 19*(3), 676-681. https://doi.org/https://doi.org/10.1037/0096-1523.19.3.676

Yeykelis, L., Cummings, J. J., & Reeves, B. (2014). Multitasking on a single device: arousal and the frequency, anticipation, and prediction of switching between media content on a computer. *Journal of Communications, 64*, 167-192.

Yoo, J., & Kim, M. (2014, November). The effects of online product presentation on consumer responses: A mental imagery perspective. *Journal of Business Research, 67*(11), 2464-2472. https://doi.org/https://doi.org/10.1016/j.jbusres.2014.03.006

Yumivore. (2011). *A brief history of the pancake*. WorkPress. Retrieved March 2019 from http://yumivore.com/2011/05/22/a-brief-history-of-the-pancake/

APPENDICES

## Appendix A. Scale Measurements

A. Health Interest

7-point Likert Scale: *Strongly Disagree, Disagree, Somewhat Disagree, Neither Disagree nor Agree, Somewhat Agree, Agree, Strongly Agree*

1. R The healthiness of food has little impact on my food choices.
2. I am very particular about the healthiness of food I eat.
3. R I eat what I like and I do not worry much about the healthiness of food.
4. It is important for me that my diet is low in fat.
5. I always follow a healthy and balanced diet.
6. It is important for me that my daily diet contains a lot of vitamins and minerals
7. R The healthiness of snacks makes no difference to me
8. R I do not avoid foods, even if they may raise my cholesterol.

B. Knowledge

A 5-item multiple choice scale. Bold and underlined responses are correct.

1) United States dietary guidance for Americans recommends that:
   a) All grains consumed should be whole grains.
   b) **<u>One-half of all grains consumed should be in the form of whole grains</u>**.
   c) Refined grains should not be consumed.
   d) Whole grains are only required during childhood and for optimal athletic performance.

2) Whole grain foods support health because:
   a) Whole grains reduce risks of heart disease and stroke.
   b) Whole grains reduce the risk of certain cancers.
   c) Whole grains reduce risks of diabetes and obesity.
   **d) <u>All of the above.</u>**

3) The definition of whole grains, as defined by the Whole Grain Council, states that a whole grain must contain the following:
   a) The bran and germ of cereal grains present in the same proportion when harvested from the field.
   b) The bran and endosperm of cereal grains present in the same proportion when harvested from the field.
   **c) <u>The bran, endosperm and germ of cereal grains present in the same proportion when harvested from the field.</u>**
   d) Only the bran portion of cereal grains present in the same proportion when harvested from the field.

4) Multi-grain foods:
   a) Are always whole grains.
   b) Are whole grains if they are brown.
   **c) <u>Contain whole grains if the ingredients list the word "whole" next to the grain.</u>**

d) Only single grain products may be whole grains.

5) The following foods are whole grains.
a) 100% whole wheat bread, Whole wheat pasta
b) Brown rice, bulgur and oats
c) Whole wheat tortillas and whole corn tortillas
**d) <u>All of the above.</u>**

C. Attitude

4-item semantic differential scale with 7 bipolar response options
Question: Please rate the food presented on the following categories:
1) positive / negative,
2) like / dislike,
3) good / bad, and
4) desirable / undesirable

D. Whole Grain Consumption

**<u>Whole Grain Consumption</u>** (adapted from Willett, 1985; Rimm, 1992; Ellis, 2005)
*How often do you eat the following foods—*
*Responses: <1/week, 1/week, 2/week, 3/week, 4/week, 5/week, 6+/week, 1/day, 2/day, Missing or Don't know*

1. *Oatmeal (regular, quick or instant)*
2. *Brown Rice (regular or quick cooking)*
3. *White Rice*
4. *Whole Grain Ready-to-Eat cereal*
5. *Ready-to-Eat cereal (not whole grain)*
6. *Whole Grain Pasta*
7. *Pasta (not whole grain)*
8. *Whole Grain bread*
9. *Bread (not whole grain)*
10. *Whole-wheat bagels*
11. *Bagels (not whole grain)*
12. *Whole-wheat crackers*
13. *Crackers (not whole grain)*
14. *Popcorn*

E. Willingness-to-purchase; willingness-to-purchase – 2 separate questions

5-point Likert scale to include: *Never Eaten, Always Unwilling, Sometimes Unwilling, Sometimes Willing and Always Willing.*

Question: *How willing are you to eat/purchase each of the following foods?*

1. Whole-wheat bread

2. Whole grain / brown rice
3. Whole grain breakfast cereal
4. Whole-wheat pasta
5. Multi-grain crackers
6. Whole-wheat pancakes

F. Perceived Competence in Cooking

*Five item 5-point Likert scale to determine level of agreement of statements. Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree and Strongly Agree.*

1. I believe I am talented at preparing health food.
2. I do pretty well preparing healthy food compared with other people my age.
3. I feel pretty confident about my food preparation skills.
4. I am satisfied with my ability to prepare healthy foods.
5. I am pretty skilled at preparing healthy foods.

G. Demographic and food habit Questions

1. In what year were you born? (example text, YYYY)
2. With which gender to you identify?
    a. Male
    b. Female
    c. Other
3. Are you Spanish, Hispanic, or Latino?
    d. Spanish
    e. Hispanic
    f. Latino
    g. None of the above
4. Choose one or more races that you consider yourself to be:
    h. White
    i. Asian
    j. Black or African American
    k. Native Hawaiian or Pacific Islander
    l. American Indian or Alaska Native
    m. Other
5. What is your marital status?
    n. Single
    o. Married
    p. Divorced
    q. Widowed
6. Do you live on-campus?

r. Yes
s. No

H. Grocery and dietary habit questions.

1. How often do you purchase groceries in -person at the various types of stores (multiple times per week, once a week, several times a month once a month less than once a month, never)?
    a. Supermarket
    b. Super-store
    c. Warehouse/discount club
    d. Drug store
    e. Farmers' market
    f. Natural foods store
    g. Convenience

2. Have you ever done any of the following (a. yes, b. no, c.not sure)
    a. Ordered groceries to be delivered
    b. Ordered groceries to be picked up from a store
    c. Ordered from a meal-kit delivery service
    d. Ordered from a prepared meal delivery service

3. On a 7-point scale, indicate your level of agreement:
    a. The price of a food product is important in my grocery food purchase decisions.
    b. The brand of a food product is important in my grocery food purchase decisions.

4. I avoid eating carbohydrates. (Exclusion criteria question)
    a. Yes
    b. No

5. I follow one of the following diets: paleo, gluten-free, keto-, or grain-free. (Exclusion criteria question)
    a. Yes
    b. No
6. Do you use a campus meal plan?
    a. Yes
    b. No
    c. Not sure

7. How often do you prepare your own meals?
    a. More than once a day

   b. Once a day
   c. A few times a week
   d. Once a week or less
   e. I never prepare my own meals
8. Do you shop for your own groceries?
   a. Yes
   b. No
   c. Not sure
9. Do you purchase groceries for people other than yourself?
   a. Yes
   b. No
   c. Not sure

I. Tangibility

*Three item 7-point Likert scale to determine level of agreement of statements. Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree and Strongly Agree.*

1. It is easy to describe many features related to this item.
2. I could easily explain many features associated with this item.
3. It is not difficult to give a precise description of this item.

## Appendix B. Message Manipulations tested and results

| | Whole Grain Bread | Whole Grain Pasta | Brown Rice | Whole Grain Cereal | Whole Grain Crackers | Whole Grain Pancakes | | Total Mean |
|---|---|---|---|---|---|---|---|---|
| *Statement: Sensory* | | | | | | | | |
| *Rich, nutty, and flavorful* | 4.02 | 3.34 | 3.43 | 4.23 | 4.09 | 4.23 | | 3.89 |
| *Chewy, nutty, and full of flavor* | 3.53 | 3.09 | 3.26 | 3.72 | 3.30 | 4.15 | | 3.51 |
| *Golden brown goodness* | 4.36 | 3.68 | 4.21 | 4.34 | 4.21 | 4.89 | | 4.28 |
| ***Rich brown and golden perfection*** | 4.28 | 3.78 | 4.24 | 4.26 | 4.20 | 5.02 | | **4.31** |
| | | | | | | | | |
| *Statement: Health* | | | | | | | | |
| ***Good source of whole grain fiber to support regularity*** | 5.45 | 4.81 | 5.00 | 5.23 | 4.85 | 4.28 | | **4.94** |
| *Contains whole grains to support healthy weight* | 5.26 | 4.83 | 4.87 | 4.98 | 4.70 | 4.04 | | 4.78 |
| *Contains whole grains for heart health* | 5.40 | 4.85 | 4.98 | 5.02 | 4.87 | 4.30 | | 4.90 |
| *Supports healthy weight management* | 4.64 | 4.64 | 4.77 | 4.89 | 4.65 | 3.85 | | 4.57 |
| *Supports Heart Health* | 4.98 | 4.79 | 4.96 | 4.91 | 4.91 | 4.06 | | 4.76 |
| *Diets rich in whole grain foods and other plant foods and low in total fat, saturated fat and cholesterol may reduce the risk of heart disease and some cancers. This product contains 16 grams of whole grains per servings.* | 5.09 | 5.02 | 4.81 | 4.85 | 4.89 | 4.77 | | 4.90 |

## Appendix C. Protocol for Cognitive Interviews

A. Introduction
   a. Greet participant
   b. Provide an overview of cognitive interview purpose
B. Explain cognitive interview process
   a. completely voluntary
   b. share who will see the results
   c. explain procedure and participant role
C. Begin online web experiment (will use pilot study for interview purposes)
   a. Encourage participant to speak out loud
   b. Audio record interview and take notes
D. With each question, ask probing questions
   a. Ask if any reactions / hesitations to questions (including reactions and hesitations to color, size, flow, display, format, wording)
   b. Ask clarifying questions
   c. Probe for detailed understanding
   d. Note any non-verbal communications
   e. Record relevant comments, errors, hesitations and other indicators of potential problems or issues as participant completes online experiment
   f. Provide positive reinforcement to participant for thoughtful and meaningful information as they complete online experiment.
E. Debriefing questions
   a. How easy / difficult was online experiment?
   b. Was anything unclear or confusing?
   c. Other comments?
F. Thank participant for time and assistance.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. John Wiley & Sons.

## Appendix D. Text and Audio Verbiage

| | **Health message: Good source of whole grain fiber to support regularity** | **Sensory message: Rich, brown, and golden perfection** |
|---|---|---|
| **Study Food** | Text / Audio HEALTH<br>*(Versatility, ease of use, replace refined grain product, how to cook/use.)* | Text / Audio SENSORY<br>*(Versatility, ease of use, replace refined grain product, how to cook/use.)* |
| Whole Grain Bread | Betsy's whole grain bread is a good source of whole grain fiber to support regularity. Whole grain bread is a versatile component of any meal; morning, noon and night. Whole grain bread can be dressed up as your morning French toast, your favorite sandwich, or enjoyed all on its own. You decide. | Betsy's whole grain bread is rich, brown, and golden perfection. Whole grain bread is a versatile component of any meal; morning, noon and night. Whole grain bread can be dressed up as your morning French toast, your favorite sandwich, or enjoyed all on its own. You decide. |
| Brown Rice | Betsy's brown rice is a good source of whole grain fiber to support regularity. Brown rice can be substituted for white rice in any dish! And it's as easy to cook as white rice. Simply add 1.5 cups of water or broth and one cup of the rice to a pot. Bring to a boil over high heat. Once boiling, cover the pot and reduce heat to low. Simmer for 20 minutes. Turn the heat off and let rice sit in the covered pot for another 10 minutes. Remove lid, fluff rice with fork, serve and enjoy! | Betsy's brown rice is rich, brown, and golden perfection. Brown rice can be substituted for white rice in any dish! And it's as easy to cook as white rice. Simply add 1.5 cups of water or broth and one cup of the rice to a pot. Bring to a boil over high heat. Once boiling, cover the pot and reduce heat to low. Simmer for 20 minutes. Turn the heat off and let rice sit in the covered pot for another 10 minutes. Remove lid, fluff rice with fork, serve and enjoy! |
| Whole-Wheat Pasta | Betsy's whole wheat pasta is a good source of whole grain fiber to support regularity. Any pasta meal can be easily transitioned to a whole-wheat pasta meal. Add whole-wheat pasta to boiling salted water and simmer for 9-12 minutes for perfectly prepared pasta. Drain and whole wheat pasta is ready to be tossed with your favorite sauce, cheese, or any seasoning. Enjoy! | Betsy's whole-wheat pasta is rich, brown, and golden perfection. Any pasta meal can be easily transitioned to a whole-wheat pasta meal. Add whole-wheat pasta to boiling salted water and simmer for 9-12 minutes for perfectly prepared pasta. Drain and whole wheat pasta is ready to be tossed with your favorite sauce, cheese, or any seasoning. Enjoy! |
| Whole Grain Cereal | Betsy's whole grain cereal is a good source of whole grain fiber to support regularity. The versatility of whole grain cereal is endless. Pour a bowl with your favorite dairy or non-dairy beverage. For colder mornings, heat in a microwave for a warmed version for those colder mornings. Top off a favorite yogurt, cottage cheese or ice cream for crunchy treat. Or, simply eat by the handful to satisfy those in-between meal hunger pangs. Enjoy! | Betsy's whole grain cereal is rich, brown, and golden perfection. The versatility of whole grain cereal is endless. Pour a bowl with your favorite dairy or non-dairy beverage. For colder mornings, heat in a microwave for a warmed version for those colder mornings. Top off a favorite yogurt, cottage cheese or ice cream for crunchy treat. Or, simply eat by the handful to satisfy those in-between meal hunger pangs. Enjoy! |
| Whole Grain Crackers | Betsy's whole grain crackers provide a good source of whole grain fiber to support regularity. Replacing refined-flour crackers with whole grain crackers is an easy way to consume whole grain foods. These tidbits of | Betsy's whole grain crackers are rich, brown, and golden perfection. Replacing refined-flour crackers with whole grain crackers is an easy way to consume whole grain foods. These tidbits of hearty snack food can easily satisfy |

| | | |
|---|---|---|
| | hearty snack food can easily satisfy the pickiest of appetites. Grab a handful and say good-bye to hunger. | the pickiest of appetites. Grab a handful and say good-bye to hunger. |
| Whole Grain Pancakes | Betsy's whole grain pancakes are a good source of whole grain fiber to support regularity. Whipping up a batch of whole grain pancakes is a wonderful way to start your day. Classic additions of syrup or jam add a touch of sweetness to these whole grain griddlecakes. For a creative touch, add a favorite cheese or eggs or meats for more versatility. In a rush? Grab a warmed cake and take breakfast 'to go' to start the day right! | Betsy's whole grain pancakes are rich, brown, and golden perfection. Whipping up a batch of whole grain pancakes is a wonderful way to start your day. Classic additions of syrup or jam add a touch of sweetness to these whole grain griddlecakes. For a creative touch, add a favorite cheese or eggs or meats for more versatility. In a rush? Grab a warmed cake and take breakfast 'to go' to start the day right! |

## Appendix E. Graphics and Product Presentation Page Parameters

### Criteria for Graphic Design Development[1-2]

| Need | Design factor | Chosen Parameters |
|---|---|---|
| Product Brand Design | Type | Founder name – "Betsy's"<br>Should provide clear identity<br>(Avoid name that could cue memory or perception of health, flavor, taste, quality, or other sensory aspects.) |
| | Font | Neutral type |
| | Color | NOT – Red (has been associated with stop, as in traffic lights. On the food label this can signify foods to avoid.)[3]<br>NOT – Green (has been associated with thoughts of health & sustainability. On food label, green can designate healthy, natural, sustainable, low calorie, low fat.)[4]<br><br>Could use – White, Blue, Yellow, Brown |
| | Differentiate | Avoid similarity to other brands |
| | Consistency | Keep consistent with all product images |
| | | |
| Package | Color | Warm – which may cue connection to whole grain foods |
| | Images, Icons, or logos | Avoid addition of these to package – these could cue various concepts of health, sensory or quality |
| | Information | Only brand name and possibly volume amounts<br>Avoid additional print or graphic information<br>Will have limited information so as to not add any confounding information |
| | Differentiate | Avoid similarity or resemblance to other brands |
| | Consistency | Keep consistent with all product images (color, fonts, sizes, etc.) |
| | | |
| Web page | Ideals:<br>• Hierarchy of info<br>• Legible, clear<br>• Appropriate use of color and white space<br>• Relevant to product and audience | Design will simulate what is currently in marketplace.<br>• Hierarchy order:<br>1. product name,<br>2. product image,<br>3. ingredient information,<br>4. nutrition facts panel,<br>5. other information<br>• Great amount of white space |

| | | |
|---|---|---|
| | • Avoid resemblance to competition (differentiate)<br>• Impactful<br>• Effective visual | • Void of other images, graphics<br>• Neutral font<br>• Able to convert to mobile screens easily |
| Message call out | Color | Background color: Contrast color from product package and brand<br>Font color: contrasted from background,<br>Draws attention / Easily recognized (will test for this) |
| | Font type | Neutral |
| | Placement | Above product image to draw attention |
| | Size | Equal or greater than font on Brand label |
| | Consistency | Will be consistent color, font size for all product presentations |
| | | |
| Product Image / Video | Communicates imagery<br><br>Draws attention / Easily recognized (will test for this) | • Avoid a packaged product<br>• Do not use symbol, icon, clip art, etc.<br>• Use: Pictorial of actual product<br>• Select from stock photo / video (will not create new)<br>• Appropriate use of image in relation to brand, web and audience<br>• Style consistent within web design |
| | | |
| Product Descriptive Text / Audio | Draws attention / Easily recognized (will test for this) | • Neutral font<br>• Limited text so to not add confusion / clutter to design<br>• Appropriate use of image in relation to brand, web and audience<br>• Style consistent within web design<br>• Placement after ingredient information<br><br>(This text / audio will communicate health or sensory descriptions and information.) |

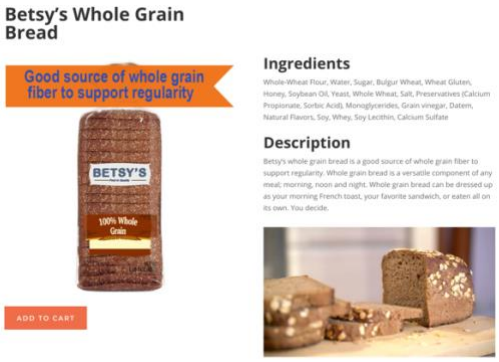

1. Landa, R. (2019). *Graphic design solutions* (Sixth ed.). Boston, MA: Cengage Learning.
2. Hagen, R., & Golombisky, K. (2017). *White space is not your enemy: A beginner's guide to communicating visually through graphic, web, & multimedia design* (Third ed.). Boca Raton, FL.
3. Wasowicz, G., Stysko-Kunkowska, M., & Grunert, K. G. (2015). The meaning of colours in nutrition labelling in the context of expert and consumer criteria of evaluating food product healthfulness. *Journal of Health Psychology, 20*(6), 907-920. doi:10.1177/1359105315580251
4. Schuldt, J. P. (2013). Does green mean healthy: Nutrition label color affects perceptions of healthfulness. *Health Communication, 28*, 814-821.

## Appendix F. Examples of Graphic Simulations of Manipulations

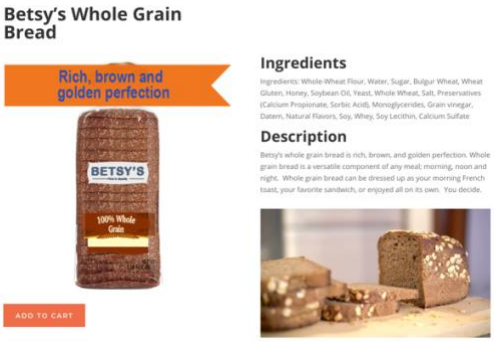
**Bread**


Bread – Refined + NFP

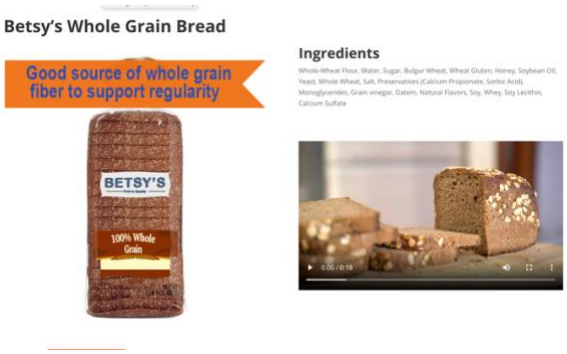

WG Bread -- + NFP



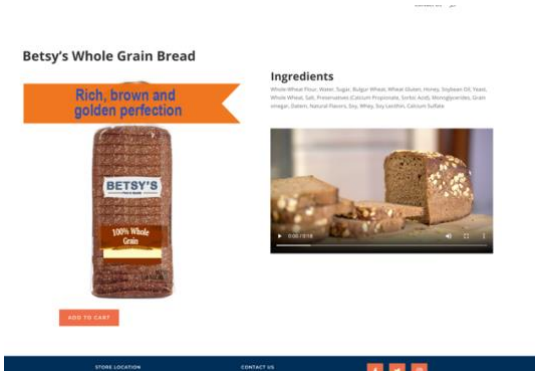

WG Bread – Health Message + Photo/Text




WG Bread – Sensory Message + Photo/Text

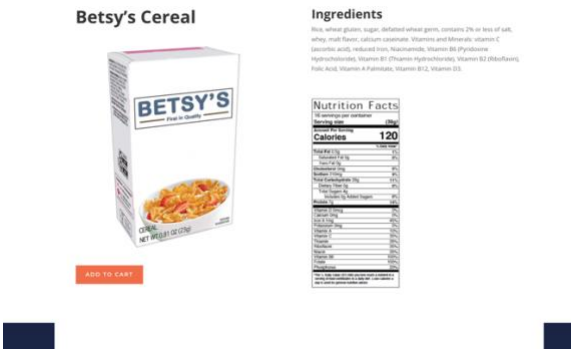



WG Bread – Health Message + Video/Audio Video/Audio

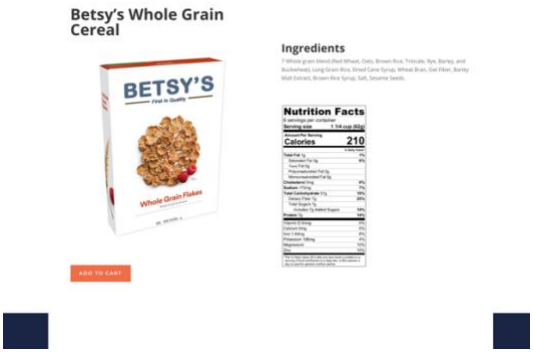



WG Bread – Sensory Message +

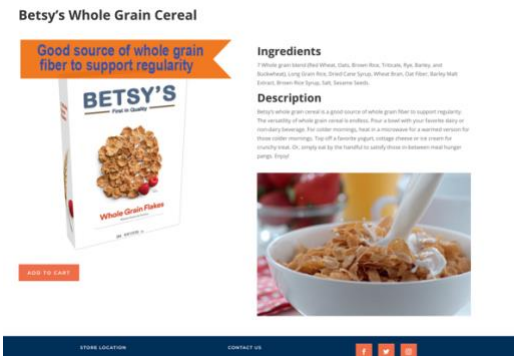
## CEREAL



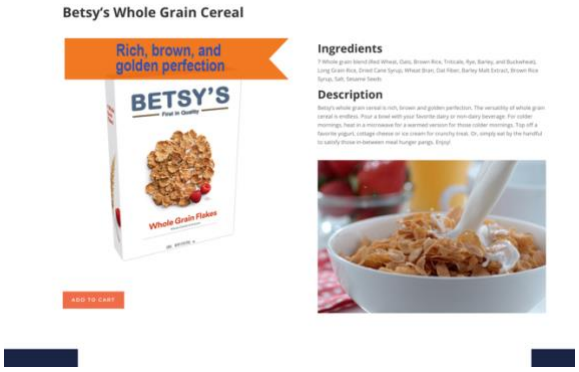

Cereal – Refined + NFP



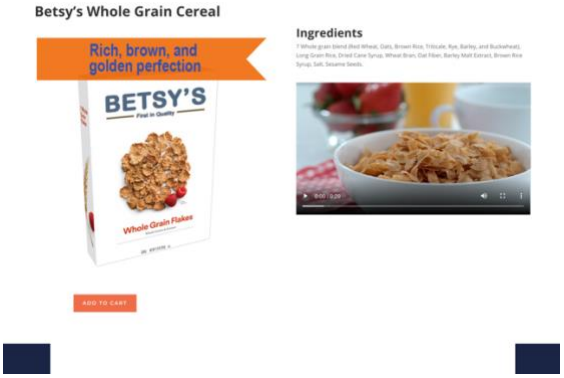

WG Cereal -- + NFP



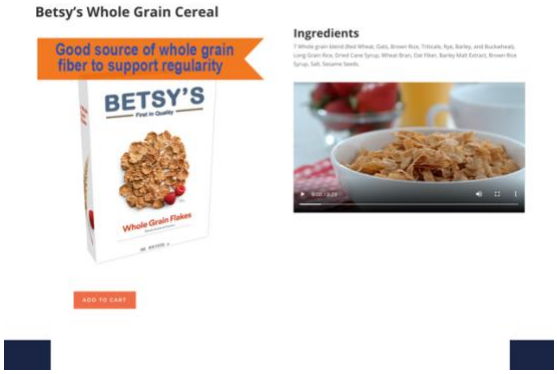

WG Cereal – Health Message + Photo/Text




WG Cereal – Sensory Message + Photo/Text

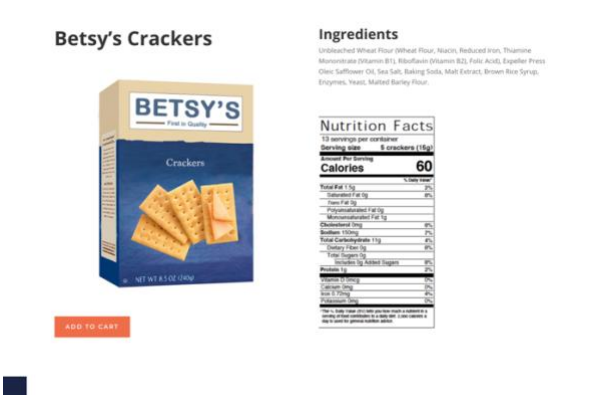



WG Cereal – Sensory Message + Video/Audio

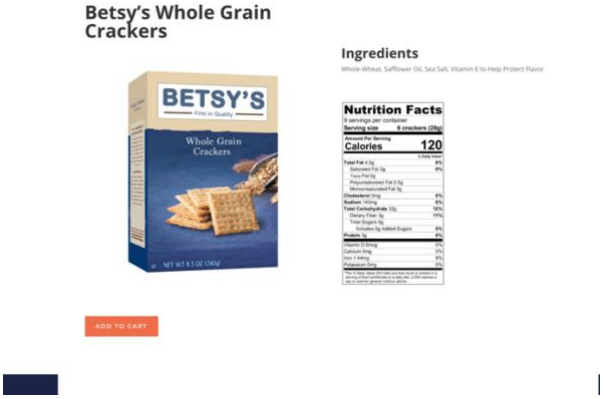



WG Cereal – Health Message + Video/Audio

## CRACKERS



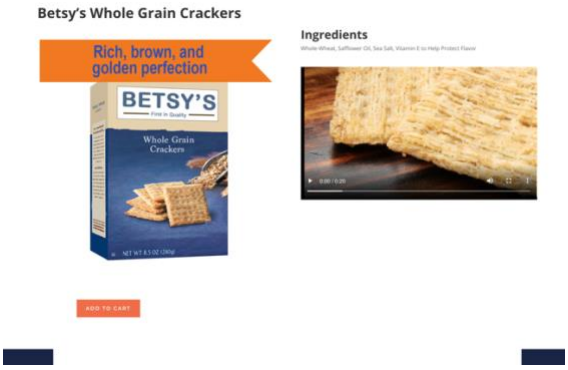

Crackers – Refined + NFP



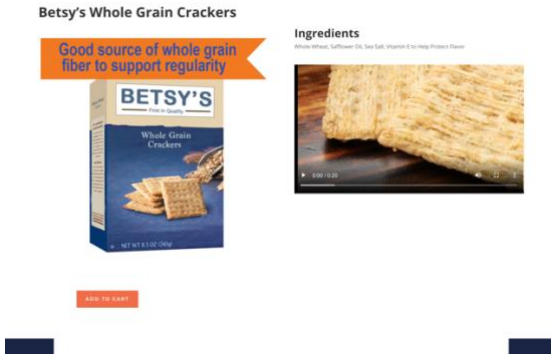

WG Crackers -- + NFP


WG Crackers – Health Message + Photo/Text


WG Crackers – Sensory Message + Photo/Text



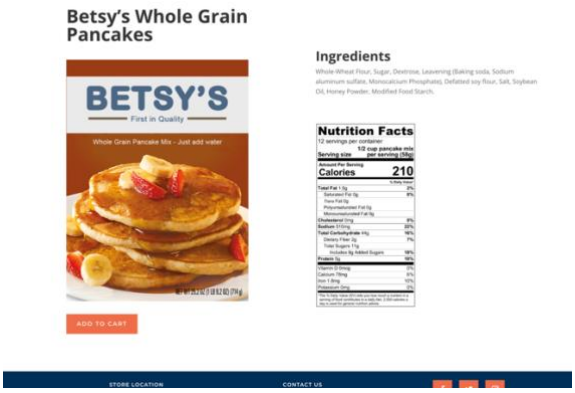

WG Crackers – Sensory Message + Video/Audio



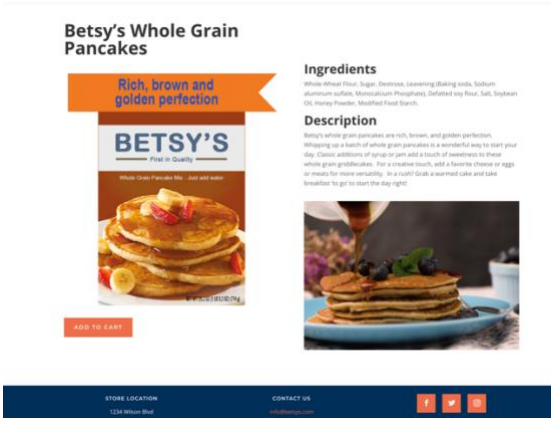

WG Crackers – Health Message + Video/Audio

## Pancakes


Pancakes – Refined grain + NFP

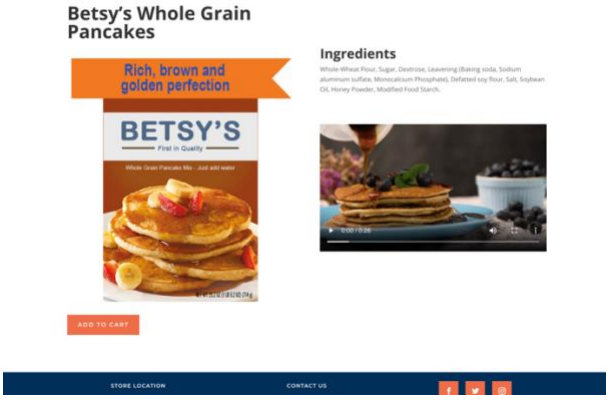



WG Pancakes -- + NFP




WG Pancakes – Sensory Message + Photo/Text


WG Pancakes – Health message + Photo/Text

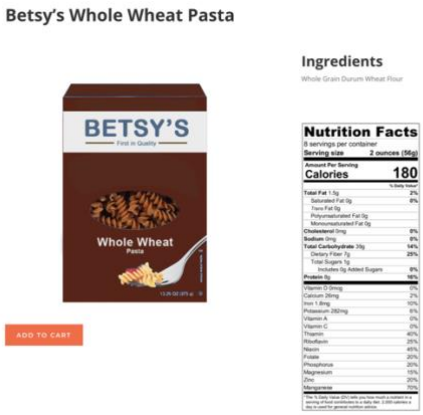



WG Pancakes – Sensory Message + Video/Audio

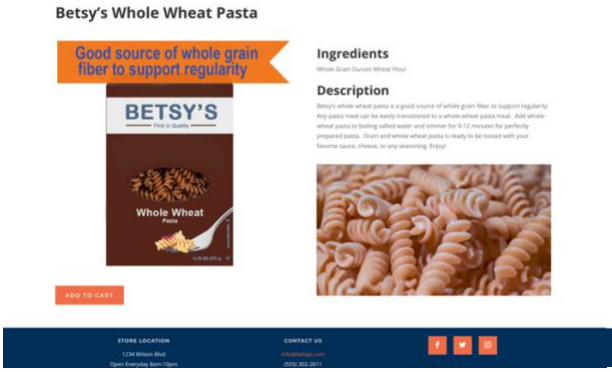

WG Pancakes – Health Message + Video/Audio

## Pastas

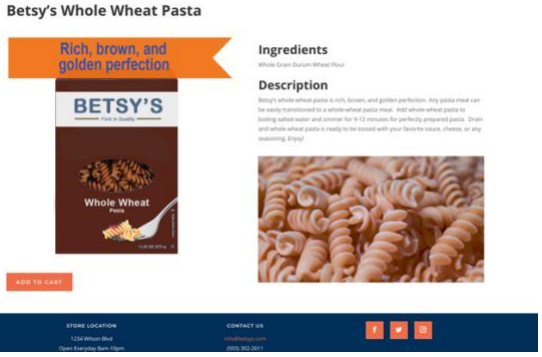

Pasta – Refined + NFP



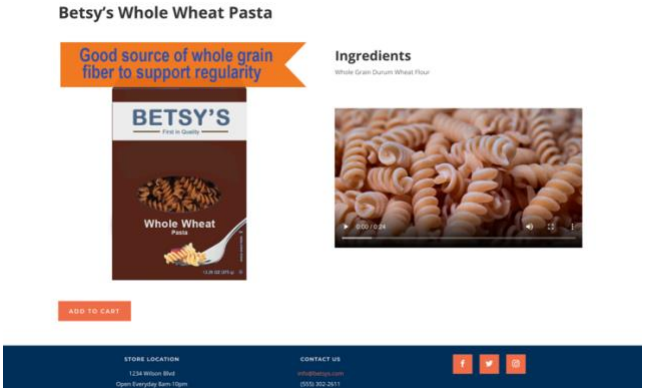

Whole Wheat Pasta -- + NFP



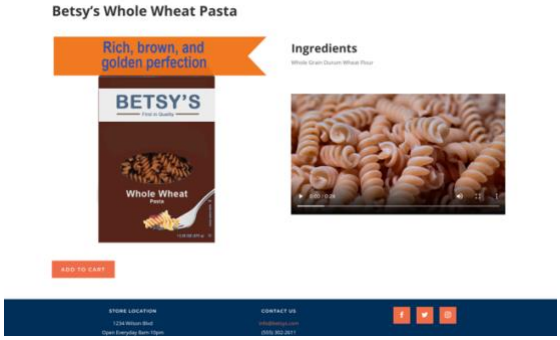

Whole Wheat Pasta – Health message + Photo/Text




Whole Wheat Pasta – Sensory message + Photo/Text




Whole Wheat Pasta – Health message + Video/Audio

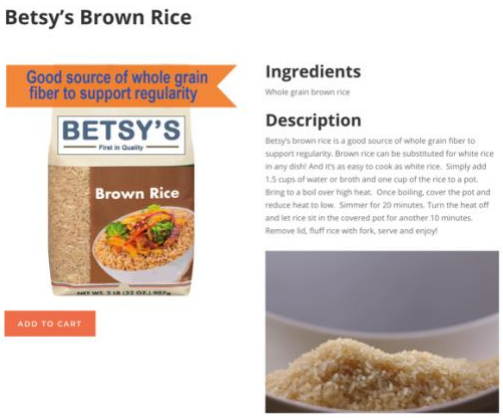



Whole Wheat Pasta–Sensory Message+ Video/Audio

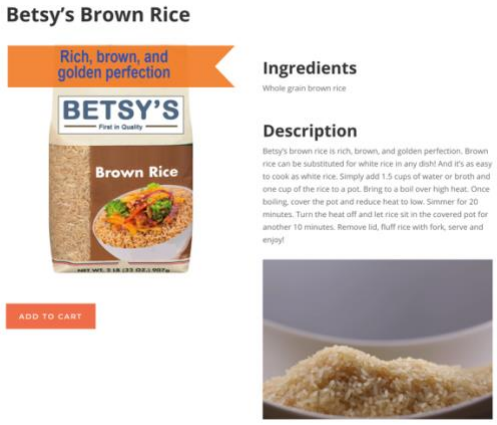
## Rice


Rice – Refined + NFP

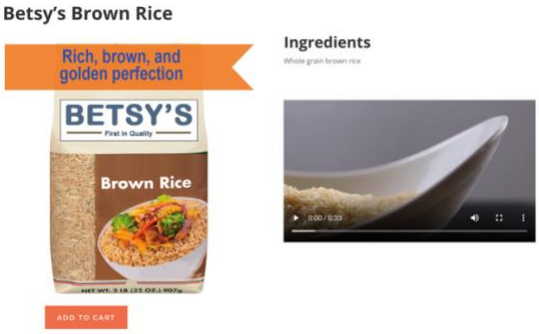

Brown Rice – + NFP



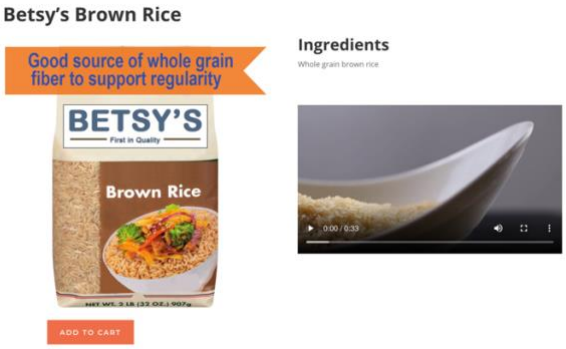

Brown Rice – Health Message + Photo/Text




Brown Rice – Sensory Message + Photo/Text




Brown Rice – Sensory Message + Video/Audio




Brown Rice – Health Message + Video/Audio

## Appendix G. Email Consent forms to participants

A. Consent for Message Development Online Survey

Dear Participant,

My name is Elizabeth Tilak and I am a researcher from Colorado State University in the Journalism and Media Communications department. We are conducting a research study on message development for food products sold in an online grocery simulation. The title of our overall project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator.

We would like you to take an anonymous online survey. Participation will take approximately 5-10 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data to others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on best communication messages associated with food products within online grocery simulation. For your participation, you will be compensated with extra credit for your JTC 100 or JTC 300 course.

There are no risks to you in participating within this online survey. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

To indicate your consent to participate in this research and to continue on to the survey, please click here: <insert link>.

If you have any questions about the research, please contact myself, Elizabeth Tilak, at Elizabeth.Tilak@colostate.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553.

Katie Abrams, PhD
Associate Professor and PI
Dept. of Journalism and Media Communications
Colorado State University
Katie.Abrams@colostate.edu

Elizabeth Tilak
PhD candidate and Co-PI
Dept. of Journalism and Media Communications
Colorado State University
Elizabeth.Tilak@colostate.edu

B. Consent for Cognitive Interviews

Dear Participant,

My name is Elizabeth Tilak and I am a researcher from Colorado State University in the Journalism and Media Communications department. We are conducting a research study on food products sold within the online grocery environment. The title of our project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing*." The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator.

We would like you to participate in a face-to-face interview. Participation will take approximately 60 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data to others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on the best food product messages and presentations for foods sold within the online grocery environment. For your participation, you will be compensated with extra credit for your JTC 100 or JTC 300 course.

There are no risks to you in participating within this online survey. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

To indicate your consent to participate in this research and to continue to schedule your interview time, please click here: <insert link>.

If you have any questions about the research, please contact myself, Elizabeth Tilak, at Elizabeth.Tilak@colostate.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553.

Katie Abrams, PhD
Associate Professor and PI
Dept. of Journalism and Media Communications
Colorado State University
Katie.Abrams@colostate.edu

Elizabeth Tilak
PhD candidate and Co-PI
Dept. of Journalism and Media Communications
Colorado State University
Elizabeth.Tilak@colostate.edu

C. Consent for Online Pilot Study

Dear Participant,

My name is Elizabeth Tilak and I am a researcher from Colorado State University in the Journalism and Media Communications department. We are conducting a research study on food products sold within the online grocery environment. The title of our project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator.

We would like you to take an anonymous online survey. Participation will take approximately 20 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data to others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on the best food product messages and presentations for foods sold within the online grocery environment. For your participation, you will be compensated with extra credit for your JTC 100 or JTC 300 course.

There are no risks to you in participating within this online survey. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

To indicate your consent to participate in this research and to continue on to the survey, please click here: <insert link>.

If you have any questions about the research, please contact myself, Elizabeth Tilak, at Elizabeth.Tilak@colostate.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553.

Katie Abrams, PhD
Associate Professor and PI
Dept. of Journalism and Media Communications
Colorado State University
Katie.Abrams@colostate.edu

Elizabeth Tilak
PhD candidate and Co-PI
Dept. of Journalism and Media Communications
Colorado State University
Elizabeth.Tilak@colostate.edu

D. Consent for Full Stduy

Dear Participant,

My name is Elizabeth Tilak and I am a researcher from Colorado State University in the Journalism and Media Communications department. We are conducting a research study on food products sold within the online grocery environment. The title of our project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator.

We would like you to take an anonymous online survey. Participation will take approximately 35 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data to others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on the best food product messages and presentations for foods sold within the online grocery environment. For your participation, you will be compensated with extra credit for your JTC 100 or JTC 300 course.

There are no risks to you in participating within this online survey. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

To indicate your consent to participate in this research and to continue on to the survey, please click here: <insert link>.

If you have any questions about the research, please contact myself, Elizabeth Tilak, at Elizabeth.Tilak@colostate.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553.

Katie Abrams, PhD
Associate Professor and PI
Dept. of Journalism and Media Communications
Colorado State University
Katie.Abrams@colostate.edu

Elizabeth Tilak
PhD candidate and Co-PI
Dept. of Journalism and Media Communications
Colorado State University
Elizabeth.Tilak@colostate.edu

## Appendix H. Descriptions of research for recruitment through SONA program

### Recruitment Descriptive Information

The following descriptions will be used within the SONA research management program to inform potential student participants.

**Message Development:**

We are conducting an online research experiment on food products sold in an online grocery simulation. The title of our overall project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator. This portion of the research will include a 5-10 minute online survey assessing food product communication messages.

**Cognitive Interviews:**

We are conducting a research study on food products sold in an online grocery simulation. The title of our overall project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator. This portion of the research will include a 60 minute face-to-face interview with a variety of times available to schedule.

**Pilot Study:**

We are conducting an online research experiment on food products sold in an online grocery simulation. The title of our overall project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator. Participation within this online experiment will take approximately 20 minutes.

**Full Study:**

We are conducting an online research experiment on food products sold in an online grocery simulation. The title of our overall project is "*The impact of message type and format on consumers' food quality perceptions and decision making in online grocery purchasing.*" The Principal Investigator is Dr. Katie Abrams, Associate Professor JMC and I am the Co-Principal Investigator. Participation within this online experiment will take approximately 35 minutes.

## Appendix I. Debrief script for research participants

**Debriefing Script**

At the completion of each online portion of this research, participants will view a window with the following statement:

*Thank you for your participation in this research. Your input is greatly appreciated. Your responses will provide valuable information in helping to determine differences of whole grain food product messages and presentations, if any, in the online grocery environment. This information could be valuable in developing best practices for whole grain food product promotions in online grocery.*

*Thank you for your participation and your time. If you have any questions or concerns, please email the Co-PI of this research project at Elizabeth.Tilak@colostate.edu.*

At the completion of the face-to-face cognitive interviews, participants will be given a paper with the same statement.