THE INFLUENCE OF PERSUASIVE COMMUNICATION ON FLORIDA CONSUMERS' CHANGE IN ATTITUDE AND CHANGE IN RISK PERCEPTION OF GENETICALLY MODIFIED FOOD

By

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To the memory of my Mother, Jean Taylor Ruth

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Attitudes	Attitudes are a learned and implicit process which can vary in intensity, as well as direction, and mediate evaluative behavior (Osgood, Suci, & Tannenbaum, 1971). For this study, attitude was measured using six items on a bipolar semantic differential scale.
Elaboration Likelihood Model (ELM)	ELM describes the process through which people interpret persuasive communication (Petty & Cacioppo, 1986). There are two processing routes: central and peripheral. The central processing route requires the individual to use careful consideration to analyze the message, and attitude change is usually predictive of behaviors. The peripheral processing route uses less consideration of the message and relies on peripheral cues, like sources, to form opinions (Petty & Cacioppo, 1986).
Genetically Engineered	Plants which have had their genes altered to produce favorable characteristics, such as growth and nutritional characteristics are called genetically engineered. The Food and Drug Administration (FDA) considers this a more precise term than genetic modification (FDA, 2014).
Genetically Modified Food	Genetically modified food was defined in this study as the intentional change made to organism's DNA in order to promote a desired trait.
Genetically Modified Organism (GMO)	According to the World Health Organization (WHO, 2009), genetically modified organisms are defined as "organisms in which genetic material (DNA) has been altered in a way that does not occur naturally. It allows selected individual genes to be transferred from one organism into another, also between non-related species." (p.104).
Persuasion	"A symbolic process in which communicators try to convince other people to change their attitudes or behaviors regarding an issue through the transmission of a message in an atmosphere of free choice" (Perloff, 2008, p.17).
Shannon and Weaver Model of Communication	This model explains the linear communication that occurs between an information source and recipient. However, unwanted signals called noise can distort the intended message before the recipient interprets it (Lee & Baldwin, 2004; Shannon & Weaver, 1949).

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By

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Science has shown the safety and benefits of using genetically modified food. Consumers have been historically misinformed and uniformed about genetically modified food, which has led to skepticism related to both the products and the producers. A greater understanding for how consumers form perceptions of genetically modified food is essential since public acceptance is related to the success of a product.

The purpose of this study was to examine the influence of persuasive communication on consumers' change in attitude and change in risk perception of genetically modified food. Using a conceptual model based on the ELM and Shannon and Weaver's communication model, an experimental design tested how different message sources (Industry and Government) influenced changes in attitude and risk perception. An online survey was administered to Florida residents using non-probability sampling and post-stratification weighting to match the state's demographics (n = 515).

Results from this study suggested that the message source was associated with change in attitude, but not change in risk perception. Additionally, source credibility influenced attitude change while prior knowledge did not. Risk perception did not appear

to operate within the ELM or proposed conceptual model. The findings suggested that changes in attitude and risk perceptions are processed differently from one another, and further research is needed to explore these differences. Recommendations for practitioners include using more credible sources when communicating about genetically modified food and using value-driven messages because they may elicit more favorable attitudes than simply stating facts about the technology.

CHAPTER 1
INTRODUCTION

The purpose of this research was to analyze the influence of persuasive communication on Florida consumers' change in attitude and change risk perception of genetically modified food. The study was specifically interested in the effect different message sources would have on consumers' change in attitude and change in risk perception of genetically modified food. Chapter 1 described the history and science behind genetically modified (also called genetically engineered) food, the public's opinions of the technology, and the importance of proper communication.

History of Genetically Engineered Food

Humans have been altering the genes in plants for centuries using the science of Charles Darwin and Gregor Mendel, along with laws of hereditability, to select for specific traits (Henig, 2000). These alterations have given the world modern strawberries, wheat, and corn, unrecognizable today compared to their ancestors (Chassy, 2007). Through selective breeding, the productivity of corn has grown from 10 bushels per acre to 200 bushels per acres in only 125 years (University of Illinois Extension, 2001). Watson and Crick discovered the double helix model of DNA in 1954, which led to the realization that each gene encoded for a unique protein and was related to the phenotypes that were expressed. These breakthroughs led to further genome research and the discovery that ribosomal DNA (rDNA) could be inserted into another living organism (Chassy, 2007). This process became known as genetic engineering, and in 1988 genes were successfully inserted into soybean plants, which allowed 70% of the soybeans grown around the world to have been genetically engineered (James, 2007).

Genetically engineered crops have been planted on over one billion acres worldwide (James, 2007). Over 10 million farmers, including eight million in developing countries, have chosen to purchase the more expensive genetically engineered seeds to produce a higher yield, while using less chemicals, labor, and resources (Chassy, 2007; James, 2007). In the United States (U.S.), around 80% of processed food has been estimated to contain genetically engineered food ingredients (Hallman, Hebden, Aquino, Cutie, & Lang, 2003). Eight transgenic crops have been sold commercially as a whole product: corn, soybeans, cotton, canola, alfalfa, sugar beets, papaya, and squash (James, 2007). These crops have been engineered to reduce yield loss due to pests, drought, and disease (GMO answers, 2014). Genetically engineered plants have been grown in over 27 countries, and insecticide use in corn has decreased from 0.21 pounds per acre in 1995 to 0.02 pounds per acre in 2010 (Fernandez-Cornejo, Wechsler, Livingston, & Mitchell, 2014; GMO answers, 2014).

Regulation of Genetically Engineered Food

The United States National Academy of Science (NAS) was asked by the White House to investigate potential threats related to genetically engineered crops (NAS, 1987). NAS concluded that the genetically engineered plants posed little environmental, agricultural, or consumer risk (NAS, 1987). The National Research Council (NRC) followed by stating that engineered plants were just as safe, if not safer, than traditional crops (NRC, 1989). Despite agreement in the scientific community that genetically engineered crops were safe, government regulators were asked to develop separate regulations for engineered plants, due to consumer concerns (Chassy, 2007).

The Food and Drug Administration (FDA) created protocol to regulate the product itself and not the process (FDA, 2014). Using this protocol, the developers of the crop

identified distinguishing attributes of the product and presented allergens and nutrients levels (FDA, 2014). FDA's Biotechnology Evaluation Team then assessed the products to ensure they were within limits of the law (FDA, 2014). The FDA had conducted 95 consultations with seed developers by 2012, 30 of which were with corn (FDA, 2014). As part of the regulations for genetically engineered plants, the U.S. Environmental Protection Agency (EPA) evaluated the environmental impacts associated with genetically engineered, pest-resistant crops. Additionally, the United States Department of Agriculture (USDA) division of Animal and Plant Health Inspection Service (APHIS) has ensured all field-testing of genetically engineered crops were done in a controlled manner to lesson environmental consequences (Lemaux, 2008).

Advantages of Genetically Engineered Food

Approximately 800 million people do not have enough food to lead healthy lives, and poor nutrition leads to the death of three million children each year (Black et al., 2013; Food and Agricultural Organization, 2015). The world's population has been projected to increase from 7.3 billion people to 12.3 billion by 2100, and the available land for agriculture has been predicted to decrease (Chassy, 2003; Gerland et al., 2014). The discovery of genetically engineered plants, and their ability to produce a higher yield using fewer resources, could be a promising solution to this dilemma (Chassy, 2007; Phillips, 2008).

Production advantages

Increased crop yield, reduced cost for food and drug production, reduced pesticide use, and enriched nutrient content have been typical advantages to growing genetically engineered plants (Phillips, 2008). The previously mentioned glyphosate-resistant soybeans have allowed farmers to spray their fields with Roundup, a type of

herbicide, killing the weeds yet leaving the plants healthy (Phillips, 2008). A similar and common product is *Bt* corn. The insecticidal gene protein from the bacterium *Bacillus thuringiensis* was inserted into the maize genome, allowing the plant to be resistant to the European corn borer (Phillips, 2008). Pesticide quantity has been reduced by 37% and cost has decreased by 39%. Even though the genetically engineered seeds are more expensive, the average farmer still gains approximately 69% profit due to a reduction in pest management (Klumper & Qaim, 2014).

Benefits of genetically engineered crops have not been limited to just pest resistance. The papaya industry of Hawaii was saved through genetic research. Papaya ring spot virus (PRSV) was discovered in the 1940s on Oahu and eliminated most of the crop in just 10 years (Gonsalves, Ferriera, Manshardt, Fithc, & Slightom, 2000). The industry relocated to the island of Hawaii in the 1960s, which allowed scientists to find a solution before the virus was able to cross over the water. Traditional treatments, like exposing the fruit to a milder strain of the virus, have proven ineffective when met with an aggressive form of PRSV (Gonsalves et al., 2000). However, a solution was found with the introduction of genetically engineered papaya containing a viral coat protein gene (Gonsalves, 1998). By 2006, over half of the papayas grown on Hawaii were genetically engineered (Lemaux, 2008). Similarly, the citrus disease huanglongbing, or citrus greening, has had devastating effects on the citrus industry globally and in Florida (Satran, 2014). The government and citrus industry have already invested more than $220 million dollars into finding a cure (Putnam, 2012), but genetically engineering the fruit has appeared to be the most promising solution to save the industry (Bove, 2012).

The advantages of genetically engineered crops expand beyond physical characteristics. During traditional selective breeding, a plant's genome can have all the tens of thousands genes involved in the alterations (Chetelat, Deverna, & Bennet, 1995). Since selective breeding has not been specific for a gene, scientists have had no way of knowing what secondary effects may occur. Additionally, selective breeding can only be done between closely related species or genera (Chetelat et al., 1995). Genetic engineering has allowed for precise gene control, meaning that only the specific gene a scientist is interested in will be altered (Cho, Kim, Choi, Buchanan, & Lemaux, 2000). These genes can be linked to specific regulatory signals, making expression only occur in certain parts of the seed (Cho et al., 2000). Genetically engineered plants have not been limited to similar species, and genes can be inserted from other plants, animals, and bacteria (Lemaux, 2008). This has led to DNA combinations never seen before.

Human health advantages

Golden rice was another genetic engineering breakthrough for the agricultural industry and has offered a separate set of benefits. In developing countries, approximately 500,000 children will go blind each year as a result of Vitamin A deficiency, and up to half of those children will die within a year (World Health Organization, 2015). Despite efforts, such as providing Vitamin A pills, fortifying sugar with Vitamin A, and various gardening projects, this issue has still prevailed (Lemaux, 2008). These proposed solutions have been costly and have required continuous public education, making it difficult for developing countries to use these practices (Lemaux, 2008). Golden rice was developed as a genetically engineered variety of rice with increased beta-carotene levels from both daffodil and maize genes (Paine et al., 2005). Beta-carotene is the molecular precursor to Vitamin A, which when eaten will likely be

converted to the vitamin after digestion (Paine et al., 2005). There are currently Golden Rice breeding programs in India, China, Bangladesh, Philippines, and Vietnam (Paine et al., 2005). This genetically engineered rice may not be the only solution to Vitamin A deficiency, but it has been seen as a step toward combating the crisis (Lemaux, 2008).

A number of genetically engineered plants have been developed but not yet released to the public. Genetically engineered, heart-healthy oils will likely enter the market soon. These plant-derived oils have been thought to offer low trans-fat, high mono-saturated fat, and omega-3 fatty acids to help increase heart health (Takeda & Matsuka, 2008). Scientists have also engineered a variety of maize, which can express an immune response in the kernels equivalent to a vaccine, which could eliminate the need for injections and increase mass immunization (Takeda & Matsuka, 2008). The production of blight resistant potatoes has been yet another innovation which could have eliminated the great potato famine in Ireland (Takeda & Matsuka, 2008).

Disadvantages of Genetically Engineered Food

Even though genetically engineered food has been consumed and produced worldwide, and a recent meta-analysis found no issues related to its safety (Nicolia, Manzo, Veronesi, & Rosellini, 2014), the technology has been surrounded by debate and skepticism (Senauer, 2013). An anti-genetically engineered food website has claimed that genetically engineered plants are an “experimental technology which merges DNA to create unstable combinations of plant, animal, bacterial, and viral genes” (GMO Inside, 2014, para. 1). The controversy stems from concerns regarding the lack of long-term studies examining the possible effects of genetically engineered food (Kantor, 2013). Some people suggest genetically engineered crops could cause unknown effects on the environment and people (Nelson, 2001).

Environmental risks

Potential risks to the environment have been a major concern related to the use of genetically engineered crops (Nelson, 2001). Horizontal gene transfer could occur between organisms and promote pesticide and herbicide resistance in plants (Phillips, 2008). If this genomic exchange were to occur between genetically engineered plants and surrounding weeds, the weeds would become herbicide resistant and begin to grow uncontrollably (Ma, Drake, & Christou, 2003). The development of these superweeds has been a major concern and could lead to ecological imbalances due to their resistance to herbicide applications (Ma et al., 2003; Philips, 2008). Superweeds were essentially unknown before the introduction of genetically engineered crops (Benbrook, 2012), but by 2015, weeds had become resistant to 22 out of 25 herbicide action cites as identified by the Weed Science Society of America (WSSA, 2015). Even though pesticide use decreased in the U.S. during the first six years of commercialized genetically engineered crop use, by 2012, pesticide use had actually increased by seven percent (404 million pounds) as a result of the emergence of superweeds (Benbrook, 2012).

Genetically engineered plants may also be harmful to beneficial insects. One study showed that when exposed to *Bt* corn pollen, the mortality rate of monarch butterfly larvae significantly increased (Losey, Raynor, & Carter, 1999). While this study showed the pollen was harmful, the actual threat level was debated among scientists (Phillips, 2008). The concentration of pollen used in the original study was extremely high, and the migratory patterns of the butterflies did not put them in the area during the transgenic pollen shed (Sears et al., 2001). The threat against the monarch butterfly was later determined to be relatively low (Sears et al., 2001).

Human health risks

Members of the public and some in the scientific community have concluded that genetically engineered crops have been related to allergies, irritable bowels, organ damage, and cancer (Phillips, 2008). Until recently, very little literature has been available regarding the safety of genetically engineered food, and most of the health safety research has been conducted by the private companies who developed the seeds (Dona & Arvanitoyannis, 2009). Many people have been concerned that genetically engineered crops could be connected to the rise in allergies over the past decade (Philips, 2008). In 2000 a strain of *Bt* corn, Starlink, was recalled, and the Center for Disease Control (CDC) was asked to investigate the 51 people who fell ill after consuming food with Starlink as an ingredient (CDC, 2001). Over half the people expressed symptoms consistent with an allergic reaction, but none of the patients had Starlink specific antibodies in their serum (CDC, 2001). This indicated that the corn might not have caused the allergy, although some allergic reactions can occur without the presence of the specific antibody (CDC, 2001). Another concern amongst the public has been the possibility of antibiotic resistant genes being transferred to humans (Dona & Arvanitoyannis, 2009). These concerns have not been solidified in research, and an overview of literature pertaining to the safety of genetically engineered food from the past 10 years did not identify any significant health issues related to the products (Nicolia et al., 2014).

Consumer Attitudes toward Genetically Engineered Food

Consumers have tended to believe that genetically engineered foods are not regulated by the government and are not as nutritious as organic options (Chassy, 2007). While numerous peer-reviewed studies have shown that genetically engineered

food have no significant differences in nutritional value, when compared to conventional crops, the public has still felt that genetically engineered food are not as healthy (Lemaux, 2008).

Even with scientifically supported advantages, a large sense of risk has been associated with these new technologies from consumers. Over half of Americans have believed that genetically engineered food are unsafe to eat compared to only 11% of scientists (Funk et al., 2015). Consumers' higher risk perception has been a result of having limited information about the products (Carlson, Frykblom, & Lagerkvist, 2007; Lidskog, 1996). This risk perception has led people to purchase produce free of genetic engineering at a premium price, up to 43% higher than genetically engineered food (Lusk, Jamal, Kurlander, Roucan, & Taulman, 2005).

Studies have shown that a little over half of the American population believes genetically engineered foods are not safe to eat (Langer, 2013). An overwhelming majority has agreed that the federal government should require foods containing genetically engineered food to be labeled, and more than half of the public has said they would not purchase food that was labeled as genetically engineered (Langer, 2013; Pounds, 2014).

Demographics can have an effect on consumers' attitudes toward genetically engineered food (Langer, 2013). Women were significantly less likely to purchase food that had been genetically engineered, compared to men (Napier, Tucker, Henry, & Whaley, 2003; Pounds, 2014). Langer (2013) reported that people under the age of 45 were more likely to call genetically engineered food safe than those over 45 years old, and only a small portion of young adults thought genetically engineered food were

unsafe. People may also not purchase genetically engineered food because of their personal or religious beliefs (Phillips, 2008). Some have believed that “tampering with nature is intrinsically wrong” and is a way to “play God” (Phillips, 2008, para. 6). Some religions have chosen to abstain from introducing new material into their food (Phillips, 2008).

The higher the level of perceived risks consumers associated with genetically engineered food, the less likely they were to purchase genetically engineered food (Napier et al., 2003). Common risks consumers associated with genetically engineered food included human health complications, harm to wildlife, and loss of agricultural productivity (Napier et al., 2003). The top reasons consumers felt genetically engineered food posed a risk were the creation of pesticide resistant weeds or insects and the threat posed to beneficial insects (Napier et al., 2003). A study in Florida showed that consumers believed that genetically engineered food presented a greater risk of food allergies or poisoning and were unsure of the possible advantages of genetically engineered food (Rumble & Leal, 2013). The majority of the public did not believe it had consumed genetically engineered food and agreed that the quality of the products had decreased over recent years (Rumble & Leal, 2013).

Opinions toward Agricultural Biotech Research Companies

Consumers’ skepticism surrounding genetically engineered food has not been confined to just the product. The main sources of information regarding genetically engineered food have been institutions directly involved with the products, and the public has not always viewed the information as unbiased (Huffman, Roussu, Shogren, & Tegene, 2004). The companies selling and researching the technology have been under scrutiny from the public and by the media (Caffrey, 2014; Chaussee, 2014;

Nichols, 2014). Dr. Kevin Folta (2012), a plant molecular biology professor at the University of Florida, said the public has trouble separating its feelings toward these companies with its feelings toward the science. Two major businesses that have been in the spotlight include Green Giant and AgLabs (these are pseudonyms for real companies which will be used throughout this thesis). Green Giant is a large agricultural biotechnology company that is known for its development of herbicide-resistant corn and other herbicide resistant crops (Green Giant, 2014). AgLabs is a similar business involved in genetic engineering research and recently developed a variety of drought resistant corn (Karole, 2014). These are also the two leading companies in field releases for testing genetically engineered crops. As of September 2013, Green Giant had 6,782 authorized field releases and AgLabs had 1,405 (Fernandez- Cornejo et al., 2014).

Green Giant has fallen under a lot of criticism over the past decade and has often been portrayed as the “bully” of the agricultural community (March against Green Giant, 2014). While there have been a number of companies researching and selling genetically engineered seeds, Green Giant has become the most active. From 2000 to 2015, around 1000 articles were published in The New York Times focusing on the company (The New York Times, 2015c). Most media coverage remarked on the seed producer’s multiple lawsuits against farmers who were growing the company’s patent-protected seeds on their family farms (Caffrey, 2014). Green Giant has also been instrumental in lobbying efforts against the labeling of genetically engineered food, saying the labels would increase production costs, making food more expensive (Russia Today, 2014). The media and the public have interpreted these movements as Green

Giant trying to keep consumers in the dark about what they are buying so the company will not lose sales (Russia Today, 2014). A “March against Green Giant” gathered on May 24, 2014 across 50 countries asking the public to sign a petition calling for a five-year ban on genetically engineered food in order to conduct more comprehensive tests (March against Green Giant, 2014).

AgLabs has not had the same media coverage as Green Giant, with only around 121 articles written in The New York Times from 2000 to 2015 about the company (The New York Times, 2015b). The biotechnology company has produced relatively similar seed products and has the same stance on labeling laws as Green Giant but has not been as publicly ridiculed. When AgLabs did appear in popular media, it was almost always in an article involving Green Giant. Typically, the media has focused on the agritech giants and their lobbying against the labeling of genetically engineered food (Dubois, 2014).

Genetically Engineered Food in the Media

Consumers have often sought agricultural information from news media, due to their lack of knowledge about the industry (Zimbelman, Wilson, Bennett, & Curtis, 2005). The popular media has often reported misinformation, due to the complexity surrounding genetic engineering technology and the lack of credible sources (Whitaker & Dyer, 2000). This theme of misinformation has not been confined to just the agricultural industry, but has been seen as an issue with science research in general (Weigold, 2001). The general consumer has shown limited science knowledge, and scientists have not been trained in communication, making it difficult for people to gather accurate information. Due to the media reporting on information, which has often

been vague or biased, consumers have often made conclusions with limited information (Goodwin, 2013).

As the prevalence of genetically engineered crops in the U.S. has risen, so has the coverage by the media. The New York Times, one of the most circulated newspapers in the world, published 660 articles about genetically engineered food from 2000 to 2015 (The New York Times, 2015a). Despite the numerous scientific advancements made in genetically engineered crop production, global coverage of genetically engineered food from 1997 to 2001 has been approximately 90% negative, focusing on health risks (Abbott, Lucht, Jensen, & Jordan-Conde, 2001). Genetically engineered crops were coined “Frankenfood” in a letter written to The New York Times editor by Paul Lewis in 1991. This term gained popularity in 1998 when non-government organizations (NGOs) used the term to further fuel the public’s fear and skepticism toward the technology (Lemaux, 2008). Content analysis of newspaper coverage of agricultural biotechnology has shown that the media typically cover the danger of the technology rather than the safety (Hoban, 1995). Additionally, Marks, Kalaitzandonakes, Allison, and Zakharova (2002, 2003) identified newspapers in the U.S. and U.K. as covering the environmental risks of genetically engineered plants over the benefits.

Companies have also started expressing their views on the debate of genetically engineered food. Chipotle is one of the most vocal businesses, having created two separate televised commercials supporting locally grown organic food and even creating a satire which aired on HULU called “Farmed and Dangerous” (Doering, 2014). Their first commercial, “Back to the Start”, depicted farm animals confined and being injected with various drugs before being released by a benevolent farmer (Chipotle,

n.d.). The commercial launched the “Food with Integrity” campaign, where only “nourishing food” was sold instead of food which was genetically engineered (Ells, 2014). The burrito restaurant has claimed that genetically engineered food production has supported only big agricultural businesses instead of the farmer, and little objective research has existed to support any of the reported benefits of genetically engineered foods. Chipotle said that plants have evolved alongside people naturally for centuries and that tampering with the food is wrong (Ells, 2014). In 2015, Chipotle said they would remove any and all genetically engineered food from their menu, which made them the first national restraint chain to use all non-genetically engineered ingredients (Chipotle, 2015).

During the past several years, the media has focused its attention on genetically engineered food and the lack of labeling of food products containing genetically engineered material. A number of states, including California and Vermont, have voted on whether labeling of genetically engineered food should take place (Chaussee, 2014). Newspapers have also claimed that labeling should occur, because people have the right to know what they are eating and that current label laws hide the ingredients, making it dangerous for consumers to eat (Rabin, 2014).

Agricultural Communications

The knowledge gap between agriculture and consumers has become increasingly apparent as rural and urban areas have begun to intersect (Wachenheim & Rathge, 2000). Knowledge gap, referring the difference between information known and understood in agriculture, has been contributed to by consumer skepticism about agricultural practices and technology. In order to develop effective agricultural

communication practices, understanding consumer perceptions related to agriculture and the developments of these perceptions is essential (Verbeke, 2005).

Communicating about Genetically Engineered Food

Innovations in the food industry are facilitated through the use of new technologies, like genetic engineering (Siegrest, 2008). As the agricultural industry has made improvements in practices and technology, consumers have become increasingly skeptical toward the advancements (Sparks, Shepherd, & Frewer, 1994). Consumer acceptance of new technologies is essential for their success in the food industry (MacFie, 2007). However, many of consumers' concerns related to agricultural production, such as genetic engineering, have failed to be addressed by the agricultural industry (Goodman & Dupuis, 2002).

Consumers typically have limited knowledge of new technologies, including genetic engineering (Durant, Bauer, & Gaskell, 1998). Experts within the biotechnology industry have blamed consumer ignorance for the public's resistance to genetically engineered food (Frewer, Scholder, & Bredahl, 2000), but their lack of knowledge may be a result of the agricultural industry not properly communicating with the public (McCullum-Gomez & Palmer, 2010). Not understanding genetic engineering has made it difficult for consumers to decide about possible risks associated with the technology (Siegrest, 2008). In order to make up for their lack of knowledge, consumers have had to rely on the trust of communication to lessen the complexity of their attitude formation (Earle & Cvetkivich, 1995). However, there has been a lack of communication with the public about genetically engineered food, which has led to debates about the safety of the product and caused distrust toward food producers among consumers (McCullum-Gomez & Palmer, 2010).

Research Problem

Genetically engineered foods have been proven safe and beneficial, but consumers have remained suspicious of the technology and have called for tighter regulations. Modernization of the agricultural industry has developed a disconnect between the farmer and the consumer (Zimbelman et al., 1995). The public has too often been misinformed about the facts surrounding genetically engineered food, causing skepticism and distrust toward the product (Durant et al., 1998; Siegrest, 2008). These views have perhaps been fueled in combination by the negative portrayal of genetically engineered food by the media and lack of communication between the public and the agricultural industry. Additionally, consumers' lack of knowledge regarding genetically engineered food has forced them to rely on the trust of the communication for information (Earle & Cvetkivich, 1995). This has created a need to develop better communication practices, mainly with a focus on the consumer (Telg & Irani, 2012).

Purpose & Objectives

The purpose of this study was to analyze how persuasive communication influenced Florida consumers' change in attitude and change in risk perception of genetically modified food. The following objectives guided this study:

1. Compare Florida consumers' change in attitude toward genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.
2. Compare Florida consumers' change in risk perception of genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.
3. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in attitude toward genetically modified food.

4. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in risk perception of genetically modified food.

Significance

This research will give greater insight into changes in attitude and risk perceptions made by consumers toward genetically engineered crops after receiving persuasive communication. Since consumers possess limited knowledge of new technology, such as genetic engineering, they have to trust communication about the products to be accurate (Durant et al., 1998; Earle & Cvetkivich, 1995). The agricultural industry has lacked exhibiting communication with the public, making it difficult for consumers to trust the technology and food producers (McCullum-Gomez & Palmer, 2010). In order for a new food technology to be successful, consumers must first accept it (MacFie, 2007). Consumer acceptance is largely guided by their perceptions, which must be further analyzed to develop proper communication for genetically engineered food (Verbeke, 2005). The results of this research can be applied in the industry to help consumers better understand the technology and to make more informed decisions about genetically engineered products. Industry companies, retailers, advertisement agencies, agricultural communicators, extension agents, and government organizations can use this information to develop messages that will be better received by the consumer. Agricultural companies, agricultural communicators, and food retailers can use the results of this study to create effective messages and communication to promote the sale of genetically engineered food. Advertising agencies can use this research to gain a deeper insight into how source credibility can affect consumers' attitude and as a result, develop better advertising campaigns. Extension agents will find this research useful when presenting information about genetically engineered food

to the general public or teaching farmers how to present information about genetically engineered products. Finally, government agencies can use this research to guide their future communication strategies and policies.

Summary

Humans have been modifying the genetic traits of plants for centuries. It was not until the late 1980s that scientists were able to manipulate specific genes in organisms, even inserting DNA from one genome into another (Henig, 2000; Hinchee et al., 1988). Genetic engineering of plants has given the world crops which will grow faster, cheaper, and use less land, helping to solve the issue of the expanding population (James, 2007; Chassy, 2007). The technology has also created crops resistant to disease and higher in vitamin content (GMO answers, 2014). Even though genetic engineering has been proven safe and the science detailing the possible dangers is limited, the media has still portrayed genetically engineered food negatively (Abbott et al., 2001). Additionally, the agricultural industry has not properly communicated with the public on the topic, which has led to skepticism and concern (Goodman & Dupuis, 2002). Consumers have been demanding tighter government regulation, as well as labeling laws, and have grown more and more concerned about the environmental and health impacts of genetically engineered food (Phillips, 2008). Consumers have also held strong feelings toward the companies producing the seeds. Organized marches against agritech companies have even petitioned for a five-year ban of genetically engineered food (March against Green Giant, 2014).

Consumers have been misinformed concerning genetically engineered food, making it more difficult for the industry to market these scientifically advantageous products (Weigold, 2001). Agricultural communicators need to determine more effective

messaging strategies to allow the public to make informed decisions. Looking at message sources and the effect they have on attitudes and risk perceptions of genetically engineered food has been one approach to the problem (Durant et al., 1998). This study will be valuable to the industry, communicators, extension agents, and government organizations to create new communication strategies to aid consumers in making informed decisions.

CHAPTER 2
RELEVANT LITERATURE

Chapter 1 discussed the advantages and disadvantages of using genetically engineered food along with consumers' attitudes toward the product, and the importance of properly communicating about the technology. Chapter 2 focused on the theoretical foundation for this research along with literature relevant to consumers' formation of attitudes toward genetically engineered food.

Shannon and Weaver Communication Model

Claude Shannon developed a classical model for transmitting information in 1949 at Bell Telephone Laboratories (Lee & Baldwin, 2004). Warren Weaver discovered that the model could be applied to more than just the engineering project for which Shannon had intended (Shannon & Weaver, 1949). The model (Figure 2-1) has been used to examine a number of communication processes between people, from interpersonal to mass communication (Lee & Baldwin, 2004).

The Shannon and Weaver communication model explains the linear process of how a message moves from the information source to the final destination (Lee & Baldwin, 2004). The model starts by using a source to develop a thought or idea. A transmitter then transforms the thought into a signal, which moves through a channel. Finally, a receiver accepts the signal, creating a new mental image of the thought for the final destination. In simplest form, the model demonstrates how Person A is the information source with a thought, using his/her mouth to transmit the message. Air can be considered the channel, and Person B's ear is the receiver. As the destination, Person B then develops a mental image of the message (Lee & Baldwin, 2004). The transmitter is not always the only sound in the room (Lee & Baldwin, 2004). Unwanted

signals, called noise, can add clutter and distort a message (Lee & Baldwin, 2004; Shannon & Weaver, 1949).

Even though this model was intended for the transmission of voices over radio waves, communicators have applied the theory to the encoding and decoding of messages (Lee & Baldwin, 2004). In the example described above, Person A had to transform a thought into a code the receiver could understand. The code in that case was language. Person B then had to decode the message to create his or her own mental image of the language used. The previously mentioned "noise" can distract the receiver during the decoding process and alter the intended message (Lee & Baldwin, 2004).

Attitudes

Attitude is a "state of mind of the individual toward a value" (Alport, 1935, p. 6). Attitude has also been defined as:

- "An association between a given object and a given evaluation." (Fazio, 1989, p. 155)
- "A learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object." (Fishbein & Ajzen, 1975, p. 6)
- "A more or less permanently enduring state of readiness of mental organization which predisposes an individual to react in a characteristic way to any object or situation with which it is related." (Cantril, quoted in Allport, 1935, p. 804)

These various definitions have demonstrated that many components are involved in attitude formation. The reoccurring themes have been that attitudes are a learned tendency and can steer behavior (Perloff, 2008). No one is born with attitudes, and much of a person's initial opinion formation occurs during adolescence. Attitudes are developed over time through various socializations and interactions (Perloff, 2008). Tesser (1993) argued that attitudes are not genetic, except for inherited traits like taste

and smell, which can impact attitudes toward things like food or perfume. Attitudes are essential in the development of thought and action (Perloff, 2008). They help to organize an individual's social world, categorizing people, places, and events in life.

Behavior is also greatly impacted by a person's attitude. The old proverb of "practice what you preach" has been reflective in society's desire to stay consistent with their opinions and actions (Perloff, 2008). Characteristics of attitudes, like structure and strength, can vary from person to person, as well as situation to situation (Perloff, 2008). Structure, such as general versus highly specific, is one way to differentiate attitudes (Ajzen & Fishbein, 1977). A general attitude is considered the global evaluation, can be used in many different situations, and is typically directed toward an object (Perloff, 2008). A specific attitude differs because it is evaluative of a single incident and is typically directed toward a behavior (Perloff, 2008). For most cases, general attitude cannot predict behavior but can be generalized to the public. In contrast, a specific attitude cannot be applied to a general public but is predictive of behavior. Attitude strength can also affect a person's actions. People who have stronger attitudes make more predictable behavioral decisions (Perloff, 2008). This can be best demonstrated with political issues. If individuals feel strongly about immigration, they are more likely to lobby for legislation or stand in a picket line.

Characteristics of the person can be just as influential toward behavior as characteristics of the attitude. Two major factors influence attitudes: Self-monitoring habits and direct experiences of the individual (Perloff, 2008). Snyder (1974) described self-monitoring people as those who pick up social cues to attempt to behave in a manner they believe is "correct" for the situation. Low-self monitors differ by looking at

their internal feelings rather than the situation to decide how to behave. Experience has also been concluded to affect attitude (Perloff, 2008). Direct experience can lead to attitudes which “are more clearly defined, held with greater certainty, more stable over time, and more resistant to counter influence” (Fazio & Zanna, 1981, p. 185).

The theory of planned behavior has been used for years to predict individuals’ behaviors (Ajzen, 1991). This theory takes into account peoples’ attitude toward the behavior, along with the subjective norm in society, and their perception of how much control they have over a behavior. Fishbein and Ajzen (1975) developed a separate model to predict behavior called the theory of reasoned action. This concept relies on four different factors: attitude toward the behavior, subjective norm, behavioral intention, and behavior (action in a situation). Both the theory of planned behavior and the theory of reasoned action suggest that attitudes do not predict behavior when subjective norms apply. That is, when there is pressure from peers or society, behavior will not always reflect attitude. In most cases though, these theories support the idea that people will behave according to attitude.

Persuasive Communication

Since attitudes are developed over time from learned experiences, attempts to change an existing attitude can be met with resistance. Persuasion can be described as “a symbolic process in which communicators try to convince other people to change their attitudes or behaviors regarding an issue through the transmission of a message in an atmosphere of free choice” (Perloff, 2008, p. 17).

Persuasion is often a symbolic process (Perloff, 2008). The symbols can range from messages, like “freedom” and “justice”, to nonverbal cues, such as the American flag or the Starbucks logo. Communicators can use symbols to alter the opinions of the

public (Perloff, 2008). Persuasion, the study of attitudes and how to change them, has also attempted to influence individuals (Perloff, 2008). However, persuasion has not always been seen as acceptable. In order for persuasion to succeed, communicators must know on some level they are trying to alter the recipient's attitude or behavior (Perloff, 2008). Not only is the communicator intending to sway someone's opinion, but the recipient must also persuade himself or herself for an attitude to change. Whalen (1996) said,

> You [cannot] force people to be persuaded- you can only activate their desire and show them the logic behind your ideas. You [cannot] move a string by pushing it, you have to pull it. People are the same. Their devotion to and total commitment to an idea come only when they fully understand and buy in with their total being. (p. 5)

Another important aspect of persuasion is that it involves the transmission of a message (Perloff, 2008). This message can be verbal or non-verbal, rational or irrational, via mass media or person-to-person (Perloff, 2008). People must also have free choice for persuasion to be effective. Since self-persuasion is essential, individuals must be able to freely process the information (Perloff, 2008).

Persuasion can be described as having an impact on attitude by shaping, reinforcing, or changing the attitude (Miller, 1980). Perceived association can attract and mold attitudes; this type of communication is called shaping persuasion (Perloff, 2008). An example of this type of messaging has been when celebrities endorse a makeup brand to convince consumers that the products will make them beautiful. Reinforcing persuasion serves to strengthen current attitudes (Perloff, 2008). If a consumer is already a fan of a certain football team, exposure to a commercial will only strengthen their attitude. Finally, changing persuasion refers to communication trying to actively alter attitudes (Perloff, 2008). Changing persuasion has often been seen in politics,

racial segregation, and women's suffrage, for example, and requires repeated exposure to the communication (Perloff, 2008).

The Yale attitude change approach was the first empirical research that was conducted on the effect of persuasive communication (Perloff, 2008). Hovland, Janis, and Kelly (1953) examined the effect of the source's credibility, interest in the message, and participants' personalities on attitudes. Hovland et al. (1953) argued that persuasion requires that receivers learn the message arguments, and change in attitude occurs in a series of steps. While studies have indicated that as people become more knowledgeable about an argument, they are more likely to accept the position, researchers cannot assume that people will be able to just passively receive information and understand it (Chaiken, Wood, & Eagly, 1996; Perloff, 2008).

The cognitive response approach to persuasion has suggested that an individual's mental reaction to a message plays a large part in attitude change. This approach has helped to fill a missing gap in the Yale attitude change approach (Brock, 1967). Cognitive responses can include both favorable responses, as well as criticisms elicited by the message. Persuasion can only occur if people view the message as more favorable than unfavorable. However, some researchers have argued that the cognitive approach still has issues. First, it assumes that people always think highly about messages, and secondly, the cognitive approach does not examine how messages influence people (Perloff, 2008).

To address issues with the cognitive model approach, researchers have developed process-based models for persuasion. The Heuristic-Systematic Model (Chaiken, Liberman, & Eagly, 1989) and the Elaboration Likelihood Model (ELM; Petty

& Cacioppo, 1986) have been the most common process-based models used to understand persuasion. These are both dual-process models that have examined how ways of thinking and processing information can affect persuasion. The Heuristic Model uses two routes to describe how individuals process information (Chen & Chaiken, 1999). The first route is the systematic route, which requires the receiver to use a high level of thought when considering an argument. The second route is heuristic processing, which allows the person to apply memories and cognitive structures to an argument rather than intense analysis (Chen & Chaiken, 1999). While the Heuristic model has been proven reliable in persuasion research, the ELM has been examined more often in research (Perloff, 2008), as it provides a more comprehensive understanding of persuasive communication effects (Perloff, 2008).

Elaboration Likelihood Model

The Elaboration Likelihood Model (Figure 2-2) of persuasion was originally developed to account for both active and passive processors of information (Petty, Brinol, & Priester, 2009). ELM demonstrates that the consequences of persuasion can be different, depending on whether the thought process is high or low (Petty & Cacioppo, 1986; Petty & Wegner, 1999). The model explains how an individual processes persuasive communication, but it can also be used to explain attitude shifts, which are not always associated with persuasion (Petty & Cacioppo, 1986). There are two routes in which attitude change can occur: the central processing route and the peripheral processing route. The central processing route occurs when an individual uses careful consideration, along with past experiences, to develop opinions (Petty et al., 2009). The peripheral processing route uses a less extensive thought process;

instead, the route relies on peripheral cues, like message source or number of arguments (Petty & Cacioppo, 1986).

Seven postulates have provided the basis of the ELM (Petty & Cacioppo, 1986):

1. People want to hold what they believe to be correct attitudes.
2. Elaboration is on a continuum and is dependent on the situation of the argument, as well as the amount and nature of issue-relevant material in the message.
3. Variables can play multiple roles within an argument depending on the context of the communication. The role can be a persuasive argument, serve as peripheral cue, or impact the extent of elaboration.
4. Objective processing occurs when variables influencing ability and motivation to process are unbiased and either enhance or reduce scrutiny toward an argument.
5. Biased variables can lead to either positive or negative ability/motivation to process information and create bias in the issue relevant thoughts of the receiver.
6. As issue-relevant thinking increases, the use of peripheral cues decreases. However, when argument scrutiny is low, the impact of peripheral cues increase.
7. Attitudes changed by the central processing route are more persistent and are resistant to persuasion.

Elaboration

Petty and Cacioppo (1986) defined elaboration in persuasion as the "extent to which a person thinks about the issue-relevant material contained in a message" (p. 129). The likelihood of elaboration is high when the motivation and ability to engage in thinking about an issue are also high (Petty & Cacioppo, 1986). High elaboration leads people to draw upon past experiences, scrutinize and elaborate on present messages, and access relative associations and images to develop overall attitudes toward the message (Petty & Cacioppo, 1986). The model suggests that once elaboration has occurred, people's translation of the argument will be integrated into their belief structure, or schema, and a new attitude toward the object will be formed (Cacioppo & Petty, 1986). Elaboration can be conducted in a fairly objective manner when

dependent on the strength of the issue-relevant arguments in the message (Petty & Cacioppo, 1986). Other times, the elaboration is actually biased and governed by the individual's prior attitudes (Petty & Cacioppo, 1986).

The amount of elaboration people use in response to persuasive communication is considered to be on a continuum (Petty & Cacioppo, 1986). Elaboration ranges from no thought of considering the issue-relevant material of a message to scrutiny of every argument presented, resulting in integration of the new attitude into a person's schema (Petty & Cacioppo, 1986). The central route of persuasion is used when the motivation and ability to scrutinize arguments are high, leading to a higher likelihood of elaboration (Petty & Cacioppo, 1986). The peripheral processing route is used when motivation and ability are low, resulting in a low likelihood of elaboration (Petty & Cacioppo, 1986).

Central Processing Route

As mentioned earlier, the central processing route is used when the motivation and ability to process a message are high, consequently leading to a greater likelihood of elaboration and attitude change (Petty & Cacioppo, 1986). The process involves actively generating positive or negative thoughts in response to a persuasive message (Petty et al., 2009). Not every argument is interesting to a consumer, and not every situation allows time for proper evaluation of the message (Petty et al., 2009). However, when the content is relevant, and individuals are able to carefully consider the message, people can evaluate the extent to which they agree or disagree with the arguments, ultimately affecting attitudes. As mentioned previously, the more knowledgeable individuals are toward the subject, the more likely they are to use greater elaboration and thoughtfully process the information. The purpose of this route is to determine if the arguments presented have any merit (Petty et al., 2009).

The information that is considered central to an issue can differ, depending on the person viewing the message and the situation itself (Petty et al., 2009). For example, when considering social issues (such as capital punishment), some people may feel religious considerations hold more weight, while others focus more on the legalistic and logistical arguments (Cacioppo, Petty, & Sidera, 1982). The most important dimensions of the argument, as evaluated by the person, receive the most scrutiny and lead to elaboration (Petty et al., 2009; Petty & Wegener, 1998).

If the individual has the ability and motivation to process the information, either more or less favorable thoughts will form (Petty et al., 2009). If the individual's thoughts toward the topic remain the same, the original attitude will be retained (Petty et al., 2009). Once individuals have developed their thoughts toward the message, the new thoughts need to be integrated into their cognitive structure for attitude change to occur (Petty et al., 2009). If there is no change in the cognitive structure, the individual will shift from use of the central processing route to the peripheral processing route for attitude formation (Petty et al., 2009). Cognitive structural change is more likely to occur if the attitudes are rehearsed and held with confidence (Petty et al., 2009).

Even if the new thoughts become fully integrated, one cannot always claim the thoughts to be accurate (Petty et al., 2009). Regardless of how extensive the information processing may be, bias can still occur (Petty et al., 2009). Bias can be a direct result of an individual's prior attitude, prior knowledge, or emotional state at the time of message exposure (Petty et al., 2009). Essentially, attitudes are changed as the result of an extremely thoughtful process when people use their past experiences and knowledge, along with the dimensions they deem as central to the issue, to integrate

thoughts into their schema (Petty et al., 2009).

After a change in cognitive structure occurs, there will either be a central positive or central negative attitude change (Petty et al., 2009). Attitude change through the central processing route has distinct characteristics (Petty et al., 2009). These attitudes are predictive of behavior, persistent, held with confidence, and resistant to change until challenged by opposing arguments (Petty, Haugtvedt, & Smith, 1995). These persistent attitudes are a result of the attitudes being well developed and integrated into a person's cognitive structure (Petty et al., 1995).

Peripheral Processing Route

Sometimes an individual's motivation or ability to process information is low, and persuasion occurs through the peripheral processing route (Petty et al., 2009). This route acknowledges that people are not always actively thinking about the communication they receive and sometimes must rely on peripheral cues to form an attitude (Petty et al., 2009). McGuire (1969) stated that people often act like "lazy organisms" (p. 198), and this characteristic sometimes leads to people needing to use simpler means of evaluations when exposed to persuasive communication (Bem, 1972).

After individuals are exposed to persuasive communication, they must first be motivated to process the information (dependent on personal relevance, need for cognition, etc.) using the central processing route (Petty et al., 2009). If motivation is not present, the peripheral processing route will be used. This process will be effective in changing attitude if the peripheral cues are operating effectively. If the cue is not effective, the initial attitude will be retained. Just because the individual is motivated to process does not guarantee use of the central route. A person must also possess the ability to process the communication. The ability to process information is often

associated with knowledge of the topic (Petty & Cacioppo, 1986). When knowledge of the topic is limited, elaboration is reduced, and the peripheral route will be used (Petty et al., 2009). Individuals either retain their initial attitude or experience a peripheral attitude change, depending on the effectiveness of the peripheral cue (Petty et al., 2009).

Peripheral cues can serve to elicit positive associations with a product, like the pleasant scenery in a commercial, similar to classical conditioning (Staats & Staats, 1958). Message sources are one type of peripheral cue and can be viewed as experts by the recipients, eliciting more favorable responses to an argument than just the message alone (Chaiken, 1987). Additionally, when a large group supports a message, others will follow simply because it appears correct (Axsom, Yates, & Chaikem, 1987). This bandwagon effect has been used by a number of persuasive speakers in the past (Lee & Lee, 1939).

The peripheral approach has proven to be effective in the short term (Petty et al., 2009). The issue lies in the fact that people's emotions toward sources can change, and cues associated with messages can dissipate (Petty et al., 2009). Therefore, attitude change that occurs through the peripheral processing route is said to be "less accessible, enduring, and resistant to attacking messages" (Petty et al., 2009, p. 135) than attitudes formed by the central processing route. Essentially, this type of attitude formation is the result of passive evaluation of simple cues with a weaker foundation (Petty et al., 2009). As time passes, these cues lose meaning, and attitudes shift back to the original thoughts of the individual (Petty et al., 2009).

Prior Knowledge

Prior knowledge has been identified as a factor affecting an individual's ability to process information (Petty & Cacioppo, 1986). When people are well informed concerning an issue, they are much more likely to thoughtfully process a persuasive message. Having more knowledge about the subject allows people to evaluate the legitimacy of the information more carefully and identify shortcomings of the communication (Wood, Rhodes, & Biek, 1995). Since people who are knowledgeable about a topic process information with a higher amount of elaboration, they typically use the central processing route (Wood et al., 1995). Those who are not as informed rely on the peripheral route. These peripheral processors are not as confident in their opinions and are more susceptible to contradicting persuasion to their new attitude (Perloff, 2008).

Source Cues

Petty and Cacioppo (1986) proposed that peripheral cues can "affect attitude in the absence of argument processing" (p. 134). A common example of a peripheral cue is the message source (Petty et al., 2009). The way a source is perceived has been linked to the likeliness of elaboration and changes in attitude (Priester & Petty, 1995).

Credibility of a source has been defined as "the attitude toward a source of communication held at a given time by a receiver" (McCroskey, 1997, p. 87). Source credibility is part of a two-way interaction between a communicator and receiver (Perloff, 2008). Thus, just because a speaker may be famous does not mean he or she is viewed as credible by the listener. A number of components have been found to comprise a credible source. Perloff (2008) listed expertise, trustworthiness, and goodwill as the most researched and most important aspects of credibility.

Expertise refers to the perceived knowledge of the communicator (Perloff, 2008). Use of “experts” has been a proven communication strategy to impact attitudes, and experts have often been perceived as credible (Perloff, 2008). However, communicators should be careful how they use experts. For example, if a group is trying to communicate with inner-city drug abusers, using doctors would not be the best choice. Even though doctors are knowledgeable about public health, the drug abuser’s receiver would not view them as expert. A better choice would be a former drug user with whom the intended receivers could connect (Perloff, 2008).

Trustworthiness refers to the source’s perceived honesty, safety, and character (Perloff, 2008). The trustworthiness of a source can sometimes be a crucial component of credibility. Communicators can lack expertise, but if they are viewed as trustworthy, persuasion can still occur. Goodwill communicators make receivers feel as though the speaker has their best interest at heart. Sources that are considered credible typically have at least one of the previously mentioned aspects (Perloff, 2008).

Attitudes toward Genetically Engineered Food

The ELM explains changes in attitudes (Petty & Cacioppo, 1986), which is why it is important to understand attitudes toward genetically engineered food before further discussing ELM related research. The Center for Public Issues Education in Agricultural and Natural Resources at the University of Florida conducted a public opinion study regarding food in Florida with a segment focused on genetically modified organisms (GMOs), which is another common term for genetically engineered food (Rumble & Leal, 2013). The survey was distributed online to 500 respondents in Florida, and demographics were weighted to reflect the 2010 Florida census. Slightly over 40% of respondents were unsure if GMOs had improved their quality of life, and the majority

agreed or strongly agreed that their food quality used to be better. Once again, around 40% of the sample was unsure if scientists should genetically modify crops to make them resistant to disease. The same proportion of respondents was unsure if they had ever consumed or purchased GMOs. Fewer than 40% felt that GMOs were a possible solution to world hunger, as well as pest and disease problems. However, around the same percent were unsure about these benefits. Almost half of the respondents agreed that GMOs presented a greater risk for food allergies and food poisoning and were unsure if they threatened the environment. GMO food was also identified as being artificial and unhealthy.

The survey also looked at the purchasing intentions of the Florida consumers. Almost 40% disagreed that they would purchase food labeled as GMO (Rumble & Leal, 2013). When asked about specific products, around 40% of respondents reported they would not purchase meat from animals that were was fed GMO feed, and slightly less said they would not purchase GMO produce. When asked about GMOs being used to combat citrus greening (a disease in Florida threatening the citrus industry), 52% responded that genetic engineering should be used, and 42% said they would purchase GMO citrus. The researchers concluded that most respondents are likely answering "unsure" to most of the questions due to the lack of knowledge they have toward GMOs. The only time a positive response was seen was for the citrus greening questions, and this was likely because there was greater personal relevance with that topic (Rumble & Leal, 2013).

Bredahl (2001) conducted a study to examine the determinants of consumers' attitudes toward genetically modified food and their intent to purchase the products. The

study used the term genetic modification to describe food that had been genetically altered in some way (Bredahl, 2001), which is similar to the term genetic engineering. Over 2000 consumers were interviewed in Germany, Denmark, the United Kingdom (UK), and Italy about their attitudes toward genetically modified yogurt and beer. The study found that attitudes toward genetically modified products were similar among the Denmark, Germany, and UK consumers, but the Italian consumers had typically less negative associations with genetically modified food (Bredahl, 2001). The attitudes were influenced by the perceived risks and benefits of the food. However, consumers did not distinguish between the risks and benefits of the product compared to the technology (genetic modification). Bredahl (2001) concluded that the perceived risks and benefits are strongly embedded in consumers' general attitudes toward genetically modified food. The strong embedment of these beliefs makes it difficult to change consumers' attitudes toward food biotechnology and causes them to reject the technology all together (Bredahl, 2001).

Demographics and Attitude

Attitudes toward genetically engineered food have been strongly influenced by the demographics of consumers. Verdurme and Viaene (2003) developed a model on Finnish consumers purchasing intent for genetically modified food, and began the model with the cultural and socio-economic impact of the consumers. The model suggested that the demographic characteristics greatly influenced consumers' knowledge of genetically modified food and overall attitudes and risk perceptions of genetically modified food. This model was developed from qualitative data and a review of existing literature. Through quantitative data collection, other research has concluded that socio-demographic characteristics did not clearly predict attitudes, but political values did

when examining Greek consumers (Antonopoulou, Papadas, & Targoutzidis, 2009). Antonopoulou et al. (2009) added that age did not have a huge impact on attitudes; however, younger consumers typically held more favorable attitudes toward genetically modified food. Literature has also illustrated how education level can have an impact on the perceptions of risk associated with genetically modified food (Hall & Moran, 2006; Gaskell, 2003; Moon & Balasubramanian, 2001). Consumers with post-graduate degrees have been identified as having lower perceptions of risk for genetically modified food.

A study by Irani, Sinclair, and Malley (2001) described how various demographic characteristics impacted the perceptions of GMOs and GMO labels. Race, gender, and culture were examined to see if they had an effect on attitudes. A survey was distributed to approximately 400 college-age students at three different universities in the U.S. An overwhelming 85% of respondents agreed that GMO food should be properly labeled, and demographics showed no impact on the responses. The majority of the respondents reported that even if the food were labeled GMO, they would still consider purchasing the product. The majority of white and Hispanic respondents said they would consider purchasing food labeled GMO, but only 33% of African-American respondents said yes to this question. Additionally, men were significantly more likely to consider purchasing the labeled food, as were the students located at a more rural campus. Respondents were also asked how much trust they placed in six different sources. The Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) were the first and second most trusted sources, respectively, and the companies producing the GMO products were the least trusted (Irani et al., 2001).

Pounds (2014) identified significant differences in the purchasing intent of GMOs between men and women in the state of Florida. Overall, females had a lower purchasing intent compared to men. Men appeared unsure if they would purchase GMOs, while women were less likely to engage in purchasing behaviors (Pounds, 2014). The study also concluded that both genders supported ballot initiatives to label GMO products, but women agreed more that they would support the initiative. Other studies have determined that women held more negative perceptions of genetically modified food compared to men (Lockie, Lawrence, Lyons, & Grice, 2005), and were less likely to accept GMOs (Hall & Moran, 2006).

Knowledge and Attitudes

The majority of people in developed nations have a good familiarity with the concepts of genetics (Condit, 2010), and believe science to have a positive impact on society (Pew Research Center, 2009). Scientists have thought that greater understanding of science would lead to more support for research. A study by Evans and Durant (1995) concluded that as science knowledge increased, so did general attitudes toward science in general. However, respondents who reported a higher level of knowledge reported a lower level of acceptance for morally contentious areas of research. Literature has also shown that when respondents gained new information about genetically modified food specifically, their negative attitudes were actually enhanced (Grice & Lawrence, 2003). Similar studies have concluded that an increase in knowledge did not necessarily have a positive influence on attitudes toward genetically modified food (McFadden & Lusk, 2015; Verdurme & Viaene, 2003).

Source Credibility Research in the ELM

Understanding the role of source credibility in the ELM was essential to this research, and a number of studies have examined its relationship with attitude change within the model. Hovland and Weiss (1951) first determined that high credibility sources produced greater attitudinal change than low credibility sources. The study also noted that credibility had greater effect on attitudes toward a topic when people had less prior knowledge on the subject and saw the message as less relevant (Hovland & Weiss, 1951). Petty and Cacioppo (1979) found that when message relevance and source expertise interacted, the source cue was more effective in determining attitudes toward low relevance messages. Another study by Petty et al. in 1983 looked at message endorsers of advertisements using magazines. The researchers concluded that using a celebrity endorser of a product was important for low relevance messages, compared to high relevance messages (Petty et al., 1983). These studies demonstrated the importance of source credibility when message relevance was low.

Trustworthiness of a source has been identified as one factor that can impact elaboration (Priester & Petty, 1995). Since the ELM's first postulate is that people are motivated to hold correct attitudes, perceived trust in a source may impact elaboration by validating an argument (Petty et al., 2009). Therefore, when a source is perceived as trustworthy and knowledgeable, people assume the source presents accurate information (Petty et al., 2009). This trustworthiness of sources allow people to be confident that the attitude they are forming is "correct" (Petty et al., 2009).

A study by Priester and Petty (1995) manipulated trust of a source while keeping the expertise high. The manipulation occurred either by making a speaker look dishonest or advocating a self-serving position. Regardless of how the trustworthiness

was altered, less trustworthy sources led to greater elaboration than the trusted sources. Other studies supported these results and showed that when trustworthiness was low, elaboration was high (Priester & Petty, 2003). This aligned with research showing that as people were less inclined to think about issues, they were forced to elaborate when presented with a distrusted source (Petty et al., 2009). However, people who enjoyed thinking elaborated equally despite the level of trust associated with the source (Petty et al., 2009).

The previously mentioned research presented the sources prior to the message (Petty et al., 2009). When the source was revealed after message exposure and thought processing had begun, confidence in thoughts increased if the source was considered an expert (Brinol, Petty, & Tormola, 2004). However, this effect was reversed when weak arguments were supported by a credible source, likely because the highly credible source strengthened the individual's negative thoughts toward the weak argument (Petty et al., 2009).

These studies demonstrated the importance of source cues when people were not likely to use a great deal of cognitive effort when thinking about persuasive communication (Petty et al., 2009). Trustworthiness and expertise support most messages when motivation to process was low. However, distrusted sources sometimes caused higher elaboration for those who may not typically be inclined to thoughtful thinking (Petty et al., 2009).

ELM in Agricultural Research

ELM research in agriculture has been used to help researchers understand consumers' attitudes toward the industry, as well as agricultural products. Verbeke (2005) wrote a literature review that described communication about agriculture and the

food industry. Information processing was identified as a major component affecting consumers' purchasing decisions, and the ELM was listed as a model guiding this process. A study by Verbeke and Ward (2006) looked into attitudes associated with a beef traceability campaign in Belgium. The researchers used a pre and post-campaign survey to measure the impact of information cues. The campaign used full-page advertisements in over 20 newspapers and offered a phone number for participants to call to receive an information packet. Only around 300 consumers called for more information out of the estimated 15,000 people exposed to the advertisements. This lack of participation supported the assumption that the motivation or ability to process the message was low, and likelihood for elaboration was likely limited. A separate study by Verbeke and Vackier (2004) analyzed how issue involvement could alter attitude formation with a study involving perceptions of meat. Their sample was divided into four groups; meat lovers, meat consumers, cautious meat lovers, and concerned meat consumers. The research showed that only meat lovers (highly involved) were interested in intangible qualities, in addition to the tangible qualities the other groups prioritized. This supported the view that involvement is connected with motivation to process persuasive communication and can lead to higher elaboration.

ELM studies have not been confined to just agricultural products. A study conducted by Morgan and Gramann (1989) used the model to develop effective teaching strategies for wildlife education. An experimental design was used to manipulate the amount of information presented to children, along with their level of involvement of the subject (snakes). The information presented to the children was in the form of a slide show. Students who only saw the slide show and were not exposed

to the snakes saw no attitude change. However, students who viewed the slide show and were able to interact with live snakes in the classroom exhibited an attitude change. This was likely because the snakes were not of high importance to those who only viewed the slide show, and the children used the peripheral route to form opinions. The researchers concluded that involvement with snakes increases students' motivation to process the information and use of the central processing route.

Research involving message testing and message frames has also used ELM to examine how communication impacts attitude. Meyers (2008) examined how persuasive communication influences media coverage of agricultural biotechnology. Positively framed messages were used to determine the impact of the frame on the communicators' attitudes toward the argument, along with their likelihood to publish the information. The study also looked at issue involvement and prior attitudes. Meyers (2008) concluded that preexisting attitudes had more effect on attitudes toward agricultural biotechnology than issue involvement, which indicated that high amount of elaboration was not likely. The study did not directly look at the routes of information processing, but it did suggest further research about the topic.

A similar study conducted by Goodwin (2013) used ELM to explore how personal relevance and transparency affect college students' perception and trust of communication about the livestock industry. The study found that message transparency had an impact on attitude and trust, but personal relevance did not. Even though the ELM suggests that personal relevance is associated with the motivation to process information, transparent communication may have been more salient, allowing it to have a greater impact on attitudes. The lack of significance was also supported by

assumptions that food is considered a low-involvement good (Beharrell & Denison, 1995), and prior knowledge may be confounded by personal relevance (Petty & Cacioppo, 1986). These findings indicated that in the absence of transparent communication, consumers do not exhibit a great deal of elaboration concerning agricultural messages.

In general, research has supported that consumers use a low amount of elaboration when presented with information about agricultural products (Goodwin, 2013; Meyers, 2008; Morgan & Gramann, 1989; Verbeke & Vackier, 2004; Verbeke & Ward, 2006). Frewer, Howard, Hedderley, and Shepherd (1997) concluded that the majority of food-related decisions made by consumers are developed using the peripheral processing route.

ELM Research with Genetically Engineered Food

ELM has also been applied to research specifically concerning the communication of genetically modified food. Frewer, Howard, Hedderley, and Shepherd (1999) examined how personal relevance and persuasiveness impact attitudes toward genetically modified food. An experimental design was used to present information of varying levels of relevance and persuasiveness, using “thought-listing” to collect data. This form of data collection asks participants to write down any thoughts that cross their mind after exposure to communication (Petty, Cacioppo, & Schumann, 1983). The list was analyzed by experts on both the dimensions of the thoughts, as well as the number of thoughts (Petty et al., 1983). The results of this study were contradictory to predictions made by the ELM. Personal relevance, which is associated with motivation to process information, did not influence the elaboration process to the extent researchers expected. In fact, messages low in relevance led to more elaborative

processing. The researchers suggested this might be because participants felt they did not have the “power” to influence the outcomes of genetically engineered food when personal relevance was high and products were already available for sale. The study also showed that respondents became more negative when exposed to negative cues but were not more positive when exposed to positive cues. This finding may have been the result of thought-listing measuring the strength of participants’ attitudes rather than mediating cognitive responses. Positive attitudes may not have been expressed by respondents who did not feel strongly enough about the issue, thus altering the results.

Krause, Meyers, Irlbeck, and Chambers (2015) used the ELM to guide a content analysis of YouTube videos for and against Proposition 37 in California. If the bill were passed, genetically engineered food would have been legally required to be labeled. The bill did not pass, and the study found that scientists were typically used as sources in the videos opposing the proposition. Krause et al. (2015) concluded scientists offered high credibility and worked effectively as a peripheral cue. In addition to sources used in the videos, message frames were also analyzed. Different from prior research, this research identified emotionally driven frames supporting the bill. The researchers concluded that agricultural communicators should shift from using fact based messages to more emotional appeals to target non-agricultural consumers (Krause et al., 2015).

Risk Perception and Genetically Engineered Food

Risk communication research has been conducted on food products using the ELM to determine how different variables affect consumer attitudes (Frewer et al., 1997). Risk perception has often driven consumer acceptance of products, as opposed to actual risk estimates made by professionals (Frewer, Howard, & Aaron, 1998). Food technology in particular can possess a number of risk factors, which are of great

concern to consumers (Ronteltap, van Trijp, Renes, & Frewer, 2007). Specifically with genetic engineering, the unknown consequences of the technology likely shape the risk perception (Sparks & Shepherd, 1994). The public's skepticism toward genetically engineered food supports the trend that consumers have typically viewed products as riskier when effects of the possible hazard are mostly unknown (Slovic, 1987). The effect is heightened when the proposed hazard is viewed as hidden by the producers (van Kleef et al., 2006).

A study conducted by Frewer, Howard, and Shepherd (1998) examined how initial attitudes toward GMOs affect communication about food production. A survey was distributed to assess the respondents' initial attitudes by collecting data about their risk perceptions associated with GMOs. The researchers concluded that prior risk perception is an important indicator for attitudes after exposure to a message. When respondents viewed GMOs with a higher level of risk, they perceived the information source as being less knowledgeable and less trustworthy. The study also found that when a source admitted uncertainty of risk rather than denying it, consumers viewed the source as more credible.

Source Credibility and Genetically Engineered Food

As more demand has been placed on regulations requiring the labeling of genetically modified food, communication research has looked into the effects of different labels, along with message sources. A number of studies have reviewed trust associated with regulatory agencies, but not specific companies in the agricultural industry (Barnett, Cooper, & Senior, 2007; Poortinga & Pidgeon, 2005; Siegrest, 2000).

Frewer et al. (1997) looked specifically at how source credibility impacts attitudes within the ELM. A distrusted source (government), trusted source (consumer

organization), and collaboration of both types of sources were tested using an experimental treatment. Results showed that the hypothesized distrusted source (government) was connected to information about GMOs, which resulted in greater acceptance (Frewer et al., 1997). The research also looked at prior attitude and determined that positive initial attitudes toward GMOs were not greatly affected by the credibility of a source. However, respondents who were initially found to have negative attitudes showed a greater impact on their attitude from the message, depending on the source. Individuals with negative prior attitudes viewed the sources as less trustworthy and less knowledgeable than those with positive attitudes. Credibility also appeared to be linked with attitude formation toward GMOs, but attitude was dependent on various contextual factors. When presented with a “consensus” source (government and consumer organization both endorsing a message), respondents did not improve perceptions of information or credibility, as the researchers expected. This was likely because the respondents did not expect the two sources to agree, leading to reduced impact of the consensus (Frewer et al., 1997).

Frewer et al. (1999) conducted a similar experiment to study the relationship of source characteristics, personal relevance, and persuasiveness in communication about GMOs. Once again, the government was used as a distrusted source, while a consumer organization was treated as a trusted source. Thought listing was used to determine the amount of elaboration used. This study showed that elaboration was high when persuasive information about GMOs was low and source credibility was high. The same held true when persuasive information was high and credibility was low. These results indicated that these conditions facilitated the central processing route of elaboration.

The researchers concluded that “trust in the information source is an important contextual clue in determining public reactions to information about genetic engineering” (Frewer et al., 1999, p. 45). This contrasted with previous research showing that the message source did not impact attitudes about microbiological risk. The study recommended that distrusted sources remain proactive in their communication with the public about controversial technologies.

Conceptual Model

The conceptual model (Figure 2-3) for this study was based partly on the Shannon and Weaver (1949) model for communication, as well as ELM (Petty & Cacioppo, 1986). The two models were used to describe how individuals show a change in attitude and change in risk perception of genetically engineered food products after being exposed to some type of persuasive communication. The conceptual model shows how a message is encoded and decoded before reaching the final destination.

The studies in the literature review used a variety of terms for genetically engineered food, but this conceptual model used *genetically modified* to describe the food since the public has been familiar with the term (Miller, Annou, & Wailes, 2003). The encoding section of the model was the persuasive communication about genetically modified food that the respondents received. This communication signal would be transmitted, and the decoding process would begin. The peripheral processing route from the ELM was used to model the decoding process. Research in agriculture using the ELM has shown that respondents almost exclusively use the peripheral route (Frewer et al., 1997). As described by ELM, peripheral cues, such as sources, can be used to influence attitude formation. Since consumers have been skeptical of organizations involved in the development of genetically modified food (McCullum-

Gomez & Palmer, 2010), the message source served as the noise in the model (Shannon & Weaver, 1949). The noise has the potential to distort the message before the recipient can begin decoding.

The decoding process of the communication involves the consumer's demographics (age, race, sex, education, income, and whom food was purchased for), prior knowledge of genetically modified food, and source credibility. Prior research indicated that demographics could influence consumers' knowledge of genetically modified food (Verdurme & Viaene, 2003). Additionally, literature has suggested that people have limited knowledge concerning genetically modified food (Durant et al., 1998; Rumble & Leal, 2013), which would decrease their ability to process information and use a higher level of elaboration (Wood et al., 1995). Prior knowledge has been identified to have an influence on consumers' perception of source credibility (Frewer et al., 1999; Frewer et al, 1997; Petty et al., 2009), and source credibility has been identified as having influence on final attitudes after receiving communication (Petty et al., 2009). Research has also suggested that there is an influence on risk perception of genetically modified food in relation to source credibility and prior knowledge (Frewer et al., 1998; Sparks & Shepherd, 1994). Since the ELM was used to guide this model, the *change* in attitude and *change* in risk perception were measured as the dependent variables rather than just the final attitude or final risk perception of genetically modified food.

Summary

Shannon and Weaver's information theory was used to explain a linear communication process (Shannon & Weaver, 1949). Part of the communication model displayed how noise could interfere with the message signal and distort the purpose of

the communication, which would influence the receiver's final attitude. Persuasion occurs when a communicator is trying to change an individual or group's attitude toward a topic (Perloff, 2008). Elaboration Likelihood Model is one way to explain attitude change as a result of persuasive communication (Petty & Capaccio, 1986). ELM suggests that two different information-processing routes can be used when people are exposed to communication (Petty & Capaccio, 1986). The route used by a person depends on his or her motivation and ability to process the message. Prior knowledge can have a great impact on a person's likeliness to elaborate (Wood et al., 1995). These individuals with prior knowledge use higher elaboration and the central processing route. Those who do not have the knowledge to scrutinize a message use lower elaboration through the peripheral processing route. This route relies on peripheral cues, like sources, to inform opinion. In order for a source to be effective, it needs to be viewed as credible (Perloff, 2008).

Research focused on attitudes toward genetically modified food has shown that people are typically negative and unsure about the technology (Rumble & Leal, 2013). ELM research in agriculture has demonstrated that people form attitudes using the peripheral route because they simply do not possess the motivation to thoughtfully analyze agricultural messages (Frewer et al., 1997). Trust in the information source has appeared to be the most important function in determining the public's reaction to a message (Frewer et al., 1999). Research related to risk perceptions of genetically modified food has shown that when initial associated risks are high, sources are typically viewed as more distrusted and less credible, leading to the peripheral processing route (Frewer, Howard, & Shepherd, 1998).

The conceptual model for this study used Shannon and Weaver's information theory to demonstrate the process of how a message is encoded by an information source before being decoded by the target destination. Noise, like a message source, can distort the message before reaching the recipient. The peripheral processing route of elaboration is used to explain the decoding process. The receivers' demographics, prior knowledge, and perception of the source's credibility will influence how they interpret the message. The decoding process will result in a change in attitude and risk perception of genetically modified food.

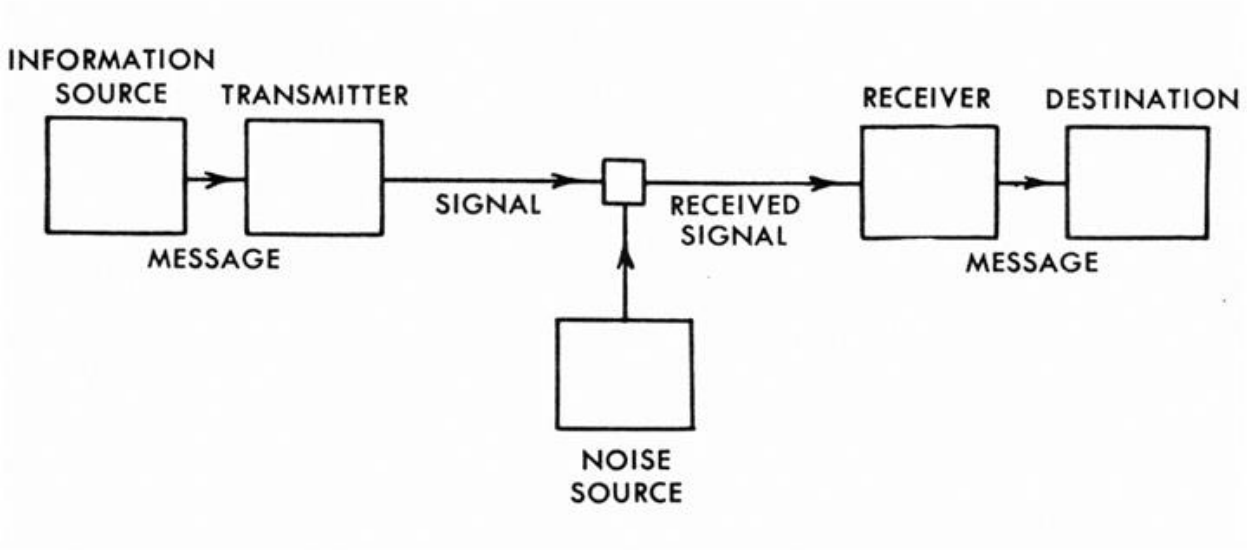

Figure 2-1. Shannon and Weaver's model of communication (1949).

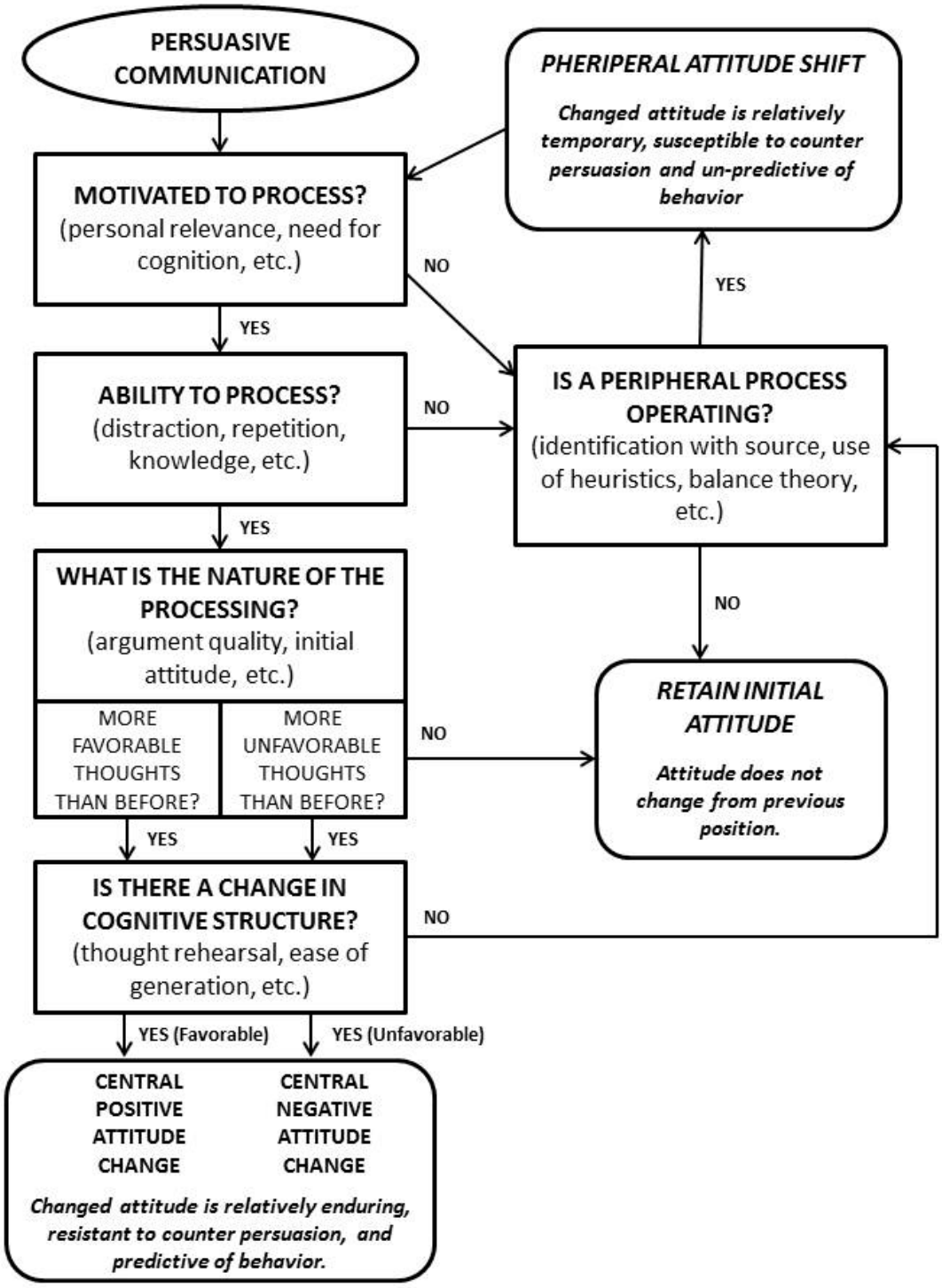

Figure 2-2. The Elaboration Likelihood Model of persuasion (Petty et al., 2009).

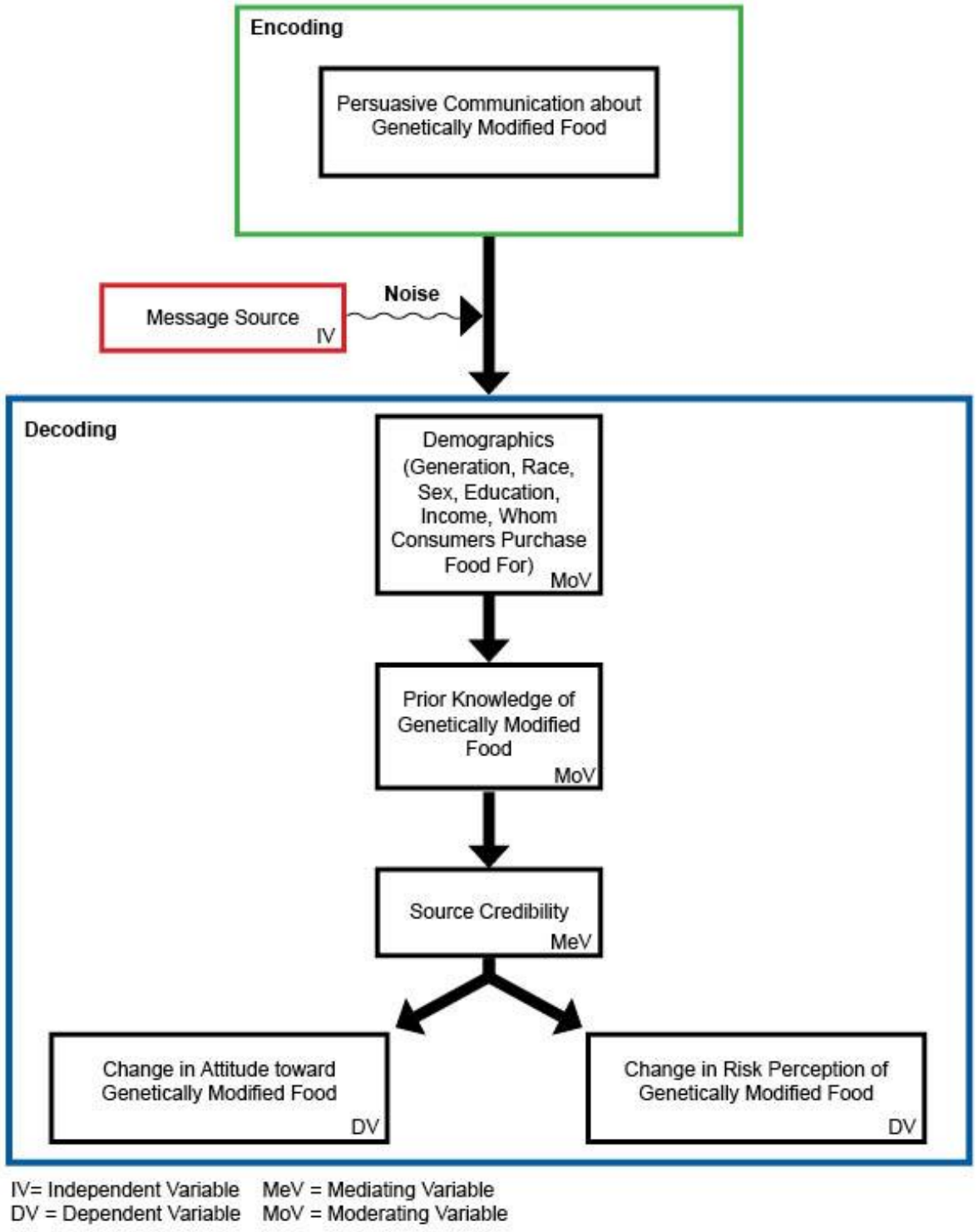

Figure 2-3. Conceptual model of the affect of persuasive communication on consumers' change in attitude and risk perception of genetically modified food. Adapted from the ELM and Shannon and Weaver's model of communication.

CHAPTER 3
METHODOLOGY

Chapter 1 described a growing problem the agricultural community has been facing over the past several decades. Consumers have become more skeptical about genetically modified food, even though the technology has been scientifically proven to be safe and advantageous. Chapter 2 described the theoretical framework guiding this study using the ELM and Shannon and Weaver's model of communication. Literature related to respondents' demographics, prior knowledge of genetically modified food, and source credibility were discussed pertaining to their influences on attitudes and risk perception related to genetically modified food. The purpose of this thesis was to analyze how persuasive communication influenced Florida consumers' change in attitude and change in risk perception of genetically modified food. The following objectives guided this study:

1. Compare Florida consumers' change in attitude toward genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.
2. Compare Florida consumers' change in risk perception of genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.
3. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in attitude toward genetically modified food.
4. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in risk perception of genetically modified food.

Experimental Design

This research was a quantitative study that utilized a pretest- posttest experimental design within a survey to answer the research objectives. One intervention

was used in this study with four different variations of the treatment. The intervention was the source attributed to a message which described genetically modified food. Four groups were used, each one presented the same message about genetically modified food, but each group used only one of the four sources. Even though genetic engineering is the technically correct term (FDA, 2014), the questionnaire designed for this study used the term genetically modified because consumers have been more familiar with the term (Miller et al., 2003). Additionally, genetic engineering has less positive associations than genetic modifications (Miller et al., 2003) and could have biased the respondents. The survey adapted the FDA's (2014) definition of genetic engineering to provide the following definition of genetic modification to the respondents, "Genetic modification refers to the intentional change made to organism's DNA in order to promote a desired trait."

Two government agencies and two agricultural biotechnology companies were selected as the message sources. The FDA, USDA, Green Giant, and AgLabs were chosen as the information sources based on conflicting literature and lack of research for the credibility associated with these organizations/companies (Barnett, et al., 2007; Frewer et al., 1997; Irani et al., 2001; Poortinga & Pidgeon, 2005; Siegrest, 2000). The names Green Giant and AgLabs were selected as pseudonyms for the companies used in the study; however, respondents were exposed to the actual names. Literature has suggested that consumers have had little trust in government organizations regulating a product or the companies which have developed them (Rothenberg & Becker, 2004). However, the research has been inconsistent, and other studies have suggested that agencies like the FDA, along with the USDA, have been more trusted than consumer

organizations when concerning genetically modified food (Frewer et al., 1997; Irani et al., 2001). The FDA and USDA were selected as the two government sources since research indicated these were trusted sources (Irani et al., 2001). Little research had been conducted examining how the specific agricultural companies delivering a message could have an impact on consumers' opinions, so this study used media coverage to choose the industry sources. Green Giant had been frequently reported on in the news, and while AgLabs was a similar company, it had only received a fraction of the publicity (The New York Times, 2015a, 2015b). Additionally, these are the two leading companies in the development of genetically modified seeds (Fernandez-Cornejo et al., 2014).

A pretest-posttest design was used to measure attitude and risk perception change resulting from the source treatment. The independent variable, *X,* was the message source and was manipulated by using FDA, USDA, Green Giant, or AgLabs in each group (Table 3-1). As stated previously, the message stayed constant, and only the source was manipulated between groups (Appendix C). The survey instrument also asked questions about respondents' prior knowledge of genetically modified food. After completion of the posttest questions, respondents were asked questions to measure their perception of the source's credibility.

The message source served as the independent variable in this study, and the instrument measured change in attitude toward genetically modified food and change in risk perception of genetically modified food as dependent variables. Moderating and mediating variables were also measured in this experiment. A moderating variable affects the strength and/or direction of the relationship between the independent and

dependent variable (Baron & Kenny, 1986). The moderating variables in this study were the prior knowledge of genetically modified food and consumer demographics. Mediating variables are different than moderators because they intervene between the independent and dependent variable (Baron & Kenny, 1986). Also, variations in the independent variable impact the mediator, and variations in the mediator impact the dependent variable. The source credibility measure was a mediating variable in this study.

Population and Sample Size

This study looked at Florida residents' change in attitude and change in risk perception of genetically modified food. Examining consumers' opinions toward food related issues and genetically modified food has been vital for the success and sustainability of the agricultural industry. Florida agriculture has contributed $7.8 billion dollars a year to the state's economy (National Agricultural Statistic Service [NASS], 2011); one billion dollars alone came from the citrus industry in 2012 (NASS, 2012). The Florida citrus industry has recently been affected by the devastating disease citrus greening, and with limited solutions, genetically modified citrus may be the only solution (Bove, 2012). Additionally, the Florida House of Representatives (2015) has denied two bills which would have required the labeling of genetically modified food if passed. The state's large agricultural production, combined with the threat of citrus greening and increased proposals for regulation, has made it important to study Florida residents' attitudes and risk perception of genetically modified food. The target population was all Florida residents (N = 15,321,354) who were 18 years and older (United States Census Bureau, 2014). A required sample size of 385 was calculated using a margin of error of +/- 5%, a 95% confidence interval, and a standard deviation of 0.5 (Ary, Jacobs, &

Sorensen, 2010). The survey was distributed to 770 respondents, and 523 (*n* = 523) of the surveys were usable, due to incomplete questionnaires and respondent errors. The survey also included quality check questions, which required respondents to select a specific answer (e.g. select strongly agree). If the requested choice was not selected, the survey was terminated and responses were excluded from analysis. The quality check questions were used to reduce straight-line responses. Outliers were also removed, which made the sample size 514 (*n* = 514) respondents. This larger sample size resulted in a smaller margin of error (+/- 4.3%, Ary et al., 2010).

Non-probability sampling with an opt-in panel was used for the sample in this study (Baker et al., 2013). In non-probability sampling, not every person in the population has the same chance of being chosen for the research. This study was limited to only people who had Internet access and had opted to take the survey. Opt-in panels consist of respondents who have typically been recruited in advance and have agreed to complete surveys. Opt-in panels have evolved over time, and previous research on these types of panels held little relevance to the current methods used (Baker et al., 2013). The public survey software company, Qualtrics, hired to administer the survey, used monetary incentives to recruit the opt-in panel for this study.

Limitations associated with non-probability sampling, like selection, exclusion, and non-participation bias, can be addressed by using post-stratification sampling. Post-stratification sampling has been used to weight the sample after data collection, based on demographic characteristics of the population (Baker et al., 2013). This study weighted the sample based on the 2010 Florida census for sex, race, ethnicity, age, and rural/urban continuum. The weights and population percentages for the individual

demographics can be seen in Table 3-2. The ages were later grouped into the following generations for analysis by birth year: Millennials and younger (1977- 1996), Generation X (1965– 1976), Young Baby Boomers (1955- 1964), Old Baby Boomers (1946- 1954), and the Silent Generation and older (1945 and earlier; Zickuhr, 2010). Some demographic groups had to be condensed for analysis, and demographics were fully described in Chapter 4. Rounding error from the weighting of the respondents changed the *n* from 514 to 515 (Maletta, 2007). Post-survey adjustment of the non-probability sample has been shown to mirror the effects of probability sampling, but selection bias can still occur (Baker et al., 2013).

While post-stratification weighting does increase generalizability of the sample to the population (Baker et al., 2013), random assignment of the sample to the four treatments groups was more important. Randomization provides the best way to achieve the control necessary for an experiment to evaluate the independent variable (Ary et al., 2010). Qualtrics was programmed to randomly assign respondents to each group, and the weighting of the demographics allowed the four groups to be equal in regards to the characteristics of the respondents.

Data Collection

Before data collection began, the survey instrument was approved by the University of Florida's Institutional Review Board (UF IRB) for social and behavioral research (IRB#2013-U-0494, Appendix A). An informed consent form, along with the purpose of the study and the survey, were submitted to the IRB prior to release of the survey. Data collection occurred after the IRB approved the instrument and procedures.

The survey was created in an online public opinion survey company's website. An online survey was deemed appropriate for the study since a larger sample could be

collected when compared to mail or telephone surveys and respondents could easily be randomly assigned to one of the four treatment groups (Dillman, Smyth, & Christian, 2009). The company, Qualtrics, was employed to collect the data for this study. The survey was released in September 2014 and was open for 10 days before closing. All respondents were given an anonymous survey link to protect the privacy of the individuals. Post-stratification weighting procedures were completed after the survey was closed.

Validity and Reliability of the Instrument

Validity can be defined as "the extent to which an instrument measured what it claimed to measure" (Ary et al., 2010, p. 225) and is a vital consideration in the development of a survey. The focus of validity has shifted over recent years from the validity of the instrument to validity of the results' interpretation (Ary et al., 2010). Validity of this research was supported by the adoption of previous instruments, which had operationalized the conceptual constructs (Ary et al., 2010; Hallman & Metcalf, 1993; Frewer et al., 1997; Frewer, Howard, & Shepherd, 1998; Osgood, Suci, & Tannenbaum, 1971; Roe & Teisl, 2007; Rumble & Leal, 2013). Validity was also ensured through the use of a panel of experts. The panel included a University of Florida professor in the Plant Molecular and Cellular Biology program, two faculty members associated with the UF Center for Public Issues Education in Agriculture and Natural Resources (PIE Center), and three industry leaders known for their expertise in agricultural policy and specialty crops.

A soft launch of the survey (similar to a pilot study) was used to ensure the instrument was working properly and free of error (Dillman et al., 2009). The soft launch

also allows researchers to make appropriate adjustments to the instrument before the survey has been released on a larger scale (Ary et al., 2010).

Threats to Validity in an Experimental Design

Researchers must determine if the conclusions made about the relationship between variables demonstrated in an experiment are valid or not (Ary et al., 2010). Cook and Campbell (1979) identified four different types of validity: internal validity, external validity, construct validity, and statistical conclusion validity.

Internal validity

Internal validity is necessary for correct conclusions to be made from an experiment (Campbell & Stanley, 1963). A number of different threats to internal validity were present in this study:

History effect. History effect can occur when extraneous events happen outside the experimental treatment at the same time as the study and could alter the outcome (Ary et al., 2010). The longer the time is between the pretest and posttest, the greater the history threat becomes. An example of history threat for this study would be if research were released supporting the dangers of genetically modified food halfway through the data collection. Respondents completing the survey after the event would likely have different attitudes toward genetically modified food than those who took it before the event. To lessen the history threat, the survey was only active for 10 days. Media was also tracked during this time, and no major news stories pertaining to GMOs, genetically engineered, of genetically modified food was covered in the national papers (The New York Times, 2015a).

Pretest sensitization. Pretest sensitization can occur when the pretest causes respondents to think more carefully about the questions and give different responses in

the posttest (Ary et al., 2010). This would mean the pretest caused the change in attitude rather than the intervention (Ary et al., 2010). In this study this threat was present and could be used to explain unanticipated changes in attitude and risk perception.

Instrumentation threat. Instrumentation threat to validity can occur when the instrument is altered during the study (Ary et al., 2010). Changes can include the type of instrument, the difficulty level, and the way tests are administered (Ary et al., 2010). The instrumentation threat was limited by not changing the study once the survey was activated online.

Selection bias. Selection bias can occur when there is a significant difference in the sample between the control and experimental groups before the study begins (Ary et al., 2010). To avoid selection bias, the survey computer software randomly assigned the respondents to one of the four treatment groups.

Experimental attrition. Experimental attrition threat is present when there is a differential loss of participants from the treatment groups (Ary et al., 2010). This can alter the measurement of the dependent variable for the experiment. A survey panel was used to avoid this threat (Ary et al., 2010). The survey software company guaranteed complete surveys by each respondent through the use of incentives and randomly assigned each person to a treatment group.

Construct validity

Construct validity can be defined as “validity of the inferences made about a construct based on the measures, treatment, subject, and setting used in an experimental study” (Ary et al., 2010, p. 291). To account for construct validity, clear operational measurements of the construct were based on previous literature (Frewer et

al., 1997; Frewer, Howard, & Shepherd, 1998; Hallman & Metcalf, 1993; Osgood et al., 1971; Roe & Teisl, 2007) and outlined in the conceptual model (Figure 2-3).

The following are threats to construct validity (Ary et al., 2010):

- Measures of the construct used were not appropriate leading to inaccurate results.
- Manipulation of the construct was not properly done leading to incorrect inferences.

External validity

External validity is concerned with the generalizability of the findings from a study (Ary et al., 2010). The following are threats to external validity:

Selection-treatment interaction. Selection-treatment interaction can occur when results for certain subjects are not true for a different kind of subject (Ary et al., 2010). This is typically the result of the sample not being representative of a larger population (Ary et al., 2010). Using volunteers is another threat to external validity since the sample may have different characteristics than non-volunteers (Ary et al., 2010). Post-stratification weighting and random assignment of the sample was used to limit the threat of selection-treatment interaction (Kalton & Flores-Cervantes, 2003).

Pretest-treatment interaction. Pretest-treatment interaction can cause respondents to be more or less sensitive to the experimental treatment (Ary et al., 2010). The only way to account for this threat would be to eliminate the pretest (Ary et al., 2010). Since the experiment looked at how persuasive communication changed attitude and risk perception, data collection would have been difficult without a pretest. However, small changes in attitude and risk perception in the results could be attributed to a pretest-treatment interaction.

Statistical conclusion validity

Statistical conclusion validity refers to the correct use of statistics to infer that a relationship between variables is true and not a result of chance (Ary et al., 2010). This was a threat to validity in this study because incorrect statistical procedures can lead to inaccurate interpretations of the results. To account for this threat all assumptions had to be met for the statistical procedures used. Each item measuring attitude toward genetically modified food, risk perception risk perception of genetically modified food, knowledge of genetically modified food, source credibility, and attitudes toward the source used an interval scale, which allowed for an index to be created for each variable.

Survey Error

Even though this study used an experimental design, it was administered in the form of a survey, so survey errors must be acknowledged and addressed. The five types of survey error are as follows: coverage error, sampling error, rounding error, nonresponse error, and measurement error (Dillman et al., 2009; Maletta, 2007).

Coverage errors. Coverage errors occur when members of the population are not given the same probability of being chosen, often due to the survey method (Dillman et al., 2009). For this study, coverage error could have occurred because the survey was administered online and an opt-in panel was used. However, post-stratification weighting was used to lesson this error (Kalton & Flores-Cervantes, 2003), and due to the experimental design of the study, it was more important for random assignment of the sample to the treatment groups.

Sampling Error. Sampling Error can occur when a sample is gathered from a larger target population (Dillman et al., 2009). For results to be considered generalizable

to the population, the entire population would ideally be studied (Dillman et al., 2009). Since this is not always practical, a sample is used, and the larger the sample the smaller the margin of error. An online survey can lead to larger sample sizes, but non-probability sampling methods can cause the sample to not necessarily be representative of the population. This study attempted to decrease the sampling error by using post-stratification weighting methods, so the sample reflected the target population's demographics (Baker et al., 2013) and by collecting a large sample of respondents.

Rounding errors. Rounding errors can occur when using post-stratification weighting methods (Maletta, 2007). When respondents are weighted on more than one category, underrepresented cases will be weighted higher and over-represented cases will be weighted lower. Data was analyzed in SPSS ® 21.0, which rounded the frequency of the demographic categroies to nearest integer. This rounding is not done on individual cases, but rather on the total weighted frequency (Maletta, 2007). This can cause inconsistency in the data, such as the sample reported as 515 cases rather than 514 in this study.

Nonresponse errors. Nonresponse errors are common in surveys and occur when not all the respondents in the sample complete the survey (Dillman et al., 2009). Nonresponse can impact results if a group or demographic elects not to complete the survey (Dillman et al., 2009). For example, people with stronger negative feelings toward genetically modified food could complete the survey, but those who were more passive toward the subject may not feel the need to respond, thus skewing the results. Nonresponse error was accounted for by using post-stratification weighting methods to

weight the sample to reflect the demographics of the population (Baker et al., 2013). This also ensured that respondents would be equally represented in each of the four treatment groups. Additionally, quality check questions were used which asked respondents to answer a question a certain way to ensure they were reading the survey and not straight-lining their answers. Incorrect responses led to termination of the survey.

Measurement error. Measurement error is the final type of error and can occur when the respondent's answer is inaccurate (Dillman et al., 2009). This type of error can be the result of a complicated survey design or unclear questions (Dillman et al., 2009). The panel of experts used to ensure validity of the instrument served to lower measurement error. The panel reviewed the questionnaire content to make sure the questions were clear and concise. The study also removed any respondents who did not complete the survey or were outliers, changing the total number of actual respondents from 770 to 514.

Instrumentation

An online survey was developed for the distribution of this study's instrument. The questions developed for this research were a part of a larger survey done for the Center for Public Issues Education in Agricultural and Natural Resources at the University of Florida as part of the 2014 Florida Food Panel (Anderson, Ruth, & Rumble, 2014). The complete questionnaire consisted of 62 questions (Appendix D), and six of those questions were analyzed for this study (see Appendix B). The intervention in the survey was the message source. Four groups were used, each containing only one source (FDA, USDA, Green Giant, or AgLabs). The constant in this study was the message, which was used in all four groups and said,

> Before [genetically modified foods] reach the market, crops from [genetically modified seeds] are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history. (GMO answers, 2014, para. 16)

Respondents saw the same message but were exposed to only one of the four sources. The survey software randomly assigned an equal number of respondents to each group to account for selection bias (Ary et al., 2010). Real limits were created for each variable to aid interpretation of the results. The limits were assigned to the scales to standardize the numerical data and allow for easier discussion of the descriptive data (Sheskin, 2004). A description for how each variable was measured was described in the following sections.

Demographics

Demographics were measured using a multiple choice or check all that apply question style. The following demographics were analyzed for this study: generation, sex, race, level of education, income level, rural/urban continuum, and whom consumers typically purchased food for. The demographic data was measured through descriptive statistics.

Prior Knowledge of Genetically Modified food

Respondents' prior knowledge of genetically modified food was measured through a seven-item, five-point Likert-type scale adapted from an instrument used in previous research (Hallman & Metcalf, 1993). The scale asked about respondents' general knowledge of science and technology, their knowledge of food science and food technology, and how much they had heard and read about genetically modified food. The scale was labeled as *strongly disagree* =1, *disagree* = 2, *neither agree nor disagree* = 3*, agree* = 4, and *strongly agree* = 5. A 5 indicated a higher level of prior knowledge

while a 1 indicated a lower level. For a scale to be considered reliable, it has to have a Cronbach alpha value of .7 or higher (Field, 2013).The prior knowledge scale was calculated to have an α of .88. An index was created to determine the overall mean for this scale by adding the value for each item and dividing by the total number of items (seven). The real limits used to interpret the results for the respondents agreement with their knowledge of genetically modified food were 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree.

Source Credibility

Source credibility was measured with a six-item, five-point Likert-type scale that was shown after persuasive communication about genetically modified food. The scale used was as follows: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, and 5 = *strongly agree*. Higher source credibility was assigned a 5 and lower source credibility was assigned a 1. The reliability for the source credibility scale in each of the groups ranged between α = .75 and α = .85. The scale had six items to measure trustworthiness, knowledge, and goodwill of the source, which are the three areas defined as part of credibility by Perloff (2008). Items in the scale were adapted from an instrument used by Frewer et al. (1997). Indexed means were created for source credibility in each of the four groups by summating the items in the scale and dividing by six. The real limits set for respondents' agreement with source credibility were as follows: 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree.

Attitudes toward Genetically Modified Food

Attitude was measured using an eight-item, five-point semantic differential scale. The scale was adapted from definitions of attitudes described by Osgood et al. (1971) (α = .91) and an instrument used by Frewer, Howard, and Shepherd (1998). Eight different pairs of adjectives were used on a scale of 1 to 5. For analysis, the *negative* adjectives (e.g. “unhealthy”) were assigned a 1, and the *positive* adjectives (e.g. “healthy”) were assigned a 5. This variable was considered reliable; the pretest had an α = .94 and posttest had an α ranging from .94-.95 in each of the four groups. Indexed means were calculated for the overall pretest, and the posttest for each of the four groups by adding the value for each item in the scale and dividing by eight (separate indexes were created for pretest and posttest). Real limits were used to interpret respondents’ responses. The following real limits were established for attitude toward genetically modified food: 1.00 – 1.49 = negative, 1.50 – 2.49 = slightly negative, 2.50 – 3.49 = neutral, 3.50 – 4.49 = slightly positive, 4.50 – 5.00 = positive.

Risk Perceptions of Genetically Modified Food

Risk perceptions of genetically modified food was measured using a six-item, five-point Likert-type scale: *strongly disagree* =1, *disagree* = 2, *neither agree nor disagree* = 3*, agree* = 4, and *strongly agree* = 5. Lower perceptions of risk were assigned a 5 and higher perceptions were assigned a 1. The α for the pretest was .86 and the α in the posttest fell between .83 and .88 in each group. The statements used in the instrument were adapted from similar studies by Roe and Teisl (2007), Frewer, Howard, and Shepherd (1998), and Rumble and Leal (2013). Researcher developed items were included to assess risks perceived by consumers as described in Chapter 1. Risk perception was measured in the pretest and posttest, and separate indexes were

created by calculating the overall average of six items in the scale. Responses were categorized into real limits for the respondent's' agreement with risks of 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree.

Analysis

Data for this study were analyzed using SPSS ® 21.0. Below is a description of the data analysis for each objective.

Objective 1. Compare Florida consumers' change in attitude toward genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.

The dependent variable, *change in attitude*, was created by subtracting the index created for the prior attitude from the index of final attitude toward genetically modified food. An independent analysis of variance (ANOVA) was used to compare the change in attitudes between groups to determine if any significant differences existed between the groups using different message sources. This type of analysis was used since the independent variable was categorical and the dependent variable was continuous. Initially, the assumptions for normality were not met for the change in attitude variable (Table 3-3, Figure 3-5). An acceptable skewness and kurtosis would be +/- 2 (George & Mallery, 2010). The skewness for change in attitude was 1.14, but the kurtosis was 3.07. Nine outliers were removed from the data, and the adjusted skewness (1.04) and kurtosis (1.57) met the criteria for normality. After the dependent variable was adjusted for normality, the assumptions for normality were met for an ANOVA to be used (Field, 2012). The histogram for the adjusted change in attitude can be seen in Figure 3-6.

Homogeneity of variance, or the assumption that variance in the change in attitude was similar in all four groups, was another assumption that had to be met. A Levene's test, which tests the null hypothesis that variance between the groups was the same, can be used to test for homogeneity. This test was performed and was not significant ($p > .05$), meaning there were no differences in variance (Field, 2013). Additionally, the large sample size of this study would generally lower issues with homogeneity of variance. All assumptions for the ANOVA were met, and a Bonferonni test was performed as post hoc analysis to identify which groups were significantly different for change in attitude.

Objective 2. Compare Florida consumers' change in risk perception of genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.

Similar to objective two, the prior risk perception index was subtracted from final risk perception index to create a dependent variable for *change in risk perception.* An ANOVA was conducted to identify significant differences between the message source groups for change in risk perceptions. Objective two also used a categorical independent variable with a continuous dependent variable, which is why an ANOVA was selected. Assumptions for normality were not initially met (skewness = -1.74, kurtosis = 8.79, see Table 3-3, Figure 3-7). After the removal of the nine outliers described in objective one, the adjusted skewness was -.79 and the adjusted kurtosis was 1.64 (Table 3-3, Figure 3-8). The adjusted data met the assumptions of normality. A Levene's test was not significant ($p > .05$), and no issues with the homogeneity of

variance were identified. All assumptions the ANOVA was met and analysis was performed.

Objective 3. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in attitude toward genetically modified food.

A multiple regression analysis was performed to identify how well variables in the conceptual model (Figure 2-3) predicted the respondents' change in attitude toward genetically modified food. Dummy variables were used for the different sources in order to compare one control (FDA) to the other three groups since literature has already identified the FDA as more trusted than the USDA or industry sources when communicating about agricultural biotechnology (Irani et al., 2001). Source credibility, prior knowledge, and demographics were also included in the model. Assumptions for normality were met for both source credibility (Figure 3-3) and prior knowledge (Figure 3-1) before removal of the previously described nine outliers. The outliers for change in attitude and change in risk perception were completely excluded from analysis, but the adjusted skewness and kurtosis for source credibility (Figure 3-4) and prior knowledge (Figure 3-2) still fell within +/- 2 and the exact values be seen in Table 3-3. The demographic variables had to be dummy coded, and the category with the highest percent of respondents was used as the constant in the model (sex – females; education - completing a four-year degree; generation – Millennial Generation or younger; race – white; income - $25,000 to $49,999; Field, 2013). Since respondents were able to select multiple answers for the question asking whom they purchased groceries for, each predictor was treated as a dichotomous variable.

Hierarchical order of entry of the predictor variables was used since the variables were likely related to each other as identified in previous research (Field, 2013; Irani et al., 2001; Wood et al., 1995). The first model used only the grouping variable (message source), and models two and three included known predictors (Field, 2013): demographics (model two) and prior knowledge (model three; Irani et al., 2001; Wood et al., 1995). Source credibility was not included until the final model since its importance was still unclear (Hovland & Weiss, 1951).

Multiple regression analysis assumptions were met because the outcome variable was continuous and an index was created, and more than one continuous or categorical predictor variable was used (Field, 2012). Some demographic groups had to be grouped since their *n* was relatively small. Ten cases per predictor is typically sufficient (Field, 2010), but due to the large sample size of the study, demographics were grouped to ensure approximately 30 cases were in each predictor (see Table 4-1 for demographics). Additionally, the assumptions for normality were met once all outliers were removed (Table 3-3). An additional concern for multiple linear regression was multicollinearity, which can occur when a strong correlation is present between two predictor variables. The variance inflation factor (VIF) indicates how strong the relationship is between two variables, while the tolerance measures its inverse (1/VIF, Field, 2012). Multicollinearity is not an issue when the values for VIF are not substantially higher than one and when tolerance does not fall below 0.1. Table 3-4 showed the variables' VIF and tolerance from this study, and indicated that there was little concern for multicollinearity since all values fell within the previously described parameters (Bowerman & O'Connell, 1990; Menard, 1995).

Objective 4. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in risk perception of genetically modified food.

Consistent with objective three, a multiple linear regression model using hierarchical order of entry of predictor variables was created using the following predictors: message source (dummy coded), demographics (dummy coded), prior knowledge of genetically modified food, and source credibility. Predictor variables were entered in the same manner as objective three to predict the outcome variable, change in risk perception. All assumptions discussed in objective three were met in objective four (Table 3-3, Table 3-4).

Limitations

Since this study was administered online, the sample was limited to people who had a computer. In addition, the sample was limited to people recruited by the online public survey company used to administer the instrument. Another limitation for the online survey was information was only collected for the specific questions asked. This can sometimes lead to researchers missing information that may be important to the research problem that could have been found in qualitative research. Limitations associated with non-probability sampling include that not every person in the population has an equal chance of being selected (Avery et al., 2010). This limitation was reduced through post-stratification weighting for the Florida population (Baker et al., 2013).

Another limitation for this research was the feasibility for collecting information about the processing route used by the respondents when presented with persuasive information toward genetically modified food. A common way to gather this information would be by using thought-listing procedures, which would ask respondents to write

down every thought they have about a given subject. Since this research was a small section of a larger study, and was administered online, the cognitive load for the respondents was assumed to be too high to use this procedure. It was not likely that the respondents would type out their thoughts without a researcher sitting alongside them.

Additionally, since the survey already covered a number of topics with more than 60 questions, the number of questions this study could feasibly ask was limited. Another limitation to consider was that the other questions in the survey could have influenced respondents' answers to the questions analyzed in this study. Also, using a pretest may have interacted with the treatment, and cause respondents to be less sensitive to the message prompt, which would result in small changes in attitude and risk perception.

Assumptions

An assumption for this research was that consumers, at the very least, had been exposed to genetically modified food and had already formed an opinion toward them. A similar assumption was that respondents were aware of the industry companies and government agencies used as sources for the treatments and had some prior opinions toward those sources. Prior literature indicated that people rely on the peripheral processing route when forming attitudes about agriculture, including genetically modified food. This study assumed that people would follow this trend and take notice of the source presenting the information.

Another assumption made was that the sample accurately reflected the population of Florida. The sample was weighted to reflect the 2010 Florida census in order to be more generalizable to the public. Since the researcher could not see who had completed the survey online, another assumption was that each respondent was a

different person. This was also assured by the public opinion company by using specific links for the survey associated with each individual.

Summary

This research was conducted using a pretest-posttest experimental design implemented through an online survey. The independent variable in the study was the message source: FDA, USDA, Green Giant, and AgLabs. The online pretests and posttests measured change in attitude toward genetically modified and change in risk perception of genetically modified food. Additional questions gathered information about consumers' knowledge of genetically modified food, along with their opinions of the source's credibility.

The target population was all Florida consumers 18 years and older. The sample size was 515 (*n*= 515) and provided a margin of error of +/- 4.3% (Ary et al., 2010). The survey software company, Qualtrics, used non-probability methods to recruit an opt-in panel with a monetary incentive. To lower various biases associated with non-probability methods, post-stratification weighting was used so the sample demographics better reflected to demographics of the population (Baker et al., 2013).

Validity was accounted for by adapting previously used instruments and having a panel of experts review the questionnaire (Ary et al., 2010). Reliability was reviewed by using a soft-launch to ensure the instrument was working correctly (Ary et al., 2010). Additionally, after data collection was complete, Cronbach's alpha was run to test the internal consistency of the instrument's measures (Ary et al., 2010). These errors included coverage, sampling, rounding, nonresponse, and measurement error (Dillman et al., 2009; Maletta, 2007). Survey errors were accounted for by using post-

stratification sampling methods, discarding incomplete surveys, and having a panel of experts review the instrument before distribution.

The instrument was adapted from six similar studies (Frewer et al., 1997; Frewer, Howard, & Shepherd, 1998; Roe & Teisl, 2007; Rumble & Leal, 2013; Osgood et al., 1971; Hallman & Metcalf, 1993). Likert-type scales, along with bipolar semantic differential scales, were used to measure the previously described variables. Analysis of the instrument included descriptive statistics, ANOVAs, and multiple linear regression models using statistical software SPSS ® 21.

Table 3-1. Experimental design for the study.

Pretest	Independent Variable	Posttest
O_1	X_1	O_2
O_1	X_2	O_2
O_1	X_3	O_2
O_1	X_4	O_2

Note. X_1 = FDA, X_2 = USDA, X_3 = Green Giant, X_4 = AgLabs

Table 3-2. Proportional weights of demographics in the sample.

	Population %	*Proportional Weight*
Age		
19 and under	1.3	.013
20-29	12.8	.128
30-39	12.2	.122
40-49	14.2	.142
50-59	13.5	.135
60-69	11.1	.111
70-79	7.4	.074
80 and older	4.9	.049
Sex		
Male	41.1	.489
Female	51.1	.511
Hispanic	22	.220
Race		
White	75	.750
American Indian/Alaska Native	0.4	.004
African American	16.0	.160
Asian or Pacific Islander	2.5	.025
Multiracial	2.5	.025
Other	3.6	.036

Table 3-2. Continued.

	Population %	*Proportional Weight*
Rural/Urban Continuum		
Metro - Counties in metro areas 1 million population or more	63.1	.631
Metro - Counties in metro areas of 250,000 to 1 million population	25.7	.257
Metro- Counties in metro areas of fewer than 250,000 population	4.8	.048
Non-metro - Urban population of 20,000 or more, adjacent to a metro area	3.5	.035
Non-metro - Urban population of 2,500 to 19,999, adjacent to a metro area	2.6	.026
Non-metro - Completely rural or less than 2,500 urban population, adjacent to a metro area	0.3	.003

Table 3-3. Normality assumptions of variables.

	With Outliers		*Without* Outliers	
	Skewness	*Kurtosis*	*Skewness*	*Kurtosis*
Change in Attitude	1.14	3.07	1.04	1.57
Change in Risk Perception	1.74	8.79	.79	1.64
Prior Knowledge	-.372	.410	-.328	.271
Source Credibility	-.334	-.270	-.190	-.179

Note. Acceptable skewness and kurtosis level is +/- 2 (George & Mallery, 2010).

Table 3-4. VIF and Tolerance for variables in objective three and four.

Variable	Model 1		Model 2		Model 3		Model 4	
	Tol.	*VIF*	*Tol.*	*VIF*	*Tol.*	*VIF*	*Tol.*	*VIF*
Green Giant	.695	1.439	.663	1.508	.655	1.526	.655	1.527
AgLabs	.688	1.454	.639	1.564	.637	1.569	.637	1.571
USDA	.685	1.460	.613	1.633	.609	1.642	.608	1.646
Generation								
Generation X			.690	1.449	.690	1.449	.686	1.458
Young Baby Boomers			.688	1.454	.658	1.520	.652	1.534
Old Baby Boomers			.734	1.363	.725	1.380	.720	1.388
Silent Generation or older			.661	1.513	.626	1.596	.622	1.608
Men			.886	1.129	.874	1.144	.845	1.183
Education								
High School Degree or less			.669	1.495	.607	1.647	.607	1.648
Some college, no degree			.704	1.421	.697	1.434	.694	1.442

Note. Acceptable tolerance does not fall below 0.1 and acceptable VIF is not substantially higher than 1.0.

Table 3-4. Continued.

Variable	Model 1		Model 2		Model 3		Model 4	
	Tol.	*VIF*	*Tol.*	*VIF*	*Tol.*	*VIF*	*Tol.*	*VIF*
Education								
Two-year college degree			.714	1.401	.709	1.410	.709	1.411
Graduate or Professional Degree			.792	1.262	.791	1.265	.789	1.267
Race								
African American			.818	1.223	.817	1.223	.817	1.224
Other			.845	1.183	.845	1.183	.842	1.187
Annual Income								
$24,000 or less			.766	1.305	.765	1.306	.765	1.307
$50,000-$74,000			.727	1.376	.726	1.377	.725	1.378
$75,000- or more			.720	1.388	.700	1.429	.696	1.437

Table 3-4. Continued.

Variable	Model 1		Model 2		Model 3		Model 4	
	Tol.	*VIF*	*Tol.*	*VIF*	*Tol.*	*VIF*	*Tol.*	*VIF*
Purchase Groceries for…								
Self			.803	1.245	.803	1.245	.797	1.255
Spouse			.724	1.382	.713	1.402	.709	1.411
Children			.754	1.326	.754	1.326	.753	1.328
Others			.857	1.167	.857	1.168	.855	1.170
Prior Knowledge					.754	1.326	.741	1.350
Source Credibility							.874	1.144

Note. Acceptable tolerance does not fall below 0.1 and acceptable VIF is not substantially higher than 1.0.

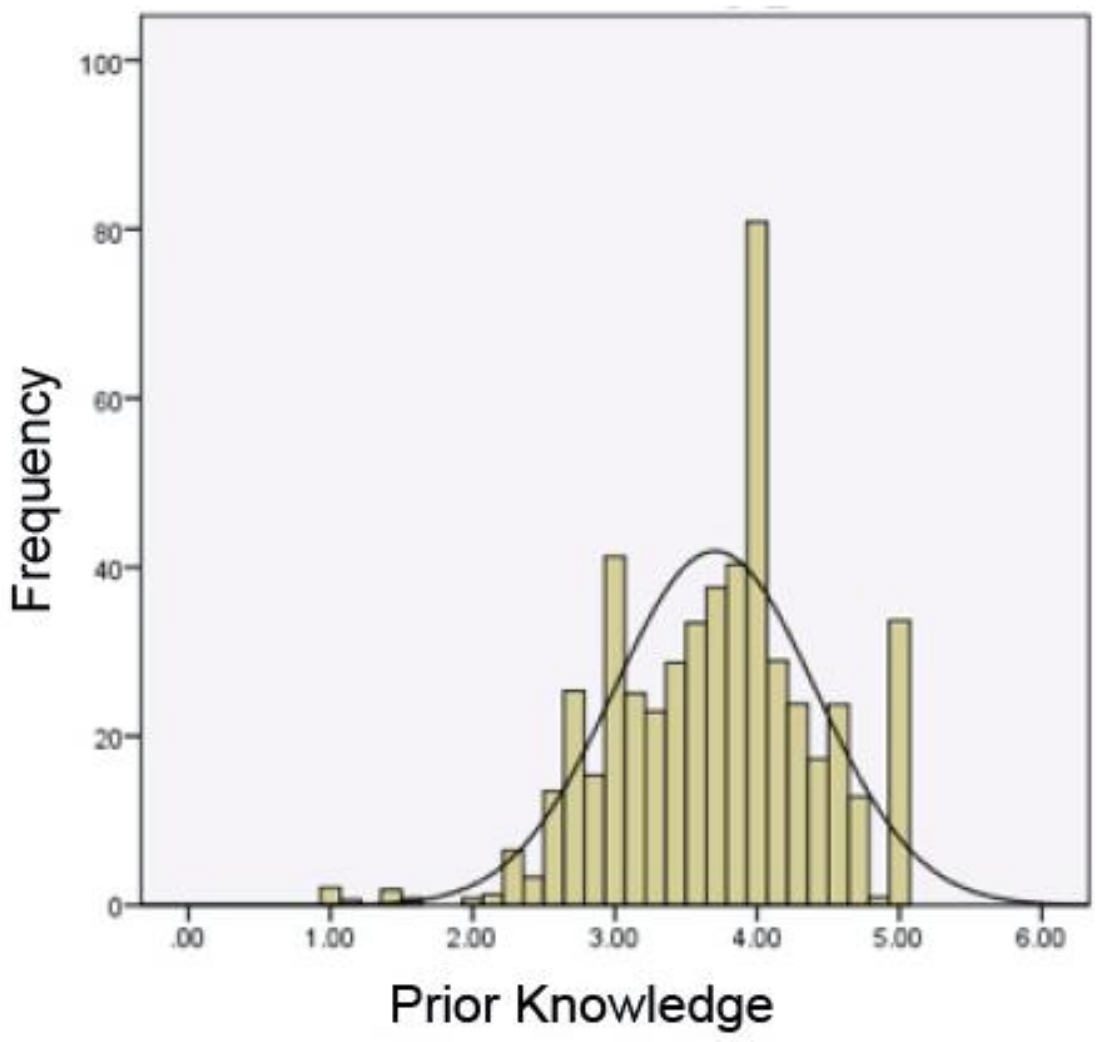

Figure 3-1. Normality curve for prior knowledge prior to removal of outliers.

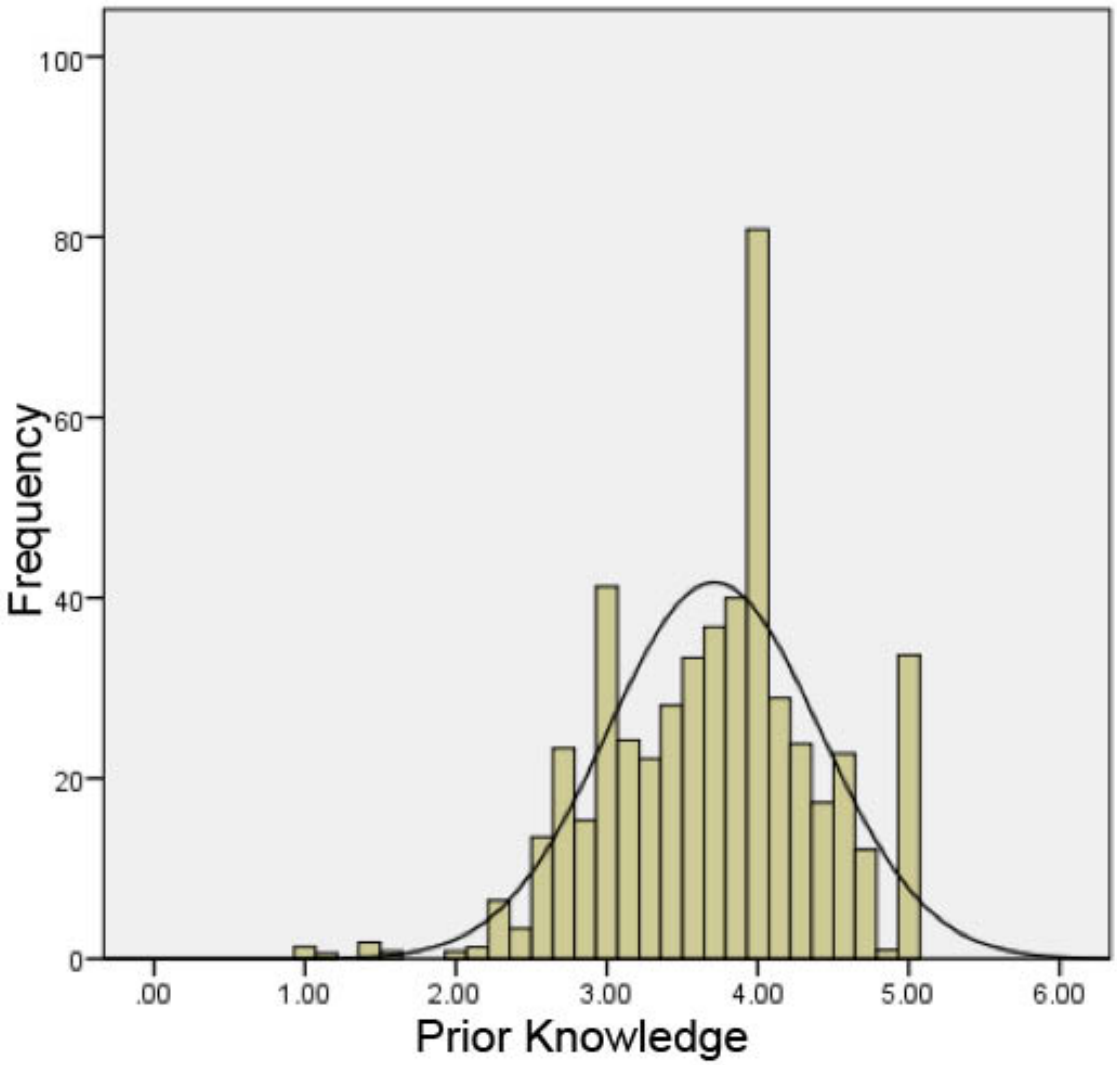

Figure 3-2. Normality curve for prior knowledge after removal of outliers.

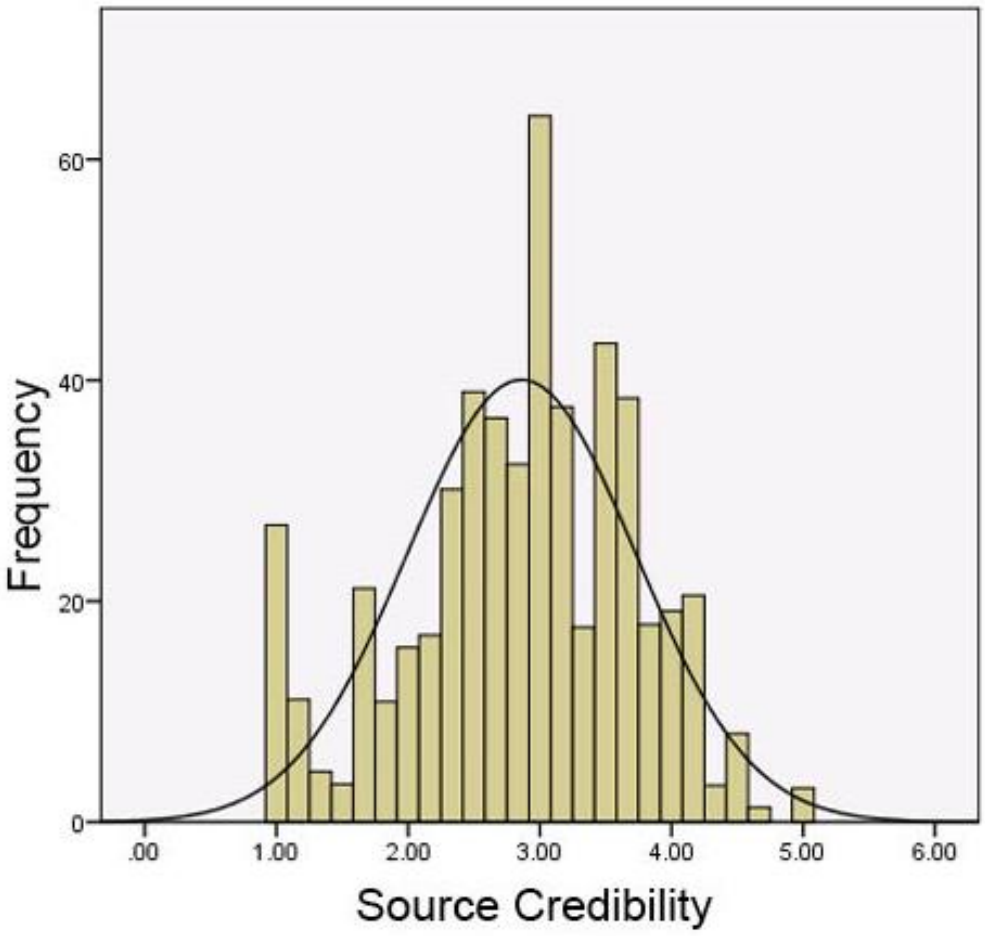

Figure 3-3. Normality curve for source credibility prior to removal of outliers.

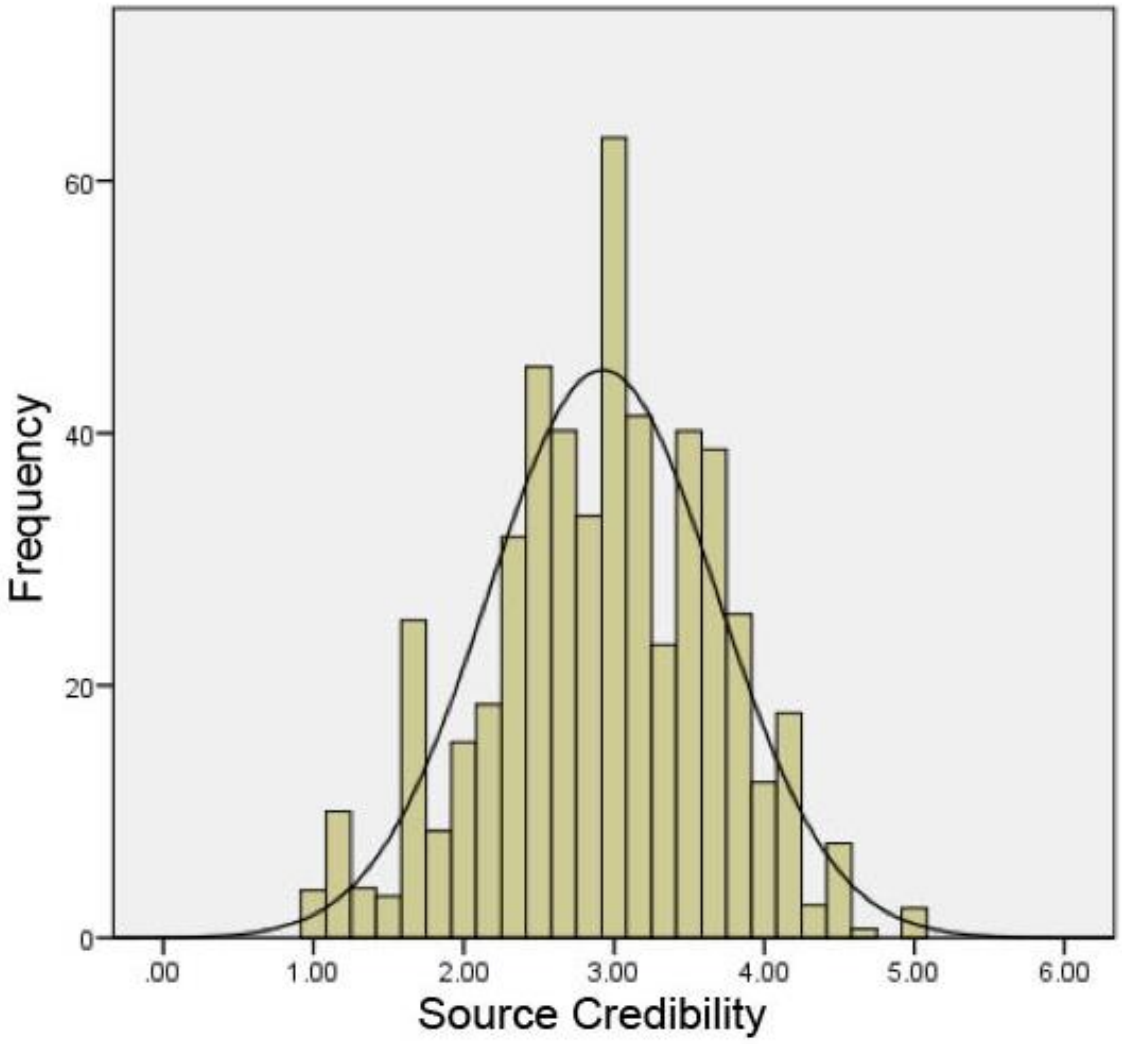

Figure 3-4. Normality curve for source credibility after removal of outliers.

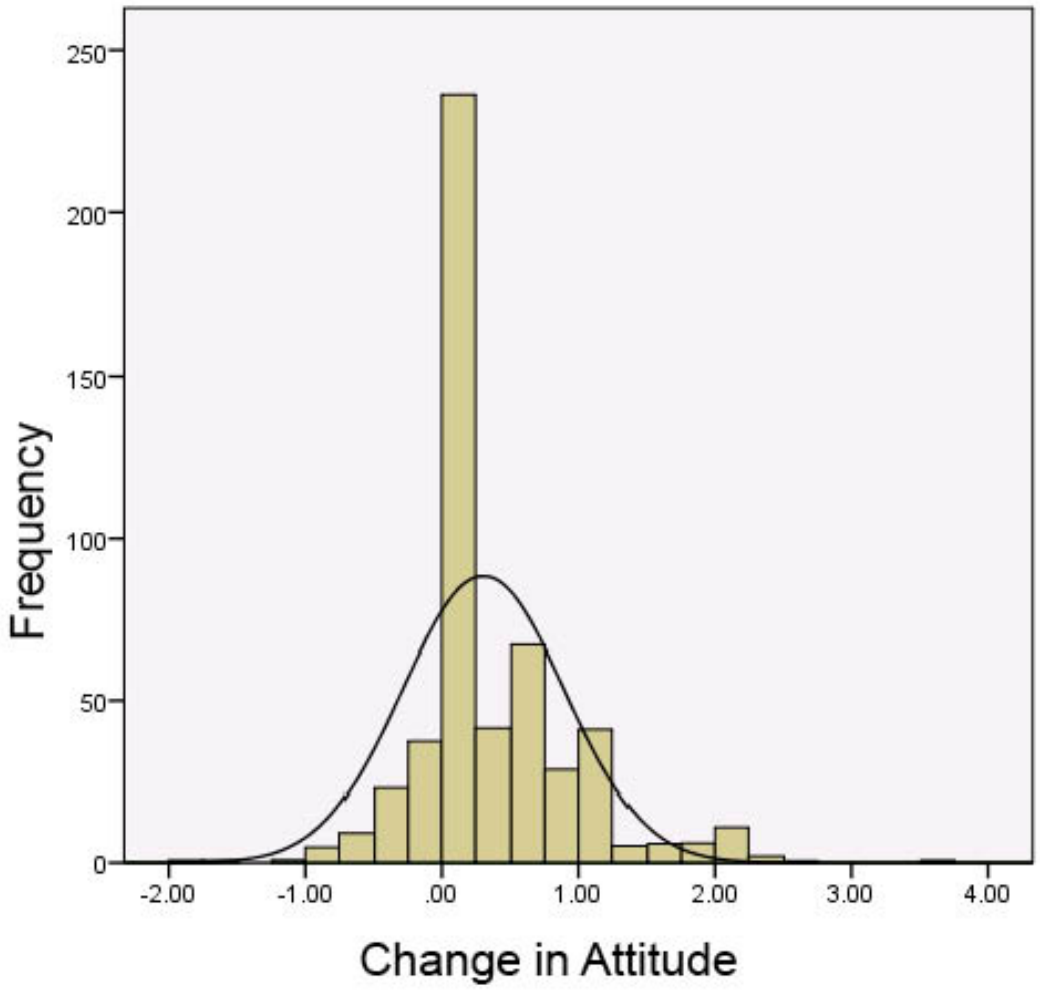

Figure 3-5. Normality curve for change in attitude prior to removal of outliers.

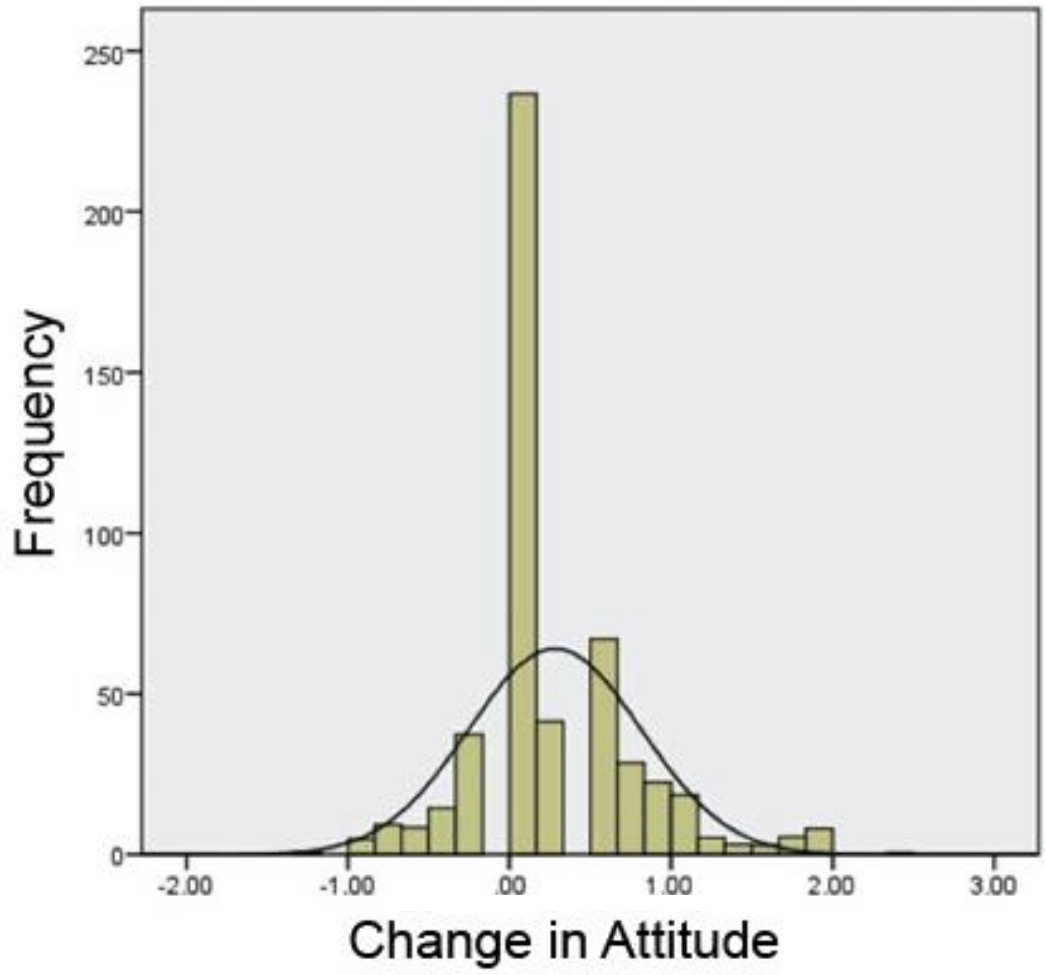

Figure 3-6. Normality curve for change in attitude after removal of outliers.

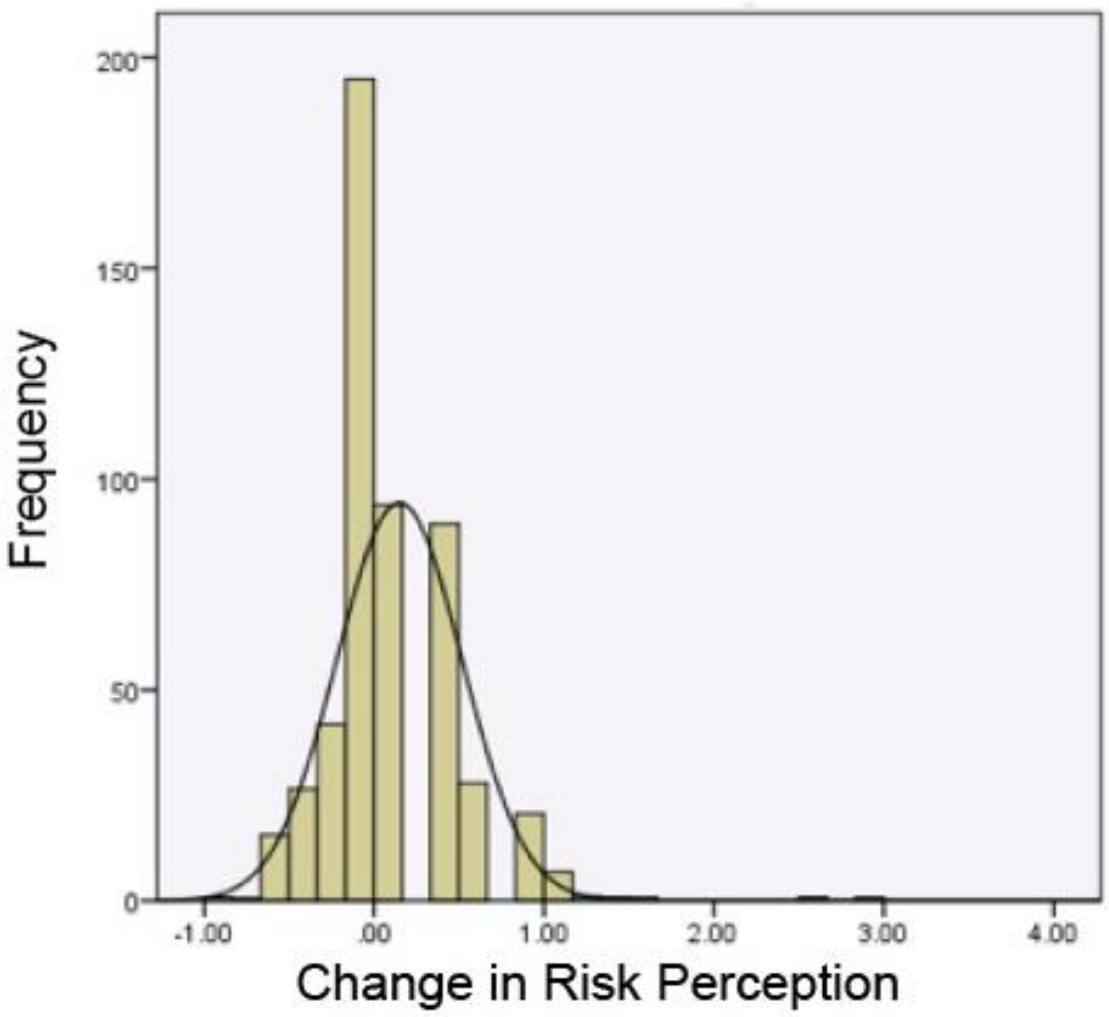

Figure 3-7. Normality curve for change in risk perception prior to removal of outliers.

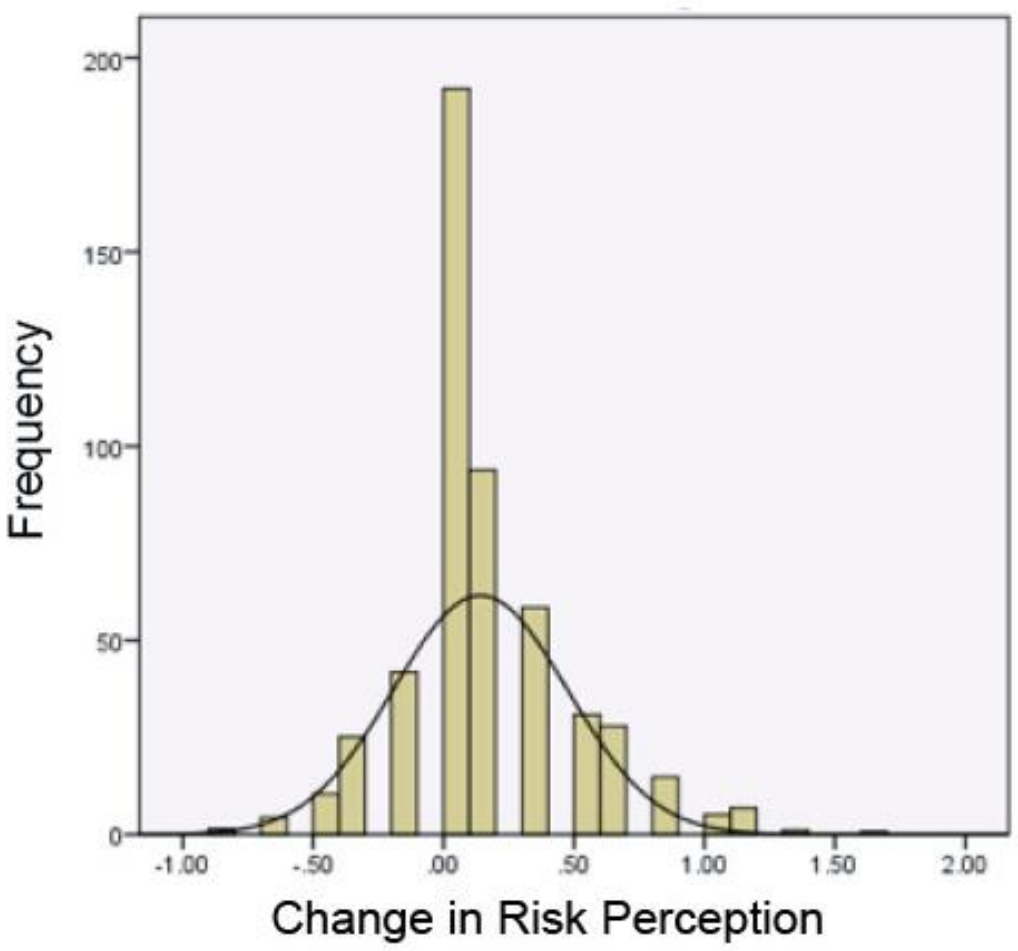

Figure 3-8. Normality curve for change in risk perception after removal of outliers.

CHAPTER 4
RESULTS

Chapter 3 described how an online survey was developed to fit the model for this research based on the ELM and Shannon and Weaver's communication model. The population for the study was Florida consumers over the age of 18. Non-probability sampling was used to collect panel data, and the sample demographics were weighted to match the 2010 Florida Census. The total sample for the study was 515 respondents, but rounding error can change the *n* for each objective due to weighting (Maletta, 2007).

The purpose of the study was to analyze the influence of persuasive communication on Florida consumers' change in attitude and change in risk perception of genetically modified food. The experimental design for the study included one treatment with four different sources: Green Giant, AgLabs, FDA, and USDA. These sources served as the independent variables and the message they presented was the constant. Change in risk perception and change in attitude toward genetically modified food were the dependent variables. Moderating and mediating variables included prior knowledge of genetically modified food, source credibility, and demographics. Chapter 4 presented an analysis of the variables of demographics, variables of interest, and objectives.

Analysis of Demographics

Demographics for the respondents are reported in Table 4-1. The instrument was distributed to 770 Florida consumers, and 514 (*n* = 514) completed the questionnaire. Demographics were weighted to match the Florida 2010 census for age, sex, rural/urban continuum, race, and, ethnicity (Table 4-1). Due to rounding errors from post-stratification weighting, the adjusted *n* was equal to 515 (Maletta, 2007). The

weighted demographics will be described since all analysis used the weights; unweighted demographics can also be seen in Table 4-1. For analysis, the weighted ages of respondents were grouped into appropriate generations, and the majority of respondents' ages were in the Millennial Generation or younger (30.3%, *n* = 156). There were more women (51.1%, *n* = 263) than men, and the majority of respondents were white (75.1%, *n* = 387); 22.9% (*n* = 118) of the sample indicated they were Hispanic. Education was also included in demographics, and the largest percent of respondents had graduated from college with a four-year degree (31.4%, *n* = 162). Most respondents reported earning less than $50,000 for their annual income (54.8%, *n* = 282) and resided in metro areas with a population over 1 million people (62.0%, *n* = 325). The census for Florida also reported residents living in urban and rural areas not adjacent to metro areas. None of the respondents in the survey indicated they lived in these areas, which is why the weighted percentages for the rural/urban continuum do not equal 100%. Respondents were also asked whom they purchased food for as part of the demographic questions. The majority of respondents purchased food for themselves (97.5%, *n* = 502), their spouses (57.8%, *n* = 298), and their children (29.2%, *n* = 151).

Analysis of Variables of Interest

Prior Knowledge

Prior knowledge was measured using a seven-item, five-point Likert-type scale ranging from *strongly disagree* =1, *disagree* = 2, *neither agree nor disagree* = 3*, agree* = 4, to *strongly agree* = 5. This scale was adapted from an instrument designed by Hallman and Metcalf (1993) with the overall reliability for the index being α = .88. The grand mean for respondents' prior knowledge was 3.71 (*SD* = .70), which indicated respondents agreed that they were knowledgeable about genetically modified food.

Source Credibility

An index for source credibility was measured using a six-item, five-point Likert-type scale adapted from previous research (Frewer et al., 1997; Perloff, 2009). The scale used the same labels as the prior knowledge index. The same credibility index was completed by each group after exposure to the treatment and had reliabilities ranging from α =.75 and α = .85 in each of the four groups. The average for each group's source credibility was close between AgLabs (*M* = 2.92, *SD* = .70), FDA (*M* = 2.91 *SD* = .76), and USDA (*M* = 2.93, *SD* = .76); Green Giant received the lowest credibility average (*M* = 2.87, *SD* = .78). The overall mean for the source credibility index was 2.91 (*SD* = .75, Table 4-2). The individual and overall credibility scores indicated that respondents neither agreed nor disagreed that the source(s) was credible. An ANOVA was run to determine if there was a significant difference between the source credibility associated with the four different sources (Table 4-3). The p-value was .93, and no differences in credibility were identified (F (3, 511) = .15, p = .93).

Change in Attitude

Change in attitude toward genetically modified food was calculated using a pretest- posttest design. The prior attitude index was subtracted from the final attitude index. Attitude was measured using six bipolar semantic differential scales based off of attitude measurements suggested by Osgood et al. (1971) and Frewer, Howard, and Shepherd (1998). Measurements included natural/artificial, unhealthy/healthy, dangerous/safe, beneficial/not beneficial, wholesome/not wholesome, and unnecessary/necessary. *Negative* adjectives were assigned a 1 and *positive* adjectives were assigned a 5. The pretest index for attitude had a reliability of α = .94 and posttest α ranging from .94 to .95. Table 4-4 shows the overall prior attitude index mean was

slightly negative (*M* = 2.33, *SD* = 1.07) and final attitude mean was neutral (*M* = 2.61, *SD* = 1.10). Change in attitude was calculated, and FDA produced the greatest average change in attitude (*M* = .40, *SD* = .53) and Green Giant produced the smallest change (*M* = .17, *SD* = .54). Even though the FDA did produce the greatest change in attitude, it had the most negative attitude score both before and after receiving the message. The grand mean for change in attitude was index .28 (*SD* = .54). A paired t-test was performed to see if there was a significant change in attitude for each group and for the overall change in attitude (Table 4-5). All p-values were less than .01, which meant that there was a significant difference between the prior and final attitude.

Change in Risk Perception

Risk perception was measured through questions adapted from Frewer, Howard, and Shepherd (1998), Roe and Teisl (2007), and Rumble and Leal (2013). A five-point Likert-type scale with six items made up the index. Lower perceptions of risk were assigned a *5* and higher perceptions of risk were assigned a *1*. The overall reliability for the prior risk index was α = .87 and the posttest reliability score fell between .83 and .88 in each group. The average for the prior risk perception index was 2.83 (*SD* = .89) and final risk perception was 2.97 (*SD* = .89). Both the prior and final risk perception scores indicated that respondents neither agreed nor disagreed about the risks of genetically modified food. The results can be seen in Table 4-4. Change in risk perception of genetically modified food was calculated by subtracting the prior risk perception from the final risk perception (Table 4-6). FDA produced the greatest change in risk perception (*M* = .16, *SD* = .33), but Green Giant and AgLabs yielded similar changes in risk perception (*M* = .15, *SD* = .35 and *M* = .15, *SD* = .36 respectively). The smallest change in risk perception came from the USDA with only a .09 increase in the mean

(*SD* = .29). The overall average for the change in risk perception index was *M* = .14 (*SD* = .33). A paired t-test was performed to see if there was a difference between the prior and final risk perception of genetically modified food (Table 4-7). There was a significant difference in all four groups and the overall change in risk perception (all $p < .01$).

Analysis of Objectives

Objective 1. Compare Florida consumers' change in attitude toward genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.

Objective one examined if there were any differences in the change in attitude between the four different groups. An ANOVA in Table 4-8 showed that there were significant differences between the four groups (F (3, 511) = 4.24, p = .01). A Bonferroni test was performed as a post-hoc analysis to determine which groups showed significant differences. Table 4-9 showed the results of the test. The only significant differences in groups were between Green Giant and FDA (p = .00). The mean difference showed that Green Giant's mean change in attitude was .23 lower than the FDA's mean for change in attitude toward genetically modified food.

Objective 2. Compare Florida consumers' change in risk perception of genetically modified food after receiving persuasive communication from Green Giant, AgLabs, FDA, or USDA.

Table 4-10 showed the ANOVA for change in risk perception between the source groups. There were no significant differences (F (3, 511) = 1.36, p= .25), therefore, post-hoc tests were not performed.

Objective 3: Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in attitude toward genetically modified food.

A hierarchical regression was performed to satisfy objective three. The first model used only the message source to determine if the source used could predict the change in attitude toward genetically modified food (Table 4-11). The model was significant (F (3, 511) = 4.237, p = .006), and Green Giant and USDA were identified as significant predictors (p = .001 and .022 respectively). When compared to the FDA, there was a .229 smaller attitude change when respondents were exposed to Green Giant (B = -.229) and .149 smaller change in attitude when exposed to USDA (B = -.149). An examination of the means in Table 4-4 shows that attitude change was still positive for all four sources though. The R^2 value was .024, which indicated the model only accounted for 2.4% of variance in change in attitude.

The second model was also significant (F (3, 511) = 2.137, p = .002) and included demographics (generation, sex, education, race, annual income, and whom the respondent purchased food for when shopping) and the message source. Green Giant (B = -.252, p < .000) and USDA (B = -.145, p = .032) were still predictors of change in attitude. The Silent Generation and older were identified as significant predictors of attitude change as well (p = .008). When compared to respondents in the Millennial Generation, those in the Silent Generation and older showed a .203 larger change in attitude (B = .203). Men were also a significant predictor (p = .002); males had a .155 smaller change in attitude than females (B = -.155). The R^2 value increased from the first model by .059 to .083; the second model could account for 8.3% of the

variance in change in attitude accounted for by the predictors. This was a significant change in the R^2 (p = .026).

Models three and four can be seen in Table 4-12. Model three was significant (F (3, 511) = 2.334, p = .001), and used all the same predictors as before with the addition of prior knowledge of genetically modified food. The use of Green Giant (B = -.234, p = .001) and USDA (B = -.133, p = .050) as a source were still significant predictors of attitude change. Men were also still a significant predictor of a change in attitude (B = -.141, p = .004), as was the Silent Generation or older (B = .159, p = .039). The addition of prior knowledge to the model did make education level significant. Respondents with a high school degree or less were predictors of attitude change when compared to those with a four-year degree (p = .027), and had a .166 smaller change in attitude comparatively (B = -.166). Prior knowledge was also a predictor (p = .015), and as prior knowledge increased one unit, there was a predicted .092 decrease in the change in attitude (B = -.092). The third model represented 9.4% of the variance (R^2 = .094) in the change in attitude as explained by the set of predictors, which was .011 higher than the second model. This was a significant change (p = .015).

The fourth and final model included all previous predictors along with source credibility. This model was significant (F (3, 511) = 3.905, p < .000) and had the highest R^2 value, representing 15.5% of variance in the outcome of change in attitude (R^2 = .155). Green Giant (B = -.237, p < .000), USDA (B = -.151, p = .022), men (B = -.193, p < .000), and having a high school diploma or less (B = -.156, p = .032) were still significant predictors of attitude change. Additionally, respondents who reported they purchased groceries for a spouse were a significant predictor compared to those who

did not; these respondents were reported to have a larger change in attitude (B = .104, p = .052). With the addition of source credibility to the model, the Silent Generation or older (p = .106) and prior knowledge (p = .086) were no longer significant predictors of change in attitude. However, source credibility was identified as a significant predictor (p < .000), and for every one-unit increase in source credibility, there was a .188 increase in attitude change (B = .188). The R^2 for this model was .060 higher than in model three and was significantly different (p < .000), which made model four the best fit.

Objective 4. Determine how the message source, consumers' demographics, prior knowledge of genetically modified food, and source credibility predict Florida consumers' change in risk perception of genetically modified food.

Similar to objective three, a hierarchical regression model was used to answer objective four. Table 4-13 showed regression model one the change in risk perception after receiving persuasive communication about genetically modified food. Model one (F (3, 511) = 1.362, p = .254) was not significant, so subsequent models were not tested. The message source alone was not predictive of a change in risk perception.

Post-Hoc Analysis

Post-hoc tests were performed to further explore the influence of persuasive communication on both risk perceptions and attitudes toward genetically modified food.

Change in Risk Perception

Since the regression model for objective four was not significant for predicting a change in risk perception using only the message source, a regression was run including the remaining moderating and mediating variables without the presence of the source. Table 4-14 showed the results from this regression. The model was significant (F (3, 511) = 1.924, p = .010), but it only accounted for 7.2% of the variance in change

in risk perception (R^2 = .072). When demographic characteristics were examined, men were significant predictors of a smaller change in risk perception when compared to women (*B* = -.065, *p* = .039), and respondents categorized as “other” were predicted to have a smaller change in risk perception than white respondents (*B* = -.109, *p* = .043). Additionally, when compared to respondents earning between $25,000 and $49,999 annually, those who earned $50,000 to $74,999 were predicted to have a larger change in risk perception (*B* = .093, *p* = .015). Source credibility was not a significant predictor of change in risk perception (*p* = .217), but prior knowledge was (*p* = .030). As prior knowledge increased one unit, change in risk perception was predicted to decrease by .052 (*B* = -.052).

Final Attitude

The relatively small R^2 seen in the regression models for both change in attitude and change in risk perception indicated that the conceptual model created for this research did not predict the dependent variables as anticipated. Since risk perception did not appear to be operating within the proposed conceptual model or ELM, further research on this dependent variable was not conducted for this study. The ELM does discuss attitude changes and shifts, but the model more specifically examines the actual final attitude rather than individual changes (Petty et al. 2009). For this reason, the *final attitude* was treated as a dependent variable in post-hoc analysis. Additionally, literature has suggested that prior risk perception can be predictive of final attitudes toward genetically modified food (Frewer, Howard, & Shepherd, 1998). Therefore, prior risk perception was added as a moderating variable to the regression model along with message source, demographics, prior knowledge, and source credibility. Results from the regression can be seen in Table 4-15. The model was significant (*F* (3, 511) =

68.845, $p < .000$) and could account for 74.6% of the variance in the final attitude toward genetically modified food ($R^2 = .746$).

A number of different demographic categories were predictive of the final attitude toward genetically modified food. Generation X ($B = .160$, $p = .026$), Young Baby Boomers ($B = .215$, $p = .008$), and Old Baby Boomers ($B = .237$, $p = .008$) were all predicted to have a more positive final attitude compared to the Millennial Generation or younger. Respondents earning less than $25,000 a year were predicted to have a more positive final attitude than respondents earning between $25,000 and $49,999 annually ($B = .183$, $p = .017$). Finally, respondents who purchased food for themselves were predicted to have more negative final attitudes toward genetically modified food compared to those who did not purchase food for themselves ($B = -.485$, $p = .007$).

Prior knowledge was not a significant predictor of final attitude toward genetically modified food ($p = .343$), but prior risk perception ($p < .000$) and source credibility ($p < .000$) were significant predictors. As prior risk perception increased one unit, the final attitude increased by .776 ($B = .776$); prior risk perception of a higher score indicated more positive perceptions of risk. Source credibility was the final significant predictor, and as it increased by one unit, the final attitude toward genetically modified food increased by .423 ($B = .423$).

Table 4-1. Demographic characteristics of the respondents.

	n	%	*Weighted n*	*Weighted %*
Generation				
Millennials or younger	136	26.5	156	30.3
Generation X	102	19.8	115	22.4
Young Baby Boomers	120	23.3	91	17.7
Old Baby Boomers	93	18.1	65	12.7
Silent Generation or older	63	12.3	87	16.9
Sex				
Male	188	36.6	252	48.9
Female	326	63.4	263	51.1
Education				
High School Degree or less	93	18.1	98	19
Some college, no degree	131	25.5	121	23.5
Two-year college degree	76	14.8	82	15.9
Four-Year College Degree	159	30.9	162	31.4
Graduate or Professional Degree	55	10.7	52	10.1
Hispanic	52	10.1	118	22.9
Race				
White	463	90.1	387	75.1
African American	25	4.9	82	15.8
Other	26	5.1	47	9.1
Annual Income				
$25, 999 or less	95	18.5	87	16.9
$25,000-$49,999	188	36.6	195	37.9
$50,000- $74,999	130	25.3	138	26.8
$75,000 or more	101	19.6	95	18.4

Table 4-1. Continued.

	n	*%*	*Weighted n*	*Weighted %*
Rural/Urban Continuum				
Metro - Counties in metro areas 1 million population or more	309	60.1	325	62.0
Metro - Counties in metro areas of 250,000 to 1 million population	133	25.9	132	25.2
Metro- Counties in metro areas of fewer than 250,000 population	25	4.9	25	4.8
Non-metro - Urban population of 20,000 or more, adjacent to a metro area	30	5.8	18	3.4
Non-metro - Urban population of 2,500 to 19,999, adjacent to a metro area	16	3.1	14	2.7
Non-metro - Completely rural or less than 2,500 urban population, adjacent to a metro area	1	0.2	2	0.4
Purchase Groceries for…				
Self	507	98.6	502	97.5
Spouse	302	58.8	298	57.8
Children	158	30.7	151	29.2
Other	72	14.0	74	14.4
Total	514	100	515	100

Table 4-2. Description of source credibility.

	Green Giant (*n* = 120) *M(SD)*	AgLabs (*n* = 128) *M(SD)*	FDA (*n*= 137) *M(SD)*	USDA (*n* = 131) *M(SD)*	Total *M(SD)*
Source Credibility	2.87(.78)	2.92(.70)	2.91 (0.76)	2.93 (0.76)	2.91(.75)

Note. 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree; *5* indicated high credibility, *1* indicated low credibility.

Table 4-3. ANOVA for source credibility between groups.

	SS	*df*	*MS*	*F*	*p*
Between Groups	.25	3	.08	.147	.932
Within Groups	286.86	511	.56		
Total	287.11	514			

Table 4-4. Description of attitudes toward genetically modified food.

	Green Giant (*n* = 120) *M(SD)*	AgLabs (*n* = 128) *M(SD)*	FDA (*n* = 137) *M(SD)*	USDA (*n* = 131) *M(SD)*	Total *M(SD)*
Prior Attitude	2.47(1.06)	2.25(1.04)	2.13(1.01)	2.49(1.13)	2.33(1.07)
Final Attitude	2.63(1.17)	2.55(1.12)	2.52(1.00)	2.73(1.10)	2.61(1.10)
Change in Attitude	.17(.54)	.30(.55)	.40(.53)	.25(.51)	.28(.54)

Note. 1.00 – 1.49 = negative, 1.50 – 2.49 = slightly negative, 2.50 – 3.49 = neutral, 3.50 – 4.49 = slightly positive, 4.50 – 5.00 = positive.

Table 4-5. Paired sample t-test between prior and final attitude.

	Green Giant (*n* = 120)	AgLabs (*n* = 128)	FDA (*n* = 137)	USDA (*n* = 131)	Total
p	.000	.000	.000	.000	.000

Table 4-6. Description of risk perception of genetically modified food.

	Green Giant (*n* = 120) *M(SD)*	AgLabs (*n* = 128) *M(SD)*	FDA (*n* = 137) *M(SD)*	USDA (*n* = 131) *M(SD)*	Total *M(SD)*
Prior Risk Perception	2.87(1.03)	2.83(.87)	2.75(.86)	2.87(.78)	2.83(.89)
Final Risk Perception	3.03(1.07)	2.97(.84)	2.92(.86)	2.96(.78)	2.97(.89)
Change in Risk Perception	.15(.35)	.15(.36)	.16(.33)	.09(.29)	.14(.33)

Note. 1.00 – 1.49 = strongly disagree, 1.50 – 2.49 = disagree, 2.50 – 3.49 = neither agree nor disagree, 3.50 – 4.49 = agree, 4.50 – 5.00 = strongly agree; Lower perceptions of risk assigned a 5 and higher perceptions of risk assigned a 1.

Table 4-7. Paired sample t-test between prior and final risk perception.

	Green Giant (*n* = 120)	AgLabs (*n* = 128)	FDA (*n* = 137)	USDA (*n* = 131)	Total
p	.000	.000	.000	.000	.000

Table 4-8. ANOVA for change in attitude.

	SS	*df*	*MS*	*F*	*p*
Between Groups	3.57	3	1.19	4.24	.01
Within Groups	143.40	511	.28		
Total	149.28	514			

Table 4-9. Follow-up test for change in attitude.

	Mean Difference	*p*
Green Giant		
AgLabs	-.14	.27
FDA	-.23	.00
USDA	-.08	1.00

Table 4-9. Continued.

	Mean Difference	*p*
AgLabs		
Green Giant	.14	.27
FDA	-.09	.93
USDA	-.06	1.00
FDA		
Green Giant	.23	.00
AgLabs	.09	.93
USDA	.15	.13
USDA		
Green Giant	.08	1.00
AgLabs	-.06	1.00
FDA	-.15	.13

Table 4-10. ANOVA for change in risk perception.

	SS	*df*	*MS*	*F*	*p*
Between Groups	.45	3	.15	1.36	.25
Within Groups	56.80	511	.11		
Total	57.26	514			

Table 4-11. Multiple linear regression analysis for variables predicting change in attitude (Model 1 and 2).

Variable	Model 1			Model 2		
	B	*t*	*p*	*B*	*t*	*p*
Constant	.395	8.726	.000	.403	2.074	.039
Green Giant	-.229	-3.449	.001	-.252	-3.769	.000
AgLabs	-.093	-1.426	.154	-.083	-1.249	.212
USDA	-.149	-2.299	.022	-.145	-2.149	.032
Generation						
Generation X				-.005	-.069	.945
Young Baby Boomers				.039	.533	.594
Old Baby Boomers				.116	1.441	.150
Silent Generation or older				.203	2.682	.008
Men				-.155	-3.171	.002
Education						
High School Degree or less				-.110	-1.533	.126
Some college, no degree				.044	.678	.498
Two-year college degree				.022	.300	.765
Graduate or Professional Degree				-.026	-.305	.761
Race						
African American				-.031	-.438	.661
Other				.145	1.665	.096

Table 4-11. Continued.

Variable	Model 1			Model 2		
	B	*t*	*p*	*B*	*t*	*p*
Annual Income						
$24, 999 or less				.015	.218	.828
$50,000- $74,999				.019	.311	.756
$75,000- or more				.028	.397	.691
Purchase Groceries for…						
Self				-.043	-.260	.795
Spouse				.096	1.751	.081
Children				-.036	-.613	.540
Other				.007	.100	.920
R^2	.024			.083		
F	4.237		.006	2.137		.002
ΔR^2				.059		
ΔF				1.768		.026

Table 4-12. Multiple linear regression analysis for variables predicting change in attitude (Model 3 and 4).

Variable	Model 3			Model 4		
	B	*t*	*p*	*B*	*t*	*p*
Constant	.769	3.148	.002	.206	.807	.420
Green Giant	-.234	-3.494	.001	-.237	-3.655	.000
AgLabs	-.074	-1.113	.266	-.087	-1.356	.176
USDA	-.133	-1.966	.050	-.151	-2.306	.022
Generation						
Generation X	-.007	-.102	.919	.023	.362	.718
Young Baby Boomers	.001	.013	.990	.041	.576	.565
Old Baby Boomers	.094	1.161	.246	.130	1.652	.099
Silent Generation or older	.159	2.065	.039	.121	1.621	.106
Men	-.141	-2.880	.004	-.193	-4.000	.000
Education						
High School Degree or less	-.166	-2.211	.027	-.156	-2.148	.032
Some college, no degree	.028	.440	.660	.056	.885	.377
Two-year college degree	.008	.104	.917	.017	.243	.808
Graduate or Professional Degree	-.036	-.424	.672	-.058	-.696	.487

Table 4-12. Continued.

Variable	Model 3			Model 4		
	B	*t*	*p*	*B*	*t*	*p*
Race						
African American	-.028	-.398	.691	-.019	-.276	.783
Other	.140	1.616	.107	.112	1.331	.184
Annual Income						
$24, 999 or less	.021	.304	.762	.029	.432	.666
$50,000- $74,999	.023	.374	.709	.034	.571	.568
$75,000- or more	.057	.805	.421	.026	.377	.706
Purchase Groceries for…						
Self	-.047	-.286	.775	-.130	-.814	.416
Spouse	.080	1.450	.148	.104	1.950	.052
Children	-.038	-.654	.513	-.050	-.883	.378
Other	.010	.140	.889	-.007	-.105	.917
Prior Knowledge	-.092	-2.452	.015	-.063	-1.720	.086
Source Credibility				.188	5.910	.000
R^2	.094			.155		
F	2.334		.001	3.905		.000
ΔR^2	.011			.060		
ΔF	6.010		.015	34.926		.000

Table 4-13. Multiple linear regression analysis for variables predicting change in risk perception.

Variable	*B*	*t*	*p*
Constant	.166	5.840	.000
Green Giant	-.012	-.293	.770
AgLabs	-.014	-.345	.730
USDA	-.076	-1.853	.064
R^2	.008		
F	1.362		.254

Table 4-14. Post-hoc analysis for change in risk perception.

Variable	*B*	*t*	*p*
Constant	.256	1.551	.121
Generation			
Generation X	-.014	-.327	.744
Young Baby Boomers	-.054	-1.157	.248
Old Baby Boomers	-.042	-.814	.416
Silent Generation or older	.037	.757	.449
Men	-.065	-2.072	.039
Education			
High School Degree or less	.078	1.653	.099
Some college, no degree	.028	.691	.490
Two-year college degree	.088	1.869	.062
Graduate or Professional Degree	.061	1.138	.256
Race			
African American	.013	.296	.767
Other	-.109	-2.027	.043
Annual Income			
$24, 999 or less	.048	1.093	.275
$50,000- $74,999	.093	2.434	.015
$75,000- or more	.075	1.687	.092
Purchase Groceries for…			
Self	-.030	-.292	.771
Spouse	.025	.716	.474
Children	-.038	-1.055	.292
Other	-.061	-1.392	.164
Prior Knowledge	-.052	-2.176	.030
Source Credibility	.026	1.235	.217
R^2	.072		
F	1.924		.010

Table 4-15. Post-hoc analysis for final attitude.

Variable	*B*	*t*	*p*
Constant	-.477	-1.678	.094
Generation			
Generation X	.160	2.229	.026
Young Baby Boomers	.215	2.684	.008
Old Baby Boomers	.237	2.682	.008
Silent Generation or older	-.027	-.325	.745
Men	.085	1.545	.123
Education			
High School Degree or less	.084	1.021	.308
Some college, no degree	.083	1.178	.239
Two-year college degree	-.117	-1.453	.147
Graduate or Professional Degree	.161	1.729	.084
Race			
African American	.047	.631	.528
Other	-.054	-.585	.559
Annual Income			
$24, 999 or less	.183	2.396	.017
$50,000- $74,999	.089	1.351	.177
$75,000- or more	.089	1.158	.248
Purchase Groceries for…			
Self	-.485	-2.710	.007
Spouse	.062	1.039	.299
Children	.032	.514	.607
Other	-.100	-1.311	.190

Table 4-15. Continued.

Variable	*B*	*t*	*p*
Prior Risk Perception	.776	18.209	.000
Prior Knowledge	-.039	-.949	.343
Source Credibility	.423	8.506	.000
R^2	.746		
F	68.845		.000

CHAPTER 5
CONCLUSIONS

Overview

This study explored how persuasive communication influenced change in attitude and change in risk perception of genetically modified food. The elaboration likelihood model (ELM) and Shannon and Weaver's communication model were used to develop a conceptual model explaining how message sources affected changes in attitude and changes in risk perception. An online survey was distributed to Florida residents. The same message was shown to each respondent in the survey, but different message sources were used. Two government sources (FDA and USDA) and two industry companies (Green Giant and AgLabs) were used as the sources in the four groups. Respondents were randomly assigned to each of the four groups.

Chapter 4 showed the majority of the respondents were in the Millennial Generation (30.3%, *n* = 156), women (51.1%, *n* = 263), and white (75.1%, *n* = 387). Post-stratification weighting methods were used so the sample demographics matched the demographics from the 2010 Florida census, and respondents were randomly assigned to each group. An ANOVA was used to compare the changes in attitude and changes in risk perception between the source groups, and a hierarchical regression was ran to see how well the variables identified in the conceptual model predicted change in attitude and change in risk perception.

Key Findings

Descriptive data from this study showed that respondents agreed they were knowledgeable (prior knowledge) about science and genetically modified food (*M* = 3.71, *SD* = .70). Respondents neither agreed nor disagreed that the sources were

credible, and there was no statistical difference between the four groups. The USDA was viewed as having the highest credibility (*M* = 2.93, *SD* = .76), closely followed by AgLabs (*M* = 2.92, *SD* = .70), and the FDA (*M* = 2.91 *SD* = .76). Green Giant had the lowest credibility score out of the four groups with an overall mean of 2.87 (*SD* = .78). The average credibility score between the four groups was 2.91(*SD* = .75).

Change in attitude was also measured in this study, and the group exposed to the message using the FDA as the source showed the greatest change in attitude (*M* = .40, *SD* = .53). Green Giant was associated with the smallest change in attitude (*M* = .17, *SD* = .54), and the overall mean for change in attitude was .28 (*SD* = .54). Overall, the prior attitude was slightly negative (*M* =2.33, *SD* = 1.07) and changed to a neutral final attitude (*M* = 2.61, *SD* = 1.10) after exposure to the persuasive communication. Change in risk perception was the final dependent variable in this study, in which lower scores indicated higher perceived risk, while higher scores indicated lower risk perception. Prior to receiving the persuasive communication, respondents neither agreed nor disagreed about the risks associated with genetically modified food (*M* = 2.83, *SD* = .89). The final risk perception showed little change (*M* = 2.97, *SD* = .89) after the treatment. Between the four groups, the FDA message source was associated with the greatest change in risk perception (*M* = .16, *SD* = .33). The smallest change in risk perception came from the USDA, which only changed risk perceptions by .09 (*M* = .09, *SD* = .29). Overall, the grand mean for risk perception changed by .14 (*M* = .14, *SD* = .33).

This study examined four objectives, the first of which determined if there were any differences in the change in attitude associated with message sources. An ANOVA

showed that there were significant differences, specifically between Green Giant and the FDA. The change in attitude for Green Giant was .23 lower than the change associated with the FDA. This meant the FDA was able to create a more positive change in attitude when compared to an industry source like Green Giant. The second objective in the study looked to see if there were any differences between message groups for the change in risk perception. The ANOVA was not significant, which meant the message sources were not associated with any differences in change in risk perception.

Objective three in the study sought to further explore change in attitude after receiving persuasive communication about genetically modified food. A hierarchical regression was ran to see how well message source, demographics, prior knowledge, and source credibility could predict a change in attitude. The fourth model included all predictors and could account for 15.5% of the variance in change in attitude ($R^2 = .155$), which was the highest R^2 out of the four models. The use of Green Giant or USDA as sources were significant predictors of change in attitude, as were men, respondents purchasing food for a spouse, and having a high school diploma. Green Giant and USDA were predicted to have smaller changes in attitude compared to the FDA, men had smaller changes in attitude compared to women, and respondents with a high school diploma were predicted to have smaller changes in attitude than those with a four-year college degree. Also, respondents who purchased food for a spouse were predicted to show a larger change in attitude than those who did not. Even though prior knowledge was a significant predictor in model three, the addition of source credibility eliminated its significance. Source credibility was a significant predictor though, and for

every one-unit increase in source credibility, there was a .188 increase in change in attitude (*B* = .188). The fourth objective used a regression similar to objective three, but with change in risk perception as the dependent variable. The first model was not significant, concluding that the source alone was not a good predictor for the change in risk perception. The remaining models were not tested since the first was not significant.

Implications

There are various theoretical and practical implications that can be made from this study. Results from this research can provide further insight into the ELM and the Shannon and Weaver communication model. Practical implications can also be made from these results.

Theoretical Implications

This study offered greater insight into how attitudes and risk perceptions are influenced by persuasive communication. The ELM shows that when motivation or knowledge is low, people will use the peripheral pathway to assess a message (Petty et al., 2009). This route relies on peripheral cues, such as sources. Data from this research showed that there were differences in attitude change associated with different message sources. The source identified as the least credible (Green Giant) showed a significantly lower change in attitude when compared to a source with higher credibility (FDA). This may indicate that the source's credibility could have influenced whether or not the peripheral cue was operating correctly. If the cue was not effective, then no attitude change would occur according the ELM (Figure 2-2). Additionally, since Green Giant had a lower credibility score than the other sources, the respondents may have actually given more consideration to the message (Frewer et al., 1997). If more thought

was used to analyze the message from Green Giant, a change in attitude may not have been seen because

When examining the regression model for change in attitude, the effect of the message source could still be seen. Compared to the FDA, Green Giant predicted a smaller change in attitude, which supported findings from the ANOVA. Additionally, the USDA predicted a smaller change in attitude, even though the source's credibility score was higher than that of the FDA. This may be because the USDA was viewed generally as a credible source, but lost its effect when communicating about genetically modified food. The model did show that as source credibility increased, the change in attitude increased. This was consistent with previous research showing that high credibility sources were associated with larger changes in attitude compared to low credibility sources (Hovland & Weis, 1951).

The fact that prior knowledge was no longer significant in the presence of source credibility indicated that respondents did not have either the motivation to process the information, or that another factor inhibiting the ability to process (e.g. distraction, lack of repetition, etc.) was present, and respondents used the peripheral processing route to assess the message (Petty et al., 2009). This finding supports literature which has shown that most consumers use the peripheral pathway when assessing food communication (Frewer et al., 1997; Goodwin, 2013; Meyers, 2008). The message source and source credibility would likely not be predictive of attitude change if the central processing route was used.

In the third model, prior knowledge had an influence on the change in attitude in the absence of source credibility. As knowledge increased, the change in attitude

decreased. The ELM describes knowledge as an influencing factor for a person's ability to process information (Petty & Cacioppo, 1986). In the presence of knowledge, peripheral cues will not be as effective, but if the message does not elicit more positive or negative thoughts or if there was no change in the cognitive structure of the respondents, they would retain their initial attitude (Petty et al., 2009). Respondents' lack of attitude change may explain why the change in attitude became smaller as prior knowledge increased. These results supported previous findings that an increase in knowledge does not necessarily mean an increase in positive perceptions toward genetically modified food (McFadden & Lusk, 2015; Verdurme & Viaene, 2003).

When change in risk perception was analyzed, there were no differences between the message groups. Additionally, the descriptive statistics showed that respondents neither agreed nor disagreed about risks associated with genetically modified food for both prior and final risk perceptions, which indicated there was no practical change in risk perception. Additionally, the regression model for change in risk perception which used the message source alone as a predictor was not significant. Based on the ELM, it was apparent that prior perceptions of risk were retained (Petty et al., 2009); however, further conclusions could not be made about how people processed the information regarding risks. Changes in risk perception did not seem to be operating within the ELM or the conceptual model developed for the study.

This study also supported Shannon and Weaver's communication model. The message source was used as noise in the conceptual model; it could distort the intended message (Lee & Baldwin, 2004). The results from the ANOVA of change in attitude showed that there were differences in change in attitude between the sources

and supported the model. Message source was able to influence the respondents' change in attitude, indicating the message was interpreted differently between the groups. However, the noise did not appear to matter when discussing a change in risk perception. There may also be other distractions or noise that could have distorted the message when communicating about risks (Lee & Baldwin, 2004).

The decoding process of the communication model was also explored in this study. Demographics were important predictors for attitude change. Source credibility was also significant in the decoding process for change in attitude, but prior knowledge was not. Since the first regression model for risk perception was not significant, and subsequent models were not tested, no conclusion could be made about the decoding process.

Practical Implications

Consumers have had limited knowledge concerning genetically modified food and have relied on various communications to provide trustworthy information (Durant et al., 1998; Earle & Cvetkivich, 1995). In the past, the agriculture industry has not been open when communicating to the public, which has led to distrust amongst consumers (McCullum-Gomez & Palmer, 2010). Since the success of new technology is often dependent on consumer acceptance (MacFie, 2007), further investigation into how consumers form opinions toward genetically modified food was necessary to develop strategic communication plans. This study looked at message sources specifically since the public has had to rely on outside communication for information on genetically modified food (Durant et al., 1998; Earle & Cvetkivich, 1995).

This research found that message source was associated with differences in change in attitude exhibited by the respondents; however, the difference in change in

attitude between the groups was relatively small and held little practical implications. Two government (FDA and USDA) and two industry companies (Green Giant and AgLabs) were used as the message sources in this study. Research has shown that the government has typically been more trusted than producers of genetically modified seeds (Irani et al., 2001), but an ANOVA showed no statistical differences between the message sources for source credibility. This finding conflicts with previous literature concluding that the FDA was more trusted than the USDA, and both were more trusted than industry companies (Irani et al., 2001). Trust is only one component of credibility (Perloff, 2008), which may explain why the FDA was not viewed as being the most credible source since goodwill and expertise were also considered for credibility. Additionally, the topic of genetically modified food may have generated such strong attitudes by the respondents that all sources were perceived similarly for delivering the message.

The FDA proved to be more persuasive compared to Green Giant since there were significant differences between the change in attitude between shown in an ANOVA and Bonferroni test. Even though there was a statistical difference between the FDA and Green Giant, there were a few considerations that needed to be made when interpreting the data. The first was that the mean difference between the two sources was smaller than the standard deviation for change in attitude, which indicated that the difference may not have been that large in a practical discussion. Additionally, the group who was assigned to the FDA had the lowest prior attitude and final attitude toward genetically modified food. Therefore, the respondents' large change in attitude may be a

result of their negative prior attitude rather than the effect of the FDA (Frewer et al., 1997).

When examining prior knowledge in the regression models for change in attitude, it was significant until the addition of source credibility. The credibility of the source was more influential on the change in attitude than the respondents' prior knowledge of genetically modified food. Also, an increase in prior knowledge was associated with a decrease in attitude change. This may have occurred due to the moral implications of using genetic technology as seen in earlier studies (Evans & Durant, 1995).

Demographics also played a role in the change in attitude exhibited by the participants. Differences in' attitudes toward genetically modified food exhibited by demographic groups has been seen previously (Antonopoulou et al., 2009; Hall & Moran, 2006; Irani et al., 2001; Pounds, 2014; Verdurme & Viaene, 2003), but this study further explored how well the demographics could predict changes in attitude or risk perception as a result of persuasive communication about genetically modified food. When discussing changes in attitude, men generally had smaller changes compared to women. Literature has shown that men typically hold more positive views toward genetically modified food (Irani, 2001; Pounds, 2014, Verdurme & Viaene, 2003), but this research demonstrated men were not as greatly influenced by persuasive communication as women. Women may have had the motivation or ability to process the information more so than men, or the peripheral cue may have greater influence on women's attitude than men's.

Having a high school diploma or less was also a significant predictor of change in attitude compared to those with a four-year college degree. Respondents with a high

school diploma or less had a smaller change in attitude comparatively. This may have occurred because consumers with a higher education typically have had more negative attitudes related to genetically modified food (Hall & Moran, 2006; Gaskell, 2003; Moon & Balasubramanian, 2001), which allowed them to demonstrate a greater change in attitude (Frewer et al., 1997). Respondents who purchased food for a spouse were the final demographic predictor for change in attitude. This characteristic was not specifically discussed in Chapter 2, and this finding indicated that demographic characteristics, other than those typically studied, had an influence on respondents' change in attitude.

Since the statistical analyses performed for change in risk perception were not significant, few practical implications could be made. The descriptive statistics showed that respondents neither agreed nor disagreed about the risk genetically modified food posed to consumers, the environment, and the world. Additionally, the persuasive communication did not increase or decrease the risk perceptions. Post-hoc analyses were required for further conclusion to be made about changes in risk perception.

Limitations

This research provided further insight into how persuasive communication influenced Florida consumers' change in attitude and change in risk perception of genetically modified food, but there are limitations to the research. One of the first limitations of the study was that the instrument did not include a manipulation check. A manipulation check is used to ensure that respondents actually saw whatever treatment was used in the experiment. In the absence of this check, this study had to assume respondents saw the source used to deliver the message.

There were also limitations associated with the method data was collected. Since prior knowledge was self-reported, the data had to rely on what the respondents' perceived prior knowledge compared to their actual knowledge. Actual prior knowledge could have been more predictive of a change in attitude or change in risk perception compared to the perceived prior knowledge. Additionally, the study sought to measure a change in attitude and a change in risk perception. Since the variables were determined using a pretest-posttest design, there was the possibility of pretest-treatment interaction (Ary et al., 2010). The effect of pretest-treatment interaction may have caused minimal changes from the posttest and pretest responses due to prior exposure. This interaction may explain why the changes in attitude and risk perception were so marginal in this study. There was also not a substantial amount of time between the pretest and posttest. A lack of attitude change may be a result of limited time to process the information since a change in attitude requires multiple exposures to a message over time (Perloff, 2003; Petty et al., 2009). Alternatively, an attitude change may have just been a respondents' initial reaction and not reflective of an actual change in attitude. Conclusions from this study were limited to the sources used and cannot be generalized to all sources used to communicate about genetically modified food. Alternative government and industry sources may have had a different effect on changes in attitude and risk perception than organizations used in the study. Another limitation for this study was that it only examined message source as a peripheral cue. Other peripheral cues, such as number of arguments, could have affected the dependent variables (Petty et al., 2009). Similarly, questions asked throughout the instrument may have also been

influencing respondents' answers since they were prompted with a number of food safety related questions before completing this part of the questionnaire.

Recommendations

Future Research

This study supported that consumers used the peripheral pathway of the ELM when forming attitudes toward genetically modified food, similar to other agricultural studies (Frewer et al., 1997; Goodwin, 2013; Meyers, 2008). To gain a better understanding of the pathway used when presented with a message about genetically modified food, researchers should utilize thought-listing procedures to gain a greater understanding for how consumers process these messages (Petty et al., 1993). Prior knowledge was measured in this study, but relevance/motivation to process was not. Gathering information on these variables will give a more holistic understanding for how consumers move through the ELM when assessing information regarding genetically modified food (Petty et al., 2009). Also, not using a pretest-posttest design would eliminate issues associated with pretest-treatment interactions (Ary et al., 2010). Instead, only gathering attitude and risk perception data after exposure to a message could provide results more representative of final attitude and risk perception.

When asked about changes in risk perception, it was not as clear which pathway respondents used when forming perceptions of risk. Further research specifically addressing risk communication needs to be conducted to identify how consumers are assessing associated risks with genetically modified food or agricultural technology in general, especially since the regression model did not account for much variance for changes in risk perception. Alternatives to the ELM should be explored since the conceptual model did not appear to accurately predict changes in risk perception. The

possibility exists that a new theoretical framework is needed to explain risk perceptions related to morally contentious issues.

The ELM does aide in understanding shifts in attitude when communicating about genetically modified food. The peripheral pathway appeared to be used, but there is room for further research. This study only provided the name of the organization for the experiment. Adding a brief description of the organization, the brand logo, or organizational values may yield different results and provide greater understanding for how peripheral cues operate. Other sources could also be explored to see their affect as well. For instance, a popular blogger, politician, or restaurant chain may prove to yield different results from this study and give a greater understanding of the influence of message sources. Additionally, collecting source credibility data before exposure to the message may give a more realistic understanding of the variable since the message itself may have influenced perceived source credibility for this research. Sources are only one element of peripheral cues, and others should be studied as well. Researchers should utilize qualitative or mixed methods strategies to examine the quality and quantity of arguments, or imagery associated with a message. This information would give researchers a greater understanding of how consumers use the peripheral pathway to assess persuasive communication.

The affect of prior knowledge on both attitude and risk perception should also be further examined. Since this study used a self-reported assessment, an actual evaluation of the respondents' prior knowledge of genetically modified food would be useful. Also regarding prior knowledge, research should explore best practices for communicating factual information to the public. Since a greater level of prior knowledge

was not associated with more positive views of genetically modified food, agricultural communicators need to realize that an increase in knowledge will not increase acceptance of genetically modified food (McFadden & Lusk, 2015; Verdurme & Viaene, 2003). Discussing concerns and values related to the technology could prove more effective in changing attitudes and risk perception than simply stating statistics and facts. Replacing the message in this study with a value-driven message could provide needed insight into attitude formation, and have a stronger influence on changes in attitude and risk perception (Krause et al., 2015). Further research is needed to evaluate how consumers form attitudes toward morally contentious science and technology issues to better understand how to communicate with the public about these topics.

Research should explore what platforms consumers use and trust the most (e.g. social media, web, television, or print), both for seeking information about their food, as well as general information. Understanding how these platforms are used will allow communicators to strategically place messages for effective communication. There is also the possibility that the platform itself could serve as a peripheral cue and influence attitude change. Different types of appeals should also be tested to see which ones best facilitate changes in attitude and risk perception when communicating information on a contentious topic, such as genetically modified food. This will be important for future communication development since only informing people about the topic does not result in the desired positive attitudes (McFadden & Lusk, 2015; Verdurme & Viaene, 2003).

The Shannon and Weaver communication model can also be used to examine other sources of noise that distract the receiver from the intended message (Lee &

Baldwin, 2004). Genetically modified food has been surrounded by debate, and the different sources of noise should be explored. Media coverage, personal values, and conflicting scientific findings may prove to distort messages about genetically modified food. Identifying sources of noise can help communicators develop messages which would lessen the degree of distortion of the intended message.

A content analysis of who is currently communicating about genetically modified food, along with how successful their communication is, would be insightful to how the agricultural industry is communicating about genetically modified food compared to opponents. Understanding who has been communicating about the technology could help make stronger connections to the data found in this study about source credibility and give agricultural communicators ideas for collaborations, which would have a positive impact for the industry.

Demographic relationships with attitude and risk perception change should also be further explored. Specifically, value based-demographics should be assessed in addition to the general demographics used in this study. Examining where respondents were raised, their political or religious beliefs, and even the type of diet they follow could give a greater insight into how they interpret a message.

This study could be replicated on a larger scale to see if there were regional differences when assessing the credibility of different sources and determine if differences in attitudes and risk perceptions were present in different areas of the United States and the world. This research should also be replicated with other contentious agricultural and natural resource issues, such as irradiation of food or fracking. However, if this study were to be replicated, manipulation checks should be used to

ensure respondents viewed and paid attention to the treatment. The methods used in this study could also be expanded outside of the agricultural industry to the larger scientific community. Consumer skepticism is not contained to agriculture alone, and risk and attitude formation needs to be further explored regarding scientific advancements if new technologies are to succeed (MacFie, 2007).

Industry and Practitioners

This study provided valuable insight into how consumers form attitudes and risk perceptions after receiving persuasive communication about genetically modified food. One of the most significant findings was the model for change in attitude and change in risk perception should be different. Changes in attitude were more dependent on source credibility than prior knowledge, and conclusions about change in risk perception could not be made. Agricultural communicators need to consider this when developing messages or persuasive communication campaigns. Using a highly credible source would help create larger changes in attitude. Even though AgLabs has had minimal press coverage, it was viewed just as credible as the FDA and USDA, and Green Giant did not have a statistically different credibility score either. Communicators and extension agents should understand that the message sources were perceived similarly by respondents when communicating about genetically modified food. However, source credibility was a significant predictor of change in attitude. The target audience should be considered when selecting a source for the information since people may view the credibility of the same source differently, and using a distrusted source could lead to undesired effects. For instance, producers may view certain industry sources as credible while consumers do not.

Agricultural communicators, and the agricultural industry in general, need to recognize that increasing consumer knowledge will not necessarily increase favorable attitudes toward genetically modified food. Attitude formation consists of more than only gaining more knowledge, and cultural values and demographics also need to be accounted for. For example, women typically hold more negative attitudes toward genetically modified food (Irani, 2001; Pounds, 2014, Verdurme & Viaene, 2003), but men showed a smaller change in attitude when compared to women. Changes in attitude were positive for both genders, and communication should target women in order to increase their attitudes toward genetically modified food. Since consumers who purchased food for a spouse were predicted to have a larger change in attitude than those who did not, creating family focused communication about genetically modified food could be a successful strategy. Additionally, placing advertisements in magazines targeting housewives would be good platforms to reach the intended audience.

Having a high school diploma or less was also a significant predictor of change in attitude; however, this group only accounted for a small portion of the population and practical recommendations cannot be made until further research is done. Communication campaigns should not produce one message and expect it work universally for the population. The differences in demographic characteristics illustrated how different communication strategies will be needed for different population segments.

The influences on changes in risk perception were different than changes in attitude. The results were inconclusive as to what route respondents used when assessing risks, and the ELM may not have been used at all. Different considerations

need to be made when communicating about risks associated with genetically modified food to the public. Further research was needed before practical recommendations could be made. These recommendations for practitioners could be extended to other contentious issues in science and agriculture.

Post-Hoc Key Findings

Two post-hoc tests were ran to further examine the affect of persuasive communication on attitude and risk perception of genetically modified food. The first test used a regression model to predict change in risk perception with all variables from the conceptual model except for message source. The model was significant, but only accounted for 7.2% of the variance in change in risk perception (F (3, 511) = 1.924, p = .010, R^2 = .072). Men were predicted to have smaller changes in risk perception compared to women, respondents with a race categorized as other were predicted to have a smaller change than white respondents, and those earning between $50,000 and $74,999 were predicted to have a larger change in risk perception than respondents who earned $25,000 to $49,999 annually. Additionally, as prior knowledge increased, change in risk perception decreased. Source credibility was not a significant predictor of change in risk perception.

A second regression was ran to examine how well the variables in the conceptual model could predict respondents' *final attitude* toward genetically modified food. Additionally, prior risk perception was added as a moderating variable (Frewer, Howard, & Shepherd, 1998). This model was significant and accounted for 74.6% of the variance (F (3, 511) = 68.845, p < .000, R^2 = .746). Source credibility and prior risk perception were both significant predictors, and final attitude became more positive as these variables increased. Generation X, Young Baby Boomers, and Old Baby Boomers were

predicted to have a more positive final attitude compared to the Millennial Generation or younger, and respondents earning $24,999 or less a year were predicted to have more positive final attitudes than those earning between $25,000 and $49,999. The final demographic predictor was respondents who purchased food for themselves. These respondents were predicted to have more negative attitudes than those who did not purchase food for themselves.

Post-Hoc Implications

Theoretical Implications

A post-hoc analysis of risk perception (message source omitted) showed that some demographic characteristics were predictors, as was prior knowledge, but source credibility was not. The R^2 for this model was small (R^2 = .072), and no further conclusions could be made other than that initial perceptions of risk were retained. In fact, the R^2 was so small, that it supported previous findings in the study that risk perception was not operating within the ELM or the conceptual model.

The post-hoc analysis examining the final attitude yielded a much higher R^2 (R^2 = .746) than any of the regression models used to fulfill the objectives. The ELM does illustrate changes in attitude, but this research showed that examining the change in attitude as a dependent variable was not as informative as studying the final attitude when using the model. More positive prior risk perception and source credibility were both predicted to positively increase attitudes toward genetically modified, which aligned with prior research (Frewer, Howard, & Shepherd, 1998; Frewer et al., 1999). Risk perception may have represented motivation to process information in the ELM due to personal relevance. Respondents who perceived less risks were given higher scores and predicted to have more positive final attitudes toward genetically modified food.

Respondents who viewed risk perceptions positively may have not viewed the message as personally relevant and used the peripheral route to process the information. Additionally, prior knowledge was not a significant predictor of final attitude, and source credibility was, which would also indicate that respondents were using the peripheral processing route to assess the information (Petty et al., 2009). This finding supported previous research (Frewer et al., 1997; Goodwin, 2013; Meyers, 2008). Demographics, prior risk perception, and source credibility were identified as important variables used in the decoding process as described by Shannon and Weaver's (1949) communication model.

Practical Implications

Regarding change in risk perception, an increase in prior knowledge led to a smaller change in risk perception in the post-hoc analysis. Again, this supports previous literature that consumers with a greater understanding of science were not more likely to accept genetically modified food (McFadden & Lusk, 2015; Verdurme & Viaene, 2003). The findings also showed that source credibility was not a significant predictor of changes in risk perception, which was different from the data examining change in attitude.

Research had been inconsistent on the effect of income on perceptions of genetically modified food (Antonopoulou et al., 2009; Verdurme & Viaene, 2003), but the post-hoc analysis for this study showed that respondents with an annual income between $50,000 and $74,999 showed a greater change in risk perception than those in lower income bracket. Finally, differences in attitudes toward genetically modified food have been identified amongst races (Irani et al., 2001). This study identified respondents grouped as other to have a smaller change in risk perception compared to

white respondents. These differences in demographics could be the result of cultural differences in values (Verdurme & Viaene, 2003).

The post-hoc regression ran for final attitude also presented valuable practical implications. The first implication was that prior knowledge was not a predictor of final attitude and source credibility was, thus supporting previous literature and regression models in this study (McFadden & Lusk, 2015; Verdurme & Viaene, 2003). Additionally, prior risk perception was a significant predictor. This finding was consistent with prior research (Frewer, Howard, & Shepherd, 1998). Similar to the objectives studied in this research, demographic characteristics were important predictors of final attitude. Most importantly, older generations, excluding the Silent Generation or older, were predicted to have more positive final attitudes compared to the Millennial Generation or younger, which conflicted with previous literature (Antonopoulou et al., 2009). Additionally, respondents who purchased food for themselves were predicted to have a more negative final attitude compared to those who did not purchase food for themselves. One of the income categories was also a predictor, but did not make up for as large of the population as the previously discussed categories.

Post-Hoc Recommendations

Future Research

Risk perception should be studied as a moderating variable for final attitude toward genetically modified food rather than a dependent variable. Understanding influences of persuasive communication on risk perception is still important, but so is its influence on attitudes toward genetically modified food. The post-hoc analysis also supported that an alternative theory or model should be used when researching risk perceptions specifically.

Since respondents who purchased food for themselves was a predictor of final attitude, further research looking at food purchasing and consuming behaviors should be studied to see how well they predict final attitude toward genetically modified food. Additionally, researching final risk perception and final attitude toward genetically modified food would be more beneficial than studying changes when using ELM to guide the study.

Industry and Practitioners

When communicating about specific risks, using a credible source will have limited effect, and increasing knowledge may decrease changes in risk perception. Discussing concerns of the consumers and framing the message based on values could be more effective when discussing risks (Frewer, Howard, & Shepherd, 1998; Krause et al., 2015). The post-hoc analysis showed that an increase in knowledge led to smaller changes in risk perception. Agricultural communicators should focus on the concerns of the consumer (Frewer, Howard, & Shepherd, 1998) or deliver context driven communication (e.g. citrus greening in Florida) to elicit positive final attitudes and perceptions from consumers (Pounds, 2013). Avoiding logic and fact-based messages may prove to be more effective in evoking positive final attitudes.

This study showed that older generations were predicted to have more positive final attitudes toward genetically modified food than Millennials, and people purchasing for themselves had more negative final attitudes than those who did not. Communicators and extension agents should develop different communication campaigns for older and younger consumers. Additionally, appropriate mediums should be used for the targeted age category. For instance, Millennials may be more receptive to receiving communication online or through social media than older generations.

Since people who purchased food for themselves were predicted to have more negative final attitudes toward genetically modified, point of purchase advertising for genetically modified food should be avoided to keep these consumers from actively thinking about genetically modified food while making purchases. Framing the messages around the direct tangible benefits genetically modified food offers consumers could make the message more relevant and elicit more positive thoughts.

Summary

This study sought to determine the affect of persuasive communication on Florida consumers' change in attitude and change in risk perception of genetically modified food. The ELM and Shannon and Weaver's communication model were used to guide the study. The results indicated that source and source credibility matter much more when examining change in attitude. Change in risk perception yielded different results, and conclusions from the objective could not be made.

The findings illustrated that the peripheral pathway was likely used by consumers when forming general attitudes, but this was not necessarily the case when discussing perceptions of risk. In fact, changes in risk perception did not appear to operate within the ELM. When communication efforts aims to effect general attitudes, care should be taken when selecting information sources. While the source used for the message was identified as important, prior knowledge should also be considered. However, in the presence of source credibility, prior knowledge was no longer a predictor of attitude change, but it was shown to be associated with a smaller change in attitude. The agricultural and biotechnology industry needs to realize that increasing knowledge alone will not lead to increased positive perceptions of genetically modified food. Demographics, and likely personal values, also played a role in how effective

communication can be on a topic like genetically modified food. Post-hoc analysis used prior risk perception as a moderating variable in a regression model to predict final attitude. The model was concluded to be a much better fit that the ones used to fulfill the objectives. As perceptions of risk perception increased favorably, the final attitude was predicted to become more positive. Further research is needed to explore additional influences on risk perception and attitudes to aid agricultural communicators in developing effective communication campaigns.

APPENDIX A
IRB APPROVAL

UF | Institutional Review Board
UNIVERSITY of FLORIDA

PO Box 112250
Gainesville, FL 32611-2250
352-392-0433 (Phone)
352-392-9234 (Fax)
irb2@ufl.edu

DATE: September 17, 2014

TO: Joy Rumble
PO Box 110540
Campus

FROM: Ira S. Fischler, PhD; Chair
University of Florida
Institutional Review Board 02

SUBJECT: **Exemption of Protocol #2013-U-1051**
Public Opinion of Food

SPONSOR: None

The request to revise the above referenced protocol has been reviewed and approved. The revision has not changed the status, as the study remains exempt in accordance with the following:

> *45 CFR 46.101(b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior*

Should any further revisions be made to the protocol, the Board must review prior to implementation.

IF:dl

- *Revised the survey to make wording more succinct and added questions to capture the scope of the study*

UF | Institutional Review Board
UNIVERSITY of FLORIDA

PO Box 112250
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DATE: October 3, 2013

TO: Joy Rumble
PO Box 110540
Campus

FROM: Ira S. Fischler, PhD; Chair
University of Florida
Institutional Review Board

SUBJECT: **Revision of Protocol #2013-U-1051**
Public Opinion of Food

SPONSOR: None

The request to revise the above referenced protocol has been reviewed and approved. The revision has not changed the status, as the study is not research and remains exempt in accordance with the following:

> *45 CFR 46.101(b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior*

Should any further revisions be made to the protocol, the Board must review prior to implementation.

IF:dl

- *Revised survey to make wording more succinct and added questions to capture the scope of the study*

Food Panel-2013

Dear Florida resident, You are receiving this survey because we are interested in your opinions regarding issues in Florida. · This survey will take approximately 30 minutes to complete. · Your participation is completely voluntary. · There is no penalty for not participating. · You can withdraw from the survey at any time without penalty. · You do not have to answer any question you do not wish to answer. · Your identity will be unknown to the researchers, and your responses will be anonymous. · There are no known risks associated with this study. · There is no compensation or other direct benefit to you for participation. If you would like to learn more about this study, please contact me, Dr. Joy Rumble at 352-273-1663 or by email at jnrumble@ufl.edu. If you have questions about your rights as a research participant, please contact the UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250, (352) 392-0433. By clicking agree below, you agree that you have read this statement and are aware of your rights.

❍ I agree to participate
❍ I do not agree to participate

If I do not agree to participate Is Selected, Then Skip To End of Survey

Approved by
University of Florida
Institutional Review Board 02
Protocol # 2013-U-1051
Reviewed on : 09/18/2013

UF Institutional Review Board
UNIVERSITY of FLORIDA

PO Box 112250
Gainesville, FL 32611-2250
352-392-0433 (Phone)
352-392-9234 (Fax)
irb2@ufl.edu

September 18, 2013

TO: Joy Rumble
PO Box 110540
Campus

FROM: Ira S. Fischler, PhD; Chair
University of Florida
Institutional Review Board 02

SUBJECT: **Exemption of Protocol #2013-U-1051**
Public Opinion of Food

SPONSOR: None

Your protocol submission was reviewed by the IRB. The Board determined that your protocol is exempt based on the following category:

> *45 CFR 46.101(b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior*

Should the nature of your study change or if you need to revise this protocol in any manner, please contact this office before implementing the changes.

IF:dl

APPENDIX B
INSTRUMENT USED FOR STUDY

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Please indicate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I understand *basic* science.	○	○	○	○	○
I understand *food* science.	○	○	○	○	○
I understand *basic* technology.	○	○	○	○	○
I understand *food* technology.	○	○	○	○	○
I understand the science of genetically modified food.	○	○	○	○	○
I have heard about genetically modified food.	○	○	○	○	○
I have read about genetically modified food.	○	○	○	○	○

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Please indicate your attitudes about the phrase: "I believe genetically modified food is..." Each line has a different set of adjectives to gather your opinions.

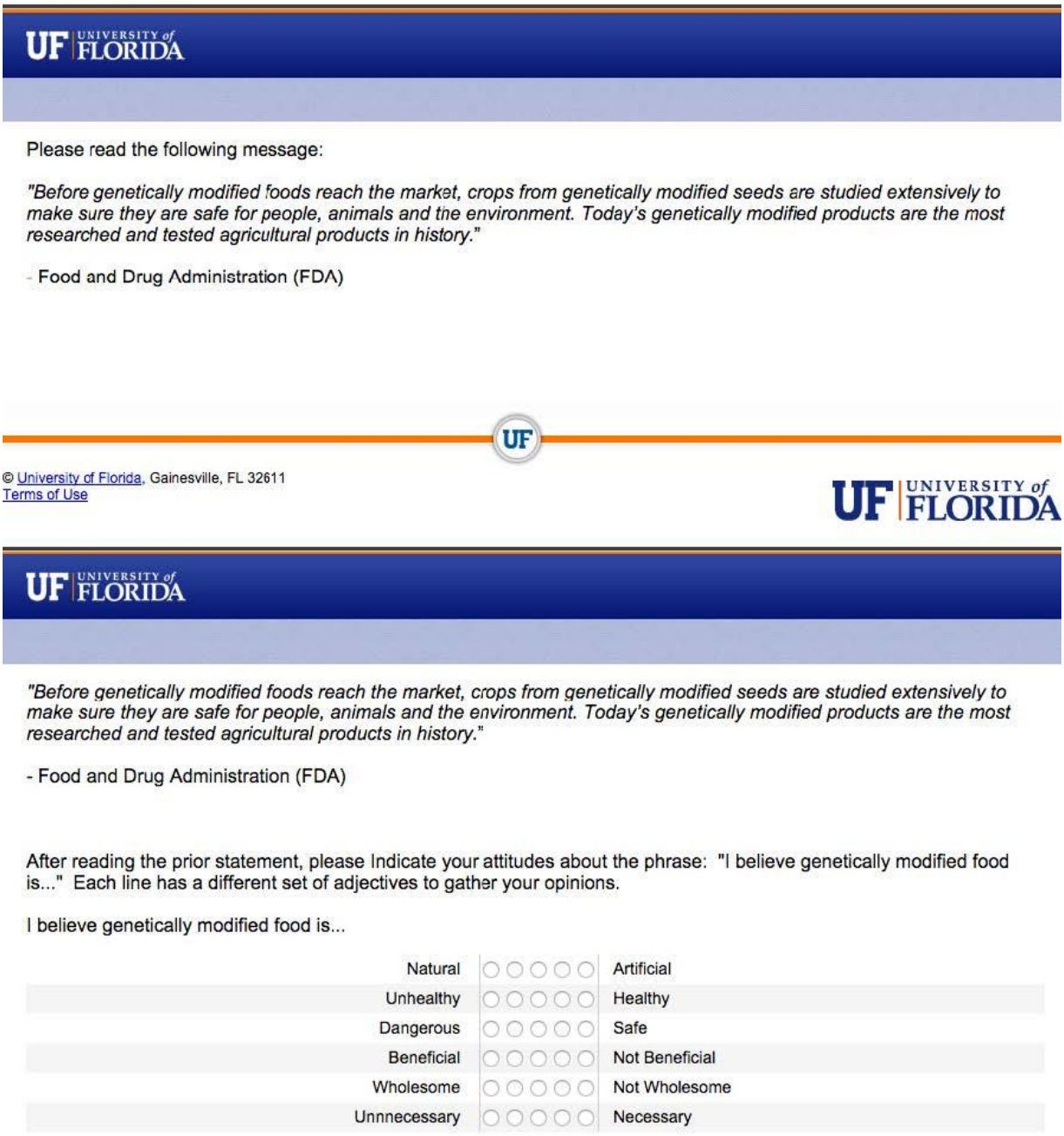
I believe genetically modified food is...

Natural	○ ○ ○ ○ ○	Artificial
Unhealthy	○ ○ ○ ○ ○	Healthy
Dangerous	○ ○ ○ ○ ○	Safe
Beneficial	○ ○ ○ ○ ○	Not Beneficial
Wholesome	○ ○ ○ ○ ○	Not Wholesome
Unnecessary	○ ○ ○ ○ ○	Necessary

UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements about genetically modified food.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe that development of genetically modified food tampers with nature.	○	○	○	○	○
I believe the genetically modified food is a possible solution to world hunger.	○	○	○	○	○
I believe genetically modified food provides solutions to pest and disease problems.	○	○	○	○	○
I believe genetically modified food carries little risk to the person consuming them.	○	○	○	○	○
I believe that the growing of genetically modified food threatens the environment.	○	○	○	○	○
I believe that genetically modified fruits and vegetables can be modified to contain higher levels of certain nutrients.	○	○	○	○	○



Note. This example shows the FDA, but respondents were randomly assigned to the FDA, USDA, Green Giant, or AgLabs.

UF UNIVERSITY of FLORIDA

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

After reading the prior statement, please indicate your level of disagreement or agreement with the following statements about genetically modified food.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe that use of genetically modified food tampers with nature.	○	○	○	○	○
I believe genetically mocified food is a possible solution to world hunger.	○	○	○	○	○
I believe genetically mocified food provides solutions to pest and disease problems.	○	○	○	○	○
I believe genetically mocified food carries little risk to the person consuming them.	○	○	○	○	○
I believe that the growing of genetically modified food threatens the environment.	○	○	○	○	○
I believe that genetically modified fruits and vegetables can be modified to contain higher levels of certain nutrients.	○	○	○	○	○

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"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

After reading the prior statement, please indicate your level of agreement or disagreement with the following statements completing the sentence, " I believe the Food and Drug Administration .....".

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
is likely to withhold information	○	○	○	○	○
is extremely knowledgeable about genetically modified food	○	○	○	○	○
is trustworthy	○	○	○	○	○
provides expertise about genetically modified food	○	○	○	○	○
is concerned with public welfare	○	○	○	○	○
has a vested interest in promoting a particular view about genetically modified food	○	○	○	○	○

Note. This example shows the FDA, but respondents were randomly assigned to the FDA, USDA, Green Giant, or AgLabs.

APPENDIX C
EXPERIMENTAL TREATMENT

UF UNIVERSITY of FLORIDA

Please read the following message:

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

UF UNIVERSITY of FLORIDA

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Please read the following message:

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- United States Department of Agriculture (USDA)

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Please read the following message:

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Green Giant

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Please read the following message:

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- AgLabs

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APPENDIX D
COMPLETE SURVEY INSTRUMENT

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Dear Florida resident,
You are receiving this survey because we are interested in your opinions regarding issues in Florida. Specifically in this study you will be asked about food issues including the topics of food safety and genetically modified food.

- This survey will take approximately 30 minutes to complete.
- Your participation is completely voluntary.
- There is no penalty for not participating.
- You can withdraw from the survey at any time without penalty.
- You do not have to answer any question you do not wish to answer.
- Your identity will be unknown to the researchers, and your responses will be anonymous.
- There are no known risks associated with this study.
- There is no compensation or other direct benefit to you for participation.

If you would like to learn more about this study, please contact me, Dr. Joy Rumble at 352-273-1663 or by email at jnrumble@ufl.edu. If you have questions about your rights as a research participant, please contact the UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250, (352) 392-0433.

By clicking agree below, you agree that you have read this statement and are aware of your rights.

- ○ I agree to participate
- ○ I do not agree to participate

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Do you currently live in the state of Florida?

- ○ Yes
- ○ No

How many years have you lived in Florida? (e.g., 15)

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What is your current ZIP code in Florida? (e.g., 32611)

Please think about the city or town where you receive your mail. For how many years has your mailing address been in the same city or town? (e.g., 12)

Which of the following best describes where your home is in relation to this city or town?

- Within the city or town limits
- Outside the city or town limits

UF UNIVERSITY of FLORIDA

Please indicate the level of importance you associate with each of the following Florida issues:

	Not at all important	Slightly important	Fairly important	Highly important	Extremely important	Unsure
The economy	○	○	○	○	○	○
Health care	○	○	○	○	○	○
Public education	○	○	○	○	○	○
Housing and foreclosures	○	○	○	○	○	○
Water	○	○	○	○	○	○
Immigration	○	○	○	○	○	○
Taxes	○	○	○	○	○	○
Environmental conservation	○	○	○	○	○	○
Select "Highly important"	○	○	○	○	○	○
Food production	○	○	○	○	○	○
Climate change	○	○	○	○	○	○

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Please indicate the level of importance you associate with each of the following food production issues:

	Not at all important	Slightly important	Fairly important	Highly important	Extremely important	Unsure
Food safety	○	○	○	○	○	○
Food security	○	○	○	○	○	○
Food costs	○	○	○	○	○	○
Environmental impact of food production	○	○	○	○	○	○

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In the next section of the survey you will be asked some questions about food safety.

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Please indicate your level of disagreement or agreement with the following statements about the safety of **vegetables**.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe raw vegetables are safe	○	○	○	○	○
I believe canned vegetables are safe	○	○	○	○	○
I believe frozen vegetables are safe	○	○	○	○	○
I believe dried vegetables (i.e. sun dried tomatoes) are safe	○	○	○	○	○

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Please indicate your level of disagreement or agreement with the following statements about the safety of **vegetables**.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe raw vegetables are safe	○	○	○	○	○
I believe canned vegetables are safe	○	○	○	○	○
I believe frozen vegetables are safe	○	○	○	○	○
I believe dried vegetables (i.e. sun dried tomatoes) are safe	○	○	○	○	○

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UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements about the safety of **fruits**.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe raw fruits are safe	○	○	○	○	○
I believe canned fruits are safe	○	○	○	○	○
I believe frozen fruits are safe	○	○	○	○	○
I believe dried fruits are safe	○	○	○	○	○

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Please indicate your level of disagreement or agreement with the following statements about the safety of animal-based food products.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe eggs are safe	○	○	○	○	○
I believe ground beef is safe	○	○	○	○	○
I believe steak is safe	○	○	○	○	○
I believe chicken is safe	○	○	○	○	○
I believe pork chops are safe	○	○	○	○	○
I believe sausage is safe	○	○	○	○	○
I believe seafood is safe	○	○	○	○	○
I believe milk is safe	○	○	○	○	○

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How worried are you about the safety of food containing....

	Not Worried	Slightly Worried	Somewhat Worried	Moderately Worried	Extremely Worried
Bacteria	○	○	○	○	○
Growth hormones	○	○	○	○	○
Pesticide residues	○	○	○	○	○
Antibiotic residues	○	○	○	○	○

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How worried are you about the safety of food containing...

	Not Worried	Slightly Worried	Somewhat Worried	Moderately Worried	Extremely Worried
Additives	○	○	○	○	○
Preservatives	○	○	○	○	○

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How worried are you about the safety of...

	Not Worried	Slightly Worried	Somewhat Worried	Moderately Worried	Extremely Worried
Organic Food	○	○	○	○	○
Local Food	○	○	○	○	○
All natural food	○	○	○	○	○

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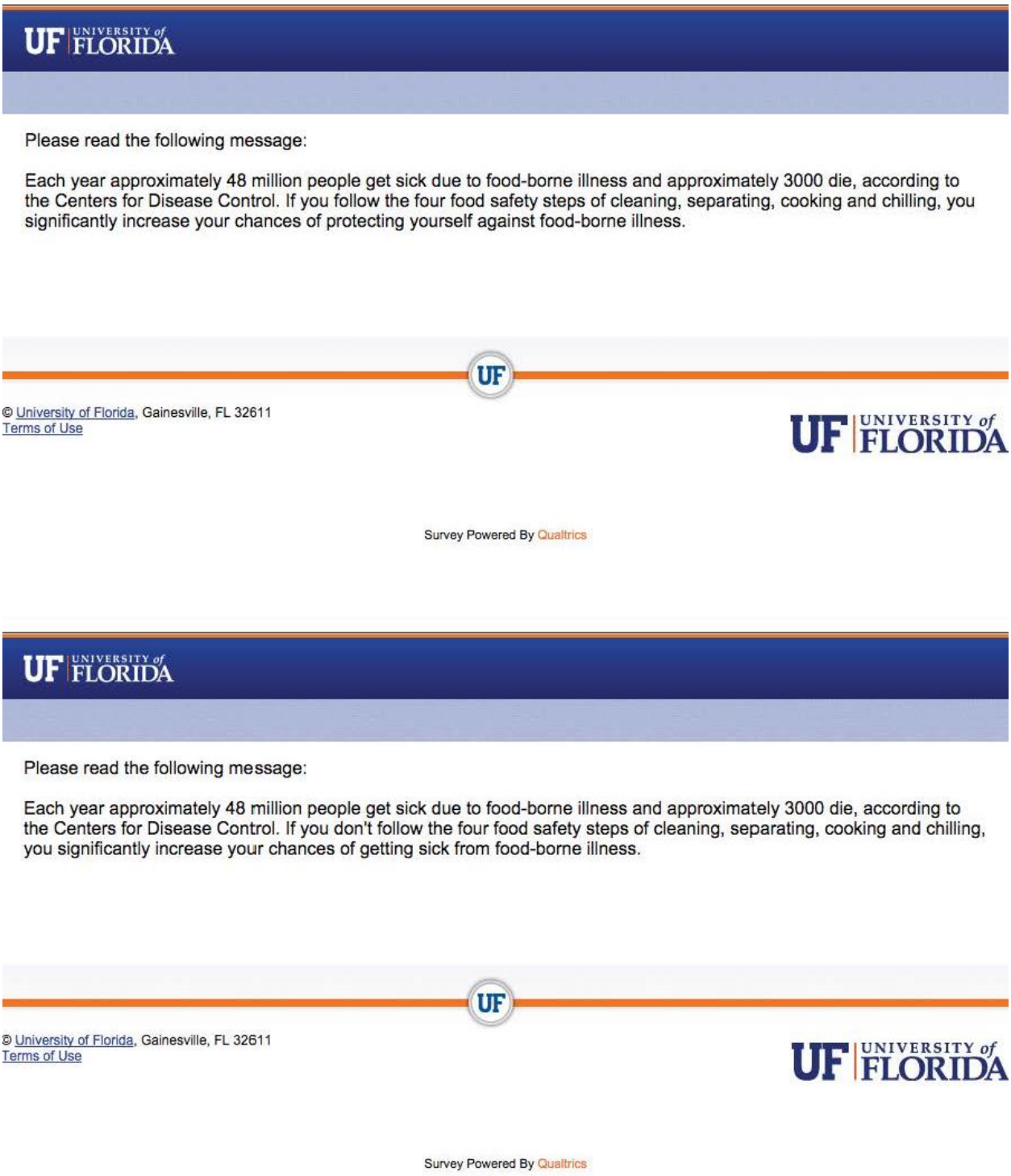
UF UNIVERSITY of FLORIDA

How worried are you about the safety of...

	Not Worried	Slightly Worried	Somewhat Worried	Moderately Worried	Extremely Worried
Food when you eat out	○	○	○	○	○
Food prepared in your kitchen	○	○	○	○	○

UF UNIVERSITY of FLORIDA



Note. Respondents were randomly shown one of these two messages.

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After reading the prior statement, please indicate your attitudes about the phrase: "Following the four food safety steps of cleaning, separating, cooking and chilling is..." Each line has a different set of adjectives to gather your opinions.

"Following the four food safety steps of cleaning, separating, cooking and chilling is..."

Good	○ ○ ○ ○ ○	Bad
Important	○ ○ ○ ○ ○	Unimportant
Foolish	○ ○ ○ ○ ○	Wise
Benefical	○ ○ ○ ○ ○	Harmful
Positive	○ ○ ○ ○ ○	Negative
Unnecessary	○ ○ ○ ○ ○	Necessary

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After reading the prior statement, please indicate how you feel about the phrase: "Following the four food safety steps of cleaning, separating, cooking and chilling is..." Each line has a different set of adjectives to gather your opinions.

"Following the four food safety steps of cleaning, separating, cooking and chilling is..."

Possible for me	○ ○ ○ ○ ○	**Not** possible for me
Easy for me	○ ○ ○ ○ ○	**Not** easy for me
In my control	○ ○ ○ ○ ○	**Not** in my control
Up to me	○ ○ ○ ○ ○	**Not** up to me
Practical for me	○ ○ ○ ○ ○	**Not** practical for me

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Please rate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
There is little I can do about food safety	○	○	○	○	○
It is impossible to avoid food safety risks	○	○	○	○	○
Everything we eat these days is dangerous	○	○	○	○	○
I can avoid unsafe food when I am careful	○	○	○	○	○
Concerns about food safety are exaggerated	○	○	○	○	○
Food safety is a major concern of mine	○	○	○	○	○
Food safety is a major concern of Americans	○	○	○	○	○
Please select Strongly Disagree to continue	○	○	○	○	○
I am responsible for my own food safety	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please indicate how often you take the following actions regarding food safety.

	Never	Rarely	Sometimes	Often	Always
Make sure that fresh fruits and vegetables are washed before I eat them	○	○	○	○	○
Peel edible skins from fresh fruits and vegetables before eating	○	○	○	○	○
Read food labels for food safety information	○	○	○	○	○
Disinfect counters before preparing food	○	○	○	○	○
Wash hands before preparing food	○	○	○	○	○
Wash hands before eating food	○	○	○	○	○
Use a food thermometer to check the doneness of meat and poultry items	○	○	○	○	○
Separate raw meat, poultry and seafood from ready-to-eat products	○	○	○	○	○
Defrost frozen foods in the refrigerator or microwave	○	○	○	○	○
Look for expiration dates on food before eating	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please indicate whether the following statements are true or false.

	True	False
It is very important to wash your hands with soap and water before you eat or touch food	○	○
Leaving frozen foods on the kitchen counter is the best way to defrost them	○	○
Cooked foods should be tightly wrapped or covered and put in the refrigerator within two hours	○	○
Ground meat will stay fresh in the refrigerator for four to five days	○	○
Keeping refrigeration at 40°F or below is one of the most effective ways to reduce the risk of foodborne illness	○	○
Fruits and vegetables cannot cause food poisoning	○	○
Meat, poultry and fish should be kept in the coldest part of the refrigerator	○	○
Eggs should be cooked until the white and yolk are not wet or runny	○	○
Eating raw eggs and meat is healthy because they have extra vitamins	○	○
Ground meat and poultry should be thoroughly cooked until there is no pink or red in the middle	○	○
The cutting board used for raw meat or poultry should be washed before being used from fruits or vegetables	○	○
Meat should be rinsed under cold water before cooking	○	○

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Where have you learned about food safety? (Select all that apply)

- ☐ Television
- ☐ Parents
- ☐ Relative(s)
- ☐ Food safety class
- ☐ Cooking class
- ☐ Cookbooks
- ☐ Job training
- ☐ Magazine articles
- ☐ Online sources (i.e. websites, social media, blogs, videos)
- ☐ Other (Specify)
- ☐ I have never learned about food safety

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Of the following choices where have you learned the MOST about food safety?

- ○ » Television
- ○ » Parents
- ○ » Relative(s)
- ○ » Food safety class
- ○ » Cooking class
- ○ » Cookbooks
- ○ » Job training
- ○ » Magazine articles
- ○ » Online sources (i.e. websites, social media, blogs, videos)
- ○ » Other (Specify)
- ○ » I have never learned about food safety

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For the following set of questions about food safety please mark the most appropriate answer.

During the past six months, how many people have you told about food safety issues?

Told no one ○ ○ ○ ○ ○ Told a number of people

In general, do you talk to your friends and colleagues about food safety issues...

Never ○ ○ ○ ○ ○ Very Often

When you talk to your friends and colleagues about food safety, do you:

Give very little information ○ ○ ○ ○ ○ Give a great deal of information

In a discussion about food safety, which of the following happens most?

Your friends tell you about issues including new developments ○ ○ ○ ○ ○ You tell friends about issues including new developments

Compared with your circle of friends, how likely are you to be asked about new information relating to food safety?

Not at all likely to be asked ○ ○ ○ ○ ○ Very likely to be asked

Overall, in all your discussions with friends and colleagues, regarding food safety are you:

Not used as a source of advice ○ ○ ○ ○ ○ Often used as a source of advice

UF UNIVERSITY of FLORIDA

In the next section of the survey you will be asked questions about your attitudes toward genetically modified foods. Genetic modification refers to the intentional change made to an organism's DNA in order to promote a desired trait.

UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I have purchased genetically modified food in the past.	○	○	○	○	○
I currently purchase genetically modified food.	○	○	○	○	○
I plan to purchase genetically modified food in the future.	○	○	○	○	○
I know what foods contain genetically modified ingredients.	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
If my favorite food was only available as a genetically modified, I would purchase it.	○	○	○	○	○
I would purchase genetically modified produce.	○	○	○	○	○
I would purchase genetically modified fish, such as salmon.	○	○	○	○	○
I would purchase meat from an animal that was fed genetically modified feed.	○	○	○	○	○
I would purchase food products containing genetically modified ingredients, such as cereal.	○	○	○	○	○
I would purchase a genetically modified food product if it cost less.	○	○	○	○	○
I would purchase clothes made from genetically modified fibers.	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I would purchase food labeled as "contains genetically modified ingredients".	○	○	○	○	○
I would prefer to purchase food labeled as "free of genetically modified ingredients" over unlabeled food.	○	○	○	○	○
I would prefer to purchase food labeled as "free of genetically modified ingredients" over food labeled as "contains genetically modified ingredients".	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I understand *basic* science.	○	○	○	○	○
I understand *food* science.	○	○	○	○	○
I understand *basic* technology.	○	○	○	○	○
I understand *food* technology.	○	○	○	○	○
I understand the science of genetically modified food.	○	○	○	○	○
I have heard about genetically modified food.	○	○	○	○	○
I have read about genetically modified food.	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please indicate your attitudes about the phrase: "I believe genetically modified food is..." Each line has a different set of adjectives to gather your opinions.

I believe genetically modified food is...

Natural	○ ○ ○ ○ ○	Artificial
Unhealthy	○ ○ ○ ○ ○	Healthy
Dangerous	○ ○ ○ ○ ○	Safe
Beneficial	○ ○ ○ ○ ○	Not Beneficial
Wholesome	○ ○ ○ ○ ○	Not Wholesome
Unnecessary	○ ○ ○ ○ ○	Necessary

UF UNIVERSITY of FLORIDA

Please indicate your level of disagreement or agreement with the following statements about genetically modified food.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe that development of genetically modified food tampers with nature.	○	○	○	○	○
I believe the genetically modified food is a possible solution to world hunger.	○	○	○	○	○
I believe genetically modified food provides solutions to pest and disease problems.	○	○	○	○	○
I believe genetically modified food carries little risk to the person consuming them.	○	○	○	○	○
I believe that the growing of genetically modified food threatens the environment.	○	○	○	○	○
I believe that genetically modified fruits and vegetables can be modified to contain higher levels of certain nutrients.	○	○	○	○	○

UF UNIVERSITY of FLORIDA

Please read the following message:

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

UF UNIVERSITY of FLORIDA

"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

After reading the prior statement, please Indicate your attitudes about the phrase: "I believe genetically modified food is..." Each line has a different set of adjectives to gather your opinions.

I believe genetically modified food is...

Natural	○ ○ ○ ○ ○	Artificial
Unhealthy	○ ○ ○ ○ ○	Healthy
Dangerous	○ ○ ○ ○ ○	Safe
Beneficial	○ ○ ○ ○ ○	Not Beneficial
Wholesome	○ ○ ○ ○ ○	Not Wholesome
Unnnecessary	○ ○ ○ ○ ○	Necessary

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- Food and Drug Administration (FDA)

After reading the prior statement, please indicate your level of disagreement or agreement with the following statements about genetically modified food.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe that use of genetically modified food tampers with nature.	○	○	○	○	○
I believe genetically modified food is a possible solution to world hunger.	○	○	○	○	○
I believe genetically modified food provides solutions to pest and disease problems.	○	○	○	○	○
I believe genetically modified food carries little risk to the person consuming them.	○	○	○	○	○
I believe that the growing of genetically modified food threatens the environment.	○	○	○	○	○
I believe that genetically modified fruits and vegetables can be modified to contain higher levels of certain nutrients.	○	○	○	○	○

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"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

After reading the prior statement, please indicate your attitudes toward the phrase: "I believe the information presented by the Food and Drug Administration is.....". Each line has a different set of adjectives to gather your opinions. Please mark the most appropriate answer.

I believe the information presented by the Food and Drug Administration is....

Truthful	○ ○ ○ ○ ○	Not truthfull
Not factual	○ ○ ○ ○ ○	Factual
Distorted	○ ○ ○ ○ ○	Not distorted
Untrustworthy	○ ○ ○ ○ ○	Trustworthy
Biased	○ ○ ○ ○ ○	Unbiased

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"Before genetically modified foods reach the market, crops from genetically modified seeds are studied extensively to make sure they are safe for people, animals and the environment. Today's genetically modified products are the most researched and tested agricultural products in history."

- Food and Drug Administration (FDA)

After reading the prior statement, please indicate your level of agreement or disagreement with the following statements completing the sentence, " I believe the Food and Drug Administration .....".

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
is likely to withhold information	○	○	○	○	○
is extremely knowledgeable about genetically modified food	○	○	○	○	○
is trustworthy	○	○	○	○	○
provides expertise about genetically modified food	○	○	○	○	○
is concerned with public welfare	○	○	○	○	○
has a vested interest in promoting a particular view about genetically modified food	○	○	○	○	○

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Please indicate your level of disagreement or agreement with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe food containing genetically modified products should be labeled.	○	○	○	○	○
I believe food that is not genetically modified should be labeled as "free of genetically modified ingredients."	○	○	○	○	○
I would support a ballot initiative to label food containing genetically modified ingredients.	○	○	○	○	○
I believe genetically modified food is properly regulated by the government.	○	○	○	○	○
I would like to learn more about genetically modified food.	○	○	○	○	○

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For the following set of questions about genetically modified food please mark the most appropriate answer.

During the past six months, how many people have you told about genetically modified food?

Told no one ○ ○ ○ ○ ○ Told a number of people

In general, do you talk to your friends and colleagues about genetically modified food...

Never ○ ○ ○ ○ ○ Very Often

In a discussion about genetically modified food, which of the following happens most?

Your friends tell you about issues including new developments ○ ○ ○ ○ ○ You tell friends about issues including new developments

When you talk to your friends and colleagues about genetically modified food, do you:

Give very little information ○ ○ ○ ○ ○ Give a great deal of information

Compared with your circle of friends, how likely are you to be asked about new information relating to genetically modified food?

Not at all likely to be asked ○ ○ ○ ○ ○ Very likely to be asked

Overall, in all your discussions with friends and colleagues, regarding genetically modified food are you:

Not used as a source of advice ○ ○ ○ ○ ○ Often used as a source of advice

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In the next section, you will be asked about your familiarity with food policies.

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Please indicate your level of familiarity with the following food policies.

How familiar are you with these food policies?

	Not at all familiar	Slightly Familiar	Somewhat Familiar	Moderately Familiar	Extremely Familiar
Food Safety Modernization Act	○	○	○	○	○
Farm Bill	○	○	○	○	○
Supplemental Nutrition Assistance Program (SNAP)	○	○	○	○	○
Federal Food, Drug, and Cosmetic Act	○	○	○	○	○

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Please indicate your level of disagreement or agreement with the following statements.

When preparing to vote on a policy that impacts agriculture and natural resources...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I would seek factual information from multiple sources.	○	○	○	○	○
I would seek to fully understand the policy.	○	○	○	○	○
I would consider both the positive and negative implications that could result.	○	○	○	○	○
I would discuss my opinion with others.	○	○	○	○	○
I would ask others what their opinion was.	○	○	○	○	○

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If you had the following kinds of learning opportunities to learn more about food topics such as food safety, and genetically modified food, which would you most likely take advantage of? (Please select up to 3 items)

- [ ] Read printed fact sheets, bulletins, or brochures
- [ ] Visit a website
- [ ] Attend a short course or workshop
- [ ] Look at a demonstration or display
- [ ] Read a newspaper article or series
- [ ] Watch TV coverage
- [ ] Take part in a one-time volunteer activity (for example, food bank or education)
- [ ] Get trained for a regular volunteer position
- [ ] Attend a fair or festival
- [ ] Watch a video
- [ ] Attend a seminar or conference
- [ ] Other

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In the next section, you will be asked about how you deal with different situations.

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We would like to gain an understanding about how survey respondents approach and deal with situations as they arise throughout life. When answering the following questions, please try to indicate the degree to which you agree or disagree with the statements as they relate to how you naturally tend to approach situations. You will find some you strongly agree with and some you strongly disagree with; there is not a right or wrong response.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I listen carefully to the opinions of others even when they disagree with me.	○	○	○	○	○
I look for opportunities to solve problems.	○	○	○	○	○
I am interested in many issues.	○	○	○	○	○
I enjoy learning about many topics.	○	○	○	○	○
I am able to relate to a wide variety of issues.	○	○	○	○	○
I ask lots of questions in a learning environment.	○	○	○	○	○
I enjoy finding answers to challenging questions.	○	○	○	○	○
I am a good problem solver.	○	○	○	○	○
I am confident that I can reach a reasonable conclusion.	○	○	○	○	○
It is important to be well informed.	○	○	○	○	○
I am willing to change my opinion when I am given new information I find to be credible.	○	○	○	○	○
I try to consider the facts without letting my biases affect my decisions.	○	○	○	○	○
I enjoy learning even when I am not in school.	○	○	○	○	○
I can get along with people who do not share my opinions.	○	○	○	○	○
I present issues in a clear and precise manner.	○	○	○	○	○
I search for the truth even when it makes me uncomfortable.	○	○	○	○	○
I will go out of my way to find the right answers to a problem.	○	○	○	○	○
Please select "Disagree"	○	○	○	○	○
I try to find multiple solutions to problems.	○	○	○	○	○
I ask many questions when making a decision.	○	○	○	○	○
I believe that most problems have more than one solution.	○	○	○	○	○

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For each of the following statements, please indicate whether or not the statement is characteristic of you or of what you believe.

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When answering the following questions, please try to indicate the degree to which the statement is characteristic or uncharacteristic of you or of what you believe. You will find some are extremely characteristic of you and some are extremely uncharacteristic of you; there is not a right or wrong response.

	Extremely uncharacteristic of me	Somewhat uncharacteristic of me	Uncertain	Somewhat characteristic of me	Extremely characteristic of me
I prefer complex to simple problems.	○	○	○	○	○
I like to have the responsibility of handling a situation that requires a lot of thinking.	○	○	○	○	○
Thinking is not my idea of fun.	○	○	○	○	○
I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.	○	○	○	○	○
I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something.	○	○	○	○	○
I find satisfaction in deliberating hard and for long hours.	○	○	○	○	○
I only think as hard as I have to.	○	○	○	○	○
I prefer to think about small daily projects to long term ones.	○	○	○	○	○
I like tasks that require little thought once I've learned them.	○	○	○	○	○
The idea of relying on thought to make my way to the top appeals to me.	○	○	○	○	○
I really enjoy a task that involves coming up with new solutions to problems.	○	○	○	○	○
Learning new ways to think doesn't excite me very much.	○	○	○	○	○
I prefer my life to be filled with puzzles I must solve.	○	○	○	○	○
The notion of thinking abstractly is appealing to me.	○	○	○	○	○
I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.	○	○	○	○	○
I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.	○	○	○	○	○
It's enough for me that something gets the job done; I don't care how or why it works.	○	○	○	○	○
I usually end up deliberating about issues even when they do not affect me personally.	○	○	○	○	○

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In the last section of the survey you will be asked to answer a few demographic questions.

What is your sex?

- ○ Male
- ○ Female

What is the highest level of education you have completed?

- ○ Less than 12th grade (did not graduate high school)
- ○ High school graduate (includes GED)
- ○ Some college, no degree
- ○ 2-year college degree (Associates, Technical, etc.)
- ○ 4-year college degree (Bachelor's, etc.)
- ○ Graduate or Professional degree (Master's, Ph.D., M.B.A., etc.)

Do you consider yourself to be Hispanic/Latino(a)/Chicano(a) (e.g., Mexican, Puerto Rican)?

- ○ Yes, I consider myself to be Hispanic/Latino(a)/Chicano(a)
- ○ No, I do not consider myself to be Hispanic/Latino(a)/Chicano(a)

Which category(ies) best describes your race(s)? (Feel free to select more than one if applicable.)

- ☐ American Indian or Alaska Native
- ☐ Black or African American
- ☐ Asian or Pacific Islander
- ☐ White
- ☐ Other (please specify)

Which of the following best describes your political beliefs or values?

- ○ Very Liberal
- ○ Liberal
- ○ Moderate
- ○ Conservative
- ○ Very Conservative

In politics TODAY, do you generally think of yourself as a...

- ○ Republican
- ○ Democrat
- ○ Independent
- ○ Non-affiliated

In 2013, what was your total family income from all soures, before taxes?

- ○ $24,999 or less
- ○ $25,000 to $49,999
- ○ $50,000 to $74,999
- ○ $75,000 to $149,999
- ○ $150,000 to $249,999
- ○ $250,000 or more

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Which of the following types of diets do you follow? Check all that apply OR choose "none of the above"

- [ ] Vegetarian (no meat, chicken, or fish/seafood)
- [ ] Pescatarian (no flesh of any animal except fish/seafood)
- [ ] Vegan (no animal or seafood products of any kind, including dairy)
- [ ] None of the above

On average, how many people do your grocery purchases feed?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ More than 6

Who do your grocery purchases feed on a regular basis?

Please check all that apply.

- [ ] Self
- [ ] Spouse
- [ ] Children (How many?)
- [ ] Roommate(s) (How many?)
- [ ] Relative(s) (How many?)

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Thank you for completing this survey. Please note that messages used were for research purposes only and may not accurately reflect the view of the organization listed.

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BIOGRAPHICAL SKETCH

Taylor Ruth was born in 1991, and grew up in the outskirts of Jacksonville, Florida in the small town of Fleming Island. Taylor is the only child of David and Jean Ruth. Taylor attended the University of Florida pursuing a Bachelor of Science in microbiology and cell sciences. After becoming a sister in Sigma Alpha, a professional agricultural sorority, she learned about the agricultural education and communication department, and eventually pursued a minor in agricultural communications. Once she graduated with her bachelor's degree in 2013, Taylor took two semesters off to research genetic mutations in maize in the Horticulture Sciences Department at the University of Florida. In the spring of 2014, Taylor began her enrollment in the Master of Science program for agricultural education and communication, specializing in agricultural communication. She spent the majority of her time researching consumer perceptions related to food and natural resources in the state of Florida through the Center for Public Issues Education (PIE Center). Taylor will begin the doctoral program at the University of Florida in agricultural education and communication in the fall of 2015. She has accepted an assistantship through the PIE Center, and will continue researching consumer perceptions related to agricultural issues.