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Abstract

Consumer acceptance of new food technology, like genetically modified food, is essential for the product's success. Consumers have been skeptical toward the technology of genetically modified food due to lack of knowledge by the public, negative portrayal of the technology by the media, and a lack of communication about the technology from those who develop and use it. This research was guided by the Elaboration Likelihood Model to investigate the influence of persuasive communication on Florida consumers' attitude toward genetically modified food. Consumers typically use the peripheral route to assess food information, therefore a message source (peripheral cue) was manipulated to examine its effect on attitude. An experimental design administered through an online survey was used to collect data (n = 515). Respondents reported that they agreed they were knowledgeable about genetically modified food, but they were unsure about associated risks. Respondents neither agreed nor disagreed that the four sources were credible, and there were no differences in credibility. Additionally, there were no differences in their attitude toward genetically modified food associated with the source. The results showed that the source did not predict attitude, but source credibility, risk perception, and some demographic characteristics did. Prior knowledge was not a predictor of attitude, and the respondents likely used the peripheral route to assess the message. Agricultural communicators should target communication for specific audiences and deliver value-driven messages rather than trying to increase consumer knowledge alone. Future research should explore different peripheral cues and their effects on attitude formation.

Keywords

Credibility, Elaboration Likelihood Model, Genetically Modified Food, Message Source, Risk Perception

RESEARCH

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ABSTRACT

Consumer acceptance of new food technology, like genetically modified food, is essential for the product's success. Consumers have been skeptical toward the technology of genetically modified food due to lack of knowledge by the public, negative portrayal of the technology by the media, and a lack of communication about the technology from those who develop and use it. This research was guided by the Elaboration Likelihood Model to investigate the influence of persuasive communication on Florida consumers' attitude toward genetically modified food. Consumers typically use the peripheral route to assess food information, therefore a message source (peripheral cue) was manipulated to examine its effect on attitude. An experimental design administered through an online survey was used to collect data (n = 515). Respondents reported that they agreed they were knowledgeable about genetically modified food, but they were unsure about associated risks. Respondents neither agreed nor disagreed that the four sources were credible, and there were no differences in credibility. Additionally, there were no differences in their attitude toward genetically modified food associated with the source. The results showed that the source did not predict attitude, but source credibility, risk perception, and some demographic characteristics did. Prior knowledge was not a predictor of attitude, and the respondents likely used the peripheral route to assess the message. Agricultural communicators should target communication for specific audiences and deliver value-driven messages rather than trying to increase consumer knowledge alone. Future research should explore different peripheral cues and their effects on attitude formation.

KEY WORDS

Credibility, Elaboration Likelihood Model, Genetically Modified Food, Message Source, Risk Perception

INTRODUCTION

New technologies facilitate the majority of innovations in the food industry (Siegrist, 2008). While United States consumers view science favorably, there is little consensus between scientists and the public about the safety and ethical implications of certain research areas (Funk & Raine, 2015). Consumer skepticism has limited the success and acceptance of new technologies (MacFie, 2007), and policy makers now have to consider the public's moral values when making policy decisions about science (Burgess, 2014). However, research concerning the public's understanding of science has mostly focused on consumers' lack of knowledge rather than sociological issues (Gauchat, 2012).

Consumers typically have limited knowledge of new technologies, including genetically engineered food (Durant, Bauer, & Gaskell, 1998), which are also known as genetically modified organisms (GMO) or genetically modified food. The Food and Drug Administration (FDA; 2014) described genetically engineered plants as organisms that have had genes altered to produce a desirable trait. Researchers have proposed that not understanding genetic modification has made

it difficult for consumers to decide about possible risks associated with the technology (Mielby, Sandoe, & Lassen, 2012; Siegrist, 2008). However, studies have reported conflicting information on the importance of knowledge in attitude formation (Flipse & Ossewijer, 2012; Ishiyama et al., 2011; Mielby et al., 2012; McFadden & Lusk, 2015; Verdurme & Viaene, 2003).

Genetically modified foods have been deemed safe and beneficial (National Academy of Sciences, 2016; Nicolia, Manzo, Veronesi, & Rosellini, 2014), but consumers do not view the technology as safe (Funk & Kennedy, 2016) and have called for tighter regulations (Senauer, 2013). In August of 2016, President Obama signed a law that would mandate all food containing genetically modified ingredients be labelled (Popken, 2016). Due to a general lack of knowledge, consumers will have to trust information and sources to be credible to make informed purchasing decisions about genetically modified food (Earle & Cvetkivich, 1995). Attitudes toward genetically modified food are influenced by consumers' trust of the regulators and experts of the technology (Ishiyama et al., 2011; Marques, Critchley, & Walshe, 2015). Therefore, there is a great need to research effective communication practices regarding genetically modified food, mainly with a focus on the consumer (Telg & Irani, 2012), to understand the role of message source in communication. This research sought to explore the role of message source and persuasive communication on consumers' attitudes toward genetically modified food.

LITERATURE REVIEW

A number of researchers have explored consumers' attitudes toward genetically modified food. Bredahl (2001) conducted a study in the United Kingdom and concluded that consumers' perceived risks and benefits associated with genetically modified food were strongly embedded in their attitudes. The close relationship between perceived risks and attitudes makes it difficult to change consumers' attitudes toward food biotechnology, which can cause them to reject the technology all together (Bredahl, 2001). Dean and Shepherd (2007) found that consumers viewed genetically modified food as harmful, unethical, and unnatural.

The demographics of consumers have strongly influenced attitudes toward genetically modified food as well. Verdurme and Viaene (2003) developed a model that suggested demographic characteristics greatly influenced consumers' knowledge of genetically modified food as well as overall attitudes and risk perceptions of products. A study by Irani, Sinclair, and Malley (2001) described how various demographic characteristics influenced the perceptions of GMOs and GMO labels. Eighty-five percent of respondents agreed that GMO food should be properly labeled. 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. Pounds (2014) identified significant differences in the purchasing intent of GMOs between men and women in the state of Florida. Men appeared unsure if they would purchase GMOs, while women agreed they were unlikely to engage in purchasing behaviors (Pounds, 2014). Other studies have determined that women held more negative perceptions of genetically modified food compared to men (Ishiyama et al., 2011; Lockie, Lawrence, Lyons, & Grice, 2005) and were less likely to accept GMOs (Hall & Moran, 2006). Research has also concluded that younger consumers have held more favorable attitudes toward genetically modified food (Antonopoulou, Papadas, & Targoutzidis, 2009) but are unsure about the benefits and risks associated with the products (Ruth, Gay, Rumble, & Rodriguez, 2015).

Elaboration Likelihood Model

The Elaboration Likelihood Model of persuasion guided this research. Originally, the model was developed to account for both active and passive processors of information (Petty, Brinol, & Priester, 2009). The ELM describes two routes in which attitude change can occur: the central processing route and the peripheral processing route. The central processing route is used when an individual possesses the motivation (e.g. personal relevance) and ability (e.g. knowledge) to process the information and 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).

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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 message. Because people who are knowledgeable about a topic process information with a higher amount of elaboration, they typically use the central processing route, while those who are less informed use the peripheral processing route (Wood, Rhodes, & Biek, 1995). The peripheral processing route relies on the use of peripheral cues, such as a message source (Petty et al., 2009). The way an individual perceives a source has been linked to the likelihood of elaboration and changes in attitude (Priester & Petty, 1995). McCroskey (1997) defined source credibility as "the attitude toward a source of communication held at a given time by a receiver" (p. 87). Perloff (2008) added to this definition by explaining that credibility also consisted of three main components: trust, goodwill, and expertise of a source.

Research in food science has determined that a low amount of elaboration is used by consumers 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 consumers determine the majority of food-related decisions using the peripheral processing route. Krause, Meyers, Irlbeck, and Chambers (2015) used the ELM to guide a content analysis of YouTube videos for and against Proposition 37 in California (bill proposed to label genetically engineered food). The bill did not pass, and the study found that the videos opposing the proposition used scientists as sources. Krause et al. (2015) concluded scientists offered high credibility and worked effectively as a peripheral cue. The researchers also concluded that language in the food industry should shift from using fact-based messages to more emotional appeals to target non-agricultural consumers based on the prevalent frames used in the videos (Krause et al., 2015).

Risk communication research related to food products has also used the ELM to determine how different variables affect consumer attitudes (Frewer et al., 1997). Risk perception often drives consumer acceptance of products, as opposed to actual risk estimates made by professionals (Frewer, Howard, & Aaron, 1998). A study conducted by Frewer, Howard, and Shepherd (1998) used the ELM to examine how initial attitudes toward GMOs affect communication about food production. A survey captured respondents' risk perceptions associated with GMOs before and after exposure to a message. The researchers concluded that prior risk perception was an important indicator for attitudes after exposure to a message.

Source credibility is a key component of peripheral processing route of ELM. Researchers have found that source credibility related to risk communication may differ across cultures. Therefore, it is important to consider the characteristics of the people viewing messages or labels to develop effective communication (Regan et al., 2014). A study by Stijbos et al. (2016) determined that education, age, and gender influenced consumers' trust in information about the health benefits of food.

Frewer et al. (1997) looked specifically at how source credibility affects attitudes within the ELM. A distrusted source (government), trusted source (consumer organization), and collaboration of both types of sources were tested using an experimental design. The research concluded that source credibility did not influence final attitudes toward genetically modified food if initial attitudes were positive. The researchers also found that the hypothesized distrusted government source lead to greater acceptance of the information presented. Other studies support these findings. Irani et al. (2001) concluded that the FDA was the most trusted source used to communicate information about genetically modified food to consumers when compared the United States Department of Agriculture (USDA) and industry organizations. However, compared to non-government organizations and university scientists, Dean and Shepherd (2007) determined government and industry sources were the least trusted sources for communicating information about genetically modified food. Frewer, Howard, Hedderley, and Shepherd (1999) conducted a similar study examining source credibility and determined that "trust in the information source is an important contextual clue in determining public reactions to information about genetic engineering" (p. 45).

PURPOSE & OBJECTIVES

The purpose of this research was to examine the influence of persuasive communication on Florida consumers' attitudes toward genetically modified food. The following objectives guided this study:

1. Describe Florida consumers' prior knowledge of genetically modified food science and technology.
2. Describe Florida consumers' risk perceptions of genetically modified food.
3. Describe Florida consumers' perception of source credibility for FDA, USDA, Ag Business 1, and Ag Business 2 after receiving an informational message about genetically modified food.
4. Describe Florida consumers' attitude toward genetically modified food after receiving an informational message.
5. Determine how the message source, source credibility, consumers' demographics, prior knowledge of genetically modified food science and technology, and risk perception of genetically modified food predict Florida consumers' attitude toward genetically modified food after reading a message about genetically modified food.

METHODS

This research used survey methodology with an experimental design to answer the research objectives. The population for this study was Florida consumers 18 and older. The state's large agricultural production (National Agricultural Statistic Service [NASS], 2011), combined with an increase in proposals for regulation of genetically modified food (Florida House of Representatives, 2015), has made it important to study Florida consumers' attitudes toward genetically modified food. Non-probability sampling and an opt-in panel was used to collect the sample for this study. The survey company, Qualtrics, distributed the questionnaire online to 770 respondents, and 514 of the responses were complete and usable (68% participation rate).

Literature has shown that consumers use the peripheral route when processing information about agriculture (Frewer et al., 1997), therefor the peripheral cue (message source) for a message that described genetically modified food was manipulated to test its effect on attitude. The experiment used four different sources, and each source presented the same message about genetically modified food. The selected sources were FDA, USDA, Ag Business 1, and Ag Business 2 based on conflicting literature and lack of research for the credibility associated with these organizations/companies (Barnett, Cooper, & Senior, 2007; Dean & Shepherd, 2007; Frewer et al., 1997; Irani et al., 2001; Poortinga & Pidgeon, 2005; Siegrist, 2000). Ag Business 1 and Ag Business 2 are pseudonyms used for the purpose of this paper, and respondents saw the actual company names in the questionnaire. Ag Business 1 and Ag Business 2 represent two of the largest producers of genetically engineered seeds in the United States (Fernandez-Cornejo, Wechsler, Livingston, & Mitchell, 2014). The control group for the experiment was the FDA, because previous literature had found the organization to be trusted (Irani et al., 2001). Respondents were randomly assigned to one of the four treatment groups to ensure statistical equivalence of the groups before the treatment was introduced (Ary, Jacobs, & Sorensen, 2010).The following message was adopted from GMO answers (2014) and shown to respondents:

> 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. (para. 16)

Even though genetic engineering is the technically correct term (FDA, 2014), the questionnaire designed for this study used the descriptor genetically modified because consumers have been more familiar with the term (Miller, Annou, & Wailes, 2003). Additionally, genetic engineering has less positive associations than genetic modifications (Miller et al., 2003) and could have biased the respondents.

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The questions analyzed in this study were a part of a larger questionnaire (62 questions) that asked respondents about their perceptions of food safety, genetically modified food, and food policy. Respondents' prior knowledge of genetically modified food science and technology was measured through a seven-item, five-point Likert-type scale adapted from an instrument used in previous research that relied on self-reported knowledge (Hallman & Metcalf, 1994). Knowledge statements asked about basic science, basic technology, food science, food technology, and genetically modified food. The scale was labelled *strongly disagree* = 1, *disagree* = 2, *neither agree nor disagree* = 3, *agree* = 4, *and strongly agree* = 5. With a Cronbach's alpha greater than 0.7, the scale was considered reliable (α = .88; Field, 2013). The construct for prior knowledge was created by summating the average for each item in the scale and dividing by seven. Real limits were created to provide consistent interpretation of the results (Sheskin, 2004) and were as follows for the respondents' agreement with their knowledge of genetically modified food and science: 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*.

Risk perceptions of genetically modified food were measured with a six-item, five-point Likert-type scale, which was adapted from prior studies (Frewer, Howard, & Shepherd, 1998; Roe & Teisl, 2007; Rumble & Leal, 2013). Statements from this scale included "I believe that development of genetically modified food tampers with nature," "I believe genetically modified food carries little risk to the person consuming them," and "I believe that the growing of genetically modified food threatens the environment." The Likert-type scale for risk perception used the same labels and real limits as the prior knowledge scale. Questions were recoded so a score of five indicated agreement that genetically modified food posed no risk. The scale was reliable (α = .89), and an index was created by summating and averaging the items in the construct.

A six-item, five-point Likert-type scale shown after the message about genetically modified food measured source credibility. Items in the scale were adapted from an instrument used by Frewer et al. (1997) that accounted for trust, goodwill, and expertise (Perloff, 2008). These statements would say "I believe [source]…" and included statements such as "is likely to withhold information," "provides expertise about genetically modified food," and "has a vested interest in promoting a particular view about genetically modified food labels." Real limits used to measure and interpret source credibility were the same as prior knowledge and risk perception. A higher score indicated agreement that the source was credible. The reliability for the source credibility scale in each of the treatment groups ranged between α = .76 and α = .85. An index was created by summating the average for each item measuring credibility and dividing by six.

The final variable, attitude toward genetically modified food, was measured using a six-item, five-point semantic differential scale. The scale was adapted from definitions of attitudes described by Osgood, Suci, and Tannenbaum (1971) and an instrument developed by Frewer, Howard, and Shepherd (1998). *Positive* adjectives were assigned a five and *negative* adjectives were assigned a one. Examples of the adjective pairs included "natural/artificial," "beneficial/not beneficial," and "necessary/not necessary." Real limits used to interpret the results were as follows: 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. The attitude toward genetically modified food was calculated by adding the average of the six items measuring attitude and dividing by six. The reliability for attitude in each treatment group ranged from α = .94 to α = .95.

Post-stratification weighting of the respondents' demographics lessened the limitations associated with non-probability sampling, like selection, exclusion, and non-participation bias (Baker et al., 2013). Researchers weighted the sample based on the 2010 Florida census for sex, race, ethnicity, age, and rural/urban continuum. One error associated with post-stratification weighting is rounding error. When researchers weight respondents on more than one category, under-represented cases will be weighted higher and over-represented cases will be weighted lower (Maletta, 2007). Rounding errors can cause the sample total to change, such as the sample in this study reported as 515 cases rather than 514. After data was collected, the ages of the respondents were grouped into Zickuhr's (2010) generational categories for analysis: 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). Additionally, due to the small percentage of respondents who identified as Pacific Islander and Native Alaskan, those two racial categories were combined with the option for other.

The majority of respondents were white (77.6%, *n* = 400) and female (51.7%, *n* = 266). The Millennial Generation or younger (31.5%, *n* = 162) represented the largest generation in the sample, and more than half of the respondents earned an annual income between $25,000 and $74,999 (64.5%, *n* = 333). The questionnaire also asked respondents whom they purchased food for regularly. The question used a check all that apply option with the following categories: self, spouse, children, roommates, relatives, and other. The variable was recoded into a dichotomous variable. Respondents who only selected purchasing food for himself or herself was coded as a 1. If the respondents reported purchasing food for anyone but only themselves, they were coded as a *0*. The majority purchased for themselves and others (73.5%, *n* = 378). Table 1 shows a full description of respondents, which includes the actual demographics and the weighted demographics. This study used the weighted demographics.

Table 1
Description of Respondents

Demographic	*n*	*%*	*Weighted n*	*Weighted %*
Generation				
Millennials or younger	136	26.5	162	31.5
Generation X	102	19.8	111	21.6
Young Baby Boomers	120	23.3	88	17.2
Old Baby Boomers	93	18.1	67	13.1
Silent Generation or older	63	12.3	85	16.6
Sex				
Male	188	36.6	249	48.3
Female	326	63.4	266	51.7
Hispanic	52	10.1	109	21.1
Race				
White	463	90.1	400	77.6
African American	25	4.9	74	14.4
Other	26	5.1	41	8.0
Annual Income				
$24, 999 or less	95	18.5	84	16.4
$25,000-$49,999	188	36.6	190	36.8
$50,000-$74,999	130	25.3	143	27.7
$75,000 or more	101	19.6	99	19.1
Purchase Groceries for…				
Self only	131	25.5	137	26.5
Self and/or others	383	74.5	378	73.5
Total	514	100	515	100

Data were analyzed with SPSS ® version 21.0. Objectives one and two used descriptive statistics. Objective three also used descriptive statistics along with a one-way ANOVA to identify any differences in source credibility between the message sources. Descriptive statistics and an ANOVA was used to describe differences in attitude between sources for objective four. Objective five used a multiple-linear regression model to determine if the predictor variables, message

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source, message credibility, demographics, risk perception, and prior knowledge, could predict attitude toward genetically modified food. Message source and demographics were dummy coded when entered into the model. The control for the study was the FDA because literature has indicated it was the most trusted (Irani et al., 2001). The demographic category with the highest percentage was treated as the control for the remaining categorical variables (sex: females; generation: Millennial Generation or younger; race: white; ethnicity: non-Hispanic; income: $25,000 to $49,999; purchasing food for: self and/or others; Field, 2013).

RESULTS

Prior Knowledge of Genetically Modified Food Science and Technology

Respondents agreed that they understood basic science (M = 4.10, SD = .75) and basic technology (*M* = 4.10, *SD* = .73). They also agreed that they understood food science (M = 3.62, SD = .84) and food technology (*M* = 3.5, *SD* = .89), and that they had heard (*M* = 3.96, *SD* = .97) and read (*M* = 3.50, *SD* = 1.16) about genetically modified food. However, respondents neither agreed nor disagreed that they understood the science of genetically modified food (*M* = 3.17, *SD* = 1.08). The overall average for prior knowledge was 3.70 (*SD* = .71), which indicated respondents agreed they were knowledgeable about genetically modified food science and technology.

Risk Perceptions of Genetically Modified Food

Respondents neither agreed nor disagreed about risks associated with genetically modified food (*M* = 2.82, *SD* = .89).

Source Credibility for FDA, USDA, Ag Business 1, and Ag Business 2

The USDA (*M* = 2.93, *SD* = .75), Ag Business 2 (*M* = 2.93, *SD* = .70), and FDA (*M* = 2.91, *SD* = .76) received the highest, and nearly identical, credibility scores. Ag Business 1 had the lowest source credibility (*M* = 2.86, *SD* = .80). The overall credibility score for the sample was 2.91 (SD = .75), and respondents neither agreed nor disagreed about the credibility of the sources. An ANOVA was run to determine if there were any statistical differences between the source credibility of the four sources. The ANOVA was not significant ($F(3, 511) = .23$, $p = .88$), and there were no statistical differences between the groups.

Attitude toward Genetically Modified Food After Reading an Informational Message

The attitude associated with the FDA was the lowest (*M* = 2.53, *SD* = 1.01), and the USDA was associated with the most positive attitude (*M* = 2.74, *SD* = 1.10). Ag Business 2 (*M* = 2.57, *SD* = 1.12) and Ag Business 1 (*M* = 2.58, *SD* = 1.20) appeared to produce similar attitudes to one another; however, the attitude after reading the message from all four sources was neutral. The overall attitude index was 2.60 (SD = 1.11), which indicated the respondents had an average neutral response after reading the informational message. There was no statistical difference in attitude between the sources ($F(3,511) = .23$, $p = .89$).

Predictors of Attitude toward Genetically Modified Food

Objective five was measured using a multiple linear regression model to determine how well the predictor variables could predict attitude toward genetically modified food (Table 3). The regression model was significant ($F(19, 513) = 78.29$, $p < .01$). The R2 value for the model was .740, which indicated the model could account for 74.0% of the variance in attitude toward genetically modified food. The sources used to present the message were not significant predictors of attitude, but source credibility, risk perception, and some demographic categories were significant predictors. Out of the demographic categories controlled for in the regression model, men and some of the generations were statistically significant predictors of attitude. Compared to women, men were predicted to have a more positive attitude toward genetically modified food ($b = .14$, $p = .011$). Generation X ($b = .17$, $p = .02$), Young Baby Boomers ($b = .23$, $p = .01$), and Old Baby Boomers ($b = .21$, $p = .02$) were predicted to have more positive attitudes compared to the Millennial Generation. Source credibility was another significant predictor ($p < .01$), and for every one-unit increase in source

credibility, there was a .40 increase in a positive attitude (b = .40). Risk perception was the final significant predictor and had the greatest effect on final attitude (p < .01). As risk perception became more positive (less perceptions of risk) per one unit, positive attitude increased by .78 (b = .78). The remaining predictors, race, income, ethnicity, and for whom respondents purchased food, were not statistically significant predictors of final attitude toward genetically modified food (p > .05).

Table 2
Regression Model for Attitude toward Genetically Modified Food

Variable	*B*	*p*
Constant	-.75	.00*
Source		
Ag Business 1	.01	.85
Ag Business 2	-.05	.47
USDA	.07	.37
Generation		
Generation X	.17	.02*
Young Baby Boomers	.23	.01*
Old Baby Boomers	.21	.02*
Silent Generation or older	-.02	.81
Men	.14	.01*
Hispanic	-.10	.12
Race		
African American	.10	.18
Other	-.02	.88
Annual Income		
$24, 999 or less	.10	.19
$50,000-$74,999	.03	.69
$75,000-or more	.09	.26
Purchase Groceries for…		
Self only	-.03	.62
Prior Risk Perception	.78	.00*
Prior Knowledge	-.06	.14
Source Credibility	.40	.00*

Note. * indicates significance at α = .05. R^2 = .740

DISCUSSION AND IMPLICATIONS

Consumer acceptance of new technologies predicts the success or failure of a product (MacFie, 2007). Therefore, research exploring the influence of persuasive communication on Florida consumers' attitude toward genetically modified food was important to develop effective promotional messages. Respondents reported agreement that they understood science and technology in general and about food. They also agreed they had heard and read about genetically

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modified food; however, they neither agreed nor disagreed that they understood the science of genetically modified food. This finding was consistent with prior literature that indicated consumers had limited understanding of the science behind genetically modified food (Durant et al., 1998; Siegrist, 2008). The data from this research also indicated that respondents were unsure about the risks associated with genetically modified food, which could explain the skepticism surrounding genetically modified food (Bredahl, 2001).

Prior research had concluded government sources were more trusted when communicating about genetically modified food (Frewer et al., 1997), but this study found no differences in source credibility between two government and industry organizations. Prior research had compared perceptions of trust between sources (Dean & Shepherd, 2007; Frewer et al., 1997; Irani et al., 2001); however, credibility is composed of trust, goodwill, and expertise (Perloff, 2008). The different operationalization for credibility in this current study compared to past ones may explain the differences in results. After exposure to the persuasive communication about genetically modified food, respondents had neutral attitudes toward genetically modified food. This finding is likely reflective of their neutral risk perceptions and supports prior literature (Bredahl, 2001). However, these findings were counter to research by Dean and Shepherd (2007) and may signal a change in opinion over the nine years since that study was conducted or differences in opinions between geographic regions. There were no differences between attitudes associated with the message source, which is likely due to similar perceptions of source credibility. Factors aside from the message source were likely affecting respondents' attitude toward genetically modified food.

The regression model used for objective five demonstrated how different ELM variables interacted with respondents' demographic characteristics to predict their attitude toward genetically modified food. This model was able to account for a high amount of variance in attitude toward genetically modified food. The findings from this research 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). Lower perceived risk perception (scores closer to five) and positive perception of source credibility were both significant predictors of positive attitudes toward genetically modified food, 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 (Petty et al., 2009). Consistent with prior literature (Bredahl, 2001), respondents who perceived less risk were predicted to have more positive attitudes toward genetically modified food. Respondents who had positive risk perceptions may not have viewed the message as personally relevant because they were likely less worried about associated risks with the food. In the absence of personal relevance, individuals move through the peripheral route and do not carefully consider the message. Therefore, respondents who had fewer risk perceptions may have been influenced by the peripheral cue, or source credibility (Petty et al., 2009).

Source credibility was a significant predictor of attitude, and as source credibility increased, so did attitude toward genetically modified food. However, prior knowledge, or ability to process information, was not a predictor of attitude. Respondents were likely using the peripheral pathway because they did not have the ability to process the information (Frewer et al., 1997; Goodwin, 2013; Meyers, 2008; Petty et al., 2009) and relied on a peripheral cue (Petty et al., 2009). Additionally, knowledge was not a predictor of attitude toward genetically modified food (Flipse & Ossewijer, 2012; Ishiyama et al., 2011; McFadden & Lusk, 2015; Verdurme & Viaene, 2003). Attitudes toward genetically modified food were likely influenced by factors aside from knowledge alone.

Demographic characteristics were predictors of attitude toward genetically modified food as well. Older generations, excluding the Silent Generation or older, were significant predictors of more positive attitudes compared to the Millennial Generation or younger, which conflicted with previous literature (Antonopoulou et al., 2009). Consistent with prior literature, men had more positive attitudes toward genetically modified food compared to women (Irani et al., 2001; Ishiyama et al., 2011; Lockie et al., 2005; Pounds, 2014). The differences in attitudes between demographic categories may be the result of differences in values amongst those groups (Regan et al., 2014) or differences in trust of message sources (Stijbos et al., 2016).

RECOMMENDATIONS

When agricultural communicators develop persuasive communication about genetically modified food, they should consider the findings from this study. Communicators should purposively select sources for their target audiences when developing communication to ensure the source will be perceived as credible. For example, an agricultural biotechnology company may be viewed highly credible by producers but not by consumers.

Because risk perception was so highly predictive of attitude, communicators should focus on alleviating consumers' perceptions of risk. Consumers neither agreed nor disagreed about risks associated with genetically modified food, which provides communicators with an opportunity to shape neutral attitudes rather than change negative ones. This study and others (Flipse & Ossewijer, 2012; Ishiyama et al., 2011; McFadden & Lusk, 2015; Verdurme & Viaene, 2003) found increasing knowledge will not necessarily change perceptions. Communicators should instead focus on framing messages around the values of the consumers in an attempt to change risk perceptions or attitudes (Krause et al., 2015).

Communication campaigns regarding genetically modified food should target specific audiences. Communicators and Extension can work together to develop appropriate communication campaigns for older and younger consumers. Because most of the generations were significant predictors of more positive attitudes compared to Millennials, extension and educators should develop outreach for college students to educate them on the use of genetically modified food. Men were also significant predictors of more positive attitudes toward genetically modified food than women. Stories about genetically modified science in women's magazines or websites to increase awareness of the technology would allow female consumers to make educated decisions about the product and possibly lower their risk perceptions.

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 explore how consumers process these messages. This study measured prior knowledge, but relevance/ motivation to process was not collected. 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). In addition, 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. Researchers should also explore other sources. A popular blogger, politician, or restaurant chain may provide different results from this study and give a greater understanding of the influence of message sources. Collecting source credibility data prior to message exposure may give a more realistic understanding of its credibility because the message itself may have influenced perceived source credibility. Because prior knowledge was not identified as a predictor of attitude, future research should focus on value-driven communication for consumers. Testing a value-driven message could provide needed insight into attitude formation, and have a stronger influence on attitude formation than the current message (Krause et al., 2015).

This study does present some limitations. The non-probability sampling procedures can cause non-response and selection bias, which may provide a sample that is not representative of the population. However, the results from an experimental design cannot be generalized to the population, and additional research on messaging using a simple random sample of the population is necessary. Qualitative research using focus groups and in-depth interviews are necessary for research to gain a deeper understanding of the perceptions described in this study. Additionally, knowledge of genetically modified food science and technology was self-reported, which could decrease the validity of the finding. Collecting data on respondents' actual understanding of genetically modified food could elicit different results from this study and a more representative understanding of knowledge. Additionally, the research is limited to only one state and one topic. This research should be replicated in other areas of the United States and with other morally contentious issues in science and agriculture to better understand how to communicate with the public about these topics.

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