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# Gender and GMOs: Understanding Floridians attitudes toward GMOs through the lens of Social Judgment Theory

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## Abstract

Social judgement theory was utilized to determine if men and women showed different acceptance of messages about genetically modified (GM) foods. The primary objective was to determine if females and males had a different latitude of acceptance toward statements about GM foods. Researchers found significant differences between males and females with more males accepting messages about GM foods than females. Additionally, there were several statements with wide latitudes of acceptance across genders. These statements represent a common ground and are a good starting point for conversations about GM food.



## Keywords

Genetically modified foods, genetic modification technology, social judgement theory, consumer perceptions, consumer attitudes, gender

## Cover Page Footnote/Acknowledgements

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# Gender and GMOs: Understanding Floridians Attitudes toward GMOs Through the Lens of Social Judgment Theory

Genetically modified (GM) foods are those that have undergone a form of biotechnological changes during their development. Various and highly specialized techniques can be used to modify foods (Newell-McGloughin, 2008). Regardless of the type of modification used, the end products of these procedures are all considered genetically modified.

Genetically modified foods first became widely available in the food supply in the 1990s; the most common GM foods are corn and soybeans (Newell-McGloughin, 2008). In fact, 89% of corn and 94% of soybeans are GM (USDA AERS, 2015). Other crops including cotton, canola, sugar beets, squash, and papaya are also commonly GM (Newell-McGloughin, 2008).

There are many reasons why foods are genetically modified. Corn is genetically modified so it is herbicide-tolerant (HT), as well as insect-resistant (Bt) (USDA AERS 2015). The purpose of making a crop HT is to allow its survival of treatment with weed-killing herbicide. For insect-resistant crops, Bt stands for *Bacillus thuringiensis*. A gene from this soil bacterium is inserted into a crop, resulting in a plant which is toxic to certain insects. In the case of corn, the Bt plant is generally toxic to the corn earworm, corn rootworm, and corn borer (USDA AERS, 2015).

Much research has been performed worldwide on consumer perception of GM foods (Bawa & Anilakumar, 2013; Costa-Font, Gil, & Traill, 2008; Funk & Kennedy, 2016; Frewer et al., 2013; Prati, Pietranoni, & Zani, 2012). And, despite numerous scientific reviews (Shelton, Zhao, & Roush, 2002; Nicolia, Manzo, Veronesi, & Rosellini, 2014; Tufarelli, Selvaggi, Dario, & Laudadio, 2015; National Academies of Science, Engineering, and Medicine, 2016) that determined GM foods are as safe as conventionally grown foods, consumers are still wary. Consumers have overall negative attribute associations with the safety of GM foods, despite their reported safety (Funk & Kennedy, 2016). Klerck and Sweeney (2007) found consumers are more driven by perceived risks than they are by the estimates of technical risks provided by scientists. It is additionally possible that many consumers have a positive association regarding the benefits of GM foods but are still concerned with health, environmental, and food safety risks (Funk & Kennedy, 2016; Hossain, Onyango, Schilling, Hallman, & Adelaja, 2003).

In recent years, researchers have examined public opinion surrounding GM food and the perceptions of GM food labels (Jeong & Lundy, 2015). The relevance of this research intensified in June 2016 when the National Bioengineered Food Disclosure Standard (NBFDS) was signed into law. This law requires companies to disclose the presence of GM material by June 2018. Researchers have sought to explore consumer perceptions of these now-mandatory labels. There is a great deal of confusion among consumers related to the meaning of "organic" and "non-genetically modified" labels. Studies have shown that consumers often view the two labels as synonymous (McFadden & Lusk, 2017).

Public opinion of U.S. consumers toward GM food was largely positive in the 1990s (Ten Eyck, Thompson, & Priest, 2001), which reflected the overall way GM products were portrayed by the media at the time (McInerney, Bird, & Nucci, 2004). However, since the 1990s media coverage of GM foods and technologies has been negative, and U.S. opinion has reflected that coverage (McInerney, Bird, & Nucci, 2004). While mass media may not directly affect public opinion, it does have a long-term influence on public opinion (Priest, 1995). In addition to the mass media, social media can also have an influence public opinion. Social media can operate much like traditional news media; however, when examined from a social perspective, results have

shown that homophily among opinions is observed among social circles (Colleoni, Rozza, & Arvidsson, 2014).

Previous studies have attempted to determine if there are demographic differences in the acceptance of GM foods. Research (Siegrist, Cvetkovich, & Roth, 2000; Costa-Font & Mossialos, 2005; Hwang, Roe, & Teisl, 2005) has shown that there are differences in a number of demographic factors including gender, age, and socioeconomic status. Different groups within these demographic categories show differences in attitudes toward and acceptance of GM foods.

Several studies have shown that females are more likely to have strong anti-GM sentiments compared to males (Costa-Font & Mossialos, 2005; Frewer, Miles, & March, 2002; Hallman, Hebden, Aquino, Cuite, & Lang; 2003, Hwang, Roe, & Teisl, 2005). The Pew Research Center found that among U.S. adults 20% of females were concerned a great deal about GM foods as compared to 12% of males (Funk & Kennedy, 2016). In the same study, 53% of males said they were not concerned about GM foods as compared to 40% of females. Some concern toward GM food was reported by 35% of males and 39% of females (Funk & Kennedy, 2016). It has been hypothesized that one reason why females are more averse to GM foods and technologies compared to males is because the purchaser of food in a household is often more aware of food-related risks, and historically this individual has been female (Dosman, Adamowiz, & Hrudley, 2001). However, recent trends suggest that a growing number of males are primary grocery shoppers for their households (The Hartman Group, 2015). In addition, many households are shifting from having a primary grocery shopper to having shared grocery shopping responsibilities among the adults in the household. Thus, more men are making food-buying decisions than in the past (The Hartman Group, 2015). Additionally, family members and friends are the top influences for consumer choices about diet, according to the 2017 Food & Health Survey (IFIC, 2017). While family and friends are relied upon heavily for food choices, consumers also indicate low levels of trust for family and friends as a source of food-related information (IFIC, 2017). Of the participants in the IFIC study (2017), 20% expressed uncertainty about GM foods and 21% said that they do not have enough information on GM foods. This begs the question; what types of information would be effective in reaching individuals with information about GM food?

The purpose of this study was to identify potential GM food messages are best positioned to reach individuals, through either acceptance or non-commitment, with information about GM food. In this manuscript, social judgment theory was used to investigate messages about GM food. Differences among gender were also assessed, due to the changing make-up of food purchasers. Additionally, this study adds to the literature by providing an examination of how males and females differ in regard to acceptance, rejection, and non-commitment of potential communication messages.

## Theoretical Framework

Social judgment theory explores how strong attitudes can affect the way individuals evaluate a topic (Sherif & Sherif, 1967). This theory holds that individuals do not evaluate messages on argument presentation alone but evaluate messages based on the attitudes they already hold on the topic. Thus, how an individual perceives the position of an argument is relative to their existing opinions about the issue. There are three core concepts in social judgment theory. These concepts are (a) latitudes of acceptance, rejection, and non-commitment, (b) assimilation and contrast, and (c) ego involvement (Sherif & Sherif, 1967).

Attitudes about a message can be positive (acceptance), negative (rejection), or weak/unopinionated (non-commitment). The latitude of acceptance encompasses all of the positions on an issue that a person finds acceptable. Contrarily, the latitude of rejection includes the positions a person finds objectionable. In the middle is the latitude of non-commitment. The latitude of non-commitment includes the positions about which a person is uncertain (Sherif & Sherif, 1967). These latitudes are important because an individual who already has strong opinions on a subject will have a wide latitude of rejection; research has shown they will reject nearly all positions incongruent with their own (Sherif, Sherif, & Nebergall, 1965). Thus, if an individual already has a strong opinion it can be very difficult to change his or her mind.

Assimilation and contrast are misconceptions individuals have, which cause them to perceive experiences from their own personal point of reference. The contrast effect occurs when individuals focus on the differences between their expectations and reality. In contrast, individuals may assimilate others' opinions or attitudes as being similar to their own, even when this is not true (Perloff, 2010). Individuals judge messages from a subjective rather than objective point of view. Thus, individuals tend to overestimate the parity of a speaker's attitude with their own attitude via assimilation. Similarly, if individuals encounter an attitude with a message dissident to their own beliefs, they will overestimate the dissimilarity between their own attitude and that of the communicator (Granberg, 1993).

Ego-involvement occurs when individuals believe that an issue is related to their core values or concept of self. Individuals who are highly ego-involved have wider latitudes of rejection compared to their latitudes of non-commitment and acceptance (Sherif et al., 1965). Ego-involved individuals will also only assimilate ambiguous messages when the arguments are aligned with their previously formed attitudes (Lord, Ross, & Lepper, 1979). Individuals who are highly ego-involved are very difficult to persuade.

Based on social judgment theory, individuals who are ego-involved or those who already have strong opinions on a subject will be less likely to assimilate messages against their preconceived attitudes. The individuals who are most likely to be persuaded are individuals who are not ego-involved and who have weak or no opinions on a subject (Sherif & Sherif, 1967). These individuals have a wide latitude of non-commitment and could thus be more easily persuaded. This study will focus on identifying the latitudes of acceptance, rejection, and non-commitment of a variety of messages about GM food and then will examine the gender breakdown in each of those categories. Assimilation and contrast, as well as ego involvement, were not assessed in this study; we recommend that those components be explored qualitatively once a baseline of latitudes of acceptance, rejection, and non-commitment have been established. Researchers have applied social judgment theory to message design in social norms campaigns for health behaviors like alcohol consumption (Smith et al., 2006), finding that latitudes of acceptance and rejection were significantly different from one another in terms of believability.

## Purpose and Objectives

The purpose of this study was to identify what GM food messages resonate with Florida residents of different genders. The specific objectives of this study were to describe the latitudes of acceptance, rejection, and non-commitment of Florida residents for messages about GM food and determine differences according to gender.

## Methods and Analysis

The data utilized in this report were gathered using an online survey distributed by Qualtrics. The population of interest was Florida residents 18 years of age or older. Non-probability sampling was used through opt-in survey panels. Non-probability sampling is commonly used in social science research (Baker et al., 2013). However, non-probability samples are limited by selection, exclusion, and non-participation biases. Before analysis, the data were weighted to be representative of Florida demographic data (gender, race, ethnicity, age, and rural/urban classification), according to the 2010 U.S. census. These weighting procedures reduce the limitations associated with non-probability samples (Baker et al., 2013; Kalton & Flores-Cervantes, 2003). 1,154 Florida residents opted-in to the survey, but only 500 provided complete and usable responses. Individuals were terminated from the survey if they did not consent to take the survey, they were under 18 years of age, or if they were not residents of Florida. This 20-minute survey aimed at understanding Florida residents' opinions toward food issues covered several topics including food safety, GM food, and food waste, but this paper focuses on the GM food section. The instrument included 14 questions in the GM food section that could be translated into potential messages for discussing GM food. Seven of the questions were adapted from the National Science Board's report on public attitudes and understanding of science and technology (2014), while the remaining seven were researcher developed. The National Science Board collects and compiles national and international data to understand how the public's interaction with an understanding of science and engineering vary over time. There were 10 questions in the original instrument that asked about science. For this study, seven of those questions were used and adapted to replace "science" with "GM food" in each statement. The researcher-developed questions were based on commonly discussed benefits and criticisms of GM food (Mahgoub, 2016). Each of the question statements can be found in the results section. All 14 questions were measured on a five-point Likert-type scale ranging from strongly disagree to strongly agree. The complete instrument was reviewed for face and content validity by a panel of experts that included four interdisciplinary faculty from academia as well as three industry representatives with expertise in GM food and food policy.

To operationalize the data through the lens of Social Judgment Theory, researchers recoded responses of strongly disagree and disagree into the category of rejection, neither agree nor disagree responses into the category of non-commitment, and the responses of agree and strongly agree into the category of acceptance. Researchers operationalized the data in this way on the basis of cognitive response (Perloff, 2014). "Cognitive responses include thoughts that are favorable to the position advocated in the message (*proarguments*) and those that criticize the message (*counterargument*)" (Perloff, 2014, p. 182). Agreements are reflective of pro arguments or acceptance while disagreements are reflective of counter arguments or rejection.

Statistics Package for the Social Sciences (SPSS version 22) was used to analyze data. To fulfill the objectives frequencies and percentages were examined and a chi-square analysis was used to identify any significant associations. The findings of this study are limited by non-probability sampling, the operationalization of the data, and to the population of interest.

## Results

The results of Objective 1 show that more than 50% of respondents have a latitude of acceptance with messages discussing how the *development of GM food tampers with nature* (*n* =

319) and the ability of *GM food to have higher levels of certain nutrients* (*n* = 254; Table 1). Four other possible messages had between 40% and 50% of respondents reporting a latitude of acceptance including: *Research on GM food should be supported by the federal government* (*n* = 233); *GM food is a possible solution to world hunger* (*n* = 233); *Research on GM food is essential for improving the quality of human lives* (*n* = 207); and *GM food provides solutions to pest and disease problems* (*n* = 206). All six of these statements were had more respondents indicating acceptance than non-commitment or rejection.

Seven statements had more people reporting a latitude of non-commitment than acceptance or rejection. These messages were: *new technology used GM food allows people to live longer* (*n* = 212), *new technology used in GM food allows people to live better lives* (*n* = 209), *developments in GM food help make society better* (*n* = 198), *overall GM food does more good than harm* (*n* = 192), *I believe that the growing of GM food threatens the environment* (*n* = 191), *scientists developing GM food contribute to the well-being of society* (*n* = 184), and *I believe that GM foods are safe to consume* (*n* = 181).

Only one statement had more respondents indicating a latitude of non-commitment than acceptance or rejection. This was the statement *GM food carries little risk for the person consuming them* (*n* = 188).

Examination of the gender breakdown among the latitudes of rejection, non-commitment, and acceptance revealed a significant association between gender and latitude categories for 11 of the 14 potential GM food messages (see Table 3). However, the majority of the significant differences between gender fall in the rejection and acceptance categories. Significant differences in gender were observed for 10 statements in the rejection category and 11 in the acceptance category. Only, 3 statements showed a significant gender difference in the non-commitment category. Where significant differences are present in the rejection category, all statements have a higher percentage of females rejecting the statement than males. Similarly, significant differences in the acceptance category reveal that all statements have a higher percentage of males accepting the statement than females.

Table 1

*Latitudes of acceptance, rejection, and non-commitment for potential GM food messages*

| | Rejection *f* | Non-Commitment *f* | Acceptance *f* |
|---|---|---|---|
| New technology used in GM food allows people to live longer | 173 | 212 | 114 |
| New technology used in GM food allows people to live better lives | 163 | 209 | 128 |
| Developments in GM food help make society better | 173 | 198 | 129 |
| Overall GM food does more good than harm | 161 | 192 | 147 |
| I believe that the growing of GM food threatens the environment | 148 | 191 | 161 |
| Scientists developing GM food contribute to the well-being of society | 158 | 184 | 158 |
| I believe that GM foods are safe to consume | 155 | 181 | 165 |
| I believe GM food carries little risk to the person consuming them | 188 | 179 | 133 |
| I believe GM fruits and vegetables can be modified to contain higher levels of certain nutrients | 77 | 169 | 254 |
| I believe GM food provides solutions to pest and disease problems | 127 | 166 | 206 |
| Research on GM food is essential for improving the quality of human lives | 136 | 157 | 207 |
| I believe GM food is a possible solution to world hunger | 121 | 146 | 233 |
| Research on GM food should be supported by the federal government | 123 | 143 | 233 |
| I believe that development of GM food tampers with nature | 90 | 91 | 319 |

Table 2

*Gender and latitude category association for potential GM food messages*

| | Rejection | | Non-Commitment | | Acceptance | | *X2* | *V* |
|---|---|---|---|---|---|---|---|---|
| | M% | F% | M% | F% | M% | F% | | |
| New technology used in GM food allows people to live longer | 37.0a | 63.0b | 53.1a | 46.8a | 57.0a | 43.0b | 14.2* | .169 |
| New technology used in GM food allows people to live better lives | 37.4a | 62.6b | 50.7a | 49.3a | 58.6a | 41.4b | 13.6* | .165 |
| Developments in GM food help make society better | 40.2a | 59.8b | 42.4a | 57.6b | 68.2a | 31.8b | 27.8* | .235 |
| Overall genetically modified food does more good than harm | 42.2a | 57.8a | 47.4a | 52.6a | 56.5a | 43.5b | 6.4* | .113 |
| Scientists developing GM food contribute to the well-being of society | 39.9a | 60.1b | 46.2a | 53.8a | 59.5a | 40.5b | 12.7* | .160 |
| I believe that GM foods are safe to consume | 37.4a | 62.6b | 45.0a | 55.0a | 62.2a | 37.8b | 20.8* | .204 |
| I believe GM food carries little risk to the person consuming them | 38.8a | 61.2b | 41.9a | 58.1b | 69.9a | 30.1b | 34.6* | .263 |
| I believe GM fruits and vegetables can be modified to contain higher levels of certain nutrients | 37.7a | 62.3b | 40.5a | 59.5b | 56.7a | 43.3b | 14.8* | .172 |
| I believe GM food provides solutions to pest and disease problems | 34.6a | 65.4b | 48.2a | 51.8a | 56.5a | 43.5b | 15.1* | .174 |
| I believe GM food is a possible solution to world hunger | 36.4a | 63.6b | 45.9a | 54.1a | 55.8a | 44.2b | 12.5* | .158 |
| I believe that development of GM food tampers with nature | 69.7a | 30.3b | 48.4a | 51.6a | 42.5a | 57.5b | 20.6* | .203 |
| I believe that the growing of GM food threatens the environment | 55.4 | 44.6 | 46.1 | 53.9 | 48.2 | 51.8 | 4.5 | |
| Research on GM food is essential for improving the quality of human lives | 44.1 | 55.9 | 51.0 | 49.0 | 48.3 | 51.7 | 1.4 | |
| Research on GM food should be supported by the federal government | 48.0 | 52.0 | 48.6 | 51.4 | 48.5 | 51.5 | .013 | |

*Note:* Lowercase letters a and b are used to denote significant differences between gender for each latitude category and statement. Groups who share the same letter within a latitude category for a statement are not significantly different from one another.

*Note:* * indicates significance of $p$ " .05

## Discussion and Conclusions

Six of the 14 statements tested had more respondents fall into the acceptance category than the rejection or non-commitment category. The two messages with the largest amount of acceptance were the statements discussing the ability to modify foods nutrients and the tampering with nature through GM food development. Men more strongly accepted the statement about nutrient modification, while women more strongly accepted the statement about tampering with nature. The other statements with high levels of acceptance discussed GM food as a possible solution to world hunger and pest and disease problems as well as being essential to improving the quality of human life and being supported by government-funded research. Men more strongly accepted the statements regarding the possible solution to world hunger and pest and disease problems. No significant gender differences were examined with the other two statements.

The topics discussed in these statements should be considered when agricultural communicators are starting conversations about GM food. It is likely that Florida residents would be open to these messages because of the higher level of acceptance and pre-existing strong opinions toward the subjects discussed in these messages (Sherif & Sherif, 1967). However, gender considerations should be made when starting conversations with these messages as men were more likely to accept the statements, especially those detailing benefits of GM food such as nutrient modification, combating world hunger, and fighting pests and disease. This finding supports previous research that discussed consumers' positive association with the benefits of GM foods (Hossain et al., 2003).

Only one of the 14 statements had a higher level of rejection than acceptance or non-commitment. The statement with the highest level of rejection was "I believe GM food carries little risk to the person consuming them." A significant difference between males and females rejecting this statement was found with more females rejecting the statement than males. This statement should not be used in conversations about GM food in the state of Florida because it is incongruent with the opinion of many individuals (Sherif et al., 1965). Because many consumers reject the statement about GM food providing little risk, it is likely they feel that GM food does pose a risk. Therefore, instead of discussing the absence of risk, an opportunity may be available to discuss the potential risks of GM food as documented in scientific literature. These risks should also be discussed in the context of the potential benefits of GM foods.

Seven of the 14 statements had higher levels of non-commitment than acceptance or rejection. These included statements about GM food allowing people to live longer, to live better lives, benefiting society, doing more good than harm, contributing to the well-being of society, being safe to consume, and threatening the environment. Florida residents are most likely to be persuaded by these statements (Sherif & Sherif, 1967) because they have not made up their mind about the content of these messages, and therefore have not formed strong opinions (Sherif et al., 1965). No differences were found between males and females in the non-commitment category for all but one of these statements. More females than males were non-committal regarding the statement about GM food making society better. Once a conversation has been initiated about GM food, these messages can be used to continue the conversation and to help consumers navigate information about GM foods.

In the acceptance category, it was common to find significant differences between males and females with more males accepting than females. Conversely, it was common in the rejection category to find significant differences between males and females with more females rejecting than men. This finding aligns with previous research showing females are more likely to have

strong anti-GM sentiments compared to males (Costa-Font & Mossialos, 2005; Frewer et al., 2002; Hallmanet et al., 2003, Hwang et al., 2005). Additionally, the findings are reflective of the work done by Funk and Kennedy (2016). As more males take an active or shared role in grocery shopping, an opportunity may exist to capitalize on male's wider latitude of acceptance when communicating about GM food.

While the conclusions of this study add to the body of literature, they cannot be generalized beyond the Florida population. Bearing this in mind, the results do point to valuable recommendations for communication practitioners and future research.

## Recommendations

When communicating about GM food, communicators should consider starting conversations with messages similar to the statements that were found to have wide latitudes of acceptance in this study. It is likely that more individuals will have strong attitudes that align with these messages than not. Finding common ground is a tested and effective communication technique. Additionally, we recommend communicators broaden these conversations by focusing on messages that were found to have a higher latitude of non-commitment. There is a large group of individuals who can be persuaded by the messages with high levels of non-commitment. Communicators are advised against suggesting that GM food provides little risk as this statement was widely rejected by respondents and will likely make them unreceptive to future communications. Instead, communicators should discuss the potential risks or focus on content found in the statements with a wide latitude of acceptance or non-commitment. Communicators should also consider whether their audience is primarily male or female when starting and continuing conversations about GM food. Females are more likely to reject more of the messages about GM food and careful consideration is needed when planning these conversations.

Future research should qualitatively examine why a wide latitude of rejection exists regarding the minimal risks posed by GM food. This information would be valuable in helping communicators to understand reasons for rejection and how to use communication to overcome the strong attitudes of rejection. Additionally, future research should continue to assess the latitudes of acceptance, rejection, and non-commitment of communication about GM food and other controversial issues in other states as well as nationally. Understanding what messages around the topic are likely to be accepted or rejected is important for starting conversations and understanding messages that fall in the non-commitment category are beneficial for continuing conversations and planning persuasive communication. Future research should also examine, in a qualitative setting, the result of conversations that start with an accepted statement and then continue with messages in the non-commitment category. Additionally, qualitative methods should be used to examine the other components of social judgment theory including assimilation and contrast as well as ego involvement. Finally, qualitative methods can help researchers better understand the strong anti-GM sentiments held by some female consumers.

Social judgment theory proved a useful tool understand what messages about GM food individuals are most likely to have a latitude of acceptance, rejection, or non-commitment toward. These results add to the body of literature dedicated to the understanding and use of social judgment theory as well as contentious issues communication.

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