CONSUMERS' RESPONSE TO METAPHORIC COMMUNICATION OF GENETIC MODIFICATION TECHNOLOGY

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ABSTRACT

Controversy regarding the use of Genetically Modified Organisms (GMOs) in food production seems to be endless, and both opponents and proponents of the genetic modification (GM) technology have made many efforts to shape the public opinion in favour of their cause. Although metaphoric communications have been one pivotal strategy of the anti-GMO movement, the use of this tactic to promote GM technology has been minimal. In this research, I explored different metaphoric messaging strategies that can improve consumers' perceptions of genetic modification. I tested the effectiveness of framing GM technology as either progress or contamination protection, with manmade or natural metaphor sources and with different levels of verbal explanation to determine the best consumer response toward advertisements, and toward the use of GM technology in food production.

The conceptual framework of this study is based on metaphoric theory, prominent technology representation strategies, persuasion knowledge, and verbal anchoring theory. More specifically, I propose technology representation strategy, metaphor source strategy and level of verbal anchoring impact consumers' attitude toward the ad, perceived benefits of the GM technology, and perceived risks of the GM technology. By changing these dependent variables, metaphoric communications might be able to improve consumer's attitude toward the use of GM technology in food production and purchase intention for GMO food. First, I examined whether consumers differentiate between different types of technology representation strategies. Second, I explored whether using manmade objects as metaphor source would better improve consumers' perception of the ads, and finally, I studied whether metaphors with complete verbal anchors are more favourably processed by the audience.

My research used 16 ads to manipulate the above variables and then during two experiments, I collected quantitative information. In the first study I focused on the quality of the ads and used attitude toward the ad as the focal dependent variable for a student sample. In the context of this study, audiences preferred metaphors with a manmade construct. Interestingly, although complete verbal anchors generated a more favourable response to the GM technology advertisements (regardless of the representation strategy), the change of verbal anchoring strategy

from incomplete to complete improved consumer responses to the ads significantly more when a contamination protection strategy was used.

The second experiment was designed based on the results of the first study. In this experiment, I used a general public sample to understand their assessment of the eight selected ads from the first study as well as their perceived risk, perceived benefits, and attitude toward the use of GM technology in food production. The results of this study suggest that the general public prefers pro-GM ads which use contamination protection as their strategy for technology representation. Furthermore, believability of the ad is found to be a critical component in consumers' decision-making process.

The findings of these studies provide useful knowledge for both researchers and food marketers to better understand the impact of metaphoric communications on consumers' attitude toward GM technology and pro-GM ads. I argue that close attention to specific variables in the design and development of these ads will substantially improve their ability to enhance the image of the technology.

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1. INTRODUCTION AND STATEMENT OF OBJECTIVES

May 21, 1994 highlights the commercial launch of GM technology in the food industry when FLAVR SAVRTM tomatoes, as the first genetically engineered whole food, became available to American consumers in only two stores. Demand for this product reached an incredible climax, as in the early three days, 3,000 pounds were sold in each store (Kramer and Redenbaugh, 1994). Thanks to this initial spark, biotechnology was deemed to be critical to the future success of the food industry (Borlaug, 2000; Jones, 1999; MccCullum, 2000), However, during the last decades, GM technology has constantly suffered from consumers' dread and suspicion (Blancke, Van Breusegem, De Jaeger, Braeckman, and Van Montagu, 2015; Laros and Steenkamp, 2004) preventing it from reaching a higher potential. Various survey data show that a considerable proportion of consumers consider GMOs to be abnormal or even toxic for reasons connected with religious intuition, emotion, and folk biology (Gruissem, 2015; Health Canada, 2016).

Similar to many other debatable and complicated topics like climate change and vaccination, the positive scientific consensus on GM technology can be communicated using different tactics (Van der Linden, Leiserowitz, Feinberg, and Maibach, 2014). However, the most basic and widely used approach has been to state the simplified literal scientific facts in a descriptive text (Cook, Robbins, and Pieri, 2006). In spite of the biotech food industry's efforts to shape public opinion to support the technology, marketing strategies based on this factual/literal communication have not produced robust results. According to the latest study by Health Canada (Health Canada, 2016), 61% of Canadians have negative impressions of GM technology. Likewise, in the US, a recent nationwide survey, almost 40% of the respondents indicated that GM foods are more harmful to human health than regular foods (Funk and Kennedy, 2016).

Decisions regarding food choice are usually more complicated than they seem, and research shows that both product factors and non-product factors play roles in consumer behaviour (Grunert, 2002, 2005). Unlike product factors which are usually easy to assess and straightforward, non-product factors are generally more complicated and entangled with many preconceptions and beliefs. To respond to these types of questions consumers need to either use intuitive approach (Gigerenzer, 2008) based on previous knowledge, preconceptions, and cultural backgrounds or choose the more elaborate and resource-demanding process of

assessing the facts presented to them. Because of the inherent complexity of the GM technology, following the latter path is not a viable option for many people (Haselton, Nettle, and Andrews, 2015), and this makes changing negative beliefs regarding GM technology daunting.

Blancke et al. (2015) believe that the anti-GMO activists have been using consumers' preference for intuitive processing to their benefit to appeal to the general public. Content analysis of anti-GMO communications has revealed the popularity of this intuitive approach through the use of rhetoric in the form of comparisons and metaphors (Liakopoulos, 2002; Nielsen, Jelsøe, and Õhman, 2002). Use of these rhetorical figures in advertising and persuasion has a long history because they can make claims indirectly and thus influence beliefs (McQuarrie and Phillips, 2005; Smith, 1991).

Metaphors, as one type of trope, have been demonstrated to be effective for this purpose (Van der Linden et al., 2014). When consumers are exposed to metaphoric messages (as opposed to usual non-metaphoric ones), there is more chance for the message to gain attention and be persuasive (Scott, 1994). Previous findings on the positive impact of metaphors on consumer attitude toward the ad and belief-change might make this technique a relevant tool to communicate the positive aspects of GM technology to consumers. However, to my knowledge, few scholars or practitioners have used metaphors to promote the use of GM technology in the food industry.

Interestingly, this tool has been used widely by the opponents of GMO food through very well-known (sometimes cliché) metaphoric references like Frankenfood, Faustian food, and mad scientists (Liakopoulos, 2002; Nielsen et al., 2002). Therefore, an interesting empirical study would be to see which type of metaphors can help to modify the perceptions of consumers about GM technology. Furthermore, it seems plausible to ask how the food industry can maximize the effectiveness of metaphoric communications in the context of GMOs (i.e., what are the critical considerations in selecting the details about pro-GM metaphoric ads).

In two experiments, I compared two technology representation strategies (contamination protection and scientific progress), two metaphor source strategies (manmade and natural), and two metaphor verbal explanation strategies (incomplete and complete). The primary dependent variable of the first study was the attitude toward the ad, and perceptions of

the participants of each ad were recorded by using open-ended questions. The second study was based on the results of the first study to test the hypothesized relationships with perceived risks, perceived benefits and attitude toward GM technology as focal dependent variables.

2. LITERATURE REVIEW

2.1 Current state of GM technology and GMO food

When Fraley et al. developed the first genetically modified organism (GMO) in 1983, it was not easy to predict the significant role genetic modification (GM) technology would later play in the food industry. The technology rapidly advanced from the scientists' lab to the food production phase, and in a few years, GMO foods became available on the shelves of supermarkets (Kramer and Redenbaugh, 1994). Key opinion leaders, therefore, forecasted rapid growth in GMO crop production as stated by Monsanto's ad campaign back in 1994: "Biotechnology can feed the world... let the harvest begin"(Kimbrell, 2000). Consequently, the global area of biotech crops increased 108 fold since 1996 to reach 190 Million hectares in 2017 (ISAAA, Global Status of Commercialized Biotech/GM Crops, 2017). Considering that total global area of crops (conventional and biotech) was 1,565 million hectares in 2016 (Food and Agriculture Organization of the United Nations, FAOSTAT statistics database. Crops Production 2016), one can conclude that more than 11.8% of the arable land was used to produce biotech crops in 2016.

Unlike this triumphal surge in production, consumers' acceptance and preference for the technology has continued to decline (Costa-Font, Gil, and Traill, 2008; Hess, Lagerkvist, Redekop, and Pakseresht, 2016). Research shows that consumers have negative perceptions regarding the use of GMO food which manifests itself in low levels of perceived benefits and high levels of perceived risks for the technology and its products (Hess et al., 2016; Maghari and Ardekani, 2011). This negative image of the technology has inspired many scholars to study different considerations and assumptions that consumers use to assess GM technology and GMO food (Lusk, McFadden, and Wilson, 2018).

In a content analysis study, Hess et al. (2016) reviewed 214 articles published between 1991 and 2012. They concluded that perceptions and attitudes toward GMO foods play a pivotal role in shaping consumer behaviour. The findings of Bredahl (2001) also suggest that consumers' attitudes toward GM technology are an indisputable determinant of their purchase intention for GMO food. Scholars have also found perceived benefits and perceived risks of the technology are two main antecedents of attitude toward GM technology shaping the feelings of consumers toward this technology (Bredahl, 2001; Chen and Li, 2007; Costa-Font et al., 2008)

Negative feelings are embedded in the mind of consumers because they associate different types of risk to GM technology including potential health risk and potential negative impact on the environment along with social and ethical concerns (Hossain and Onyango, 2004; Zhang, Wohlhueter, and Zhang, 2016). Overall, studies confirm that consumers link GM foods with high levels of risk, resulting in lower levels of willingness to pay (WTP) and unsupportive attitudes toward these products (Dannenberg, 2009; Hess et al., 2016; Lusk, Jamal, Kurlander, Roucan, and Taulman, 2005).

2.2 Communication of GM technology to the public

Like any other innovation and new technology, the scientific consensus on GM technology can be communicated using different tactics (Van der Linden et al., 2014). However, the most basic and widely used approach has been to state the literal scientific facts in a descriptive text (Cook et al., 2006) which might stem from the fact that scientists involved in the GM technology development have been responsible for communicating the concept to the public. Cook, Pieri, and Robbins (2004) studied rhetorical devices that are used by GM scientists through more than 50 hours of in-depth interviews. Their results confirm that "scientific facts" lie at the heart of scientists' discourse, and the frame of empirical objectivity make communication legitimate from their point of view. Moreover, using other techniques is considered inappropriate; these non-factual discourses are perceived as anti-science and worthless. Using this lens, communication of GM technology becomes the simple matter of transferring information to the public with the assumption that a layperson will value empirical objectivity the same way as scientists. Consequently, the only concern of the scientists has been to make the "scientific facts" accessible and understandable, assuming no other factor can impact how the public interprets these simplified facts.

Cook et al. (2004) believe that scientists overlook the social aspect of the GM debate and make their discourse entirely safety-oriented. The assumption here is that if scientists give the public enough information to mitigate the risk associated with GMO food, the audience will make a "rational decision" using the rational choice model (Simon, 1955). Cost-benefit is considered as the crucial determining factor of the response to the communication, and thus many other potentially imperative variables including bounded rationality and unforeseen risk are disregarded (Gigerenzer and Selten, 2002). To assess the efficiency of these simplified factual communications, it seems reasonable to wonder how consumers decide about their food

choice in general as this can be a central piece determining their response to GMOs as a type of food.

Grunert (2002, 2005) proposed that consumers consider two types of values for each food offering including product factors (e.g., appearance, taste, and packaging) and non-products factors (e.g. cognitive information, and social factors). Unlike product factors which are usually easy to assess and straightforward, non-product factors are generally more complicated and entangled with many preconceptions and beliefs. For instance, a consumer can easily choose among different flavours of a particular product based on her/his taste preference, but is it as easy for the consumer to answer this question: Is it moral to use GM technology in food production?

To respond to these type of questions consumers need to either use an intuitive processing (Gigerenzer, 2008) based on previous knowledge, preconceptions, and cultural backgrounds or choose the more elaborative and resource demanding process of assessing the facts presented to them. Because of the intrinsic complexity of the GM technology, following the latter path is not a viable option for many people (Haselton et al., 2015), and this makes changing negative connotation about GM technology daunting. Blancke et al. (2015) believe that the anti-GMO campaign has been using consumers' preference for intuitive processing to its benefit to appeal to the general public. Content analysis of anti-GMO communications has revealed the popularity of this intuitive approach through the use of rhetoric in the form of comparisons and metaphors (Liakopoulos, 2002; Nielsen et al., 2002).

2.3 Metaphors and their application in advertising

2.3.1 Definitions

Advertisers have used rhetorical figures for decades as forms of indirect claims to influence beliefs (McQuarrie and Phillips, 2005; Smith, 1991). By using these tools, marketers invite viewers to infer additional meanings not explicitly given in the ad (Johar, 1995). Metaphors are one type of rhetorical figure known as tropes, and they are defined as an implied comparison between two different objects or concepts that on the surface appear to be dissimilar (Lakoff and Johnson, 1980; Sopory and Dillard, 2002). In other words, one object or concept (metaphor source) is being used by the advertisers to explain the other object or concept (metaphor target) through the use of this comparison (Lakoff and Johnson, 1980). Metaphors as a form of trope are intrinsically unfinished and require closure by the audience

(McQuarrie and Mick, 1996), which is done when the audience discovers the implied comparison. In the context of biotechnology, Knudsen (2005) uses the example of the "hitchhiking genes" metaphor to clarify the definition. In this example, the "ability to move" and the "ability to take others with you as you move" are the implied comparisons, although on the surface hitchhikers and genes do not seem to be similar. Using this analogy, the message can explain to the audience that certain genes can move in the genome by using other genes.

2.2.2 Metaphoric communications in advertising

Compared with literal claims, metaphors have an advantage because they can elicit more cognitive elaboration (Toncar and Munch, 2001) and this engagement increases consumers' willingness to respond positively to the advertised product or brand (McQuarrie and Mick, 1999; McQuarrie and Phillips, 2005). Another advantage of metaphors in advertising is that consumers often consider these rhetorical figures to be novel and innovative, making them more eager to process the ad (Morgan and Reichert, 1999). Compared with metaphors, literal messages are not stimulating enough to initiate the same high level of consumer involvement (Chang and Yen, 2013). Messaging strategies based on metaphors are effective through seven distinct areas, including attention, communicator credibility, relief, resource matching, reduced counterargument, stimulated elaboration, and superior organization (Van Stee, 2018).

1)Attention: Metaphors, compared to literal messages, attract more attention. A particular metaphor can successfully attract attention to an argument, or it can be used as a distraction by merely drawing attention to itself (McGuire, 2000).

2)Communicator Credibility: Audiences of the metaphoric message might consider a metaphor communicator more credible because appropriate use of this technique can be possibly considered as a sign of genius for the creator (Bowers and Osborn, 1966; Sopory and Dillard, 2002).

3)Relief: Deviation from literal language can be first annoying for the audience. However, upon discovering the metaphorical meaning, the consumer will experience relief from the initial negative tension caused by the encounter with the figurative language. This feeling of relief strengthens the metaphorical meaning and evaluation and thus leads to a higher level of persuasion (compared to literal language) (Bowers and Osborn, 1966; Sopory and Dillard, 2002).

4)Resource Matching: Resource matching is based on the theory that the level of the persuasiveness of a message reaches its peak when there is a match between the cognitive resources available and accessible to the consumer and the required cognitive resources to process and comprehend a message. Mixing this assumption with Elaboration Likelihood Model (ELM) (Petty and Cacioppo, 1986), one can conclude a metaphorical communication (requiring higher cognitive resources) will be more convincing than a literal message. Furthermore, processing of a relatively simple literal message, might result in additional and irrelevant thoughts or more counterarguments. Consequently, consumer needs to spend his/her remaining cognitive resources which usually happens through the central route of the ELM model (Sopory and Dillard, 2002).

5)Reduced counterargument: This is very close to the resource matching description. It suggests that a metaphor is more effective than a literal message because of the additional resources required to process it. Consumers then will not have excess cognitive resources to spend on counterarguing (Van Stee, 2018).

6)Stimulated elaboration: When metaphoric communications target consumers, a greater number of valance thoughts are generated compared to when they are targeted by literal messages (Hitchon, 1992). The Elaboration Likelihood Model of persuasion (ELM) predicts that If the valenced thoughts are in the intended direction, then greater persuasion should occur

7)Superior Organization: Superior organization outlines that the enhanced comprehension allowed by metaphors (compared to literal language) leads to increased persuasion. In other words, metaphors produce a greater number of semantic associations as compared to literal messages, and if these associations are consistent with the metaphor, more coherency of the connected different arguments could be achieved using these semantic associations (Sopory and Dillard, 2002).

Moreover, Phillips and McQuarrie (2009) demonstrate that use of metaphors in rhetorical figures can lead to a change of belief which can be a vital tool in the context of GMO food, where unfavourable opinions shape consumer perceptions regarding the technology (Bode and Vraga, 2015; Landrum and Hallman, 2017).

2.4 Considerations for GM technology metaphoric communications

2.4.1 Different representations of technologies in light of metaphors

Public representation of technologies like GM involves the classification and conceptualization of an unfamiliar phenomenon into some well-known constructs. Christidou, Dimopoulos, and Koulaidis (2004) classified four different categories of representation used for this purpose: (1) a construct, (2) a dipole of promise and/or scare, (3) an activity extending the frontiers of knowledge, and (4) a supernatural process. These categories are discussed below:

(1) A construct – This depiction of technology represents it as a tangible construct (object). Criteria for choosing these constructs usually include novelty, imagination, creativity and inspiration (Christidou et al., 2004). In the case of GM technology, we can see many instances of this representation when anti-GMO activists bombard the public with edited images of tomatoes with syringes (Blancke et al., 2015), implying GM technology to be an unfavourable construct (a needle).

(2) A dipole of promise and scare – Liakopoulos (2002) classified promise and scare as two common types of communications for technologies. These two opposite representations have been used widely in the context of gene-related technologies. Christidou et al. (2004) illustrate this type of image with the example of the knife metaphor:

"Cloning is a new method that resembles a knife; you can use it to cut the bread, or to kill" (p. 354)

(3) An activity expanding the frontiers of knowledge – This representation is mainly based on exploring new previously unknown domains originating from our intrinsic willingness to go beyond what we already know. Using this approach, we can portray science and technology as a tool to structure our everyday activities, which will eventually induce some sense of order (Christidou et al., 2004). St. Clair, R.N. (2002), argued that in this representation, science and technology are portrayed as natural processes used as a tool for a wide range of purposes, including testing ideas, attaching special connotations to the everyday patterns of life, making new images and modifying existing pictures, and connecting daily life experiences with law and order. Some examples include representation of technology as a mystery solver or as an adventurous expedition in an unknown land (Christidou et al., 2004).

(4) A supernatural process –This type of metaphoric representation of technologies tries to link them to religion, miracles, tricks or magic. In the case of GM technology, there are numerous references to technology as a human endeavour for playing God (Van Den Belt, 2009). Miracles, on the other hand, are considered to be an essential prerequisite for religious beliefs as they provide proof of a supernatural power, which is the core concept of every religion. Biotechnology has been widely referred to as a miracle that strengthens the perceptions of science as a similar concept to religion (Liakopoulos, 2002).

I argue that although these representations have been used separately, in many cases, it is plausible to think of different combinations of these four images for describing GM technology. This strategy is seen in the widespread use of mixed images in anti-GMO campaigns, such as the use of Frankenstein (Blancke et al., 2015; Liakopoulos, 2002). In this example, it can be inferred that GM technology is being represented as a "construct" to promote a "scare" (a mixture of the first and second representations).

Additionally, the concept of contamination has been used widely through different combinations of the above four representations. These images are usually used to convince the audience that GMOs are a form of contamination (Petersen, 2005). They make this argument plausible by implying that nature is pure and that food made using this technology contaminates this desirable state. One good example is the Guardian article on GM food in 2004, which refers to GMO seeds as a Trojan horse (Brown and correspondent, 2004). Using the same strategy, it seems reasonable to think that GM technology can be represented positively in metaphoric language by using a construct that provides a promise instead of a scare (a mixture of the first and second representations in the above classification).

Another formula that has been commonly used by anti-GMO campaigns is the combination of a construct and an activity resulting in a dystopia or an environmental disaster (Siegal, 2016). A dystopia can be regarded as the complete opposite of the third representation offered above (an activity expanding the frontiers of knowledge). Therefore, a mixed positive image of the GM technology can introduce the technology as a construct that expands the frontiers of knowledge (a mixture of the first and third representations in the above classification).

At this point, the empirical question asks which type of these two metaphoric representations (construct as a promise or construct as an activity that expands the frontiers of knowledge) will result in more positive consumer response to the GM technology ads and, consequently, to the food made using this technology.

To address this research question, I operationalized these two abstract ideas, and because of the influential role of *contamination* metaphors in the anti-GMO campaign (Petersen, 2005), I used "contamination protection" as the operationalization of a construct as a promise.

The operationalization of a construct as an activity that expands the frontiers of knowledge, on the other hand, has been done by focusing on the *progress* that lies at the core of many previous metaphoric representations of science and technology (Christidou et al., 2004). Therefore, my research proposition to be examined empirically is as follows:

RP: Which of the two metaphoric representations of GM technology – a) contamination protection or b) progress – will result in more positive consumer attitude toward the pro-GM ads?

2.4.2 Consumers' preference for natural food and GMO persuasion

Walking down the grocery aisle of a supermarket, one can see the strong desire of consumers for the food that is marketed as "all natural" or "not artificial" which manifests itself in popularity of those labels on the food packagings (Abrams, Meyers, and Irani, 2010). Leyser (2014) believes that this craving for "the natural" stems from the growing concerns over the sustainability of modern agricultural practices and people's intrinsic passion for securing their health and the environment.

This passion for "natural" seems to have applicable implications for metaphoric communications. Metaphors, by definition, are used to understand one thing in terms of another (Lakoff and Johnson, 1980), suggesting that a well-known familiar thing (metaphor source) translates a complicated item (metaphor target) for the audience. Therefore, any pro-GM technology metaphoric communication necessarily has GM technology as its target, while the choices of the source might differ. Here, the empirical question is this: what kind of metaphor source results in more positive responses to the GM-related metaphoric ads?

Knowing that GMO foods being "unnatural" is the biggest concern of consumers (Health Canada, 2016), it seems reasonable to ask whether a natural representation of the GM technology (by using a natural source) can address this concern and improve consumer attitude toward GM-related ads. This idea may have some merit because research has shown that the majority of consumers assume that everything natural is fundamentally good (Leyser, 2014; Rozin et al., 2004). Some researchers even argue that this belief that everything natural is "good" is the basis of moral opposition to human intervention in food production, which manifests itself in the strong appeal of the anti-GMO movement (Scott, Inbar, and Rozin, 2016).

Using this line of reasoning, Hingston and Noseworthy, (2018) argued that because of the absolute nature of this moral opposition, consumers fail to consider the benefits of GMO food. Furthermore, these authors demonstrated in an experiment that consumers are not opposed to a GMO food that is communicated as a manmade object because they see nothing wrong with human intervention in a manmade object. Building on their finding, I argue that metaphors using manmade sources instead of natural sources are processed with less opposition, resulting in more positive consumer attitude toward GM-related ads. The conceptual framework of this claim is based on the Persuasion Knowledge Model (PKM), which was first developed by Friestad and Wright (1994). The consumer who is being targeted in a pro-GM persuasion episode through a metaphoric ad will probably see metaphors with a natural source as attempts of the agent (advertiser) to pretend to be natural making the whole ad pretentious and less believable.

Therefore, the following hypotheses are proposed:

H_{1a}: Metaphors using manmade objects as their source improve consumer attitude toward GM technology ads more than those that use nature as their source.

H_{1b}: Ads with metaphors using manmade objects as their source are more believable than the ads using natural sources and this higher believability results in higher consumer attitude toward GM technology ads.

2.4.3 Verbal anchoring and its impact on the response to image ads

When exposed to metaphoric messages, consumers are required to go beyond the explicit meaning of messages and discover the implied comparison (Lakoff and Johnson, 1980; Sopory and Dillard, 2002). Research shows that individuals differ in their ability to detect metaphoric meanings (Burroughs and Glen Mick, 2004). As a result, advertisers need to make sure the intended metaphoric meaning has been understood by the bulk of this diverse audience (Ward and Gaidis, 1990). Words have been used to anchor or guide consumers' interpretation of metaphoric meanings (Barthes, 1977; Phillips, 2000), and research on verbal anchoring has found mixed results on how different levels of anchoring can impact attitude toward visual ads. Phillips (2000) found that verbal anchoring increases comprehension, although it might reduce the level of pleasure, and thus the degree to which these two elements tradeoff one another determines the attitude toward the ad.

I argue that because GM technology is still a complicated and puzzling concept for the majority of consumers, comprehension might play a more critical role than pleasure; Thus increasing the level of verbal anchoring might result in more positive attitude toward the ad. To test the validity this argument, I operationalized two different levels of verbal anchoring and in the context of my research and based on Phillips (2000) I defined two different levels of verbal anchoring as follows:

(1)Complete verbal anchor: The metaphoric image is accompanied by a full explanation including the connecting word "like" and the explicit name of the metaphor source

Incomplete verbal anchor: The metaphoric image is accompanied by a partial explanation excluding the connecting word "like" and the name of the metaphor source

Using this definition, my next hypotheses will be:

H_{2a}: When advertisements represent GM technology using metaphors, complete verbal anchors will result in higher attitude toward the ad as compared to incomplete verbal anchors.

H_{2b}: Pro-GM metaphoric ads with complete verbal anchors enjoy higher level of comprehension as compared to the ads with incomplete verbal anchors and this higher comprehension is the reason for more positive attitude toward these ads.

2.4.4 Role of the general attitude toward technology

By definition, general attitude shows how consumers look at abstract concepts like science, technology, and nature and how they connect these elements to food consumption (Bredahl, 2001b; Sparks, Shepherd, and Frewer, 1994). Chen and Li (2007) argued that because consumers have difficulties understanding GM technology as a concrete concept, they use their general attitude toward technology as a shortcut to assess unfamiliar GMO food. According to Bredahl (2001), general attitude itself consists of several components, including attitude toward science/technology, attitude toward nature, food neophobia (refusal to try new foods for the first time), and consumer alienation from the market place. I believe that general attitude toward technology reveals the kind of lens consumers use to look at elements like technology and science in general (regardless of the GM specifically). For instance, somebody who has a high level of food neophobia is more likely to consider GM technology as something risky. Therefore, it seems reasonable to think that metaphoric ads using the concept of progress are better at increasing the perceived benefits of GM for people who have a stronger general attitude toward technology because these people are more open to seeing the benefits of using GM technology in food production. Therefore, I propose:

H_3: When pro-GM metaphoric advertisements represent GM technology as progress, people with a more positive attitude toward technology will see a higher level of perceived benefits of GM.

2.4.5 Role of objective knowledge

Objective knowledge of GM technology is defined as the level of accurate data consumers have in their memory regarding this technology (Brucks, 1985; Klerck and Sweeney, 2007). According to Chen and Li (2007), consumers' objective knowledge is another antecedent that can impact their perceived risk of GM technology. Research shows that the more knowledgeable consumers are, the less they are concerned with the potential risks (Chen and Li, 2007).

Metaphoric ads conveying the concept of contamination protection use a specific construct to communicate one tangible benefit of GM technology. Therefore, people with greater objective knowledge might better appreciate this aesthetic/metaphoric communication

because of the confirmation of their existing knowledge (Nickerson, 1998). Thus, I propose my next hypotheses as follows:

H_{4a}: When pro-GM metaphoric advertisements represent GM technology as contamination protection, people with higher objective knowledge will see a higher level of perceived benefits of GM technology than people with lower objective knowledge.

H_{4b}: When pro-GM metaphoric advertisements represent GM technology as contamination protection, people with higher objective knowledge will see a lower level of perceived risks of GM than people with lower objective knowledge.

2.4.6 Ad believability, perceived benefits, perceived risks, and consumer attitude

When people are faced with claims about complicated concepts like innovations and new technologies, evaluation of the reliability and truth of the claims becomes very intimidating for them (Siegrist and Cvetkovich, 2000). Research shows that in those cases, social trust is used to guide the assessment and decision-making process (Earle and Cvetkovich, 1995; Luhmann, 1979). Social trust is defined as the level by which people are ready to rely on experts and organizations involved in the launch and expansion of new technologies(Earle and Cvetkovich, 1995). Trust in this context is a tool employed to mitigate the unpleasant feelings of confusion. Trust enables consumers to recruit experts, officials or other reference groups who are trustworthy and knowledgeable to evaluate the technological claims for them (Siegrist and Cvetkovich, 2000). Chen and Li (2007) found that increasing the trust of consumers to agricultural companies, scientists, and food companies will result in a higher level of perceived benefits of GM technology. However, they were not able to find a significant correlation between trust and perceived risks of GM technology. I believe in the context of my research, believability of the ad is very similar to trust mentioned here. Therefore, I argue that believability of the ad through the correct use of metaphor source improves perceived benefits and mitigates perceived risks. Therefore, I propose the following hypotheses:

H_{5a}: Metaphoric ads with a higher level of believability result in a higher level of perceived benefits of the GM technology

H_{5b}: Metaphoric ads with a higher level of believability result in a lower level of perceived risks of the GM technology

Furthermore, Lutz, MacKenzie, and Belch (1983) and MacKenzie and Lutz (1989) found out that ad credibility (the level consumers perceive the ad to be believable) is one important predictor of their attitude toward the ad. Building on their finding, I suggest pro-GM metaphoric ads with a higher level of believability will result in a better consumer attitude toward the ad. Therefore, I propose:

H_{5c}: Metaphoric ads with a higher level of believability result in a higher level of attitude toward the ad

The conceptual framework of the research along with the hypotheses is depicted in Figure 3.1.

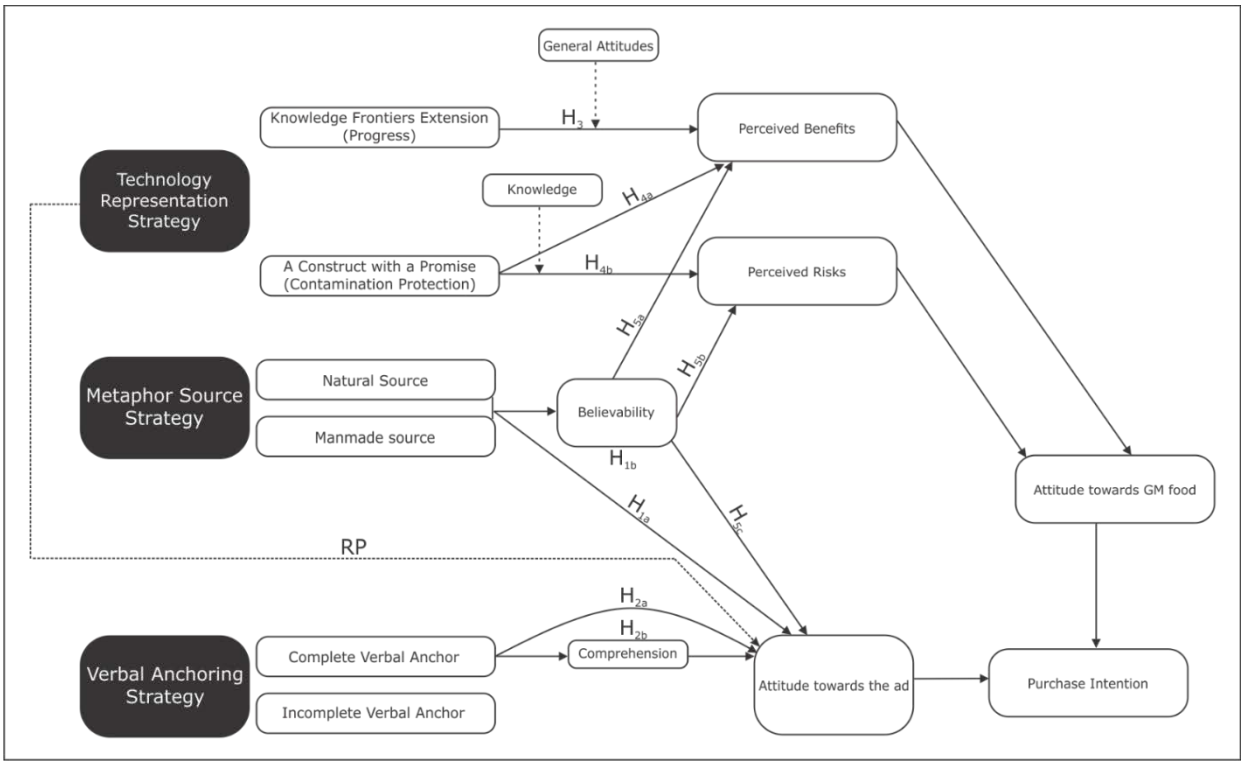

Figure 3.1- Framework

4. STUDY 1

The first study had two primary purposes. First, it was designed to test the quality of the stimuli (ads) to choose the more favourable ads for the second study. Second, the study aimed to explore RP, H_{1a}, H_{2a} and H_{2b} by focusing only on attitude toward the Ad as the focal dependent variable. To test the research proposition and these hypotheses, I needed to develop ads to be used as a stimulus for this experiment. Four different concepts were chosen by consulting with the experts using the Delphi method (Dalkey and Helmer, 1963; Rowe and Wright, 1999). Two main types of ad ideas were chosen for each technology's metaphoric representation strategy. The ideas of *light* and *way* were used to develop the ads to demonstrate progress while the concepts of *filtration* and *guard* were chosen to create the ads that illustrate contamination protection. The ideas of *way* and *light* were built on two metaphoric sources: *way* on a highway (manmade) and a pathway (natural) and *light* on a lighthouse (manmade) and the sun (natural). For the guard metaphor, the sources were a fruit screen (manmade) and a Venus flytrap (natural); for the filtration metaphors, the sources were a Brita water filter (manmade) and a waterfall (natural). Two versions of each ad (one with an incomplete tagline and one with a complete tagline) were developed to manipulate the anchoring level (Figure 4.1). Another consideration in the tagline development is the boundary between metaphor and simile. In the advertising context when we use metaphoric image ads without a tagline, there is no use of connecting words (such as like, as, so, than, or various verbs such as resemble) and without these references, these ads can be considered as metaphors and not a simile. However, use of these connecting words in the tagline will make the advertisement resemble a simile rather than a metaphor. I intentionally used the connecting word "like" in the taglines because I wanted to make sure the respondents understand the comparison as the core concept of the ad. The 16 ads used in the study can be found in Appendix A.

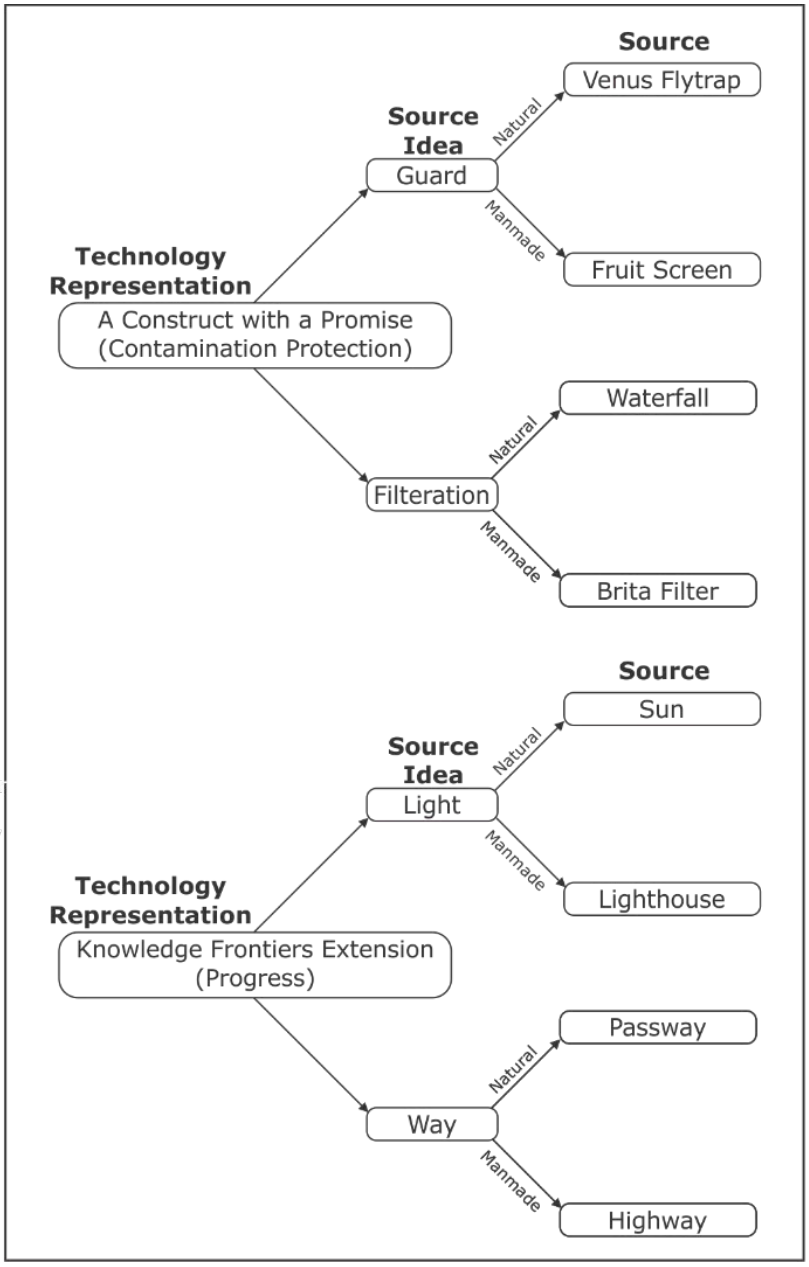

Figure 4.1- Ads developed for the first study

4.1 Methodology

4.1.1 Procedure

Data were collected in the form of paper and pencil questionnaires. Ethics approval was obtained (see Appendix B). A hard copy of the questionnaire and the consent form were handed to each participant (see Appendix C for the first study consent form and Appendix D for the first study questionnaire). Informed consent was obtained by reading and confirming the

information in the consent form. Participants were expected to return the questionnaire to the researcher after finishing the survey. Participants were encouraged to leave their e-mail addresses for follow-up if they were interested in the results of the study. All questionnaires were collected by the researcher for later coding and data input using Excel and SPSS 24.

4.1.2 Participants and samples

The study was conducted with university undergraduate students from Western Canada. A total of 305 undergraduate students participated in the experiment and returned questionnaires. After the coding and checking processes, data from six respondents were eliminated due to incomplete questionnaires. The final sample size of the first study was therefore 299.

4.1.3 Experiment design

Once the 16 ads were developed, participants were randomly assigned to eight different situations. Each of the students saw four ads either with the concepts of progress or contamination protection. The level of verbal anchoring was also randomized, so each participant saw two ads with complete verbal anchors and two ads with incomplete verbal anchors. Participants were asked about their attitude toward the four ads after each exposure along with demographic questions and were then dismissed.

4.1.4 Power and sample size

Cohen (2013) defines statistical power as the probability of rejecting the null hypothesis when it is false. Variables involved in calculation of an appropriate sample size include anticipated effect size, desired statistical power, number of predictors, and probability level. Soper, (2015) developed an online a priori sample size calculator for multiple regression which I used for this study. Sample size predicting variables were assigned as follows for the online calculator:

Anticipated effect size: Cohen (2013) uses effect sizes of 0.02, 0.15 and 0.35 to represent small, medium and large effects, and for this study, I used medium effect size (0.15).

Desired statistical power level: Some researchers believe 0.8 to be the acceptable statistical power as it shows enough power without unnecessary expenditure of resources (Diez,

Barr, and Çetinkaya-Rundel, 2015). Therefore, I used the same figure to calculate the sample size.

Number of predictors: This should be the largest number of predictors in the most complicated regression model in the study which was assigned as six.

Probability level: This item was set at 0.05.

Using the above variables in Soper's (2015) equation results in the sample size of 97. However, as each participant was assigned to see four different ads, it was crucial to show the ads with different orders to eliminate the role of fatigue and ordering bias. Consequently, I designed three different orders of ad representations, which gave me a sample size of 291 (97×3).

4.1.5 Measures

Table 4.1 shows the details of the measurement scales used in the first study. Quality of metaphors (MQ) was one criterion which was assessed by asking two questions adopted from McQuarrie and Mick (1996) and using a semantic differential scale. The attitude toward the ad was measured using a semantic differential scale made from 2 constructs adopted from Phillips (2000). The fifth question is aimed to ask the respondents the level of pleasure from seeing the ad while the next one tries to assess the comprehension level of the ad. Both of these questions are adopted from Phillips (2000) and used a semantic differential measure. Metaphor source manipulation and technology representation strategy manipulation were checked by developing measures specific to this study using Likert scales. Openness was also measured as a manipulation check for verbal anchoring strategy using the Likert scale developed by Ketelaar, Van Gisbergen, Bosman, and Beentjes (2010). Finally, the need for cognition (NFC) and subjective knowledge as two possible control variables were measured using the Likert scales developed by Cacioppo and Petty (1982), and Flynn and Goldsmith (1999) respectively. Table 4.1 summarizes the measurement scales used for the first study.

Construct	Indicator	Scale	References
Quality of the metaphor	Please rate the ad on the following scales by checking on each line	Two 7-point scales: 1. From plain/matter of fact to artful/clever 2. From silly/stupid to Creative/imaginative	McQuarrie and Mick (1996)
Attitude toward the ad		Two 7-point scales: 3. From dislike to like 4. From bad to good	Phillips (2000)
Pleasure		One 7-point scale: 5. From not enjoyable to enjoyable	
Comprehension		One 7-point scale: 6. From difficult to understand to easy to understand	
Manipulation check (Technology representation strategy)	Please indicate how well this ad conveys the following message: *(Protection level in the ad): GM technology protects food from contamination*	Two 5-point scales: From Strongly disagree to Strongly agree	Developed for this study
	Please indicate how well this ad conveys the following message: *(Progress level in the ad): GM technology is a form of progress to a better future*		Developed for this study
Manipulation check (Metaphor source)	The object in the ad picture is	One 7-point scales: From manmade to natural	Developed for this study
Manipulation check (Verbal anchoring strategy)	Please indicate your agreement to the following statements: (1) The ad provides a strong guide to the message.	Three 5-point scales: From Strongly disagree to Strongly agree	(Ketelaar et al., 2010)

	(2) The ad is like a riddle to me. (3) The ad explains the message well.		
Need for cognition (Possible control variable)	We are interested in your thinking styles. Please rate the following questions (Please see appendix C for a full list of questions)	7-point scales including 18 questions: From Strongly disagree to Strongly agree and I do not know	Cacioppo and Petty (1982)
Subjective knowledge (Possible control variable)	Please indicate the level of knowledge you think you have regarding the GM technology	4-point scales: From not knowledgeable at all to very knowledgeable	Flynn and Goldsmith (1999)

Table 4.1 Study 1 Measurements

4.1.6 Data analysis

Data analysis was primarily based on independent samples t-test, ANOVA and regression in SPSS. Independent samples t-test was used for comparing the means of two groups, and ANOVA was the preferred statistical analysis for comparison of means for more than two groups. Finally, regression was my preferred tool for doing all other analyses including continues variables (like Likert scales). Using these choices, I tested the relationships between the dependent variable (e.g., attitude toward the Ad, and comprehension) and independent variables (including technology representation strategy, metaphor source strategy, and verbal anchoring strategy) within the conceptual model depicted in Figure 3.1.

4.2 Results

4.2.1 Descriptive information

The participants included 166 males (57.4%) and 123 females (42.6%). The majority of the sample (93.4%) were between 18 and 25 years of age, and 100% of the participants were university students.

4.2.2 Measure reliability

The dimensionality of the measurement scale was done for Metaphor Quality, Openness and Attitude toward the Ad using factor analysis in SPSS 24. Kaiser's K1 rule was

used as the criterion to test if all measuring items of variables were unidimensional with only one factor's eigenvalue greater than one (Courtney and Gordon, 2013). The results from the SPSS suggest that all three scales met the unidimensional criterion. Therefore, all constructs of the scales were considered as unidimensional. To ensure the validity of indicators for each scale, the standardized loading of an indicator should be greater than 0.6 (Bagozzi and Yi, 1988). The results reported in Table 4.2 show that all three met the loading requirement.

Construct	Indicator	Standardized loadings	Cronbach's α
Metaphor quality	(1) Plain/matter of fact – Artful/clever	0.885	0.727
	(2)Silly/stupid – Creative/imaginative	0.886	
Openness	(1) The ad provides a strong guide to the message.	0.913	0.808
	(2) The ad is like a riddle to me.	0.722	
	(3) The ad explains the message well.	0.910	
Attitude toward the ad	(1) Dislike – Like	0.972	0.941
	(2) Bad – Good	0.972	

Table 4.2 Construct dimensionality and reliability for Metaphor Quality, Openness and Attitude toward the Ad

Cronbach's alpha is used as a tool to indicate the reliability of variables in the multi-indicator scale (Santos, 1999). Research suggests that 0.6 is an acceptable level for the reliability coefficient (Panayides, 2013; Santos, 1999). As shown in Table 4.2, all three variables have a Cronbach's alpha greater than 0.6. This indicates that the measurements of these constructs are reliable.

4.2.3 Manipulation Checks

Three manipulation checks were done before testing the predictions:

(1) *Technology representation strategy manipulation*: First, I tested my technology representation strategy manipulation by running an independent-samples t-test. Technology representation strategy was the independent variable for this t-test while the level of protection in the ad (how much did the consumers think the ad is about protection) was the dependent variable. The results suggest there was a significant difference in the level of protection when consumers saw contamination protection ads (M=3.9, SD=1.1) compared to when they saw progress ads (M=2.1, SD=1.0) conditions (t (1174) =29.7, p<0.001). Second, another independent-samples t-test was done using technology representation strategy as the independent variable and level of progress in the ad (how much did the consumers think the ad is about progress) as the dependent variable. The results show there was a significant difference in the level of progress when consumers saw progress ads (M=3.6, SD=1.1) compared to when they saw contamination protection ads (M=2.5, SD=1.1) conditions (t (1175) =-17.1, p <0.001).

(2) *Metaphor source strategy manipulation:* To see if respondents could spot a difference in terms of metaphor source (manmade vs natural), I explicitly asked them whether the object in the ad picture was manmade or natural in a 7 point scale and recorded the results as Naturality level (7 is the most natural perception and 1 the most manmade perception of the metaphor source). An independent-samples t-test was done using metaphor source strategy as an independent variable and neutrality level as the dependent variable. The results show there was a significant difference in neutrality level when respondents saw natural sources (M=6.4, SD=1.1) compared to when they saw manmade sources (M=2.0, SD=1.5) conditions (t (1159) =-55.48, p <0.001).

(3) Verbal anchoring manipulation: To see if respondents could spot different levels of openness in two ad anchors (incomplete and complete), I asked about the openness of the ads using three questions and calculated the average openness. Higher levels of openness shows that the ad was more open to interpretation. An independent-samples t-test was done using verbal anchoring strategy as an independent variable and openness as the dependent variable. The results show there was a significant difference in openness level when respondents saw incomplete anchors (M=3, SD=1.0) compared to when they saw complete anchors (M=2.7, SD=0.9) conditions (t (1176) =5.772, p <0.001).

The above results show that all three manipulations worked and participants could spot the intended differences for the first study.

4.2.4 Testing of the research proposition and hypotheses

An independent-samples t-test was conducted to compare two different strategies for metaphoric representations of GM technology. There was no significant difference in attitude toward the ad when consumers saw the contamination protection ads (M=3.8, SD=1.7) compared to when they saw progress ads (M=3.7, SD=1.7) conditions (t (1158) =1.2, p =0.23). These results suggest that the two different strategies in metaphoric ads do not produce different attitudes toward the ad addressing our research proposition.

I tested the validity of H_1 by running another independent-samples t-test. This time metaphor source strategy was considered as an independent variable, and attitude toward the Ad was the dependent variable. The results suggest there was a significant difference in attitude toward the ad when consumers saw manmade metaphoric sources (M=4.0, SD=1.7) compared to when they saw natural metaphoric sources (M=3.4, SD=1.7) conditions (t (1158) =6.20, p =0.0001). This analysis shows that manmade metaphoric sources generate a more favourable response to the ad, which confirms my prediction in H_{1a}. The role of the believability of the ad as a mediating variable ($H_{1b)}$ will be explored in the second study.

Finally, I ran another independent-samples t-test to validate my prediction about the verbal anchoring strategy in H_{2a}. There was a significant difference in attitude toward the ad when consumers saw advertisements with complete verbal anchors (M=3.9, SD=1.7) compared to when they saw incomplete verbal anchors (M=3.5, SD=1.7) conditions (t (1158) =-3.98, p =0.0001). To asses the mediating role of comprehension in this process, I run two regression analysis. In the first regression verbal anchoring strategy was used as the predictor and attitude toward the Ad as the dependent variable and in line with the independent-samples t-test, I can confirm that verbal anchoring strategy is a significant predictor of attitude toward the ad (Table 4.3).

Attitude toward the Ad =β1×Verbal Anchoring Strategy + error

R	R Square	Adjusted R Square	Std. Error of the Estimate
.431	.116	.014	.013

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	3.120	0.157		19.884	<0.001
Verbal anchoring strategy	0.395	0.99	0.116	3.982	<0.001

Dependent Variable: Attitude toward the Ad

Table 4.3 Model to test H_{2a}

By adding comprehension as another independent variable, I tested its mediating role in another regression model (Table 4.4) based on Baron and Kenny (1986).

Attitude toward the Ad =β1×Verbal Anchoring Strategy + β1×Comprehension+error

R	R Square	Adjusted R Square	Std. Error of the Estimate
.579	.335	.334	1.38600

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	1.234	0.152		8.135	<0.001
Verbal Anchoring Strategy	0.063	0.083	0.019	0.762	0.446
Comprehension	0.499	0.021	0.576	23.668	<0.001

Dependent Variable: Attitude toward the Ad

Table 4.4 Model to test H_{2b}

Table 4.4 shows that when verbal anchoring strategy and comprehension are used as predictors of attitude toward the ad, verbal anchoring strategy loses its significance. Therefore, one can conclude comprehension plays a mediating role (Baron and Kenny, 1986), which confirms my prediction in H_{2b}.

4.2.4 Additional analysis

Role of need for cognition (NFC): Each individual has different levels of engagement in effortful thoughts, and pleasure from thinking thoroughly is also varying among different

people. Cacioppo and Petty (1982) developed a measurement scale known as NFC to differentiate between individuals. Phillips and McQuarrie (2004) suggested that NFC can be a potential moderator of how people perceive metaphoric communications. They argued that

consumers with high levels of NFC are more welcoming toward mental challenges, and thus they might show a higher preference for metaphoric communications. Building on their research, I suspected that the level of NFC could be in play as a moderating factor on how consumers perceive different representations of GM technology in metaphoric ads. To test the validity of this argument, I measured NFC for all the participants using 18 items scales suggested by Cacioppo and Petty (1982). As each participant saw four ads (either contamination protection type or progress type), I took an average of the four attitudes toward the Ad for each participant and considered it as participant's attitude toward metaphoric protection or progress ads. After defining an interaction term (Baron and Kenny, 1986) between technology representation strategy and NFC, I run a regression to see if NFC acts as moderator. The results suggest that NFC does not play a moderating role ($p>0.05$) and thus, it was dismissed for the second study.

Interaction between technology representation strategy and metaphor source: To see if there is an interaction between technology representation strategy (contamination protection and progress) and metaphor source strategy (manmade and natural), I computed an interaction term and ran another regression (Table 4.5).

R	R Square	Adjusted R Square	Std. Error of the Estimate
.239	.057	.054	1.65280

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	7.136	.482		14.808	.000
Technology Representation	-1.688	.307	-.497	-5.499	<0.001
Metaphor source	-2.163	.305	-.637	-7.098	<0.001
Technology Representation ×Metaphor source (Interaction Term)	1.045	.194	.668	5.384	<0.001

Dependent Variable: Attitude toward the Ad

Table 4.5 Model for testing the interaction between representation strategy and metaphor source

Table 4.5 shows that a significant interaction is going on between technology representation and metaphor source. Table 4.6 and 4.7 summarize the results of ANOVA using different interactions as predictors and attitude toward the Ad as the dependent variable along with a Tukey HSD test to investigate the significant differences between each pair.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Contamination protection-Manmade	297	4.3300	1.57971	.09166	4.1496	4.5104
Contamination protection-Natural	297	3.2121	1.58182	.09179	3.0315	3.3928
Progress-Manmade	283	3.6873	1.70114	.10112	3.4882	3.8863
Progress-Natural	283	3.6148	1.74888	.10396	3.4102	3.8195
Total	1160	3.7125	1.69971	.04991	3.6146	3.8104

Dependent Variable: Attitude toward the Ad

Table 4.6 ANOVA to compare means between different interactions of technology representation and metaphor source

(I) Technology Representation and Metaphor Source Interaction	(J) Technology Representation and Metaphor Source Interaction	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Contamination protection-Manmade	Contamination protection-Natural	1.11785*	.13563	.000	.7689	1.4668
	Progress-Manmade	.64269*	.13730	.000	.2895	.9959
	Progress-Natural	.71513*	.13730	.000	.3619	1.0684
Contamination protection-Natural	Contamination protection-Manmade	-1.11785*	.13563	.000	-1.4668	-.7689
	Progress-Manmade	-.47516*	.13730	.003	-.8284	-.1219
	Progress-Natural	-.40272*	.13730	.018	-.7560	-.0495
Progress-Manmade	Contamination protection-Manmade	-.64269*	.13730	.000	-.9959	-.2895
	Contamination protection-Natural	.47516*	.13730	.003	.1219	.8284
	Progress-Natural	.07244	.13894	.954	-.2850	.4299
Progress-Natural	Contamination protection-Manmade	-.71513*	.13730	.000	-1.0684	-.3619
	Contamination protection-Natural	.40272*	.13730	.018	.0495	.7560
	Progress-Manmade	-.07244	.13894	.954	-.4299	.2850

Table 4.7 Tukey HSD test to compare different pairs of technology representation and metaphor source

These results suggest that consumers do not care whether the metaphor source is natural or manmade when progress has been used as the technology representation strategy. Conversely, manmade metaphor sources will receive a much better response than natural sources when contamination protection has been used as the technology representation strategy. These results are visualized in Figure 4.2.

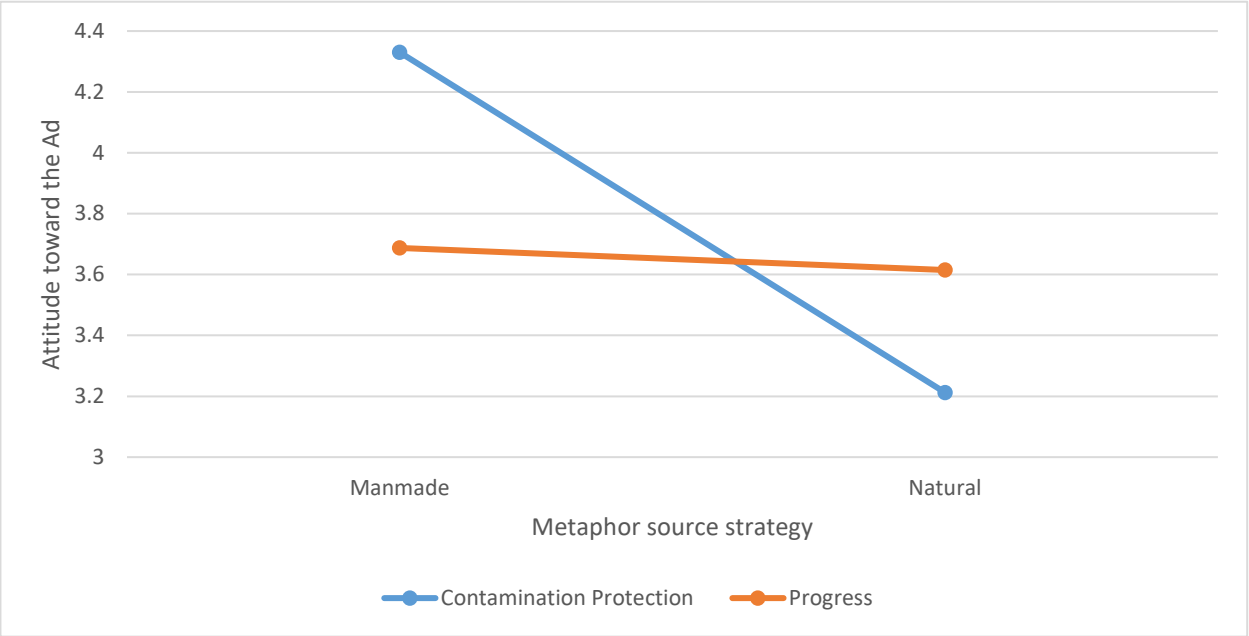

Figure 4.2- Interaction between technology representation strategy and metaphor source strategy

Interaction *between technology representation strategy and verbal anchoring strategy*: To see if there is an interaction between technology representation strategy (contamination protection and progress) and verbal anchoring strategy (incomplete and complete anchors), I computed an interaction term and ran another regression (Table 4.8).

R	R Square	Adjusted R Square	Std. Error of the Estimate
.154	.024	.021	1.68154

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	1.856	.490		3.785	.000
Technology Representation	.849	.313	.250	2.717	.007
Verbal anchoring	1.357	.310	.399	4.375	.000
Technology Representation ×Verbal anchoring (Interaction Term)	-.646	.198	-.413	-3.271	.001

Dependent Variable: Attitude toward the Ad

Table 4.8 Model for testing the interaction between representation strategy and verbal anchoring

The above regression shows that a significant interaction is going on between technology representation and verbal anchoring.

Table 4.9 and 4.10 summarize the results of ANOVA using different interactions as predictors and attitude toward the Ad as the dependent variable along with a Tukey HSD test to investigate the significant differences between each pair.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Contamination protection-Incomplete anchor	297	3.4158	1.61276	.09358	3.2317	3.6000
Contamination protection-Complete anchor	297	4.1263	1.66443	.09658	3.9362	4.3163
Progress-Incomplete anchor	282	3.6188	1.72976	.10301	3.4160	3.8216
Progress-Complete anchor	284	3.6831	1.72077	.10211	3.4821	3.8841
Total	1160	3.7125	1.69971	.04991	3.6146	3.8104

Dependent Variable: Attitude toward the Ad

Table 4.9 ANOVA to compare means between different interactions of technology representation and anchoring strategy

(I) Technology Representation and Verbal anchoring Interaction	(J) Technology Representation and Verbal anchoring Interaction	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Contamination protection-Incomplete anchor	Contamination protection-Complete anchor	-.71044*	.13799	.000	-1.0655	-.3554
	Progress-Incomplete anchor	-.20297	.13981	.467	-.5627	.1567
	Progress-Complete anchor	-.26727	.13956	.222	-.6263	.0918
Contamination protection-Complete anchor	Contamination protection-Incomplete anchor	.71044*	.13799	.000	.3554	1.0655
	Progress-Incomplete anchor	.50747*	.13981	.002	.1478	.8672
	Progress-Complete anchor	.44316*	.13956	.008	.0841	.8022
Progress-Incomplete anchor	Contamination protection-Incomplete anchor	.20297	.13981	.467	-.1567	.5627
	Contamination protection-Complete anchor	-.50747*	.13981	.002	-.8672	-.1478
	Progress-Complete anchor	-.06430	.14136	.969	-.4280	.2994
Progress-Complete anchor	Contamination protection-Incomplete anchor	.26727	.13956	.222	-.0918	.6263
	Contamination protection-Complete anchor	-.44316*	.13956	.008	-.8022	-.0841
	Progress-Incomplete anchor	.06430	.14136	.969	-.2994	.4280

Table 4.10 Tukey HSD test to compare different pairs of technology representation and anchoring strategy

These results suggest that consumers do not care whether the verbal anchoring is incomplete or complete when progress has been used as the technology representation strategy. Conversely, complete verbal anchors will receive a much better response than incomplete verbal anchors when contamination protection has been used as the technology representation strategy. I believe when GM technology is represented as progress, most consumers can see this relationship because metaphoric communications of different technologies as progress are common (Christidou et al., 2004; Liakopoulos, 2002). Consequently, consumers are more familiar with this type of rhetorical trope and thus a higher level of anchoring does not substantially improve comprehension. Promoting GM technology as contamination protection representation, on the other hand, is uncommon, suggesting that a complete verbal anchor can

significantly improve both the comprehension of and the attitude toward the ad. This result has been visualized in Figure 4.3.

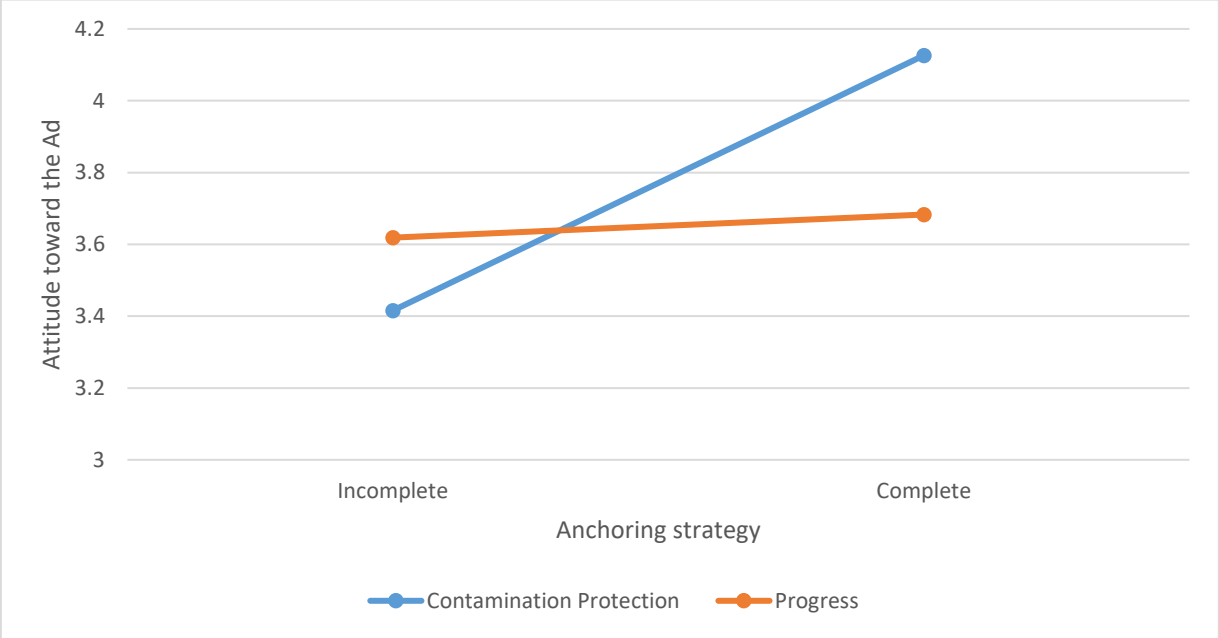

Figure 4.3- Interaction between technology representation strategy and anchoring strategy

Three-way Interaction: To see whether there is a three-way interaction among technology representation strategy, metaphor source strategy and verbal anchoring strategy, I computed an interaction term and ran another regression (Table 4.11)

R	R Square	Adjusted R Square	Std. Error of the Estimate
.223	.050	.047	1.65966

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	5.398	.570		9.463	.000
Technology Representation	-.513	.195	-.151	-2.626	.009
Metaphor source	-.986	.195	-.290	-5.064	.000
Verbal anchoring	-.015	.195	-.004	-.075	.940
Technology Representation× Metaphor source ×Verbal anchoring (Interaction Term)	.173	.075	.208	2.317	.021

Table 4.11 Model for testing the three-way interaction between technology representation strategy, metaphor source, and verbal anchoring

The above regression shows that a significant three-way interaction is going on between all independent variables. I introduced new interaction terms to find specific details about this interaction:

Fig 4.4 summarizes the means for each of the eight interactions. It can be seen that Contamination protection strategy- Manmade source- Complete anchor has produced significantly higher attitude toward the Ad (see the Tukey HSE pairwise comparison in Table 4.12) which has important managerial implications.

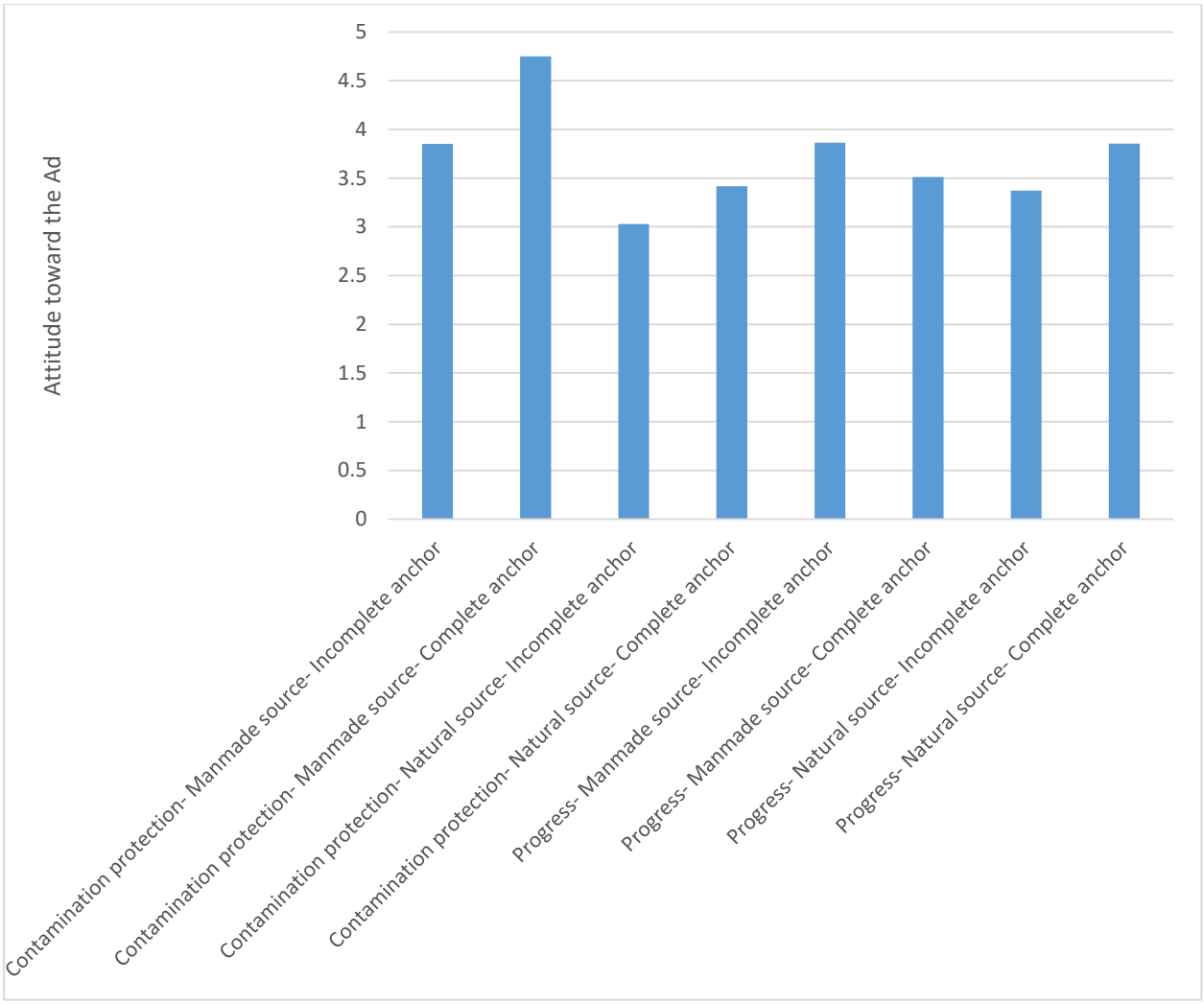

Figure 4.4- Mean Comparison for the three-way interaction

(I) Three Way Interaction	(J) Three Way Interaction	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Contamination protection- Manmade source- Complete anchor	Contamination protection- Manmade source- Incomplete anchor	.89748	.18959	.000	.3218	1.4732
	Contamination protection- Natural source- Incomplete anchor	1.71835	.18342	.000	1.1614	2.2753
	Contamination protection- Natural source- Complete anchor	1.33273	.18959	.000	.7571	1.9084
	Progress- Manmade source- Incomplete anchor	.88475	.18887	.000	.3112	1.4583
	Progress- Manmade source- Complete anchor	1.23944	.18852	.000	.6670	1.8119
	Progress- Natural source- Incomplete anchor	1.37766	.18887	.000	.8042	1.9512
	Progress- Natural source- Complete anchor	.89437	.18852	.000	.3219	1.4668

Table 4.12 HSE pairwise comparisons between Contamination protection strategy- Manmade source- Complete anchor and other interactions

4.2.5 Selecting metaphoric concepts for the second study

One of the objectives of the first study was to select one metaphoric concept for each technology representation strategy. An independent samples t-test using *screen* and *filter* metaphor concepts as independent variables and metaphor quality as the dependent variable was performed to find the better metaphor for this representation (contamination protection) to be used in the second study. The results suggest there was no significant difference in metaphor quality when consumers saw fruit screen metaphor (M=3.7, SD=1.4) compared to when they saw filter metaphor (M=3.6, SD=1.3) conditions (t (593) =1.24, p =0.215). However, when I ran the independent samples t-test with *light* and *road* as predictors, the results showed

respondent significantly preferred the light metaphor (M=3.7, SD=1.5) over the road metaphor (M=3.4, SD=1.5) conditions (t (564) =2.370, p =0.018). Therefore, I was able to choose light metaphor as the representation of progress for the next study. Because there was no significant difference between the screen and filter concepts, I chose one of them (filter) randomly to be used in the second study.

4.3 Limitations

Because I used a student sample for this study, generalizability of the results to the general public cannot be confirmed. Furthermore, each participant saw four ads and thus, his/her perceptions of each ad might have been impacted by seeing the other ads. Finally, comprehension and pleasure of seeing the ads were measured using only a single scale to prevent the questionnaire becoming too long while other researchers have used additional scales to improve the accuracy of the measurement (Phillips, 2000).

5. STUDY 2

Building on the results of the first study, the second experiment had three main objectives. First, I was planning to test the validity of the hypotheses verified in the first study this time on a general public sample. Second, I designed the second study in a way that each respondent could assess only one ad. Third, the study used new dependent variables to validate H_{1b}, H_3, H_4 and H_5. The second study was done using *filter* and *light* concepts as a depiction of contamination protection and progress technology representations, respectively.

5.1 Methodology

5.1.1 Experiment Design

One main type of ad idea was chosen for each technology's metaphoric representation strategy. The idea of *light* was used to demonstrate progress because participants of the first study significantly preferred it over the *road* metaphor. The concept of *filtration* was chosen for contamination protection randomly because there was no significant difference in consumers' preference for *filtration* over *guard* metaphors during the first study. The *light* metaphor was built on two metaphoric sources: *light* on a lighthouse (manmade) and sunlight (naturally occurring). For the *filtration* metaphors, the sources were a Brita water filter (manmade) and a waterfall (natural). Two versions of each ad (one with an incomplete tagline and one with a complete tagline) were used to manipulate the anchoring level. The eight ads used in the study can be found in Appendix A.

Participants were randomly assigned to eight different situations. Each of the respondents saw one ad. Participants were asked about their attitude toward the ad, comprehension, pleasure, believability, general attitude, Objective knowledge of GM technology, perceived risks of GM technology, perceived benefits of GM technology, and attitude toward using GM technology in food production along with demographic questions and were then dismissed.

5.1.2 Power and sample size

Power and sample size was calculated similarly to Study 1 using the process explained in section 4.1.4. The only difference was the number of predictors (this should be the largest number of predictors in the most complicated regression model in the study), which was

assigned as ten. Using Soper's (2015) equation results in the minimum required sample size of 118. Using SSRL facilities, I was able to assign an average of 30 participants for every eight conditions resulting in a total sample size of 243.

5.1.3 Procedure

Data were collected in the form of an online study. Ethics approval was obtained (see Appendix B). A copy of the consent form (Appendix G) was shown on the participants' computer screen, and the respondents were able to print it for their future reference. Informed consent was obtained by reading and confirming the information in the consent form by pressing the "I agree" button. Participants were encouraged to contact the researcher via email for follow-up if they were interested in the results of the study. Full list of questions in the questionnaire can be found in Appendix 8.

5.1.4 Participants and samples

The experiment was conducted through The Social Sciences Research Laboratories (SSRL). The formal online study was open for two days. Overall, 1943 invitation letters were sent out through E-mail (See Appendix E). 350 accepted the innovation and participated in the study yielding a response rate of 18%. Among these 350 participants, 71 only partially completed the forms, and 36 were invalid since the quota of 240-245 for sample size was already met. The final valid finished and valid data of the formal online study was 243. The numbers of participants in each of the eight different experimental conditions were also very similar, as depicted in Table 5.1.

Condition	Technology representation	Metaphor source	Verbal anchoring	Number of participants
Condition 1	Contamination protection	Manmade	Incomplete	29
Condition 2	Contamination protection	Manmade	Complete	31
Condition 3	Contamination protection	Natural	Incomplete	34
Condition 4	Contamination protection	Natural	Complete	30
Condition 5	Progress	Manmade	Incomplete	32
Condition 6	Progress	Manmade	Complete	29
Condition 7	Progress	Natural	Incomplete	29
Condition 8	Progress	Natural	Complete	29

Table 5.1 Participants' allocation for the second study

5.1.5 Measures

Measures used for the second study are summarized in Table 5.2. All the scales which were used for the first study were used again for the second study except for NFC because it did not have a significant effect on the results of the first study. To measure comprehension and pleasure of seeing the ad, I added one dimension to the one that was used in the first study. I made this amendment to improve the reliability of the measurement and remove one of the limitations of Study 1. This modification was also because previous research (Phillips, 2000) used two dimensions for measurement of pleasure; Based on this research higher levels of pleasure through using lower level of anchoring can potentially improve pleasure of seeing the ad which can eventually improve attitude toward the ad (mediating role of pleasure) and that is why I tried to separate pleasure and attitude toward the ad to check the validity of this potential relationship.

To assess H_3, H_4 and H_5, additional measurements were also embedded in the questionnaire which are discussed below:

General Attitude: According to Bredahl (2001), GA is comprised of several components including attitude toward science/technology, attitude toward nature, food neophobia, and consumer alienation from the market place. Bredahl (2001) and Chen and Li (2007) used a six-point scale to measure GA, and I used the same measures for the second study.

Objective Knowledge: Verdurme and Viaene (2003) developed a scale to measure the amount of correct information consumers have about GM technology. I used the same questions to measure objective knowledge.

Believability: Beltramini (1982) developed a scale to measure perceived believability of the advertisements, and the scale has been successfully used in many different advertising contexts like nutritional information advertisements (Beltramini, Evans, and Stan, 2000), and tobacco advertisements (Beltramini, 1988). I adopted four items from his measurement scale to be used for the second study.

Perceived benefits, perceived risks, and attitude toward using GM technology in food production: Bredahl (2001) suggested scales to measure perceived benefits, perceived risks,

and attitude toward GM technology and his questions have been used with slight modifications in the second study.

Construct	Indicator	Scale	References
Quality of the metaphor	Please rate the ad on the following scales by checking on each line	Two 5-point scales: From plain/matter of fact to artful/clever From silly/stupid to Creative/imaginative	McQuarrie and Mick (1996)
Attitude toward the ad		Two 5-point scales: From dislike to like From bad to good	Phillips (2000)
Pleasure		Two 5-point scales: From not enjoyable to enjoyable From unpleasant to pleasant	
Comprehension		Two 5-point scales: From difficult to understand to easy to understand From confusing to straightforward	
Manipulation check (Technology representation strategy)	Please indicate if you think this ad tries to convey the following messages: *(Protection level in the ad): GM technology protects food from contamination*	Two 5-point scales: From Strongly agree to Strongly disagree	Developed for this study
	Please indicate if you think this ad tries to convey the following messages: *(Progress level in the ad): GM technology is a form of progress to a better future*		
Manipulation check (Metaphor source)	How manmade or natural do you feel the object in the ad is?	One 7-point scale: From completely manmade to completely natural	Developed for this study
Manipulation check (Openness) (Verbal anchoring strategy)	Please indicate your agreement to the following statements: (1) The ad provides a strong guide to the message. (2) The ad is like a riddle to me. (3) The ad explains the message well.	Three 5-point scales: From Strongly agree to Strongly disagree	Ketelaar et al. (2010)
General Attitude	We are interested in your general attitudes. Please indicate your agreement or disagreement with the following statements. (1) Scientific progress implies social welfare (science) (2) Technology has improved the quality of life (technology) (3) Human activities seriously upset the ecological balance (nature) (4) New food products are	Six 5-point scales: From Strongly agree to Strongly disagree	Bredahl, (2001; Chen and Li (2007)

	worth trying (food) (5) Food quality used to be better (food) (6) Food is important for a healthy lifestyle (health)		
Objective knowledge	We are interested to know what you believe to be true about any of these claims. Please indicate your agreement or disagreement with the following statements. (1) Agricultural crops can be made resistant to certain diseases and plagues by modifying their hereditary material (2) All bacteria found in food is harmful (3) 'Natural' does not necessarily mean healthy (4) There are now laws or regulations on the use of gene technology in food production (5) All processed food are made using genetically modified products (6) Contrary to conventional food, GM food contains genes	Six 5-point scales: From Strongly agree to Strongly disagree	Verdurme and Viaene (2003)
Believability	We would like to know to what extent you think the ad was believable: To make your ratings, please click the dot that you feel most closely describes the ad.	Four 5-point scales: From unbelievable to believable From untrustworthy to trustworthy From not credible to credible From dishonest to honest	Adopted from Beltramini (1982)
Perceived benefits of GM technology	We are interested in learning your perceptions on the potential benefits of GM technology in food production. Please indicate your agreement or disagreement with the following statements about GM technology in food production. Overall, GM technology in food production will... (1) ...offer great benefits to me and people important to me.	Three 5-point scales: From Strongly agree to Strongly disagree	Adopted from Bredahl (2001)

	(2) ...provide benefits to agriculture and food industries. (3) ...offer great benefits to the environment.		
Perceived risks of GM technology	We are interested in learning your perceptions on the potential risks associated with GM technology. Please indicate your agreement or disagreement with the following statements about GM technology in food production. Overall, GM technology in food production ... (1) ...is risky to me and other people that are important to me (2) ...involves considerable risks to the environment (3) ...involves considerable health risks	Three 5-point scales: From Strongly agree to Strongly disagree	Adopted from Bredahl (2001)
Attitude toward using GM technology in food production	We are interested in learning your attitudes toward GM technology in food production. Please indicate your agreement or disagreement with the following statements. (1) Applying GM technology in food production is good (2) Applying GM technology in food production is wise. (3) I am strongly against applying GM technology in food production	Three 5-point scales: From Strongly agree to Strongly disagree	Adopted from Bredahl (2001)
Subjective knowledge (Possible control variable)	Please indicate the level of knowledge you think you have regarding the GM technology	One 4-point scales: From not knowledgeable at all to very knowledgeable	Flynn and Goldsmith (1999)

Table 5.2 Study 2 Measurements

5.1.6 Data analysis

Similar to the approach used in study 1, independent samples t-test, ANOVA and regression analyses were used to test the research proposition and hypotheses. I examined the relationships between the dependent variable (e.g., attitude toward the Ad, general attitude, and comprehension) and independent variables (including technology representation strategy, metaphor source strategy, and verbal anchoring strategy) within the conceptual model in Fig 3.1.

5.2 Results

5.2.1 Descriptive information

The valid data are derived from the responses of 94 men (38.7%), 148 women (60.9%), and 1 participant (0.4%) who chose “Other”. In terms of age, a large group of participants were between 56 and 65 (32.9%). In addition, the percentages of the participants in two age segments (46-55 and 66 or above) are very similar at 17.3% and 18.5% respectively. Interestingly, people under 45 years old accounted for only 30% of the sample.

In term of education, almost half of the participants (49.8%) had bachelor or a higher degree. 16.5% of the participants had a high school degree or its equivalent leaving the rest (30.2%) to have college, certificate or an apprenticeship degree (see Table 5.3 for more details). This analysis shows that in terms of gender and age sample of the second study was not necessarily a good representative of the Canadian population. Most conspicuously, a considerable proportion of respondents are between 56 and 65 years old while this age segment do not contribute more than 14% to the country’s population. Despite this deviance, the sample of the second study is still more generalizable than the sample of the first study (student sample).

	Number	%	Canadian Census* 2016 (%)
Gender			
Male	94	38.7	49.1
Female	148	60.9	50.9
Other	1	0.4	
Age			
18-25	14	5.8	10.1
26-35	34	14	13.1
36-45	26	10.7	12.9
46-55	42	17.3	14.5
56-65	80	32.9	13.6
66 or above	45	18.5	15.7
Prefer not to say	2	0.8	
Highest level of education			
High school or lower	41	16.9	23.6
College/Certificate	75	30.9	35.0
Bachelor's degree	75	30.9	20.4
Above Bachelor's	46	18.9	9.8
Prefer not to say	6	2.5	

* Source: Government of Canada (2017)

Table 5.3 Demographic characteristics of respondents (Second study)

5.2.2 Measure reliability

The dimensionality of the measurement scales was done for general attitude, objective knowledge, believability, perceived benefits, perceived risks, and attitude toward GM technology using factor analysis in SPSS 24. Kaiser's K1 rule was used as the criterion to test if all measuring items of these variables were unidimensional with only one factor's eigenvalue greater than one (Courtney and Gordon, 2013). To ensure the validity of indicators for each scale, the standardized loading of an indicator should be greater than 0.6 (Bagozzi and Yi, 1988). The results from the SPSS suggest that general attitude and objective knowledge did not meet the unidimensional criterion. Indicator modification for these two variables is as follows:

General attitude: A factor analysis in SPSS results in two dimensions that are summarized in Table 5.4.

	Dimensions	
	1	2
General attitude Q1	.631	.000
General attitude Q2	.815	-.006
General attitude Q3	-.236	.706
General attitude Q4	.722	.019
General attitude Q5	.468	.649
General attitude Q6	-.206	.709

Extraction Method: Principal Component Analysis.

Table 5.4 Factor analysis for the general attitude

This table shows that there are two dimensions for general attitude. One dimension is more focused on science, technology and innovation while the other dimension covers other concepts like health and nature. For my experiment, I chose the first dimension as it directly fits with the representation of genetic modification as a technology. Therefore, questions number 3,5, and 6 were disregarded, and a modified Likert scale using three following questions was used for the analysis:

i. Scientific progress implies social welfare (science)
ii. Technology has improved the quality of life (technology)
iii. New food products are worth trying (food)

This modification improved Cronbach's α to 0.604, which is above the threshold of 0.6.

Objective knowledge: A factor analysis in SPSS results in two dimensions that are summarized in Table 5.5.

	Dimensions	
	1	2
Objective knowledge Q1	.594	.372
Objective knowledge Q2	.699	-.266
Objective knowledge Q3	.425	.455
Objective knowledge Q4	.224	.787
Objective knowledge Q5	.613	-.409
Objective knowledge Q6	.715	-.215

Extraction Method: Principal Component Analysis.

Table 5.5 Factor analysis for objective knowledge

This table shows that there are two dimensions of objective knowledge. One dimension is more focused on possible additives to food (it can be gene or bacteria) that can potentially act as contaminations while the other dimension asks more general questions about regulations and GM technology applications. For my experiment, I chose the first dimension as it directly fits with the representation of genetic modification as a contamination protection construct. Therefore, questions number 1,3 and 4 were disregarded and a modified Likert scale using three following questions was used for the analysis:

i. All bacteria found in food is harmful
ii. All processed food are made using genetically modified products
iii. Contrary to conventional food, GM food contains genes

This modification improved Cronbach's α to 0.610, which is above the threshold of 0.6.

A summary of these modifications for general attitude and objective knowledge scales are depicted in Table 5.6.

Construct	Indicator	Cronbach's Alpha if Item Deleted	Cronbach's α	Indicator modification	Cronbach's α after modification
General Attitude	(1)	0.402	0.449	Item 3,5 and 6 disregarded and only items 1, 2 and 4 used in the calculations	0.604
	(2)	0.350			
	(3)	0.516			
	(4)	0.372			
	(5)	0.267			
	(6)	0.468			
Objective knowledge	(1)	0.500	0.568	Item1, 3 and 4 disregarded, and measurement was done using item 2, 5 and 6	0.610
	(2)	0.485			
	(3)	0.552			
	(4)	0.589			
	(5)	0.525			
	(6)	0.470			
Believability	(1)	0.949	0.958	All measurement items maintained	0.958
	(2)	0.938			
	(3)	0.940			
	(4)	0.953			
Perceived benefits of GM technology	(1)	0.802	0.901	All measurement items maintained	0.901
	(2)	0.910			
	(3)	0.857			
Perceived risks of GM technology	(1)	0.912	0.923	All measurement items maintained	0.923
	(2)	0.886			
	(3)	0.866			
Attitude toward GM technology	(1)	0.743	0.872	All measurement items maintained	0.872
	(2)	0.779			
	(3)	0.932			

Table 5.6 Construct dimensionality and reliability for study 2 variables

5.2.3 Manipulation checks

Two manipulation checks were done before testing the predictions:

(1) *Technology representation strategy manipulation*: First, I tested my technology representation strategy manipulation by running an independent-samples t-test.

Technology representation strategy was the independent variable for this t-test while the level of protection in the ad (measured through an explicit question) was the dependent variable. The results suggest there was a significant difference in the level of protection when consumers saw contamination protection ads (M=3.3, SD=1.2) compared to when they saw progress ads (M=2.4, SD=1.2) conditions (t (241) =-6.376, p<0.001). Second, another independent-samples t-test was done using technology representation strategy as the independent variable and level of progress in the ad (measured through an explicit question) as the dependent variable. The results show there was not a significant difference in the level of progress when consumers saw progress ads (M=3.2, SD=1.2) compared to when they saw contamination protection ads (M=3.3, SD=1.1) conditions (t (241) =0.441, p =0.66). These results suggest that consumers differentiate between the two types considering one of them to be more related to the concept of contamination protection while both types are equally considered to depict the concept of progress. I argue that respondents saw even contamination protection as a form of progress, and that is why the level of the progress in the two types of ads did not significantly defer. It seems plausible to think with more distinction between the two types of representations, I could have more effective manipulation and therefore, I had more chance to see consumers differentiate between the two types.

(2) *Metaphor source strategy manipulation:* To see if respondents could spot a difference in terms of metaphor source (manmade vs natural), I explicitly asked them whether the object in the ad picture was manmade or natural in a 7 point scale and recorded the results as Naturality level (7 is the "most natural" perception and 1 is the "most manmade" perception of the ad). An independent-samples t-test was done using metaphor source strategy as an independent variable and naturality level as the dependent variable. The results show there was a significant difference in naturality level when respondents saw natural sources (M=4.4, SD=2) compared to when they saw manmade sources (M=2.4, SD=1.6) conditions (t (241) =-8.66, p <0.001).

5.2.4 Testing of research proposition and hypotheses

An independent-samples t-test was conducted to compare two different strategies for metaphoric representations of GM technology. There was a significant difference in attitude

toward the ad when consumers saw the contamination protection ads (M=2.9, SD=1.2) compared to when they saw progress ads (M=2.6, SD=1.3) conditions (t (241) =2.07, p =0.04). These results suggest that contamination protection representation of GM technology in metaphoric ads produce higher attitudes toward the ad in this population addressing our research proposition.

I tested the validity of H_{1a} and H_{1b} by running another independent-samples t-test. This time metaphor source strategy was considered as an independent variable, and attitude toward the Ad was the dependent variable. The results suggest there was not a significant difference in attitude toward the ad when consumers saw manmade metaphoric sources (M=2.8, SD=1.2) compared to when they saw natural metaphoric sources (M=2.7, SD=1.3) conditions (t (241) =0.569, p =0.570). This analysis shows that manmade metaphoric sources did not generate a more favourable response to the ad and thus H_{1a} could not be supported. Furthermore, an additional independent-samples t-test using metaphor source strategy (manmade or natural) as the independent variable and believability as the dependent variable also did not yield significant results. According to this t-test, manmade metaphor sources do not differ from natural metaphor sources in increasing believability of the ad (M=2.8, SD=1.2 versus M=2.7, SD=1.2; conditions (t (241) =0.635, p =0.526)) and therefore, H_{1b} could not be supported.

Next, I ran another independent-samples t-test to examine the validity of H_{2a} and H_{2b}. In this analysis verbal anchoring strategy (incomplete or complete) was the independent variable and attitude toward the Ad was the dependent variable. There was no significant difference in attitude toward the ad when consumers saw an incomplete anchor (M=2.8, SD=1.2) compared to when they saw a complete anchor (M=2.7, SD=1.3) conditions (t (241) =0.132, p =0.895). These results suggest that the two different strategies in metaphoric ads do not produce different attitudes toward the ad, and thus, I did not find support for H_{2a} in this study. Furthermore, an additional independent-samples t-test using verbal anchoring strategy (incomplete or complete) as independent variable and comprehension as the dependent variable also did not yield significant results. According to this t-test, incomplete verbal anchors do not differ from complete verbal anchors in increasing comprehension of the ad (M=3.5, SD=1.4 versus M=3.6, SD=1.3; conditions (t (241) =-0.360, p =0.719)) and therefore, no support could be found for H_{2b}.

Next, I examined the validity of H_3 by defining the interaction term between technology representation strategy and general attitude and using perceived benefits as the dependent variable. The results of the regression analysis are summarized in Table 5.7.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.571	.327	.318	.81575

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	-.113	.900		-.125	.900
Technology Representation	.173	.572	.088	.302	.763
General Attitude	.834	.246	.565	3.386	.001
Technology Representation ×General Attitude (Interaction Term)	.001	.157	.003	.009	.993

Dependent Variable: Perceived Benefits

Table 5.7 Regression analysis to test H_3

These results suggest that I was not able to find support for my prediction in H_3. In other words, although general attitude is a significant predictor of perceived benefits, type of technology representation does not interact with this variable significantly and change the perceived benefits of GM technology.

To test the validity of H_{4a} and $H_{4b,}$ I defined an interaction term between technology representation strategy and objective knowledge using perceived benefits and perceived risks as dependent variables. The results of the regression analysis are summarized in Table 5.8 and Table 5.9.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.141	.020	.007	.98418

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	1.838	1.194		1.540	.125
Technology Representation	.428	.750	.217	.570	.569
Objective Knowledge	.304	.328	.191	.927	.355
Technology Representation ×Obj (Interaction Term)	-.080	.205	-.172	-.391	.696

Dependent Variable: Perceived benefits

Table 5.8 Regression analysis to test H_{4a}

R	R Square	Adjusted R Square	Std. Error of the Estimate
.307	.094	.083	.90073

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	4.579	1.092		4.191	.000
Technology Representation	.194	.687	.103	.283	.778
Objective Knowledge	-.304	.300	-.200	-1.013	.312
Technology Representation ×Objective Knowledge (Interaction Term)	-.091	.188	-.206	-.488	.626

Dependent Variable: Perceived risks

Table 5.9 Regression analysis to test H_{4b}

These results suggest that I was not able to find support for my prediction in H_{4a} and H_{4b}. In other words, the type of technology representation does not interact with objective knowledge significantly and change either perceived benefits or perceived risks of GM technology.

My next three hypotheses including H_{5a}, H_{5b}, and H_{5c}, use believability as the predictor and investigate its impact on perceived benefits, perceived risks and attitude toward the ad. The

results of the regression analysis using perceived benefits as the dependent variable have been shown in Table 5.10.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.552	.305	.302	.82549

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	1.844	.137		13.455	<0.001
Believability	.469	.046	.552	10.275	<0.001

Dependent Variable: Perceived benefits

Table 5.10 Regression analysis to test H_{5a}

This model shows that believability of the ad significantly improves the perceived benefits of GM technology, which is in line with my prediction in H_{5a}. The results of the regression analysis using perceived risks as the dependent variable have been shown in Table 5.11.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.415	.172	.168	.85772

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	4.204	.142		29.526	<0.001
Believability	-.335	.047	-.415	-7.071	<0.001

Dependent Variable: Perceived risks

Table 5.11 Regression analysis to test H_{5b}

This model shows that believability of the ad significantly mitigates perceived risks of the GM technology and thus validates my prediction in H_{5b}. To test the validity of H_{5c}, I ran the last regression using believability as a predictor and attitude toward the Ad as the dependent variable as depicted in Table 5.12.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.827a	.685	.683	.71493

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	.272	.119		2.293	0.023
Believability	.904	.040	.827	22.870	<0.001

Dependent Variable: Attitude toward the Ad

Table 5.12 Regression analysis to test H_{5c}

The results suggest believability is a strong predictor of consumer attitude toward GM ads (R square 69%) which provides support for my H_{5c} hypothesis.

5.2.5 Additional analysis

Attitude toward the ad and Attitude toward using GM technology in food production: It seems plausible to ask whether consumer attitude toward pro-GM ads can change their attitude toward using GM technology in food production. I ran another regression analysis using attitude toward the ad as a predictor and attitude toward GM technology as the dependent variable to address this question. Results of this analysis are summarized in Table 5.13.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.431	.186	.182	.88905

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	2.039	.137		14.851	<0.001
Attitude toward the ad	.333	.045	.431	7.412	<0.001

Dependent Variable: Attitude toward GM

Table 5.13 Regression analysis to explore the relationship between attitude toward the ad and attitude toward GM

This result suggests that changing attitude toward GM technology through improving the attitude toward pro-GM ads is possible and thus metaphoric ads have this potential to change perceptions of GM technology.

Additionally, research shows that perceived benefits and perceived risks are also good predictors of attitudes toward GM technology (Chen and Li, 2007) and my Study 2 also confirms the same results as stated in Table 5.14.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.882	.778	.776	.46504

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	3.003	.232		12.960	<0.001
Perceived Benefits	.503	.039	.506	12.990	<0.001
Perceived Risks	-.495	.041	-.473	-12.159	<0.001

Dependent Variable: Attitude toward GM

Table 5.14 Regression analysis to determine the role of perceived benefits and perceived risks in the prediction of attitude toward GM technology

Adding attitude toward the ad as another predictor to model Table 5.14 eliminates the significance of attitude toward the ad in predicting attitude toward GM which is a classic sign of mediation effect according to Baron and Kenny (1986) (Table 5.15). Therefore, one can conclude pro-GM metaphoric ads can improve attitude toward GM technology by increasing perceived benefits or reducing perceived risks of the technology.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.883	.779	.776	.46495

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	2.963	.235		12.613	<0.001
Perceived Benefits	.488	.041	.490	11.804	<0.001
Perceived Risks	-.491	.041	-.470	-12.050	<0.001
Attitude toward the ad	.028	.027	.036	1.045	0.297

Dependent Variable: Attitude toward GM

Table 5.15 Regression analysis to confirm the mediating role of perceived benefits and perceived risks in the prediction of attitude toward GM technology by using attitude toward the Ad

Role of general attitude in predicting perceived benefits and perceived risks: According to the results of Study 2, general attitude alone can be a good predictor of perceived benefits in line the findings of Chen and Li (2007). However, contrary to their finding, I found support for the predicting role of general attitude also for the perceived risks. The results of these findings have been summarized in Table 5.16 and Table 5.17.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.564	.318	.316	.81723

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	.154	.286		.539	.590
General Attitude	.833	.079	.564	10.612	<0.001

Dependent Variable: Perceived Benefits

Table 5.16 Regression analysis to confirm predicting role of general attitude for perceived benefits

R	R Square	Adjusted R Square	Std. Error of the Estimate
.473a	.224	.221	.83040

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	5.660	.291		19.449	<0.001
General Attitude	-.665	.080	-.473	-8.334	<0.001

Dependent Variable: Perceived Risks

Table 5.17 Regression analysis to confirm predicting role of general attitude for perceived risks

Role of objective knowledge in predicting perceived benefits and perceived risks: According to the results of Study 2, objective knowledge alone can be a predictor of perceived risks in line with the findings of Chen and Li (2007). However, contrary to their finding, I found no support for the predicting role of objective knowledge nor for perceived benefits. The results of these findings have been summarized in Table 5.18 and 5.19.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.119a	.014	.010	.98287

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	2.456	.374		6.574	<0.001
Objective Knowledge	.190	.102	.119	1.863	0.064

Dependent Variable: Perceived benefits

Table 5.18 Regression analysis to confirm predicting role of objective knowledge for perceived benefits

R	R Square	Adjusted R Square	Std. Error of the Estimate
.297a	.088	.084	.90001

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	4.903	.342		14.331	<0.001
Objective knowledge	-.451	.093	-.297	-4.826	<0.001

Dependent Variable: Perceived risks

Table 5.19 Regression analysis to confirm predicting role of objective knowledge for perceived risks

Technology representation strategy and purchase intention: To see whether the change in the type of technology representation (contamination protection or progress) substantially amends purchase intention for GMO food, I ran another independent-samples t-test using technology representation strategy as the independent variable and purchase intention improvement (before and after seeing the ad) as the dependent variable.

There was not a significant difference in purchase intention improvement when consumers saw progress ads (M=-0.03, SD=0.9) compared to when they saw contamination protection ads (M=-0.05, SD=1.0) conditions (t (241) =-0.118, p =0.906). These results suggest that purchase intention as a behavioural variable is not going to change by using either of the technology representation strategies. Maybe metaphoric communications might not be stimulating enough to change consumer behaviour (purchasing intention for GMO food) with only one ad and through continuous exposure to these kinds of communication consumers eventually, show higher levels of behavioural intentions.

Predictors of attitude toward the ad: I suspected that maybe pre-existing conditions including general attitude, objective knowledge of GM technology, subjective knowledge of GM technology, perceived benefits, perceived risks, and attitude toward using GM technology in food production outweigh ad related concerns including believability, comprehension, and pleasure. To assess the validity of this argument, I ran another regression model using all mentioned variables as predictors, and attitude toward the ad as the dependent variable and the results of this analysis have been summarized in Table 5.20.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.877	.768	.760	.62296

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	.679	.534		1.272	.205
General Attitude	-.143	.077	-.075	-1.855	.065
Objective Knowledge	-.133	.072	-.065	-1.838	.067
Subjective Knowledge	-.047	.051	-.030	-.914	.361
Perceived Benefits	.022	.072	.017	.305	.761
Perceived Risks	-.054	.072	-.040	-.752	.453
Attitude toward GM	.057	.091	.044	.635	.526
Believability	.544	.058	.498	9.366	<0.001
Comprehension	.152	.035	.165	4.414	<0.001
Pleasure	.356	.053	.329	6.690	<0.001

Dependent Variable: ATT toward the ad

Table 5.20 Regression analysis to explore predictors of attitude toward the ad

Table 5.20 indicates that attitude toward the ad is primarily influenced by the ad-related variables, including believability, pleasure, and comprehension meaning that participants' pre-existing beliefs regarding GM technology do not influence participants' attitude toward the ads.

Attitude toward *the ad and Purchase Intention:* It seems plausible to ask whether consumer attitude toward pro-GM ads can change their purchase intention (PI) for GMO food. I ran another regression analysis using attitude toward the ad as the predictor and purchase intention as the dependent variable to address this question. Results of this analysis summarized in Table 5.21.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.392	.153	.150	1.61553

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	2.372	.249		9.510	<0.001
Attitude toward the ad	.540	.082	.392	6.611	<0.001

Dependent Variable: Purchase Intention

Table 5.21 Regression analysis to explore the relationship between attitude toward the ad and purchase intention

Furthermore, research shows that attitude toward GM is also a good predictor of purchase intention (Bredahl, 2001; Chen and Li, 2007) and my study also confirms the same results as stated in Table 5.22.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.847	.718	.717	.93268

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	-.604	.190		-3.172	0.002
Attitude toward GM	1.510	.061	.847	24.763	<0.001

Dependent Variable: Purchase Intention

Table 5.22 Regression analysis to confirm the role of attitudes toward GM technology in the prediction of purchase intention

Adding attitude toward the ad as another predictor to model Table 5.22 eliminates the significance of attitude toward GM in predicting purchase intention which is a classic sign of mediation effect according to Baron and Kenny (1986) (Table 5.23). Therefore, a higher attitude toward the pro-GM ads can potentially improve purchase intention for GMO food only through improving the attitude toward GM (mediator).

R	R Square	Adjusted R Square	Std. Error of the Estimate
.848	.719	.716	.93316

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	-.655	.199		-3.284	0.001
Attitude toward GM	1.485	.068	.833	21.962	<0.001
Attitude toward the ad	.045	.052	.033	.865	0.388

Dependent Variable: Purchase Intention

Table 5.23 Regression analysis to confirm the mediating role of attitude toward GM in the prediction of purchase intention by using attitude toward the ad

6. COMPARISON OF STUDY 1 AND STUDY 2

Testing the research proposition and hypotheses in Study1 and Study 2 yielded different results presumably because of the inherent differences between the two samples. Table 6.1 explores the differences between the two samples of the first and the second study

	Study 1	Study 2
	%	%
Gender		
Male	57.4	38.7
Female	42.6	60.9
Other	0.0	0.4
Age		
18-25	93.4	5.8
26-35	5.5	14.0
36-45	1.1	10.7
46-55	0.0	17.3
56-65	0.0	32.9
66 or above	0.0	18.5
Prefer not to say	0.0	0.8
Highest level of education		
Below Bachelor's	99.7	47.8
Above Bachelor's	0.3	49.8
Prefer not to say	0.0	2.4
Average GMO Purchase Intention (from 7 point)	4.73	3.87
Subjective Knowledge of GM technology	2.54	1.88
Average attitude toward the Ad (from 7 point)	3.82	3.89
Average Comprehension (for eight selected ads)	4.81	4.96
Metaphor Quality (for 8 selected ads)	3.64	4.28

Table 6.1 Comparison of the sample in the first and second study

One pivotal consideration while comparing the two studies is the fact that Study 1 used a student sample while study 2 investigated the response of a general public sample to pro-GM metaphoric ads. Furthermore, as depicted in Table 6.1, Study 2 used a dominant female sample (61% female) while in the first study, I had more balance between genders (42.6% female). Furthermore, participants of the first study were much younger (more than 93% under 25 years

old) while more than 94% of the respondents in the second study were aged above 25 years old. In terms of education, there is also a substantial difference between the participants of the two studies; while almost all participants of the first study are students without a bachelor's degree, nearly half of the respondents in the second experiment have bachelor's degree or above. Table 6.1 summarizes the findings of the two studies.

Proposition/Prediction	Results of Study 1	Results of study 2
RP	No difference found	Difference found*
H1a	Supported	Not supported
H1b	Not tested	Not supported
H2a	Supported	Not supported
H2b	Supported	Not supported
H3	Not tested	Not supported
H4a	Not tested	Not supported
H4b	Not tested	Not supported
H5a	Not tested	Supported
H5b	Not tested	Supported
H5c	Not tested	Supported

*Contamination protection found to be a better strategy than progress for technology representation

Table 6.2 Results of the first and the second studies

In the below section, I explore different possible reasons for the results in Table 6.2.

RP: My research proposition explored whether consumers perceive two different representations of GM technology in metaphoric communications differently. The results suggest that for a student sample (as in Study 1) the difference between the two depictions is not significant. However, as respondents become more mature and experienced (as in Study 2), they appreciate a tangible promise (contamination protection) significantly more than a vague argument like expanding frontiers of knowledge. One factor in play might be the higher level of creativity in the contamination protection ads; referring to technologies as ways to extend frontiers of knowledge has been used widely in consumers' communications (Christidou et al., 2004; Liakopoulos, 2002) while using metaphoric language to explain a tangible benefit of the technology (contamination protection) is creative. To test this argument, I ran an independent-samples t-test to compare two different strategies for metaphoric representations of GM technology in terms of their perceived creativity. There was a significant difference in the creativity of the ads when consumers saw the contamination protection ads

(M=3.2, SD=1.5) compared to when they saw progress ads (M=2.8, SD=1.2) conditions (t (241) =2.4, p =0.017). These results suggest that contamination protection representation of GM technology in metaphoric ads are perceived as more creative than progress ads by the participants.

Research on the impact of creativity on attitude toward the ad confirms its positive effect by increasing the level of unexpectedness (Ang and Low, 2000). I argue older and more mature participants of Study 2 probably had more encounters with the repetitive depiction of technologies as progress and thus they appreciated creativity in the contamination protection ads better than student sample of Study 1.

Table 6.3 summarizes the attitude toward the Ad ratings for each technology representation in both studies.

Technology representation strategy	Attitude toward the Ad in study 1	Attitude toward the Ad in study 2*
Contamination protection (technology as a promise)	3.86	4.12
Progress (technology as an activity expanding frontiers of knowledge	3.79	3.65

*Mean converted from 5-point scale to 7-point so it can be compared to study 1 mean

Table 6.3 Comparison of attitude toward the ad between the two studies using technology representation strategy as a predictor

H_{1a} and H_{1b}: The results of the first study confirm that younger consumers prefer metaphoric ads with manmade sources in line with my prediction in H_{1a}. However, as I did not have a measurement for believability in the first study, I was not able to test H_{1b} in this study. Surprisingly, I could not find even support for H_{1a} in the second study as respondents did not show a significant difference in their attitude toward the ad between natural and manmade metaphor sources although manipulation checks showed that they clearly saw the difference between manmade and natural metaphor sources. My H_{1b} hypothesis predicts that manmade metaphor sources are perceived as more believable than natural sources but my findings in the second study did not confirm this prediction. These results show that I was not able to replicate the findings of Hingston and Noseworthy (2018) and my own Study 1 in the second study. Therefore, consumer's preference for manmade representation of GMO food or GM technology over natural deserves more future research. One possible reason can be the fact that in Study 1 participants saw four metaphoric ads with both manmade and natural sources and

thus they were primed strongly to differentiate between manmade and natural sources while in the second study this strong priming was not available for the respondents. Another factor in play might be different levels of respondent's attention between the two studies. It seems plausible that students who participated in the first study by the physical presence spend more time on the survey and had closer attention to details which eventually helped them to spot the difference between manmade and natural sources. Participants of the second study, on the other hand, filled an online questionnaire without that high level of attention.

H_{2a} and H_{2b}: I predicted that metaphoric ads with complete verbal anchors are better in improving consumer attitude toward the ad than incomplete verbal anchors ($H_{2a)}$ as they improve comprehension of the ad ($H_{2b)}$. I was able to fully confirm these hypotheses and mediating role of comprehension in the first study, but the results could not be replicated in the second experiment. It seems plausible that students sample of the first study found the ads with incomplete anchors more confusing and thus, a complete verbal anchor substantially improved their understanding of the intended communication. The general public sample of the second study with a higher level of education, on the other hand, seem to better understand the metaphoric ideas of the ads and therefore an additional elaboration by a complete verbal anchor did not improve their comprehension significantly. Using education as a possible moderating variable in predicting attitude toward the ad with the level of anchoring yielded significant results according to Table 6.4.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.147	.022	.009	1.26435

IV	Unstandardized Coefficient		Standardized Coefficient	t	p
	B	Std. Error	β		
Constant	1.401	.737		1.900	0.059
Verbal anchoring strategy	.986	.473	.389	2.086	0.038
Education level	.285	.139	.406	2.045	0.042
Verbal anchoring strategy× Education level (Interaction Term)	-.205	.090	-.591	-2.274	0.024

Dependent Variable: Attitude toward the ad

Table 6.4 Model using believability, comprehension and pleasure as predictors of attitude toward the Ad

H_3: The moderating role of the general attitude in improving perceived benefits using a metaphoric communication could not be confirmed as predicted in H_3. However, additional

analyses showed that improving consumers' general attitude toward technology, in general, can enhance their perceived benefits and reduce their perceived risks of GM technology. Using this finding, one strategy to improve GM technology perceptions can be to talk about technologies in general instead of focusing on GM itself. This strategy seems reasonable as it gives advertisers a chance to eliminate "GM" or "Genetic modification" (both terminologies have been seen to suffer from negative connotations).

H_{4a} and H_{4b}: The moderating role of objective knowledge in improving perceived benefits and perceived risks using a metaphoric communication could not be confirmed. However, I found that objective knowledge is a significant predictor for attitude toward GM because it mitigates the risks associated with using GM technology. This finding has interesting implications as it suggests communication of objective knowledge by using tools like comparisons and metaphors can potentially reduce the perceived risks of GM technology.

H_{5a}, H_{5b} and H_{5c}: My second study confirms all three hypotheses, and thus it can be concluded that believability is a crucial element that should lie at the center of the model in Figure 3.1 as it can predict perceived benefits, perceived risks, and attitude toward the ad. Additionally, Table 5.18 explores other predictors of attitude toward the ad, and it states after believability, pleasure and comprehension are significant contributors to attitude toward the ad. More specifically, pleasure's importance implies that using non-factual communications (employing comparisons and metaphors) might be a good strategy because by using this approach consumers have a chance to discover the intended relationship and therefore experience higher levels of pleasure.

7. CONCLUSION, CONTRIBUTION, AND FUTURE RESEARCH

In conclusion, I believe that GM technology has not received a favourable response from the general public because the same repetitive communication strategy of stating scientific facts about it has been used during the last decades. Using alternative tactics like metaphors has been shown to be useful in other contexts and can benefit pro-GM ads as well. However, close attention to critical variables including believability, pleasure and comprehension is essential to make this metaphoric strategy successful. This study shows that GM technology should be depicted as a construct with a tangible benefit which does not pretend to be natural. For a less educated audience, coupling this representation with a solid verbal anchoring might even improve consumers' attitude resulting in an eventual shift in beliefs and behavioural intentions. In the next sessions, I explore the theoretical and managerial implications of this research, along with some possible venues for future research.

Research has classified different metaphoric representations of technologies, mainly using content analysis method (Christidou et al., 2004; Liakopoulos, 2002). However, to my knowledge, the impact of these representations on consumers' attitude toward pro-GM metaphoric ads and attitude toward GM technology has not been explored in an experimental setting. My study sheds light on this subject and concludes which type of these representations makes consumers' perception of the ads more positive. Furthermore, using the model which was developed by Bredahl (2001) and tested by Chen and Li (2007) as a steppingstone, I could develop a customized model to explain how three layers of manipulations in a pro-GM metaphoric ad can potentially improve behavioural intentions toward GMO food with believability and pleasure of the ad lying at the center of consumers' attention. Finally, I was able to add another dimension Phillips's (2000) finding of verbal anchoring. While she suggests a higher level of verbal anchoring results in a higher level of comprehension, this study explores the moderating role of education in this relationship. The results show that for the less educated and less experienced consumers verbal anchoring is a central element that can substantially improve their attitude toward the ad, while for a more educated audience, verbal anchoring can be kept lower without significant impact on ad comprehension and attitude toward the ad.

As well as the above contributions to the theory, my study has managerial implications. I suggest that corporations involved in the sales and marketing of GMO food should more actively consider the option of moving from a literal and factual messaging strategy to metaphoric communications that can be used to correct preconceptions about GM technology

and give consumers a higher level of pleasure from seeing the ad. My findings in the first study suggest that practitioners involved in developing these kinds of ads should avoid using metaphors that suggest GM technology is something natural as this negatively impacts consumers' attitude toward the ad. However, this effect is only present when enough level of priming and differentiation between the two types of metaphors has been used. One strategy to increase the level of priming is to give more focus on the human agency in the production and development of GMO food. Another important managerial implication of this research is the critical role of general attitude (toward the use of technologies in general) on how people assess the benefits and risks of GM technology. The use of genetic modification related terms (like GM, GMO, and genetic engineering) might provoke negative feelings because of the preconceptions and widespread activities of the anti-GMO campaign. Therefore, the biotech industry might choose an indirect approach in its communications by talking about the benefits of innovative technologies in general because the results of this study show an improvement in consumers' general attitude toward technology will eventually benefit GM technology. Furthermore, ads with the most complete verbal anchors might generate the most favourable consumer response primarily when a tangible promise like contamination protection has been used as the metaphoric ad strategy. Interestingly, this effect is only present when the audience of the metaphoric ads have a low level of education making them in need for a higher level of verbal anchoring.

Finally, pro-GM metaphoric ads have the potential to indirectly impact purchase intention for GMO food by improving the perception of GM technology among consumers. Practitioners in this domain should note that consumers' attitude toward the ads is not negatively impacted by preconceptions and previous negative thoughts regarding GM technology and therefore by making believable, comprehensible and joyful metaphoric ads, it is possible to improve attitude toward GM technology through enhancing perceived benefits and reducing perceived risks of the technology. Among different ad-related variables, believability has been found to have the highest level of impact on both attitude toward the ad and perception of GM technology and thus need close attention of the practitioners.

Results of this research suggest that believability is a crucial component of the pro-GM metaphoric ads as it can impact three main variables including perceived benefits of GM technology, perceived risks of GM technology and consumer attitude toward the pro-GM ads. In this research, I tried to improve believability by changing the metaphor source from natural

to manmade, but this prediction only worked when higher levels of priming were used i.e. respondents had the chance to see both natural and manmade sources at the same time (as in Study 1). Future research can focus on practical ways to increase the level of this metaphor source priming. In other words, what can be done to shift consumers' focus on the metaphor's source being manmade. One possible way to achieve this goal is to have an additional priming step (by reading text or seeing pictures) before seeing the ad to ensure a higher level of priming. Another way to increase the level of priming is to change the anchoring language to a more active voice with humans as the subject instead of GM technology. For instance, in the case of lighthouse metaphor, the anchoring can be changed to:

"Like we made a lighthouse to show us the safe way to the shore in the sea, we developed GM technology to show us the way toward more nutritious food."

Another area for further exploration is the credibility of the source for pro-GM metaphoric ads. Here the empirical question asks whether consumers react differently when they see different stakeholders like government, scientific community or food industry are using non-literal metaphoric language. It might be the case that scientist's use of metaphoric language is incongruent with consumers' expectations (scientists are perceived to be factual by many consumers) and thus intrigues less favourable response.

Finally, in my Study, I tried to find possible moderating variables that can give a better understanding of how technology representation strategy in metaphoric ad can impact perceived benefits and risks of the GM technology. My candidate variables, including general attitude and objective knowledge, found to not significantly moderate this relationship. However, their direct role in predicting perceived benefits and perceived risks of GM technology could be confirmed. Future research could explore which types of metaphoric communications can better improve general attitude and objective knowledge which can eventually improve perceptions of GM technology.

Appendix A. Ads developed for the studies

GM technology keeps insects from your food

Like a screen, GM technology keeps insects from your food

GM technology keeps insects from your food

Like a Venus flytrap, GM technology keeps insects from your food

GM technology filters out pesticides and insecticides from your food

Like a water filter, GM technology filters out pesticides and insecticides from your food

GM technology filters out pesticides and insecticides from your food

Like a waterfall, GM technology filters out pesticides and insecticides from your food

GM technology is the way to more nutritious food

Like a highway, GM technology is the way to more nutritious food

GM technology is the way to more nutritious food

Like a pathway, GM technology is the way to more nutritious food

GM technology shows the way to more nutritious food

Like the sun, GM technology shows the way to more nutritious food

GM technology shows the way to more nutritious food

Like a lighthouse, GM technology shows the way to more nutritious food

Appendix B. Research Ethics Approval

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	ID#
David Di Zhang	Management & Marketing	557

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED: Saskatoon, Saskatchewan

STUDENT RESEARCHER(S): Ali Abbasi

TITLE: The Impact of metaphoric communication on consumer attitude toward GM technology

FUNDER(S): SSHRC – Genome Canada Special Initiative

ORIGINAL REVIEW DATE	APPROVAL ON	APPROVAL OF:	EXPIRY DATE
8-Nov-2018	21-Dec-2018	Behavioural Research Ethics Application Pilot and Main Study Recruitment Script Pilot and Main Study Implied Consent Information Revised Pilot and Main Study Questionnaire Pilot and Main Study Debrief Sheet Pilot Recruitment Script Main Study SONA Advertisement SSRL Research Participants Group	20-Dec-2019

Full Board Meeting ☐ Date of Full Board Meeting:

Delegated Review ☒

CERTIFICATION: The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2 2014). The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS: In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month prior to the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: *http://research.usask.ca/for-researchers/ethics/index.php*

Digitally Approved by Vivian Ramsden
On behalf of Diane Martz, Interim Chair
Behavioural Research Ethics Board
University of Saskatchewan

Please send all correspondence to:

Research Services and Ethics Office
University of Saskatchewan
Room 223 Thorvaldson Building
110 Science Place
Saskatoon, SK Canada S7N 5C9

Appendix C. Participant Consent Form for Study 1

Edwards School of Business

University of Saskatchewan

Project Title:

The impacts of different food advertisement strategies on consumer attitudes

Principal Investigator and Supervisor:

Dr. David Di Zhang, Associate Professor, Department of Marketing and Management, Edward School of Business. E-mail: zhang@edwards.usask.ca Phone: 306- 9965920

Student Researcher:

Ali Abbasi, Graduate Student from MSc. Marketing program, Edwards School of Business. E-mail: ali.abbasi@mail.usask.ca

Purpose(s) and Objective(s) of the Research:

- The objective of this research project is to examine which type of advertisement for food is more persuasive.
- The objective of this pilot study is to get your opinions on the quality of the ads we have developed.

Procedures:

- We will show you several print advertisements.
- You will be asked to rate the quality of the ads. There is no right or wrong answer. We simply wish to know your opinions.

Funded by:

Social Sciences and Humanity Research Council (SSHRC) of Canada and Genome Canada.

Potential Risks:

The risk of participating in this study is minimal. Participants should not have any risk of psychological or emotional harm or discomfort to answer the questionnaire. Legal repercussions, social repercussions, and physical harm or discomfort are not involved.

Potential Benefits:

Results of this study will help marketers to improve marketing strategies by choosing the best type of food-related ad to enhance consumer attitudes.

Confidentiality

- Only the student researcher, project supervisor and other two committee members have rights to access the original data. This study will involve student participants answering paper-and-pencil in a room on campus. The students might know each other. However, The researchers asks the student participants not to discuss their answers. The researchers will not collect identifiable information about the participants. Hence, the data will be "qualified" as anonymous.

- The principal investigator takes the responsibility of data storage (e.g. electronic and paper documents). The filled paper questionaires will by collected by the researcher at the site and will be kept in he office of the prinicipal investigator.

Right to Withdraw:

- Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time by not submitting the questionnaire without explanation or penalty of any sort.

- If you do not want to answer a specific question in the questionnaire, you can check "I don't know" or ignore the question.

- Once the survey is submitted it cannot be withdrawn as no identifiers are attached to the survey.

Follow up:

To obtain results from the study, please contact the researcher via email to indicate your interest. Summarized results will be provided once they became available.

Questions or Concerns:

- If you have any questions or concerns about the research, please contact researcher using the information at the top of the page.

- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free (866) 966-2975.

IMPLIED CONSENT FOR SURVEYS

By completing and submitting the questionnaire, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study.

As you complete the survey, please do not put your name or any other identifiable information on the form. Please refrain from revealing your personal identity when you are providing "additional comments" at the end of the survey.

A copy of this consent form is shared with you for your future references.

Thank you.

Appendix D. Questionnaire for the First Study

FOOD COMMUNICATION STUDY

The World Health Organization (WHO) defines genetically modified (GM) foods as foods derived from organisms whose genetic material has been modified in a way that does not occur naturally. Currently, most available GM foods are produced from plants.

We are conducting research on reactions to different ads. Please see each ad and then respond to the questions

What do you understand from this ad? Please explain.

What do you think was the main intention of the advertiser? Please explain.

Please rate the ad on the following scales by checking on each line

1. Plain/matter of fact: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Artful/clever
2. Silly/stupid: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Creative/imaginative
3. Like: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Dislike
4. Good: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Bad
5. Enjoyable: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Not enjoyable
6. Easy to understand: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Difficult to understand

The object in the ad picture is :

Manmade: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Natural

Please indicate how well this ad conveys the following messages

1. GM technology protects food from contamination

Strongly agree	Agree	Not agree/Not disagree	Disagree	Strongly disagree
❑	❑	❑	❑	❑

2. GM technology is a form of progress to a better future

Strongly agree	Agree	Not agree/Not disagree	Disagree	Strongly disagree
❑	❑	❑	❑	❑

This part is about how likely you would buy GM-based food products after seeing this Ad. Please indicate your intention to buy from **1** (**Definitely Avoid buying**) to **7** (**Definitely Buy**).

	1	2	3	4	5	6	7	Don't know
If GM foods were available in the food stores, I would intend to _ it.								

We are interested in your thinking styles

	Strongly disagree			Neutral			**Strongly agree**	
	1	2	3	4	5	6	7	Don't know
I would 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 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 that 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 required 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.								

Please indicate the level of knowledge you think you have regarding the GM technology

Not knowledgeable at all	Know very little about it	Somewhat knowledgeable	Very knowledgeable
❑	❑	❑	❑

What is your gender?

Male	Female	Others
❑	❑	❑

What is your age?

- 18-25
- 26-35
- 36-45
- 46-55
- 56-65
- 66 or older

What is the highest level of education you have achieved?

- Elementary school
- Secondary school
- Technical/ College
- University
- Graduate study

Appendix E. Debriefing sheet for the first study

Edwards School of Business

University of Saskatchewan

In order to assess your idea on genetically modified food advertising without any preconception, we preferred not to talk about the focus of this study on this technology. Below you can see full description of the study.

Project Title:

The Impact of Metaphoric Communication on Consumers' Attitude toward GM Technology

Purpose(s) and Objective(s) of the Research:

- The objective of this research project is to examine which type of metaphoric communications is more effective in improving consumer attitude toward GM technology

Potential Benefits:

- Results of this study will help marketers to improve marketing strategies by choosing the best type of food ad to enhance consumer attitudes toward GM technology.

Right to Withdraw:

- Your participation is voluntary, and you may withdraw from the research project for any reason, at any time by not submitting the questionnaire without explanation or penalty of any sort.

IMPLIED CONSENT FOR SURVEYS

By completing and submitting the questionnaire, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study.

As you complete the survey, please do not put your name or any other identifiable information on the form. Please refrain from revealing your personal identity when you providing “additional comments” at the end of the survey.

A copy of this consent form is shared with you for your future references.

Thank you.

Study Name	Food Advertisements and Attitudes
Study Type	**Standard (lab) study** This is a standard lab study. To participate, sign up, and go to the specified location at the chosen time.
Study Status	**Visible to participants:** Approved
Duration	Approximately 20 minutes
Pay	Expected Average: $10.00
Abstract	The objective of this research project is to examine which type of advertisement for food is more persuasive.
Description	During this in-lab study, we will show you one food print advertisement. The ad includes message constructed as metaphor. You will be asked to describe how you interpret the ads, rate the quality of the ads, and answer questions in an

	online survey. There is no right or wrong answer. We simply wish to know your opinions. Results of this study will help marketers to improve marketing strategies by choosing the best type of food ad to enhance consumer attitudes.
Eligibility Requirements	**You must be at least 18 year of age to participate.**

Appendix F. Invitation E-mail for the second study

Appendix G. Participant Consent Form for the Second Study

Participant Implied Consent Form

Edwards School of Business

University of Saskatchewan

Project Title:

The impacts of different food advertisement strategies on consumer attitudes

Principal Investigator and Supervisor:

Dr. David Di Zhang, Associate Professor, Department of Marketing and Management, Edward School of Business. E-mail: zhang@edwards.usask.ca Phone: 306- 9965920

Student Researcher:

Ali Abbasi, Graduate Student from MSc. Marketing program, Edwards School of Business. E-mail: ali.abbasi@mail.usask.ca

Purpose(s) and Objective(s) of the Research:

- The objective of this research project is to examine which type of advertisement for food is more persuasive.

Procedures:

- We will show you a food print advertisement.
- You will be asked to rate the quality of the ad. There is no right or wrong answer. We simply wish to know your opinions.

Funded by:

Social Sciences and Humanity Research Council (SSHRC) of Canada and Genome Canada.

Potential Risks:

The risk of participating in this study is minimal. Participants should not have any risk of psychological or emotional harm or discomfort to answer the questionnaire. Legal repercussions, social repercussions, and physical harm or discomfort are not involved.

Potential Benefits:

Results of this study will help marketers to improve marketing strategies by choosing the best type of food ad to enhance consumer attitudes.

Confidentiality

- Only the student researcher, project supervisor and other two committee members have rights to access the original data. This study will involve participants answering an online questionnaire so there is no chance of anonymity breach. The researchers will not collect identifiable information about the participants. Hence, the data will be "qualified" as anonymous.

- The principal investigator takes the responsibility of data storage (e.g. electronic and paper documents). The electronic data will be shared by the social science labs through secure internet conncetion and the analysis will be conducted by the researchers on secure computers on the University campus.

Right to Withdraw:

- Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time by not submitting the questionnaire without explanation or penalty of any sort.

- If you do not want to answer a specific question in the questionnaire, you can check "I don't know" or ignore the question.

- Once the survey is submitted it cannot be withdrawn as no identifiers are attached to the survey.

Follow up:

To obtain results from the study, please contact the researcher via email to indicate your interest. Summarized results will be provided once they became available.

Questions or Concerns:

- If you have any questions or concerns about the research, please contact the researcher using the information at the top of the page.
- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free (866) 966-2975.

IMPLIED CONSENT FOR SURVEYS

By clicking the "**I Agree"** button and completing and submitting the questionnaire, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study.

As you complete the survey, please do not put your name or any other identifiable information on the form. Please refrain from revealing your personal identity when you providing "additional comments" at the end of the survey.

A copy of this consent form is shared with you for your future reference.

Thank you.

Appendix H. Questionnaire for the second study

FOOD COMMUNICATION STUDY

The World Health Organization (WHO) defines genetically modified (GM) foods as foods derived from organisms whose genetic material has been modified in a way that does not occur naturally. Currently, most available GM foods are produced from plants.

We are conducting research on reactions to different ads. To start the survey please respond to the below question.

Please indicate your agreement or disagreement with the following statement:

If GM foods were available in food stores near me, I would buy them.

- Completely agree
- Agree
- Slightly agree
- Neither agree nor disagree
- Slightly disagree
- Disagree
- Completely disagree

On the next page, you will see an ad, and we would like to know your answers to the following questions related to this ad.

What do you understand from this ad? Please explain.

What do you think was the main intention of the advertiser? Please explain.

We would like to know to what extent you think this ad was easy to understand

1. Difficult to understand: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Easy to understand
2. Confusing: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Straightforward

We would like to know whether you find the ad enjoyable or not.

1. Not Enjoyable: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Enjoyable
2. Unpleasant: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Pleasant

We would like to know to what extent you think the ad was believable.

1. Unbelievable: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Believable
2. Untrustworthy: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Trustworthy
3. Not credible: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Credible
4. Dishonest: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Honest

We would like to know what you think of the metaphor in the ad.

1. Plain/matter of fact: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Artful/clever
2. Silly/stupid: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Creative/imaginative

Overall, what do you think of the ad.

1. Dislike: _____ : _____ : _____ : _____ : _____ : _____ : _____ : like
2. Bad: _____ : _____ : _____ : _____ : _____ : _____ : _____ : Good

How manmade or natural did you feel the object in the ad is?

- Completely manmade
- Manmade
- Slightly manmade
- Neither manmade nor natural
- Slightly natural
- Natural
- Completely natural

Please indicate your agreement or disagreement with the following statements

The ad provides a strong guide to the message

Strongly agree	**Agree**	**Not agree/Not disagree**	**Disagree**	**Strongly disagree**
❑	❑	❑	❑	❑

The ad is like a riddle to me.

Strongly agree	**Agree**	**Not agree/Not disagree**	**Disagree**	**Strongly disagree**
❑	❑	❑	❑	❑

The ad explains the message well.

Strongly agree	**Agree**	**Not agree/Not disagree**	**Disagree**	**Strongly disagree**
❑	❑	❑	❑	❑

Please indicate if you think this ad tries to convey the following messages

GM technology protects food from contamination

Strongly agree	**Agree**		**Disagree**	**Strongly disagree**

		Not agree/Not disagree		
❑	❑	❑	❑	❑

GM technology is a form of progress to a better future

Strongly agree	**Agree**	**Not agree/Not disagree**	**Disagree**	**Strongly disagree**
❑	❑	❑	❑	❑

We are interested in your general attitudes. Please indicate your agreement or disagreement with the following statements.

	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5
Scientific progress implies social welfare					
Technology has improved the quality of our life					
Human activities seriously upset the ecological balance					
New food products are worth trying					
Food quality used to be better					
Food is important for a healthy lifestyle					

We are interested to know what you believe to be true about any of these claims. Please indicate your agreement or disagreement with the following statements.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

	1	2	3	4	5
Agricultural crops can be made resistant to certain diseases and plagues by modifying their hereditary material					
All bacteria found in food is harmful					
‘Natural‘ does not necessarily mean healthy					
There are now laws or regulations on the use of gene technology in food production					
All processed food are made using genetically modified products					
Contrary to conventional food, GM food contains genes					

We are interested in learning your perceptions on the potential benefits of GM technology in food production. Please indicate your agreement or disagreement with the following statements.

	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5
Overall, GM technology in food production will offer great benefits to me and people important to me					
Overall, GM technology in food production will provide benefits to agriculture and food industries.					

Overall, GM technology in food production will offer great benefits to the environment					

We are interested in learning your perceptions on the potential risks associated with GM technology. Please indicate your agreement or disagreement with the following statements.

	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5
Overall, GM technology in food production is risky to me and other people that are important to me					
Overall, GM technology in food production involves considerable risks to the environment					
Overall, GM technology in food production involves considerable health risks					

We are interested in learning your attitudes toward GM technology in food production. Please indicate your agreement or disagreement with the following statements.

	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5
Applying GM technology in food production is good					
Applying GM technology in food production is wise					

I am strongly against applying GM technology in food production					

Please indicate the level of knowledge you think you have regarding the GM technology

- Not at all knowledgeable
- Slightly knowledgeable
- Moderately knowledgeable
- Very knowledgeable
- Completely knowledgeable

Please indicate your agreement or disagreement with the following statement:

If GM foods were available in food stores near me, I would buy them.

- Completely agree
- Agree
- Slightly agree
- Neither agree nor disagree
- Slightly disagree
- Disagree
- Completely disagree

Please tell us a bit about yourself…

Which gender do you identify with?

- Male
- Female
- Other
- Prefer not to say

What is your age range?

- 18-25
- 26-35
- 36-45
- 46-55
- 56-65
- 66 or older
- Prefer not to say

What is the highest level of education you have completed?

- No certificate, diploma, or degree
- High school diploma or equivalent
- Apprenticeship or trades certificate or diploma
- College, CEG9EP, or other non-university certificate or diploma
- University certificate or diploma below bachelor level
- Bachelor's degree
- University certificate, diploma or degree above bachelor level

Appendix I. End of Survey (the second study) Messages

Debriefing (Second study)

Edwards School of Business

University of Saskatchewan

In order to assess your idea of genetically modified food advertising without any preconception, we preferred not to talk about the focus of this study on this technology. Below you can see a full description of the study.

Project Title:

The Impact of Metaphoric Communication on Consumer Attitude Toward GM Technology

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- The objective of this research project is to examine which type of metaphoric communications is more effective in improving consumer attitude toward GM technology

Potential Benefits:

Results of this study will help marketers to improve marketing strategies by choosing the best type of food ad to enhance consumer attitudes toward GM technology.

Right to Withdraw:

- Your participation is voluntary, and you may withdraw from the research project for any reason, at any time by not submitting the questionnaire without explanation or penalty of any sort.

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By clicking the "**I Agree"** button and completing and submitting the questionnaire, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study.

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A copy of this consent form is shared with you for your future references.

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