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# Incorporating Communication Factors in the Theory of Planned Behavior to Predict Chinese University Students' Intention to Consume Genetically Modified Foods

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Aside from personal beliefs, the decision to consume genetically modified foods (GMFs) can be explained by individuals' elaboration of information gained from the media and interpersonal discussion. Based on this idea, we incorporated communication factors (i.e., media attention, interpersonal discussion, and elaboration) with factors derived from the theory of planned behavior (i.e., attitude, subjective norm, and perceived behavioral control) to predict intention to consume GMFs in China. Results of the hierarchical regression analysis based on Web survey data from 467 university students showed that attitude, subjective norm, and perceived behavioral control were positively related to intention to consume GMFs. Although all communication factors did not predict intention to consume GMFs, we found that elaboration moderated the relationship between media attention and interpersonal discussion to intention to consume GMFs. Theoretical and practical implications are discussed.

*Keywords: genetically modified foods, theory of planned behavior, media attention, interpersonal discussion, elaboration*

Genetically modified foods (GMFs) are a byproduct of past decades' biotechnology advances. Currently, China is a leader in GMF research (Wong & Chan, 2016). As one of the first countries to permit the commercialization of genetically modified (GM) crops, China has commercialized several GM crops since 1997, including tomatoes, sweet peppers, and papayas (Zheng, Gao, Zhang, Zhang, & Henneberry, 2017). To date, China's cultivation area of GM crops ranks eighth in the world, and five types of transgenic crops (i.e., soybeans, corn, cotton, canola, and sugar beets) have been permitted for import either for

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cultivation or as raw materials for processing (International Service for the Acquisition of Agri-biotech Applications, 2017).

Despite China's progress in GMF research and development, Chinese politicians, activists, and consumers have debated its commercialization (M. F. Chen & Li, 2007). GMF advocates argue that this new biotechnology lowers food production costs, diversifies food choices, and promises increased yields (M. F. Chen & Li, 2007; Huang, Qiu, Bai, & Pray, 2006; Zhong, Marchant, Ding, & Lu, 2002). Such benefits would boost farming productivity and increase food supplies for the rapidly growing world population. Increased efficiency would also reduce the costs for farmers as well as the prices for consumers (Uzogara, 2000). However, GMF opponents express ethical, environmental, food safety, and ecological concerns (M. F. Chen & Li, 2007; Hu & Chen, 2004; Wu, Lyu, & Wu, 2015; Zhong, Marchant, Ding, & Lu, 2002). For example, many consumers believe that GMFs are harmful to their health because consumption of these genetically engineered foods may cause diseases that are immune to antibiotics (Hu & Chen, 2004). Meanwhile, many communities believe that this cross-pollination method can cause damage to other organisms that thrive in the environment (Uzogara, 2000).

Although scientific panels sponsored by the National Academy of Sciences, the British Royal Society, the World Health Organization, and other reputable institutions have concluded that GMFs (e.g., biotech crops) are safe for both humans and the environment (Appell, 2003), public attitudes toward GMFs are relatively poor and many consumers are not willing to pay for or consume GMFs as a result of this debate (Cui & Shoemaker, 2018). For instance, an online survey of 50,000 randomly selected Chinese respondents showed that 84% would not consume GMFs for safety reasons (Q. Wang, 2015). Similarly, an online survey of 9,000 respondents showed that 87% were reluctant to buy GMFs because of health and ecological concerns (Wu et al., 2015). Public attitudes toward genetic engineering and the subsequent acceptance of both its application and the products derived from the technology are becoming increasingly important in determining the future role of the technology in society. If consumer acceptance issues are not adequately addressed, then the potential economic and social benefits of modern biotechnology may not be realized (Stenholm & Waggoner, 1992). As such, it is crucial for policymakers and industry researchers to empirically understand the factors affecting consumers' intent to consume or avoid GMFs.

Although several studies have investigated Chinese consumers' attitude toward and intention to consume GMFs (e.g., M. F. Chen & Li, 2007; Hu & Chen, 2004; Wu et al., 2015; Zhang, Chen, Hu, Chen, & Zhan, 2016), the factors that influence consumers' intention to consume or avoid GMFs are still unclear, especially in the context of China. This study aims to fill this gap by examining the factors affecting Chinese university students' intention to consume GMFs from a health communication perspective. Using concepts from health communication literature, this study applied the theory of planned behavior (TPB), which has been used to link personal beliefs (i.e., attitude, subjective norm, and perceived behavioral control) with consumers' food choices and consumption habits (M. F. Chen, 2017; Cook, Kerr, & Moore, 2002; Fishbein & Ajzen, 2010; Spence & Townsend, 2006), to predict intention to consume GMFs. In addition to TPB factors, we also incorporated communication factors, such as media attention, interpersonal discussion, and elaboration, because studies suggest that these factors may shape individuals' health-related behavioral intentions (e.g., E. W. J. Lee, Ho, Chow, Wu, & Yang, 2013; T. T. C. Lin, Li, & Bautista, 2017). Incorporating communication factors with TPB factors is important because the decision to consume GMFs may not depend

solely on personal beliefs; elaborating information gained from mass media and interpersonal communication may also play a role.

Aside from the theoretical contributions, the results of this study may benefit practitioners and policymakers by characterizing public attitudes toward GMFs and guiding the design of more effective educational campaigns to improve GMF consumption in China.

## Theory of Planned Behavior

The TPB has been widely used to explain the psychological underpinnings of volitional behavior (Ajzen, 1991). Given that it is relatively simple and predicts consumer intention and behavior well, the TPB has received considerable attention and has been widely and successfully applied in consumer research (e.g., Armitage & Conner, 2001; Conner & Armitage, 2006; Dean, Raats, & Shepherd, 2008), including studies regarding food choice (e.g., M. F. Chen, 2017; Cook et al., 2002; Fishbein & Ajzen, 2010; Spence & Townsend, 2006). Therefore, we use the TPB as the theoretical underpinning to investigate individuals' intention to consume GMFs.

TPB hypothesizes that behavioral intention—defined as an individual's willingness to perform a behavior—predicts actual behavior (M. F. Chen, 2017). Meta-analyses have shown that the intention of performing a behavior has a large effect size on actual health-related behaviors (e.g., Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Hausenblas, Carron, & Mack, 1997; Topa & Moriano, 2010). This suggests that the stronger intentions to engage in the behavior lead to successful performance of the behavior. The TPB also postulates that individuals' behavioral intention is influenced by three factors: attitude, subjective norm, and perceived behavioral control.

Attitude refers to the favorable or unfavorable evaluation of a behavioral object (Fishbein & Ajzen, 1975). When individuals hold positive attitudes toward a behavior, they are more willing to engage in that behavior (Ajzen, 1991; Baker & White, 2010). In this study, we expected that consumers with a positive attitude toward GMFs would have greater intention to consume GMFs than those with a negative attitude toward GMFs.

Subjective norm is a behavior's perceived prevalence and the perception of others' expectation regarding the behavior (Ajzen, 1991). If individuals believe that their social referents (e.g., parents, friends, or significant others) view certain behaviors as important, their intention to engage in such behaviors increases (Yanovitzky, Stewart, & Lederman, 2006). China is a collectivistic society (J. Chen, Yu, Zhang, Li, & McGue, 2015; Earley, 1989) and people in collectivistic societies are likely to adhere to behaviors deemed appropriate by the majority (Soh & Leong, 2002). Therefore, it is reasonable to expect that subjective norm plays an important role in shaping Chinese consumers' intention to consume GMFs.

Perceived behavioral control refers to individuals' judgment of their ability to perform a behavior, considering the constraints and opportunities in their environment (Ajzen, 1991). Intention to perform a behavior is higher when individuals are confident about performing that behavior (Heirman, Walrave, &

Ponnet, 2013). In this study, we expected that consumers who believe they have control over their GMF consumption would have a greater intention to consume GMFs.

Considering that previous studies have demonstrated the utility of TPB factors for predicting food choices and consumption habits (e.g., M. F. Chen, 2017), we proposed the following hypotheses:

*H1: Attitude toward GMFs is positively related to intention to consume GMFs.*

*H2: Subjective norm is positively related to intention to consume GMFs.*

*H3: Perceived behavioral control is positively related to intention to consume GMFs.*

## Communication Factors

Although the TPB is popular in predicting consumer intention, some researchers have criticized the TPB, questioning whether attitudes, subjective norm, and perceived behavioral control are sufficient to predict intentions and behavior. For instance, some researchers have criticized that the TPB model often neglects affective aspects of attitude and considers only personal beliefs (Bagozzi, 1988; Conner & Sparks, 1996; Cook et al., 2002; Spence & Townsend, 2006). Extant previous studies have demonstrated that individuals' eating decisions may not depend solely on personal beliefs; elaborating information gained from mass media and interpersonal communication may also play a role (Derenne & Beresin, 2018; C. A. Lin & Lagoe, 2013). As such, in addition to TPB factors, this study also incorporated communication factors, such as media attention, interpersonal discussion, and elaboration, to investigate people's intention to consume GMFs.

### *Media Attention*

Media attention refers to the level of conscious attention that individuals dedicate to a type of media message (Slater, Goodall, & Hayes, 2009). In this study, media attention specifically represented consumers' attention toward GMF news via traditional (e.g., television, newspapers) and new (e.g., the Internet, social media) platforms. According to the information-processing model (McGuire, 2001), attention to news-related media messages is required to affect behavior. That is, the more attentive individuals are to media messages, the more likely it is that their perception and behavior will be reinforced or changed by those messages (DeFleur & Ball-Rokeach, 1989; C. A. Lin & Lagoe, 2013). Previous studies have shown that media attention and behavioral intention are related. For instance, T. T. C. Lin et al. (2017) found that attention to haze-related news via traditional and new media positively predicted behavioral intention to take preventive measures against haze. Moreover, E. W. J. Lee et al. (2013) found that attention to breast cancer messages in the media was positively correlated with Singapore women's intention to engage in preventive behaviors.

GMFs have attracted media attention since the late 1990s in China. With the development of transgenic technology and commercialization of some GM crops in China, there has been dramatic increase in coverage of GMFs since 1998. However, many studies have demonstrated that most of the GMF-related news reports tends to be negative in China. For instance, Zhong et al. (2002) documented newspaper

coverage of GMFs during 1995–2001 and found that most of the GMF-related reports tended to be negative, focusing on damage to human health, biosafety, and the environment. Wu and colleagues (2015) analyzed all online news reports related to GMFs and found that nearly 50% of online news reports were negative and 25% were neutral. As such, media attention to GMF news might actually have a detrimental effect on intention to consume GMFs because GMF news on various media platforms tends to be negative.

In addition to negative media reports, Chinese media have highlighted heated debates regarding GMFs among Chinese politicians, activists, and consumers (Cui & Shoemaker, 2018; Xu & Liu, 2018). There is evidence that conflicting scientific information may result in negativity biases in which consumers attend more sensitively to negative information (vs. positive information). For example, a previous study found that negative and conflicting headlines on e-cigarettes reduced perceptions of their benefits (Tan, Lee, Nagler, & Bigman, 2017). Likewise, research on nutrition beliefs has suggested that exposure to contradictory nutrition messages on TV is positively associated with nutrition confusion, which then leads to nutrition backlash and, ultimately, reduced consumption of fruits and vegetables (C. J. Lee, Nagler, & Wang, 2018). Given the negative effects from conflicting views on GMFs, we expected that individuals' attention to GMF news on various media platforms would decrease their intention to consume GMFs. Thus, we hypothesized that

*H4: Media attention to GMFs is negatively related to intention to consume GMFs.*

### *Interpersonal Discussion*

Interpersonal discussion is another important source of information that can affect an individual's behavior (Rogers, 1975). Individuals develop various attitudes, beliefs, and behavior through discussion with social agents, including family members, friends, and colleagues (T.T.C. Lin et al., 2017). Extant research has demonstrated that interpersonal discussion can influence health-related behaviors (Husaini et al., 2001; E.W.J. Lee et al., 2013; Valente, Walter, & Saba, 2001). For instance, Husaini et al. (2001) found that women who engaged in breast cancer discussions with friends were more likely to undergo mammography. Moreover, T.T.C. Lin and colleagues' (2017) study found a significant association between interpersonal discussion and intention to engage in self-protective measures during haze events.

A recent nationwide Chinese consumer study found that most Chinese consumers have either a neutral (46.7%) or negative (41.4%) attitude toward GMFs (Cui & Shoemaker, 2018). Another large-scale Chinese study reported similar results, with only 10.8% of respondents accepting GMFs (Wei, 2018). Because most Chinese consumers hold unfavorable attitudes toward GMFs, interpersonal GMF discussions might convey negative views. In light of this, we hypothesized that

*H5: Interpersonal discussion is negatively related to intention to consume GMFs.*

### *Elaboration*

In addition to the effects of media attention and interpersonal discussion, elaboration may also influence individuals' behavioral intentions (Ho, Peh, & Soh, 2013; E. W. J. Lee et al., 2013). Elaboration

refers to the cognitive process of linking new information with prior knowledge, personal experiences, and beliefs (Eveland, 2001; Eveland & Dunwoody, 2002). Given that elaboration requires a lot of mental energy to connect new information to existing knowledge, processing messages involves a high level of engagement (Greenwald & Leavitt, 1984). Berry, Wharf-Higgins, and Naylor (2007) argue that elaborative processing depends on the level of active thinking about the message content and the relevance of the message. If the relevance of an issue is high, the individual tends to think about the issue more (Oltedal, Moen, Klempe, & Rundmo, 2004). Because GMFs are a highly relevant topic for most consumers, the likelihood of processing information about GMFs is relatively high. Thinking more about GMFs and connecting them to undesirable outcomes might decrease confidence regarding GMFs, which can consequently decrease intention to consume GMFs. Thus, we hypothesized that

*H6: Elaboration is negatively related to intention to consume GMFs.*

Going beyond the main effects of media attention, interpersonal discussion, and elaboration on intention to consume GMFs, this study explored whether elaboration moderates the effects of media attention and interpersonal discussion on the intention to consume GMFs. Testing the moderating effects of elaboration may identify how the strength of elaboration can alter the impact of information sources on behavioral intentions (Ho, Scheufele, & Corley, 2010). For instance, Ho, Scheufele, and Corley (2013) found that elaboration amplified the strength of relationship of variables related to nanotechnology benefits perception (in relation to its risk) in the United States. Specifically, perception of the benefits of nanotechnology was significantly higher among those with high elaboration in groups with higher attention to science in newspapers, attention to science on television, and interpersonal communication. On the other hand, E. W. J. Lee and Ho (2015) found that elaboration had an attenuating effect on factors predicting perceived familiarity with nanotechnology in Singapore. Specifically, for individuals who engaged in high elaboration, the difference in perceived familiarity with nanotechnology in Singapore was smaller among those with high and low education as compared with those who engaged in low elaboration. Aside from empirical evidence shown in previous work, examining how elaboration moderates the effects of media attention and interpersonal discussion on the intention to consume GMFs can offer insights into identifying groups of people in which elaboration serves as a health communication intervention component (Ko, Campbell, Lewis, Earp, & DeVellis, 2011). Therefore, we proposed the following research questions:

*RQ1: Does elaboration moderate the relationship between media attention and intention to consume GMFs?*

*RQ2: Does elaboration moderate the relationship between interpersonal discussion and intention to consume GMFs?*

## Method

### *Data Collection and Respondent Profile*

We used a quantitative approach to test hypotheses and address the research questions. We collected Web survey data from university students enrolled in multiple universities located in a medium-sized Chinese city. Because the study was a preliminary work for a larger project on this topic, we initially

used convenience and snowball sampling to recruit respondents, sending a URL survey link via WeChat (a popular instant messaging app in China) initiated from our professional network in October 2017. Respondents were also asked to invite their university classmates and friends to take the survey. Respondents gave informed consent before participating in the survey, which took about 10 minutes to complete and did not collect names or other personally identifiable information.

Overall, there were 467 valid respondents, which met our calculated sample size requirement. An a priori power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) showed that we needed at least 270 respondents to ensure that the regression analysis could detect small effect sizes (.02) with 80% power within a 95% confidence interval. Thus, although nonprobability sampling techniques might have weakened the generalizability of the findings, the sample had enough statistical power to test the theoretical links among constructs.

### *Measures*

The questionnaire was initially prepared in English and later translated into Mandarin using the translation procedure recommended by the World Health Organization (2018). Specifically, the initial translation was conducted by a researcher familiar with terminology of genetically modified technology. Then, the first version of translation was reviewed and revised by a bilingual expert to identify and resolve the inadequate expressions/concepts of the translation, as well as any discrepancies among the forward translations. Finally, the translated version of the questionnaire was pretested on the target population. Below is the description of the items that were used to measure each of the variables.

Intention to consume GMFs ($M$ = 3.13, $SD$ = 0.60) was evaluated through five items adapted from Y. G. Kim, Jang, and Kim (2014), such as "I intend to consume GMFs in the future" and "I will suggest that my family members consume GMFs." The items used a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) and had adequate reliability (Cronbach's α = .72).

Attitude toward GMFs ($M$ = 2.86, $SD$ = 0.66) was measured using four items, such as "Genetically modified foods are unhealthy" (reverse coded) and "Genetically modified foods are safer than traditional foods." The items used a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) and had adequate reliability (Cronbach's α = .80).

Subjective norm ($M$ = 2.66, $SD$ = 0.66) was measured using three items from Park and Smith (2007), such as "People whose opinions you value would approve of your consuming GMFs" and "Most people who are important to you think that you should not consume GMFs" (reverse coded). The items used a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) and had adequate reliability (Cronbach's α = .74).

Perceived behavioral control ($M$ = 3.53, $SD$ = 0.79) was measured using two items from Ho, Liao, and Rosenthal (2015): "It is possible for me to consume GMFs" and "If I wanted to, I could consume GMFs." The items used a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) and had adequate reliability (Cronbach's α = .70).

Media attention (*M* = 2.68, *SD* = 0.64) was measured using five items from T. T. C. Lin et al. (2017) that asked respondents to indicate how much attention they paid to GMF news in newspapers, television, radio, the Internet, and social media (1 = *no attention at all*, 5 = *very close attention*). The items had adequate reliability (Cronbach's α = .83).

Interpersonal discussion (*M* = 2.27, *SD* = 0.74) was measured using three items from T. T. C. Lin et al. (2017) by asking respondents to report the frequency of discussions about GMFs with family, friends, and classmates (1 = *never*, 5 = *all the time*). The items had good reliability (Cronbach's α = .81).

Elaboration (*M* = 3.26, *SD* = 0.74) was measured using three items from Ho, Peh, and Soh (2013), such as "When I am reading or watching the news, I carefully analyze the information given about GMFs" and "After I encounter news on GMFs, I am likely to stop and think about it." Respondents were asked to indicate their agreement on these items based on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). The items had good reliability (Cronbach's α = .80).

Age (*M* = 20.76 years, *SD* = 3.82), gender (1 = male, 2 = female; *M* = 3.26, *SD* = 0.74), and year level (*M* = 2.61, *SD* = 1.45) were controlled for in the analysis.

Appendix Table A1 lists the items that were used to measure each variable.

### *Data Analysis*

IBM SPSS Statistics, Version 21 was used to analyze the data. We used hierarchical regression analysis to examine relationships between the group of factors and intention to consume GMFs. Independent variables were entered in blocks to represent each group: Controlled variables were placed in the first block, TPB factors (i.e., attitude, subjective norm, and perceived behavioral control) in the second block, communication factors (i.e., media attention, interpersonal discussion, and elaboration) in the third block, and interactions (Media Attention × Elaboration and Interpersonal Discussion × Elaboration) in the final block. To examine interaction effects, we created the interaction terms by multiplying the centered values of the respective main effect variables to reduce potential multicollinearity (Cohen, Cohen, West, & Aiken, 2003). Among those with significant interaction results, we plotted high (median or above) and low (below the median) groups for media attention, elaboration, and interpersonal discussion groups based on their median. We used median values for the cut-off given that they were less likely to be affected by outliers and skewed data. Zero-order correlation was also examined before running the regression analysis.

## Results

The respondents' average age was 20.76 years (*SD* = 3.82), and most were female (61.0%) and undergraduate students (84.6%); 48.6% were enrolled in the humanities, followed by science and engineering (28.5%) and social sciences (19.1%) programs.

Table 1 presents the regression analysis results, which significantly explained 51.50% of the variance for intention to consume GMFs.

***Table 1. Hierarchical Regression Results Predicting Intention to Consume Genetically Modified Foods.***

| Variable | Zero-order correlation | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|---|
| Block 1: Control variables | | | | | |
| Age | −.19*** | −.23*** | −.10* | −.10* | −.09 |
| Gender | .04 | .02 | .07* | .06 | .05 |
| Year level | .09* | .06 | .04 | .05 | .05 |
| Incremental $R^2$ (%) | | 3.80*** | | | |
| Block 2: Theory of planned behavior factors | | | | | |
| Attitude | .61*** | | .36*** | .36*** | .36*** |
| Subjective norm | .44*** | | .09* | .09* | .09* |
| Perceived behavioral control | .61*** | | .37*** | .37*** | .37*** |
| Incremental $R^2$ (%) | | | 46.60*** | | |
| Block 3: Communication factors | | | | | |
| Media attention | −.07 | | | −.05 | −.05 |
| Interpersonal discussion | −.02 | | | .05 | .05 |
| Elaboration | −.03 | | | .02 | .02 |
| Incremental $R^2$ (%) | | | | | .30 |
| Block 4: Interactions | | | | | |
| Media Attention × Elaboration | | | | | −.11* |
| Interpersonal Discussion × Elaboration | | | | | .09* |
| Incremental $R^2$ (%) | | | | | .80* |
| Total $R^2$ (%) | | | | | 51.50*** |

*Note*. $N$ = 467. Cell entries for all models are final standardized regression coefficients for Blocks 1, 2, 3, and 4.
*$p$ < .05. **$p$ < .01. ***$p$ < .001.

Among the control variables, age ($r$ = −.19, $p$ < .001) and year level (r = −.09, $p$ < .05) were negatively related to intention to consume GMFs at the zero-order level. However, these significant correlations were nonsignificant in the regression analysis.

Among TPB factors, attitude (β = .36, $p$ < .001), subjective norm (β = .09, $p$ < .05), and perceived behavioral control (β = .37, $p$ <.001) were positively related to intention to consume GMFs, supporting Hypotheses 1, 2, and 3. These factors explained 46.60% of the variance in the model.

In terms of communication factors, media attention, interpersonal discussion, and elaboration did not predict intention to consume GMFs; thus, Hypotheses 4, 5, and 6 were rejected. However, we found significant interaction effects on intention to consume GMFs for media attention and elaboration (β = −.11, $p$ < .05) and for interpersonal discussion and elaboration (β = .09, $p$ < .05). As shown in Figure 1, among respondents with high media attention, those with greater elaboration were less willing to consume GMFs than those with lower elaboration, whereas there was little difference among those with low media attention.

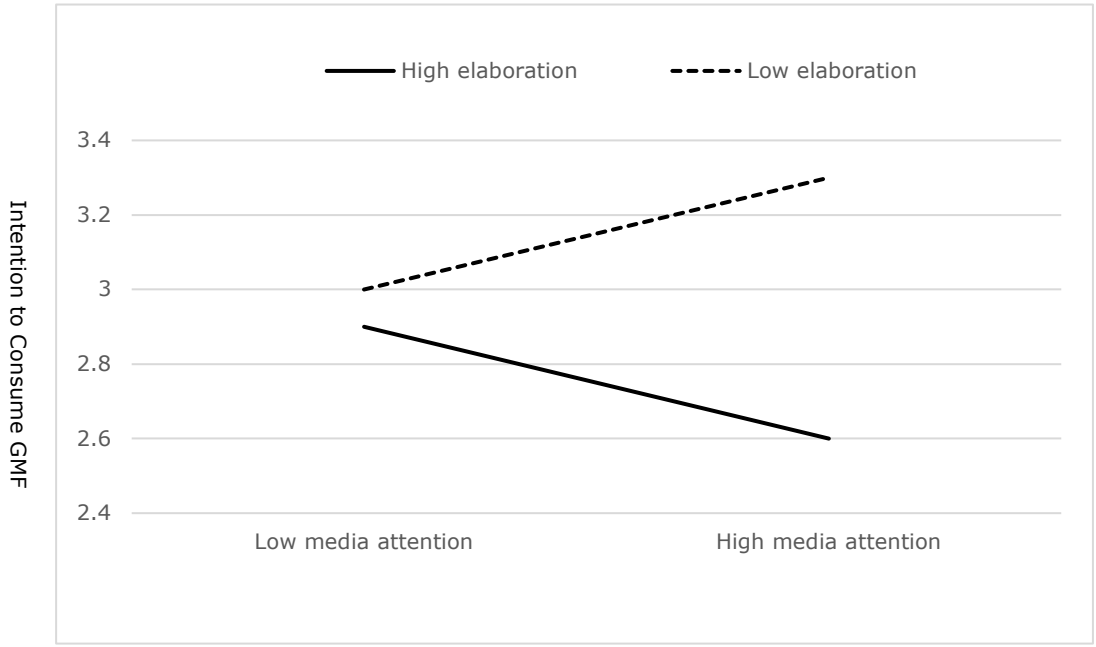


***Figure 1. Elaboration as a moderator of the relationship between media attention and intention to consume genetically modified foods. The y-axis* (intention to consume GMF) *presents the estimated values of intention to consume genetically modified foods, which controlled for all demographic and independent variables. Scale ranges are only partially displayed on the y-axis.***

Similarly, as shown in Figure 2, among respondents with higher interpersonal discussion, those with greater elaboration were more willing to consume GMFs, whereas there was little difference among those with lower interpersonal discussion.

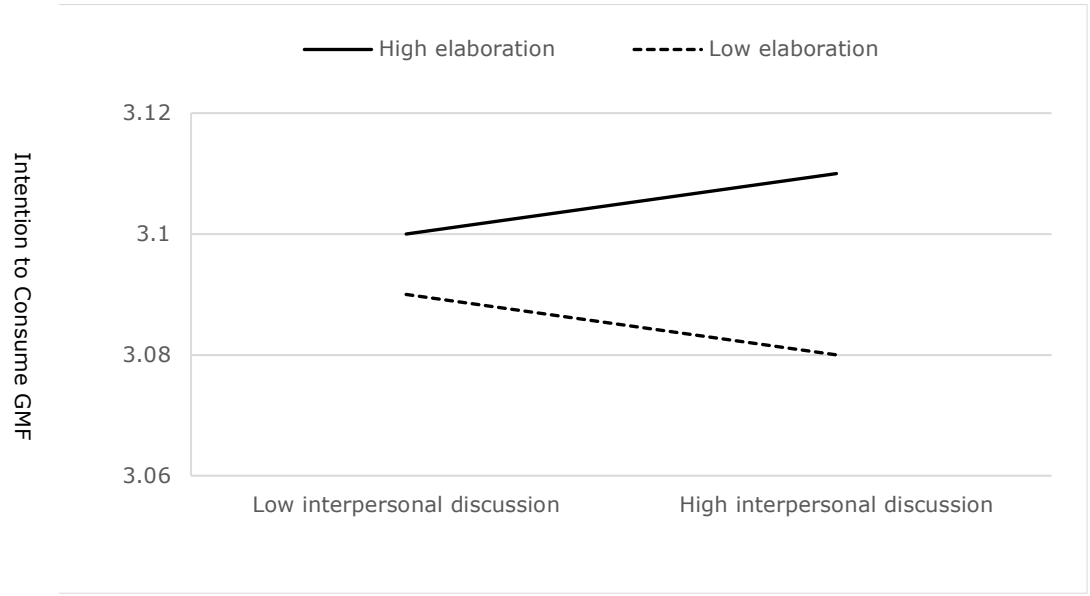


***Figure 2. Elaboration as a moderator of the relationship between interpersonal discussion and intention to consume genetically modified foods. The y-axis* (intention to consume GMF) *presents the estimated values of intention to consume genetically modified foods, which controlled for all demographic and independent variables. Scale ranges are only partially displayed on the y-axis.***

## Discussion

This study examined how TPB (i.e., attitude, subjective norm, and perceived behavioral control) and communication factors (i.e., media attention, interpersonal discussion, and elaboration) predict intention to consume GMFs based on a sample of university students in China. Overall, the study yields interesting results that contribute to a greater understanding of behavioral and communication factors that affect intention to consume GMFs.

Consistent with prior research in which TPB was used to predict food choices and consumption habits (e.g., M. F. Chen, 2017; Fishbein & Ajzen, 2010; Y. G. Kim et al., 2014; Spence & Townsend, 2006), our results show that attitude, subjective norm, and perceived behavioral control are positively associated with intention to consume GMFs. In general, the results are consistent with the TPB because intention to consume GMFs was influenced by attitude, subjective norm, and perceived behavioral control (Ajzen, 1991), suggesting that Chinese consumers have a greater intention to consume GMFs if they hold a positive attitude toward them, believe that their social agents approve of such behavior, and feel that GMF consumption is within their control. Such explanation is consistent in studies in which TPB variables were used to predict intention for human papilloma virus vaccination (Gerend & Shepherd, 2012; K. M. Kim & Choi, 2017), climate change advocacy (Elias, Blaine, Morrison, & Harris, 2019), and buying environmentally friendly products (Yadav & Pathak, 2016). Moreover, consistent with other TPB research (e.g., Norman, Clark, & Walker, 2005), this study found that TPB factors (i.e., attitude, subjective norm, and perceived behavioral control)

explained more than 50% of the variance for intention to consume GMFs, suggesting that the original TPB model is robust for predicting behavioral intention within the context of GMF consumption research in China.

Contrary to our expectations, communication factors (i.e., media attention, interpersonal discussion, and elaboration) were not directly related to intention to consume GMFs. This result is surprising because past studies on health- and science-related issues have shown that these factors play a vital role in shaping behavioral intentions (e.g., Ho et al., 2015; T. T. C. Lin et al., 2017). Contrary to past research on health-related issues (e.g., T. T. C. Lin et al., 2017) and McGuire's (2001) information-processing model, our results show that media attention had no relationship with intention to consume GMFs, suggesting that the amount of attention Chinese consumers dedicate to GMF news on various media platforms does not influence their intention to consume GMFs. This inconsistency may plausibly be because the influence of media attention on people's behavior intention is indirect. Given that previous studies have found that media attention influences cognition and attitudes, which in turn affect behavioral outcomes (López-Guimerà, Levine, Sánchez-Carracedo, & Fauquet, 2010; Ward, Epstein, Caruthers, & Merriwether, 2011), a possible aspect to consider is whether the effect of media attention on intention to consume GMFs is mediated by their cognition and attitudes toward GMFs.

Similarly, we found that interpersonal discussion was not related to intention to consume GMFs, which also contradicts past research findings that interpersonal discussion is related to behavioral intentions in health-related issues (e.g., Husaini et al., 2001; E. W. J. Lee et al., 2013). In general, our findings suggest that discussing GMF issues with others, such as family members, friends, and classmates, has no effect on Chinese individuals' intention to consume GMFs. The inconsistency may be a result of respondents' low frequency of interpersonal discussions related to GMF issues. Similar to the findings of a study regarding intention to smoke (Namkoong, Nah, Record, & Van Stee, 2017), it is also possible that interpersonal discussion did not have much effect on intention because the respondents were not keen on discussing the topic interpersonally. A close inspection of the interpersonal discussion items revealed that most participants responded either "never" or "seldom" to items that asked about discussing GMF issues with family members (59%), friends (60%), and classmates (61%). Nonetheless, considering that China has a collectivist culture that is evidenced by a tight-knit society (Nguyen, Chang, & Simkin, 2014; X. Wang et al., 2016), it is also possible that people refrain from discussing GMF-related issues interpersonally to avoid interpersonal conflicts considering how debatable the topic is. In light of this, the finding that interpersonal discussion did not affect intention to consume GMFs is reasonable.

We also did not find a significant relationship between elaboration and intention to consume GMFs, which is inconsistent with the results reported by Ho, Peh, and Soh (2013), but similar to results reported by E. W. J. Lee et al. (2013). This may be related to respondents' general lack of awareness and knowledge regarding GMF issues. Considering their low mass media attention to GMF issues, including infrequent interpersonal discussions, it is possible that they had little knowledge of GMF issues, thus making elaboration insufficient to predict intention to consume GMFs. Future research should examine the level of individuals' knowledge about GMFs in more detail to better identify potential associations with elaboration and intention to consume GMFs.

Although communication factors did not directly predict intention to consume GMFs, it is interesting that the interaction of media attention and interpersonal discussion with elaboration was statistically significant. Specifically, among those with high media attention, those who engaged in greater elaboration had lower intention to consume GMFs than those who engaged in less elaboration. Conversely, the difference in intention to consume GMFs was negligible among those who indicated low media attention. This suggests that elaboration attenuated the relationship between media attention and behavioral intention. This result is somewhat expected given that most of the GMF-related news reports tend to be negative in China (e.g., "Movie Stars and Soybeans," 2018; Wu et al., 2015; Zhong et al., 2002). It is possible that respondents were primarily exposed to large negative GMF news, causing them to elaborate on predominantly negative GMF information, which consequently attenuated their intention to consume GMFs. Based on these findings, if it is in the interest of the government to boost GMF acceptance and consumption, health authorities in China should increase media content that delivers more positive GMF messages and addresses negative concerns. Providing reliable information on the risks and benefits of GMFs will allow consumers to engage in more balanced and meaningful elaboration of GMF issues, which may positively influence the intention to consume GMFs.

We also found that the interaction between interpersonal discussion and elaboration had a significant effect on intention to consume GMFs. Specifically, respondents who indicated more interpersonal discussions and greater elaboration were more willing to consume GMFs compared with those with the same higher level of interpersonal discussion but lower elaboration. This suggests that the elaboration process strengthens the relationship between interpersonal discussion and behavioral intention. This finding may be related to our respondents' characteristics. Because this study was a preliminary work for a larger project, we gathered Web survey data from university students who were born after 1990. According to a recent national study of Chinese opinion toward GMFs, individuals born after 1990 have more positive views about GMFs (Cui & Shoemaker, 2018). Therefore, they may elaborate more on positive views when encountering both positive and negative views through interpersonal discussion, consequently positively influencing their intention to consume GMFs. This result highlights the potential importance of elaborating after discussing positive GMF issues with others given that it might lead to greater intention to consume GMFs.

### *Limitations and Future Research*

This study has several limitations that can serve as platforms for future research. First, our cross-sectional design did not allow us to infer causal relationships among variables. Future research could use a longitudinal design to establish causality. Second, even though we employed a well-known theory (i.e., TPB) and included significant findings from empirical studies to develop our research questions and hypotheses, the results may not be generalizable because our respondents were limited to university students who represent a specific context of Chinese social and cultural settings. Thus, studies should be conducted across a broad spectrum of the population to validate the conclusions and provide evidence of generalizability. Third, this study lacks data on the extent of information bias (i.e., more positive or more negative) present in the media and interpersonal discussions. Future research could examine the positive or negative potential of specific GMF media messages and interpersonal discussions to better understand how positive and negative messages affect the intention to consume GMFs. Fourth, although the predictors explained a large

proportion of the variance in the current study, more antecedent factors of GMF consuming intention should be further investigated in the future studies, such as knowledge about GMFs and public trust of science technology. Finally, although the sample size was adequate for this study, future research could increase the generalizability of the results by recruiting more respondents across a variety of demographics (e.g., age group, income, educational level, location).

## Conclusion

The study results have several theory and practice implications. First, this study is among the first to investigate the factors that predict intention to consume GMFs in China from a health communication perspective. The findings provide important knowledge that may lead to a better understanding of GMF-related issues and potential solutions. For instance, unlike the results of public opinion research from other countries, this study shows that media attention and interpersonal discussion have no significant impact on Chinese university students' intention to consume GMFs. However, these factors can influence consumption behavior depending on their level of elaboration. Second, this study contributes to existing health and science communication literature by showing how TPB and communication factors affect the intention to consume GMFs in China. The significant factors identified in this study can be used to understand other controversial health and science issues, such as embryonic stem cell research and gene therapy, in other geographical contexts. Third, this study highlights the utility of TPB for explaining intention to consume GMFs in China. Finally, the findings can be used to assist stakeholders in developing strategies to improve public opinion toward GMFs. Specifically, the results can be used to design GMF information and education campaigns. For instance, because attitude has a significant impact on intention to consume GMFs, health authorities, including GMF manufacturers and distributors, can implement campaigns to increase public awareness of GM technology, which can help build favorable attitudes toward GMFs.

Overall, this study examined young Chinese consumers' decision-making process regarding their intention to consume GMFs. The results shed light on behavioral and communication factors that influence intention to consume GMFs. Future research involving a larger sample of Chinese respondents is warranted to improve the generalizability of the results.

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## Appendix

***Table A1. Survey Items.***

| | |
|---|---|
| Intention to consume genetically modified foods (GMFs): 1 = *strongly disagree*, 5 = *strongly agree* | |
| 1 | I intend to consume GMFs. |
| 2 | I will suggest that my family members consume GMFs. |
| 3 | If the nutrients of GM food are more than non-GM, I will buy them. |
| 4 | If GM foods are cheaper than non-GM, I will buy them. |
| 5 | I am very eager to buy non-GM food. |
| Attitude toward GMFs: 1 = *strongly disagree*, 5 = *strongly agree* | |
| 1 | Genetically modified foods are safer than traditional foods. |
| 2 | Genetically modified foods are more nutritious than traditional foods. |
| 3 | Genetically modified foods are unhealthy. |
| 4 | Applying gene technology in food production is dangerous. |
| Subjective norm: 1 = *strongly disagree*, 5 = *strongly agree* | |
| 1 | People whose opinions you value would approve of your consuming GMFs. |
| 2 | People who are close to you expect you to consume GMFs. |
| 3 | Most people who are important to you think that you should not consume GMFs. |
| Perceived behavioral control: 1 = *strongly disagree*, 5 = *strongly agree* | |
| 1 | It is possible for me to consume GMFs. |
| 2 | If I wanted to, I could consume GMFs. |

| | |
|---|---|
| Media attention: 1 = *no attention at all*, 5 = *very close attention* | |
| 1 | How much attention do you pay to stories related to GMFs in print newspapers? |
| 2 | How much attention do you pay to stories related to GMFs on television? |
| 3 | How much attention do you pay to stories related to GMFs on radio? |
| 4 | How much attention do you pay to stories related to GMFs on the Internet? |
| 5 | How much attention do you pay to stories related to GMFs on social media? |
| Interpersonal discussion: 1 = *never*, 5 = *all the time* | |
| 1 | How often do you discuss GMF-related issues with your family? |
| 2 | How often do you discuss GMF-related issues with your friends? |
| 3 | How often do you discuss GMF-related issues with your classmates? |
| Elaboration: 1 = *strongly disagree*, 5 = *strongly agree* | |
| 1 | When I am reading or watching the news, I carefully analyze the information given about GMFs in the news. |
| 2 | After I encounter news on GMFs, I am likely to stop and think about it. |
| 3 | I often relate what I learned from the news on GMFs to other things I know. |