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Investigating the Impact of Message Framing on Consumer Perceptions of Food Safety: A Meta-Analytic Review

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Introduction/Theoretical Framework/Purpose/Research Questions

The way information is framed can influence people's beliefs and behaviors (Britwum & Yiannaka, 2019). Because strategically framing information draws the attention of the message recipient to important elements and emphasizes their learning of key information (Entman, 1993). Framing, as a communications strategy, is grounded in Bateson's (1972) frame theory, which posits that the manner in which information is presented influences how people make sense of it (Chong & Druckman, 2007). In recent years, science communicators have used message framing as a means to improve consumer perceptions, knowledge, and behaviors related to food safety. For example, Britwum (2019) found that a loss-framed message was most effective at increasing consumers' willingness to pay for beef products from vaccinated cattle. Gifford and Bernard (2004) found that when exposed to a negative frame, people who had high trust in food safety were less likely to purchase organic food. In addition, Schroeter et al. (2001) found that framing messages to emphasize the benefits of a food safety technology can elicit positive buying behavior in consumers. Thus, message frames effect consumers' perceptions of food safety differently, and varying evidence exists to support these effects.

The purpose of our meta-analysis is to analyze the effect message framing strategies have on consumer perceptions of food safety. Three research questions guided the study: 1) What is the overall impact message framing strategies have on consumer perceptions of food safety?; 2) How do the persuasive effects of message framing vary across different types of framing strategies?; and 3) How do the persuasive effects of message framing vary when the food safety topic involves animal agriculture versus plant agriculture?

Method

To identify studies to include in the meta-analysis, we developed a search strategy with key search phrases and Boolean operators to be used across four databases—Academic Search Ultimate, JSTOR, Web of Science, and ScienceDirect. We included only studies that used experimental or survey research designs because they needed to test the effect of a message framing strategy as an intervention. The independent variable had to be a specific type of message framing strategy, and the dependent variable had to be consumer perceptions of a food safety topic. Based on the search strategy, we uploaded 1,098 articles into Covidence and conducted an initial title and abstract screening of each article. Of these 1,098 articles, we conducted a full text review of 28. Only five articles satisfied all of our inclusion criteria and, therefore, were included in the meta-analysis (Jackson & Turner, 2017). We extracted data from the five articles to compute 12 effect sizes because each study tested the effect of at least two types of frames (i.e., gain/loss, vice/virtue). We used Cohen's *d* as the effect size metric but converted Cohen's *d* to Hedge's *g* (1981) to account for the statistical bias in small samples. Then, we used R studio to compute the variance of effect sizes.

Of the five articles included, the smallest sample size was $n = 216$ (Hsu & Chen, 2014), and the largest was $n = 700$ (Boeuf, 2019). Three articles used U.S. consumers (Anghelcev,

2020; Boeuf, 2019; Britwum & Yiannaka, 2019), one article used Taiwanese consumers (Hsu & Chen, 2014), and the other used Korean consumers (Jin & Han, 2014). The dependent variable of interest in each study was consumers' perceived safety or health risk perceptions of a specific food type or food safety intervention. The independent variables (message frames) used in the studies included gain and loss frames (Britwum & Yiannaka, 2019), binding (conservative) and individualizing (liberal) frames (Boeuf, 2019), vice and virtue frames (Anghelcev, 2020), amount of information frames (more vs. less; Jin & Han, 2014), and headline difference frames (inclusion and exclusion of "industrial"; Jin & Han, 2014). Last, the food type or food safety interventions of focus included beef tallow (Jin & Han, 2014), pus milk (Jin & Han, 2014), produce (Hsu & Chen, 2014), cattle vaccines against E. *coli* (Britwum & Yiannaka, 2019), cattle direct fed microbials (Britwum & Yiannaka, 2019), hot dogs (Boeuf, 2019), and pizza (Anghelcev, 2020).

Results

We conducted exploratory analyses by computing a forest plot to view effect sizes and their respective confidence intervals across studies. The summary effect size was 1.61, which indicates message framing has a significant, large, positive effect on consumer perceptions of food safety. The confidence interval from the summary effect size was quite wide [0.85, 2.36], which indicates low precision. We also investigated the potential for publication bias by using Egger's regression test. Results were statistically significant ($t = 5.2177$, df = 10, $p = 0.0004$), which provides evidence for publication bias. To analyze effect size homogeneity, we used a random-effects model. Results from the Q test for heterogeneity (Q(df = 11) = 1672.2972, $p < .0001$) indicated that heterogeneity exists across effect sizes. We also conducted two moderator analyses using unconditional fixed-effect ANOVA-like models. Specifically, we investigated how the type of message frame ($QE = 545.57$, $QM = 1130.73$, df = 10,1, $p < .0001$) and the type of food or food production technology used as the topic for framing ($QE = 1649.14$, $QM = 27.16$, df = 10,1, $p < .0001$) effected consumer perceptions. Both moderators had statistically significant effects on the variation of effect sizes.

Conclusions and Recommendations

Message framing has a significant, large, positive effect on consumers' perceptions of food safety, based on the summary effect size of 1.61 (RQ1). Moderator analyses revealed that the frame type and the food safety topic both had statistically significant effects on the variation of effect sizes. Specifically, gain and loss framed messages had a more significant impact on consumers' perceptions of food safety than did other types of message frames (RQ2). In addition, message frames had a more significant effect on consumers' perceptions of food safety when the message framed involved animal agriculture and a less significant effect when the message framed involved plant agriculture (RQ3). However, results from Egger's regression test indicate that severe publication bias existed. It is critical that results from studies investigating the impact of message frames be published even if they do not show statistically significant findings because results that are not statistically significant can also provide meaningful direction and reduce publication bias. We recommend a similar meta-analysis be conducted that investigates how health claims effect consumer perceptions of food safety.

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