Public's Cognitive and Emotional Responses to Nuclear Messages: Implications for Effective Nuclear Communication Programs

Hyo Jung Kim
Kepco International Nuclear Graduate School, Ulsan 689-882
hyojkim@kings.ac.kr

1. Introduction

The public debate over the use of nuclear energy is not limited to the area of technology, and has become subject to the public's subjective perceptions and emotions regarding the issue. Based on Prospect Theory, a behavioural economic theory, this study investigates how the public's *cognitive* perceptions of nuclear power are influenced by gain vs. loss framing in nuclear messages. Additionally, public's *emotional* responses to nuclear messages were also examined based on Psychological Reactance Theory.

2. Methods and Results

2.1 Gain versus Loss Framing

According to Prospect Theory (Kahneman & Tversky, 1979)[1], people would be less inclined to take risks when considering gains, whereas they would be more inclined to take risks to avoid losses because the subjective value of those losses is relatively high. This propensity to choose risk-averse options when a problem is framed as a gain and risk-seeking options when a problem is framed as a loss has been applied to the context of nuclear communication. That is, this study examined whether loss-framed messages featuring nuclear energy (i.e., emphasizing the negative outcomes of *not* using nuclear power) would be more effective than gain-framed messages (emphasizing the positive outcomes of using nuclear power), in improving public's attitudes toward nuclear energy.

A professional research institution sent an online survey to 2,000 Seoul citizens in February 2016, and a total of 566 respondents participated in this study. The results of ANOVA (Analysis of Variance) using SPSS22 program showed that the frame type had a significant main effect on credibility perceptions [F (1, 564) = 4.53, p = .034]. That is, the participants exposed to a loss-framed message tended to perceive the message as more credible, compared to those exposed to a gain-framed message. Regression analysis showed that the participants' perceptions of message credibility was positively associated with attitudes toward nuclear energy [*Adjusted R2* = .376, F(1, 564) = 341.38, p < .001, β = .614, t = 18.47 (p < .001)]. The participants' attitudes toward nuclear energy was positively associated with their intentions to support nuclear energy [*Adjusted R2* = .541, F(1, 564) = 666.31, p < .001, β = .763, t = 25.81 (p < .001)]. For conceptual model illustrating the relationships among he variables, see figure 1.

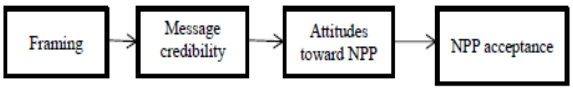

Figure 1. Conceptual model of framing effects

2.2 Moderating Factor of Framing Effects

Framing literature has suggested that the relative effectiveness of gain vs. loss framing would be moderated by various individual factors. In this study, individuals' use of online news was examined as a possible moderating factor.

The two-way ANOVA results showed a significant interaction effect between frame type and online news use [F(1,559) = 2.36, p = .053]. For participants with no or too much use of online news, gain-framed messages were more effective in improving attitudes toward NPP. In contrast, for those who consume relatively reasonable amount of online news, loss-framed messages tended to be more effective in improving attitudes toward NPP. This is in a line with the "thoughtful receiver hypothesis" (Brewer, 2001)[2] that a message recipient's prior knowledge of a given issue can facilitate the framing effects. Spence and Pidgeon (2010) [3] also argued that framing effects would be stronger when individuals attend the message more carefully and process the contents in a more systematic level.

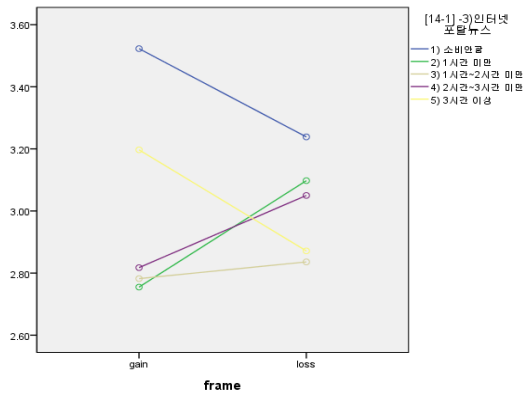

Figure 2. Interaction effect between frame type and online news use on attitudes toward NPP

2.3 Psychological Reactance

Psychological reactance theory (PRT) posits that people tend to be psychologically aroused when they perceive their freedom to be threatened by others

(Brehm, 1989)[4]. In the field of communication, PRT offers an explanation for why persuasive messages can sometimes produce unintended effects and even results at odds with their intent. Only limited research to date, however, has investigated how messages in nuclear communication would intensify the public's psychological reactance toward nuclear energy. This current study, therefore, investigates the psychological processes in the reactance to news articles featuring the benefits of nuclear energy.

This study measured psychological reactance using both affective (i.e., anger) and cognitive (i.e., unfavorable thoughts) assessments, based on prior works of Quick and his colleagues (e.g., Quick & Kim, 2009)[5]. The experiment data (N= 562) were analyzed for modeling. To test the proposed model, a structural equation modeling (SEM) analysis using AMOS 21 was performed. Missing values were treated using the method of full information maximum likelihood estimates. The proposed models did not produce relatively satisfying goodness-of-fit values at the early stage of analysis. Thus, a modification process was performed by removing insignificant paths in the initial model.

As the result, the modified models have the following goodness-of-fit values: Normative Fit Index (NFI) = 0.983; Comparative Fit Index (CFI) = 0.989; Root Mean Square Error (RMSEA) = 0.059. The modified model is presented in Figure 3 with standardized coefficients. The model illustrates how participants' reactance influences their benefit perception, risk perception, and message credibility, which in turn affect their acceptance of nuclear energy and intent to seek more information about nuclear energy.

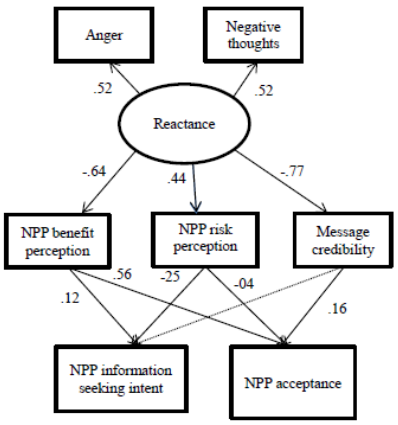

Fig. 3. Structural Equation Model illustrating the effects of public reactance to nuclear messages

3. Conclusions

This study empirically demonstrated the advantage of loss framing in improving public's favorable responses toward nuclear energy messages. Such framing effect was found to be moderated by individuals' daily use of online news. This study also found that news articles focusing on the benefits of nuclear energy could actually elicit some unintended emotional responses (i.e., psychological reactance) from publics. The findings of this study suggest that public's cognitive and emotional responses toward nuclear messages should be carefully considered when planning effective nuclear communication program.

REFERENCES

[1] Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263-291.
[2] Brewer, P. (2001).Value words and lizard brains: Do citizens deliberate about appeals to their core values? *Political Psychology* 22(1), 45–64.
[3] Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change*, *20*, 656-667.
[4] Brehm, J. W. (1989). Psychological reactance: Theory and applications. *Advances in Consumer Research*, *16*, 72-75.
[5] Quick, B. L., & Kim, D. K. (2009). Examining reactance and reactance restoration with South Korean adolescents: A test of psychological reactance within a collectivist culture. *Communication Research*, *36*, 765-782.