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Effects of Risk Presentation Format and Fear Message on Laypeople's Risk Perceptions*

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This study tests how media messages that have different risk presentation formats and include fear independently and jointly affect people's risk perceptions. An online experiment was conducted nationwide among South Korean adults regarding three major health risk topics: carcinogenic hazards, H1N1, and mad cow disease. The risk presentation formats used were numeric and verbal presentation of risk information. Fear was manipulated through the presence versus absence of laypeople's expressions of fear in the message stimuli. Analysis of Covariance (ANCOVA) results among 914 samples indicate that the message conditions with fear and with verbal risk presentation format respectively tend to have a higher level of risk perceptions than those without fear and with numeric risk presentation format. Some interaction effects were found such that the message condition with fear and verbal risk presentation format generated the highest level of risk perception in the context of mad cow disease. Practical implications are discussed regarding media strategies in various risk circumstances.

KEYWORDS risk presentation format; uncertainty; negative emotion; fear; risk perception; media

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Introduction

The public's perception of risk plays a critical role in determining the priorities, policy decisions, and responsiveness of health and risk managers. Risk perceptions are people's subjective judgments about the likelihood of negative occurrences such as injury, illness, disease, and death (Slovic, 1987). Such perceptions may often be affected by two of the key psychological components of risk—emotions and uncertainty about the unknown (Loewenstein et al., 2001; Peters & Slovic, 1996). According to accounts such as the functional theory of emotion (Nabi, 2002; Visschers et al., 2012), discrete emotions such as fear and anger play differential roles in risk perceptions and coping behavior. Uncertainty about the unknown relates to the fact that risks are fundamentally probabilistic in nature. These two psychological components of risk perception are also typically featured in news stories about risk. However, existing research has not yet examined how their presence in news coverage may affect laypeople's risk perceptions.

Many of the ways in which the media affect people's risk perceptions have been thoroughly documented. People typically do not experience the vast array of risk issues directly. Instead, they rely on how the media (particularly the news) inform them about and represent risks. Substantial research has shown that public awareness and perceptions of risk can be influenced by the way journalists frame and cover a risk issue, as well as what they decide to include and exclude from their reporting (Griffith, Mathias, & Price, 1994; Miles, Braxton, & Frewer, 1999). But one thing that is lacking in this research is a specific focus on the roles played by the topics of emotion and uncertainty. When covering various risk issues, journalists tend to highlight the specific emotions that people feel with respect to those risks, for example fear, dread, anger, worry, and outrage (Gainor & Menefee, 2007; Sandman, 1997). They also tend to highlight the scientific uncertainty surrounding a risk (Powell, Dunwoody, Griffin, & Neuwirth, 2007). Since these topics are such typical features of risk stories, it would be useful to understand how their presence in news stories might influence people's risk perceptions.

As part of such an investigation, a related issue that needs to be further explored is whether different ways of representing uncertainty may have differential effects on people's risk perceptions. Journalists can present the uncertainty surrounding risks by using either numerical estimates or verbal estimates (Patt & Schrag 2003; Wardekker et al., 2008). This choice about how to present a risk is referred to hereafter as *risk*

presentation format. Presenting risk probabilities in numbers as opposed to words could lead the public to have different levels of uncertainty, which in turn could lead them to perceive a risk with differing levels of severity. But existing research on this issue shows either limited or mixed findings (Johnson & Slovic, 1995; Kuhn, 2000). More research is therefore needed to examine the specific roles that various risk presentation formats, in conjunction with the emotional content of news coverage, play in risk perceptions.

To fill this gap in the research, the current study's purpose is to examine how people's perceptions of risks are affected independently and jointly by media messages that use different risk presentation formats (i.e., numeric vs. verbal) and that either include or exclude emotion (i.e., fear). Guided by theoretical and empirical accounts drawn from literature on uncertainty, affect heuristics, and risk communication, this study analyzes the results of a quasi-experiment collected online from a nationally representative sample of 914 South Koreans regarding three major risk topics: carcinogenic hazards, H1N1, and mad cow disease. Along with the major findings, practical implications for media strategies in various risk circumstances are also discussed.

Two main components of risk: Uncertainty and emotions

Risk presentation format and risk perception

Uncertainty is a central issue in risk communication because what people do and do not know about risks can affect how they interpret risk information, how they perceive the risk itself, and how motivated they will be to seek further information about it (Powell et al., 2007). Risk refers to "the probability of injury, illness, or death associated with … hazards" (Sellnow et al., 2009, p. 3). "Probability" here refers to either the absence of certainty or the presence of uncertainty. Uncertainty has been conceptualized in different ways across different disciplines and studies. One useful approach is to assume people experience uncertainty when "a situation can be interpreted in multiple ways or when there are divergences or contested perspectives about its meaning" (Markon, Crowe, & Lemyre, 2013, p. 314). In other words, uncertainty exists when a situation is ambiguous, unpredictable, or probabilistic, and when people feel uneasy once they realize that they don't know enough about it (Brashers, 2001).

To convey the uncertainty associated with risks, communicators might choose to use different risk presentation formats (Wardekker et al., 2008; Visschers, Meertens, Passchier, &

De Vries, 2009). The two basic formats are verbal and numeric estimates (Patt & Schrag, 2003; Wardekker et al., 2008). Verbal estimates present risks without numbers and instead with words that tend to be vague, such as *likely* or *unlikely*, *probably*, and (*almost*) *impossible* (Wallsten et al., 1986). Numeric estimates use numbers to present risk information in several possible ways (Johnson & Slovic, 1995; Kuhn, 2000): by providing a single best point estimate without any uncertainty information (point estimate); by providing a single point estimate with a verbal qualifier (verbal uncertain estimate); and by providing a range centered on a base probability value, such as a confidence interval bounding an estimate (numeric range estimate and based range with explanation about different sources in likely bias). The choice of these formats may be important because there is evidence that they have varying effects on audiences' perceptions of and reactions to risks (Kuhn, 2000).

However, there is little consensus about how people respond to different risk presentation formats based on the varying degrees of uncertainty they convey. Some risk communication experts argue that people are better able to read and remember risk information described in words rather than in numbers (Wardekker et al., 2008). This view assumes that words help people understand uncertainty better than numbers do. But according to a rival view, using words might lead to a loss of precision, especially because they can so often have different meanings for different people (Wallsten et al., 1986). Some research shows that people tend to construe words that refer to uncertainties according to the risk magnitude that they associate with an event; for example, an "unlikely" hurricane is interpreted as less likely to happen than an "unlikely" rain shower (Patt & Schrag, 2003). Verbal risk presentations may therefore lead people to make subjective inferences that overestimate the probability of low magnitude events and underestimate the probability of high magnitude events. As for numeric risk presentations, some possible persuasive advantages of numbers include precision, calculability, and a fixed rank-order. For instance, 80% is always more than 75%. In light of these considerations, the verbal risk presentation format would seem to generate a higher level of uncertainty than the numeric format, particularly compared to the single point estimate. But at present, research has not yet firmly established this supposition.

Some studies have found that different risk presentation formats can have differential effects on people's perceptions of and reactions to risks. An extensive review of studies on risk probability information concludes that people tend to overestimate

risk probabilities when they are presented in verbal as opposed to numerical formats, and that verbal information causes more variability in risk perception than numerical information (Visschers et al., 2009). But while such variability may indicate a higher level of uncertainty or ambiguity, it may not lead to a higher level of risk perception. For example, Kuhn (2000) found that, in various numeric risk presentation conditions, people who had strong environmental concerns reported a higher level of risk perception than those who did not. She suggests that the different levels of uncertainty generated by these different formats may not be necessarily and directly related to a higher level of risk perceptions. In other words, some people may interpret an uncertainty as more risky and others as less risky when either vague verbal or more precise numerical presentation formats are used. Her explanation for these differing effects is that people will interpret these formats differently depending on individual differences in attitudes and values that are relevant to the perceived risk.

While there are various types of risk presentation formats, a recent content analytic study on media coverage of carcinogenic hazards in South Korea found that the two most frequently used were single point estimate and verbal estimate (Hove et al., 2014). Based on this finding, the current study compares the two most prevalent risk presentation formats, verbal versus numeric, to see which one has a stronger effect on people's perceptions of different risks. In comparing the two, it is safe to assume that the verbal format is more vague, ambiguous, and likely to generate uncertainty compared to any of the numeric (particularly single point estimate) formats (Flugstad & Windshitl, 2003). But based on the aforementioned studies, a more contested issue is whether a format with higher levels of uncertainty would generate a higher level of risk perception. Since these studies have shown inconsistent findings on the directionality between these two variables, we cannot propose a hypothesis; instead, we ask the following research question.

RQ1: Which risk presentation format, verbal versus numeric, will generate a higher level of risk perceptions?

Emotion and risk perception

Turning to this study's second main topic, emotion has been recognized in other areas of risk communication research as an important dimension of risk and a determinant of risk perceptions. For example, Sandman and his colleagues (1993) define risk as "hazards + outrage." "Hazard" refers to the technical components of risks, which are typically the preoccupations of

experts. "Outrage" refers to the nontechnical components, which consist of the emotions felt by people who are worried about experiencing risks. These emotions concern issues such as control, responsiveness, trust, dread, worry, anger, and so on. Although outrage is a complex concept that needs further explication, it is useful for the current study because it contains emotional components such as dread and fear.

Sandman's empirical studies demonstrate the important roles of emotion in communicating risks via media (Johnson, Sandman, & Miller, 1992; Sandman et al., 1987; Sandman et al., 1993). One of these studies, a content analysis of environmental risk news stories that were chosen as best articles by newspaper editors, found that 68% of the stories did not include any risk information; instead, they focused more on conflicts and emotion-laden opinions (Sandman et al., 1987). In the same study, newspaper editors were quoted as saying that, in environmental news, the issue of whom to blame for a risk is more important than the technical facts about it. Such an editorial philosophy would be likely to generate stories that are emotionally charged. In another study, Johnson, Sandman, and Miller (1992) found that information about people's emotional reactions to risk had a substantial effect on risk perceptions, while technical details about the risk had no effect. Through these and other empirical studies, Sandman and his colleagues have affirmed the importance of emotional content in shaping the public's risk perceptions.

The purpose of the current study is to explore how emotion may work jointly with risk presentation format to heighten risk perceptions. Justification for making this link can be drawn from existing theories such as Problematic Integration Theory (Bradic, 2001) and Uncertainty Management Theory (Brashers, 2001), both of which consider emotion to be an evaluative or appraisal component of uncertainty. In an earlier effort to link emotion with perceived uncertainty, Powell et al. (2007) analyzed secondary survey data among 528 adults in the context of three environmental risk issues. They found that negative emotions (e.g., worry and anger) were significantly and positively associated with respondents' perceived uncertainty about possible health risks. The high correlation between emotion and perceived uncertainty supported their theoretical argument that emotion can serve as an appraisal of uncertainty. In addition, emotion was also significantly and positively related to various risk judgments such as perceived likelihood, perceived seriousness, and perceived future threat.

These findings are particularly relevant to the current study for two reasons: first, they provide a rationale for proposing a main

effect of emotion on risk perception; second, they indicate that emotion can work with uncertainty to predict risk perception, leading to potential joint effects of emotion and risk presentation format on risk perception. The negative emotion we single out is fear, and previous research provides two justifications for doing so. First, studies have documented that news coverage of health and risk issues has become increasingly sensationalistic (Weitser & Kubrin, 2004). In this context, sensationalism is characterized by fear-arousing words or references to the public's emotional reactions (Altheide & Michalowski, 1999; Kupchik & Bracy, 2009). As for the second justification, another line of research has highlighted the discrete nature of emotions and the differential roles they play in risk perception and coping behaviors (Dillard & Nabi, 2006; also consider the Functional Theory of Emotion in Nabi, 2002). For example, an experimental study reports that fear is related to higher risk estimations, while anger is associated with lower risk estimations (Lerner & Keltner, 2000). Based on these theoretical and empirical considerations, we propose a main effect hypothesis on the role of fear in media messages.

H1: Risk messages with fear will generate a higher level of risk perception than those without fear.

In addition, we expect that messages which have both negative emotion and verbal risk presentation format may heighten subjects' level of uncertainty and lead to a higher level of risk perceptions. But because additional literature supporting this reasoning is lacking, we propose a research question on this possible interaction effect.

RQ2: Will there be an interaction effect between fear and risk presentation format?

Methods

Study design

This experimental study employed a 2 (risk presentation format: numeric vs. verbal estimates) x 2 (fear: presence vs. absence) between-subjects design with three risk topics, creating 12 different conditions. The message factors manipulated were risk presentation format and fear. The three risk topics selected were carcinogenic hazards, H1N1, and mad cow disease because they have drawn substantial media coverage in recent years and remained salient risk topics among Korean adults (Cha, 2012). In addition, these three topics were found to differ across various dimensions of risk perception such as controllability, severity, and familiarity (Cha, 2012). Such differences are expected to secure greater generalizability

across risk topics.

Stimuli

The messages were chosen from online news articles to guarantee ecological validity, and they were modified to be equivalent across manipulation conditions and topics. The carcinogenic hazard message was about carcinogens (cancer-causing materials) found in cooking oil. The numeric vs. verbal risk presentation format was manipulated with the headline—"Cancer-causing material, Benzopyrene 4.0㎍/kg found in Hae Pyo brand organic sesame oil" versus "Large amount of cancer-causing material Benzopyrene found in Hae Pyo brand organic sesame oil"—and one sentence in the text—"according to the Korea Food and Drug Administration (KFDA), 4.0㎍/kg of a designated carcinogen Benzopyrene, an amount that exceeds twice the standard, was found in the Hae Pyo brand organic sesame oil sold in supermarkets" versus "according to the Korea Food and Drug Administration (KFDA), a large amount of a designated carcinogen Benzopyrene, which exceeds the standard amount, was found in the Hae Pyo brand organic sesame oil sold in supermarkets."

Fear was manipulated by including one of two sentences that were equivalent in length. The fear condition had a sentence stating consumers' fear about the news: "Citizens are fearful and they wonder what to eat…" The absence-of-fear message condition included a factual sentence: "Benzopyrene is generated by heating or cooking oils." A similar type of manipulation was used for the other two topics as follows. For the H1N1 message: "Confirmed rate of H1N1 patients up to 77%" (headline for numeric format) versus "Confirmed rate of H1N1 patients very high" (headline for verbal format), and "The public is afraid that the flu is becoming a pandemic again" (fear condition). For the mad cow disease message: "Mad cow disease inspection for American beef reduced from 50% to 3%" (headline for numeric format) versus "Mad cow disease inspection for American beef reduced drastically" (headline for verbal format), and "Citizens' fear about mad cow disease rises" (fear condition).

Only fear was used as the emotion in the messages because it is the emotion most commonly present in risk-related news stories, and because using multiple or different emotional elements across the topics might confound the emotional messages. The length of the messages ranged from 77 words to 91 words. Each message's readability was not considerably different or varying in difficulty across the conditions: the Flesch Reading Ease Index Score for the 12 message conditions ranged from 58.6 to 71.25, and the Flesch-Kincaid Grade Level Score had a minimum of 7.6 and a maximum of 9.5 (for a similar readability test procedure,

see Kim & Paek, 2009).

Pilot test

The pilot test had two purposes: to check the success or failure of the message manipulations and to determine whether any message errors would need to be fixed. Due to a small sample size yet multiple risk topics with different question wordings per topic, the pretest employed a mixed design, in which the two message factors (fear and risk presentation format) were within-subject variables and the three risk topics were between-subject variables. Three forms of the survey (3 topics) were randomly assigned to 128 college students enrolled in multiple communication classes at a large university in Korea. The participants read the four types of messages (numeric with fear, numeric without fear, verbal with fear, verbal without fear). Then, they were asked to indicate which of the four messages presented risk estimates numerically or verbally and which presented fear (recognition check). Finally, students were asked to rank the four messages in the order of highest to lowest level of uncertainty and fear (induction check).

The results generally indicated that the message manipulation was successful. For the recognition check, 94.5% of the students correctly answered that the two numeric risk presentation format messages used numeric estimates to present risks, and 100% answered that at least one numeric risk format message did. Also, about 94% correctly answered that the two verbal risk format messages used verbal estimates to present risks. Lastly, 93% correctly answered that the two fear messages presented fear, and all the students provided at least one correct answer. Regarding induction check, repeated-measure analysis of variance (ANOVA) via the General Linear Modeling (GLM) procedure was performed by combining the three risk topics (N = 124) and then using subsamples per topic. Briefly, the multivariate test of the mean differences via Wilks' lambda using pooled-sample shows a significant mean difference in the level of fear (Wilks' lambda = .46, $F(3, 123) = 47.80$, $p < .001$) and uncertainty (Wilks' lambda = .45, $F(3, 123) = 50.40$, $p < .001$). Pairwise comparison tests indicate that students rated the numeric-fear message as inducing the highest level of fear, followed by verbal-fear, numeric-no fear, and verbal-no fear. Subgroup analysis per topic also indicated that the numeric-fear message condition was rated as inducing the highest level of fear.

For uncertainty induction, pairwise comparison tests indicated that the verbal-fear message condition was rated to be most uncertain, followed by verbal-no fear, numeric-no fear, and numeric-fear.

Subgroup analyses per topic also showed similar patterns. The verbal conditions, regardless of presence and absence of fear, were rated to be most uncertain, while the numeric conditions were rated to be least uncertain for all three message topics.[8] Lastly, the messages were refined further in light of open-ended feedback about credibility, realism, wording differences, and length.

Sampling, samples, and procedure

A leading online research firm in Korea was hired to recruit the study participants. This company secured a panel of about 1 million people that reflects nationally representative demographics including gender, region, and age (one exception was that it under-represented people over 50). Each person was given a unique ID and the choice to volunteer to participate in a study in exchange for points that can be accumulated to spend for online purchases from designated companies. By means of a stratified random sampling method, the twelve conditions were randomized to be sent to a random sample of each age bracket.

Once participants logged in to the company's online survey website, they were asked to report their age. Only adults were qualified to participate in the study. On the next page, they were asked to read one randomly assigned risk message and to evaluate the message in terms of uncertainty, fear, message credibility, and risk perceptions. Finally, they were asked about demographic information such as gender, education, income, and residence.

Through a rigorous screening procedure identifying time spent on the study and response patterns (e.g., checking the same number throughout the questionnaire), 82 insincere cases were removed. As a result, the final sample size was 914. The mean age of participants was 38 years old (SD = 11.29). Women (53.6%) slightly outnumbered men. Median monthly household income fell into the range of 4-5 million KRW(equivalent to approximately 3600-4500 USD; SD = 2.14), and mean education range was between technical college and four-year college degree (SD = 1.02). Mean difference tests (one-way ANOVA for age and chi-square tests for gender, income, and education) indicated no statistically significant demographic differences across the conditions.

Measures

All the variables were constructed with multiple question items drawn from existing

8) We performed eight sets total of repeated-measures ANOVA (for pooled-sample and subsamples with each of the three risk topics and analyses for uncertainty and fear separately). Due to space limitations, reporting all the results would be impossible. Details are available upon request.

literature. After Exploratory Factor Analysis (EFA) and reliability analysis were performed, items were averaged to construct their respective variables.

Two variables, fear and uncertainty, were measured for induction check, which replaces manipulation check (for similar arguments, see Nabi, 2002). For fear, participants used a 7-point scale to rate how much of each negative emotion—fear, dread, worry, fright, anxiety—they felt about the topic while reading the story (1 = not at all to 7 = very much) (Nabi, 2002; Weinstein, 1984). These items were selected because they are grouped together to indicate fear (Shaver, Schwartz, Kirson, & O'Connor, 1987). EFA indicated 87.5% of total variance explained, and reliability analysis showed a strong internal consistency (alpha = .97). For uncertainty, the question items were drawn from advertising studies of message ambiguity and from risk communication studies of perceived uncertainty (Yoo, Lee, & Choo, 2005; Powell et al., 2007). These items were then modified to fit the current study context (7-point Likert scale with 1 = not at all and 7 = very much): "After reading the message, (1) I clearly understood the risk (reverse-coded); I thought the risk is (2) uncertain / (3) ambiguous." A higher numeric value indicates a higher level of uncertainty. EFA showed one factor with 51.7% of total variance explained. However, the first reverse-coded item had a low factor loading (.276), and reliability analysis indicated alpha to be .51 with the item and .60 without the item. Due to the lack of sufficiently high reliability, each of the three items was tested separately for induction check.

Two variables served as dependent variables: personal-level risk perception (hereafter, risk perception) and changes in risk perception.

The risk perception variable was measured with the following question items on a 7-point Likert scale with 1 = not at all and 7 = very much (Morton & Duck 2001; Tyler & Cook, 1984): "(1) The problem of carcinogenic hazards / H1N1 / mad cow disease is important to me; (2) I am worried that I would be affected by carcinogenic hazards / H1N1 / mad cow disease; (3) It is likely that I personally would be affected by carcinogenic hazards / H1N1 / mad cow disease; (4) I have personally felt risk from carcinogenic hazards / H1N1 / mad cow disease." EFA clearly indicated one factor structure (84.6% of total variance explained) with a strong internal consistency (alpha = .94).

The change in risk perception variable was included because it is worthwhile to examine how people's existing risk perceptions change due to the risk messages that are available in the media, and how these perception changes differ according to

different types of risk messages. Change in risk perception was measured with question wordings similar to attitude change measures from consumer behavior and advertising literature (e.g., Lee & Han, 1993) related to risk perceptions (instead of attitudes, which are evaluative judgments). Questions were as follows: "After reading the message, (1) I came to think that the problem of carcinogenic hazards / H1N1 / mad cow disease is more serious; (2) I came to think that I would be more affected by carcinogenic hazards / H1N1 / mad cow disease; (3) I came to think that I will be more likely to be affected by carcinogenic hazards / H1N1 / mad cow disease; (4) I came to think that carcinogenic hazards / H1N1 / mad cow disease is riskier; (5) I began to worry more about the risk" (1 = not at all, 7 = very much). EFA clearly indicated one factor structure (87.9% of total variance explained) with a strong internal consistency (alpha = .97).

Two covariates were considered, age and risk familiarity. According to the invulnerability hypothesis (Loewenstein et al., 2001), young people do not consider the potentially harmful consequences of risk behavior, and/or they underestimate the likelihood of these consequences happening to them. Based on this hypothesis, age was used as a covariate because people's age may affect their level of risk perception. Risk familiarity also served as a covariate because literature has shown that people's familiarity with specific risk topics may affect their risk perception (Powell et al., 2007). This variable was constructed by averaging two question items from the psychometric constructs of risk perception used by Slovic, Fischhoff, and Lichtenstein (1985) and Cha (2012). The question wordings were: "(1) I personally know the risk well and (2) I am familiar with the risk caused by carcinogenic hazards / H1N1 / mad cow disease." These items constructed one clear factor (76.5% of total variance explained) with inter-item correlation of .53.

Analytic strategy

For our hypothesis and research questions, a multivariate analysis of covariance (MANCOVA) was deemed most appropriate because there were two message factors, two covariates, and two dependent variables. Before the MANCOVA model was applied, the following assumptions for this analytic technique were checked: (1) normality assumption with skewness and kurtosis diagnostics test; (2) outliers check; and (3) homogeneity of variance (a.k.a. homo-scedasticity) using Box's M test (Hair, Tatham, Anderson, and Black 1998). Among these, homogeneity of variance was found not to exist (Box's M = 21.52, F = 2.38, $p < .05$), which indicates a failure to meet

Table 1 ANCOVA Results

Risk Topic 1: Carcinogenic Hazard (N = 312)

	Risk Perception			Changes in Risk Perception		
Factor	M[1]	SE[2]	*F(1,306)*	M[1]	SE[2]	*F(1,306)*
Risk Presentation Format			2.81#			3.72*
Numeric	4.97	.09		4.80	.10	
Verbal	4.76	.09		4.54	.10	
Fear			3.38#			9.13**
Absent	4.75	.09		4.46	.10	
Present	4.98	.09		4.88	.10	
Risk Presentation Format X Fear			.07			.44
Age (Covariate)			6.99**			21.77***
Risk Familiarity (Covariate)			16.34***			11.69**

Risk Topic 2: H1N1 (N = 313)

	Risk Perception			Changes in Risk Perception		
Factor	M[1]	SE[2]	*F(1,307)*	M[1]	SE[2]	*F(1,307)*
Risk Presentation Format			.10			8.58**
Numeric	4.03	.10		4.08	.09	
Verbal	3.98	.10		3.69	.09	
Fear			3.22#			1.55
Absent	3.88	.10		3.80	.09	
Present	4.13	.10		3.97	.09	
Risk Presentation Format X Fear			.11			.08
Age (Covariate)			.23			7.81**
Risk Familiarity (Covariate)			2.52			3.44#

Risk Topic 3: Mad Cow Disease (N = 289)

	Risk Perception			Changes in Risk Perception		
Factor	M[1]	SE[2]	*F(1,283)*	M1	SE2	*F(1,283)*
Risk Presentation Format			.07			.66
Numeric	4.32	.12		4.20	.12	
Verbal	4.36	.11		4.33	.11	
Fear			2.72			4.40*
Absent	4.20	.12		4.10	.11	
Present	4.47	.12		4.43	.11	
Risk Presentation Format X Fear			3.79*			.71
Age (Covariate)			.00			3.25#
Risk Familiarity (Covariate)			3.74*			7.10**

Note:
[1] M: Marginal mean (after controlling for age and risk familiarity as covariates)
[2] SE: Standard error
#$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

assumptions needed to perform MANCOVA. Accordingly, instead of MANCOVA, the tests performed were two sets of ANCOVA for the two dependent variables using pooled samples and six sets of ANCOVAs across three topics. Table 1 reports means and standard errors as well as ANCOVA results for each of the dependent variables per topic.

Results

Manipulation check

To check whether the messages' risk presentation format and fear were manipulated in intended ways, we followed uncertainty and fear induction analyses drawn from previous studies (e.g., Nabi, 2002). For uncertainty, independent samples t-tests indicated that verbal risk presentation conditions generally induced a higher level of uncertainty than did numeric risk presentation conditions. More specifically, for carcinogenic hazard messages, level of uncertainty was significantly higher in the verbal presentation condition than in the numeric presentation condition for uncertainty question item 1 (i.e., "I clearly understood the risk" (reverse-coded) (t (312) = 3.50, p < .001) and item 3 ("I thought the risk is unclear") (t (312) = 2.78, p < .01), but not for item 2 ("I thought the risk is uncertain") (t (312) = 1.36, p = .17). For H1N1 messages, level of uncertainty was significantly higher in the verbal presentation condition than in the numeric for all three question items (t (313) = 4.78, 3.48, 2.99, p < .01). For the mad cow disease messages, level of uncertainty was significantly higher in the verbal presentation condition than in the numeric for item 3 (t (289) = 2.12, p < .05), marginally significant for item 2 (t (289) = 1.71, p = .09), and not significant for item 1 (t (289) = .70, p = 49).

For fear, messages with fear generated a higher level of negative emtion including fear than those without fear for all three risk topics: carcinogenic hazards, t (312) = 2.02, p < .05; H1N1, t (313) = 2.03, p < .05; mad cow disease, t (289) = 2.23, p < .05. In sum, we conclude that our manipulation was generally secured.

Research question / hypothesis testing

The first research question was which risk presentation format, numeric vs. verbal, would generate a higher level of risk perception. ANCOVA models show similar patterns across the three risk topics and between the two dependent variables, but with mixed statistical significance. For carcinogenic hazards, the message condition with numeric risk presentation format had higher levels of risk perception and change in risk perception than that with verbal format, but the mean differences were only

marginally significant (for risk perception, mean diff = .207, p = .095; for change in risk perception, mean diff = .269, p = .055). For H1N1, the message condition with numeric risk presentation format had a significantly higher level of change in risk perception (mean diff = .387, p = .004) but not of risk perception (mean diff = .045, p = .755). For mad cow disease, there was no statistically significant mean difference of either risk perception or change in risk perception between the two risk presentation format conditions.

Hypothesis 1 predicted a higher mean level of risk perception and change in risk perception in the message condition with fear than without fear. This hypothesis was generally supported. For carcinogenic hazards, the message with fear had a higher level of risk perception (mean diff = .227, p = .067) and change in risk perception (mean diff = .421, p = .003) than the message without fear. For H1N1, the mean differences of risk perception and change in risk perception were higher in the message with fear than without fear, but neither of these reached statistical significance (mean diff = .258 and .164, p = .074 and .215). For mad cow disease, the message with fear had a significantly higher level of change in risk perception (mean diff = .333, p = .037) than that without fear. The mean difference of risk perception between the two conditions was in an expected direction, but it was not statistically significant (mean diff = .272, p = .100).

RQ 2 explored a possible interaction effect between risk presentation format and fear message such that the verbal risk presentation format message with fear would show the highest level of risk perception and change in risk perception. The results show that, only in the mad cow disease topic and for the risk perception dependent variable, the message with verbal presentation format and fear had the significantly highest mean (mean = 4.66, SE = .16) among all the message conditions (F (1,283) = 3.793, p = .052).

Discussion

This study tested how media messages with verbal or numeric risk presentation formats and with or without fear independently and jointly affect laypeople's risk perceptions. Three qualitatively different yet salient risk topics—carcinogenic hazards, H1N1, and mad cow disease—were chosen and tested among a national sample of adults in South Korea.

First, our data show that the verbal risk presentation format had a higher level of uncertainty than the numeric risk presentation format, but that the verbal

format did not necessarily lead to a higher level of risk perception. To the contrary, when there is statistical significance, messages with numeric risk presentation format tended to yield a higher level of risk perception. There are three possible explanations for this result. First, although humans have a basic tendency to minimize uncertainty (Uncertainty Reduction Theory: Berger & Calabrese, 1975) and/or manage it (Uncertainty Management Theory: Brashers, 2001), heightening risk perception may not necessarily be a strategy for dealing with uncertainty. Second, as Kuhn (2000) argues, uncertainty generated by messages with uncertain risk presentation format may lead to a higher risk perception only when people have pre-existing values and attitudes (which were not explored in the current study). Third, there may be other factors that explain the difference between messages with numeric versus verbal risk presentation format, and these factors might affect risk perception more directly. For example, in persuasion literature, statistics and numbers serve as salient cues that lead to judgments about argument strength and high message quality (O'Keefe, 2002). In the current study, risk information provided by numbers (e.g., "Confirmed rate of H1N1 patients up to 77%" as opposed to "Confirmed rate of H1N1 patients very high") may have been more salient and thus may have led to a higher level of risk perception.

In contrast to the uncertainty manipulation, the fear manipulation seemed to yield much clearer patterns. Consistent with existing literature (Powell et al., 2007; Sandman et al., 1997), messages with fear generated a higher level of risk perception than those without fear. While previous studies focused on the negative emotions of worry and anger, the current study's similar results suggest that fear plays a robust role in risk perception. Although our hypothesis was not supported across all three risk topics and between the two dependent variables, our findings provide some evidence that uncertain messages (i.e., verbal risk presentation format) that also contain fear could yield the highest level of risk perception compared to the other message conditions. This type of message may be particularly worrisome, especially when actual risks are low but people learn about them through emotionally charged messages and, as a result, feel unwarranted or exaggerated outrage. For such circumstances, Sandman (2003) proposes some useful risk communication strategies that he refers to as "outrage management." These strategies focus mainly on calming and reassuring the public through interpersonal communication, or through actions such as listening, acknowledging, apologizing, sharing control, and building trust.

On the other hand, there are times when vague and emotionally charged messages that incorporate laypeople's real voices may be useful, for example when the public is apathetic and inattentive in situations that are actually high-risk. For such circumstances, Sandman (2003) suggests a public relations strategy that requires refining and honing important messages and urging people to take risks more seriously. To develop messages that are circumstantially appropriate, risk communicators should collaborate with journalists by providing them sufficient information, educating and training them how to present particular risk topics, and building relationships with them to secure their cooperation in risk situations.

Several limitations should be noted. First, as noted above, our limited findings may be due to under-explication of other important factors and moderators. While this study intended to focus on independent and joint effects of message factors manipulating two important dimensions of risk (uncertainty and emotion), there may be other factors that also play important roles in shaping and changing people's risk perceptions. Previous studies have investigated factors such as risk characteristics (Jwa, Yun, & Paek, 2013), message frames and audience expertise (Kim & Kim, 2013), and cultural characteristics (Yang, 2014). Future research should continue to explore all of these factors, as well as others such as individual differences and personalities as antecedents, and trust or message credibility as mediators. Another potential factor affecting risk perceptions may be the type of risk (Kim & Kim, 2013). Categorizing risk types and identifying people's risk perceptions according to each type may provide significant practical implications for risk communicators. In addition, while an online study among a national sample may have the advantages of efficiency and external validity, one disadvantage is weak internal validity, which may explain our limited findings. To replicate them adequately, a controlled lab experiment may be necessary.

Despite these limitations, this study's findings provide useful guidance for considering appropriate health and risk communication strategies for dealing with media. Since risks and the health problems they cause are with us for the foreseeable future, publics around the world have both the need and the right to learn about them through media communication that is clear and effective.

References

Altheide, D. L., & Michalowski, R. S. (1999). Fear in the news. *Sociological Quarterly, 40(3),* 475～503.

Babrow, A. S., & Kline, K. N. (2000). From "reducing" to "coping with" uncertainty: Reconceptualizing the central challenge in breast self-exams. *Social Science and Medicine, 51(12),* 1805～1816.

Berger, C. R., & Calabrese, R. J. (1975). Some explorations in initial interaction and beyond: Toward a developmental theory of interpersonal communication. *Human Communication Research, 1,* 99～112.

Bradac, J. J. (2001). Theory comparison: Uncertainty reduction, problematic integration, uncertainty management, and other curious constructs. *Journal of Communication, 51(3),* 456～76.

Brashers, D. E., Neidigg, J. L., Haas, S. M., Dobbs, L. K., Cardillo, L. W., & Russell, J. A. (2000). Communication in the management of uncertainty: The case of persons living with HIV or AIDS. *Communication Monographs, 67(1),* 63～84.

Brashers, D. E. (2001). Communication and uncertainty management. *Journal of Communication, 51(3),* 477～497.

Cha, D. (2010). The impacts of mass communication, interpersonal communication, and multidimensional health locus of control to health related message on public's risk perception. *Journal of Humanities, 58,* 647～674.

Cha, Y. J. (2012). Risk perception model and nuclear risk: Verification and application of psychological measurement paradigm. *Korean Policy Studies Review, 21(1),* 285～312.

Fischhoff, B. (1995). Risk perception and communication unplugged: Twenty years of process. *Risk Analysis, 15(2),* 137～145.

Flugstad, A. R., & Windschitl, P. D. (2003). The influence of reasons on interpretations of probability forecasts. *Journal of Behavioral Decision Making, 16(2),* 107～126.

Gainor, D., & Menefee, A. (2006). Avian flu: A media pandemic. Retrieved from http://www.businessandmedia.org/news/2006/news20060308.asp [Accessed 19 October 2007].

Goldstein, B. D. (2005). Advances in risk assessment and communication. *Annual Review of Public Health, 26,* 141～163.

Griffith, C. J., Mathias, K. A., & Price, P. E. (1994). The mass media and food hygiene education. *British Food Journal, 96(9),* 16～21.

Hair, H. F., Tatham, R. L., Anderson, R. E., & Black, W. (1998). *Multivariate data analysis* (5th ed.). Englewood Cliffs, NJ: Prentice Hall.

Hove, T., Paek, H.-J., Yun, M., & Jwa, B. (2014). How newspapers represent environmental risk: The case of carcinogenic hazards in South Korea. *Journal of Risk Research.* Advance online edition. doi:10.1080/13669877.2014.923025

Johnson, B. B., Sandman, P. M., & Miller, P. (1992). Testing the role of technical information in public risk perception. *Risk Issues in Health and Safety, 3,* 341～375.

Johnson, B. B., & Slovic, P. (1995). Presenting uncertainty in health risk assessment: Initial studies of its effects on risk perception and trust. *Risk Analysis, 15(4),* 485～494.

Jwa, B. K., Yun, M. Y., & Paek, H.-J. (2013). Media, risk characteristics, and risk perceptions: The context of carcinogenic hazards. *Journal of Public Relations, 17(4),* 72～109.

Kim, H.-J., & Kim, Y.-W. (2013). The interaction effects of message framing, risk types and audience

expertise on risk perception in risk communication: An analysis of radiation risks. *Journal of Public Relations, 17(1),* 143～183.

Kim, J., & Paek, H.-J. (2009). How people process divisive media messages: Testing multi-motive heuristic-systematic model. *Risk Analysis, 29(12),* 1793～1806.

Kuhn, K. M. (2000). Message format and audience values: Interactive effects of uncertainty information and environmental attitudes on perceived risk. *Journal of Environmental Psychology, 20(1),* 41～51.

Lee, S., & Han, H. (1993). Verification of advertising persuasion process model through the print media reaction profile. *Advertising Research, 18,* 87～121.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127(2),* 267～286.

Markon, M.-P., Crowe, J., Leymyre, L. (2013). Examining uncertainties in government risk communication: Citizens' expectations. *Health, Risk, & Society, 15,* 313～332.

Miles, S., Braxton, D. S., & Frewer, L. J. (1999). Public perceptions about microbiological hazards in food. *British Food Journal, 101(10),* 744～762.

Morton, T. A., & Duck, J. M. (2001). Communication and health beliefs: Mass and interpersonal influences on perceptions of risk to self and others. *Communication Research, 28(5),* 602～626.

Nabi, R. (2002). Anger, fear, uncertainty, and attitudes: A test of the cognitive-functional model. *Communication Monographs, 69(3),* 204～216.

O'Keefe, D. J. (2002). *Persuasion: Theory and research* (2nd ed.). Thousand Oaks, CA: Sage.

Patt, A. G., & Schrag, D. P. (2003). Using specific language to describe risk and probability. *Climatic Change, 61(1),* 17～30.

Peters, E., & Slovic, P. (1996). The role of affect and worldviews as orienting dispositions in the perception and acceptance of nuclear power. *Journal of Applied Social Psychology, 26(16),* 1427～1453.

Powell, M., Dunwoody, S., Griffin, R., & Neuwirth, K. (2007). Exploring lay uncertainty about an environmental health risk. *Public Understanding of Science, 16(3),* 323～343.

Sandman, P. M. (1987). *Environmental risk and the press: An exploratory assessment.* New Brunswick, NJ: Transaction.

Sandman, P. M., Miller, P., Johnson, B. B., & Weinstein, N. D. (1993). Agency communication, community outrage, and perception of risk: Three simulation experiments. *Risk Analysis, 13(6),* 585～598.

Sandman, P. (1997). Mass media and environmental risk: Seven principles. In R. Bate (Eds.), *What Risk? Science, politics and public health* (pp. 275～284). Oxford: Butterworth-Heinmann.

Sellnow, T. L., Ulmer, R. R., Seeger, M. W., & Littlefield, R. (2009). *Effective risk communication: A message-centered approach.* New York, NY: Springer.

Shaver, P., Schwartz, J., Kirson, D., & O'Connor, G. (1987). Emotion knowledge: Further exploration of a prototype approach. *Attitudes and Social Cognition, 52,* 1061～1086.

Slovic, P. (1987). Perception of risk. *Science, 236,* 280～285.

Slovic, P., Fischhoff, B., & Lichtenstein, S. (1985). Characterizing perceived risk. In R. W. Kates, C. Hohenemster, and J. Kasperson (Eds.), *Perilous progress: Managing the hazard of technology* (pp. 91～125). Boulder, CO: Westview.

Slovic, P., Peters, E., Finucane, M. L., & MacGregor, D. G. (2005). Affect, risk, and decision making. *Health Psychology, 24(4),* 35～40.

Tyler, T. R., & Cook, F. L. (1984). The mass media and judgments of risk: Distinguishing impact on personal and societal level judgments. *Journal of Personality and Social Psychology, 47(4),* 693～708.

Wallsten, T. S., Budescu, D. V., Rapoport, A., Zwick, R.,

& Forsyth, B. (1986). Measuring the vague meanings of probability terms. *Journal of Experimental Psychology, 115(4),* 348～365.

Wardekker, J. A., Van der Sluijs, J. P., Janssen, P. H. M., Kloprogge, P., & Petersen, A. C. (2008). Uncertainty communication in environmental assessments: Views from the Dutch science-policy interface. *Environmental Science and Policy, 11(7),* 627～641.

Weinstein, N. D. (1984). Why it won't happen to me: Perceptions of risk factors and susceptibility. *Health Psychology, 3(5),* 431～457.

Yang, J. (2014). The influence of culture on Koreans' risk perception and communication: An Exploratory Study. *Journal of Public Relations, 18(1),* 107～150.

Yoo, C., Lee, S., & Choo, M. (2005). The moderating role of brand reputation in the relationship between explicit and implicit expression in ad and brand attitude/purchase intention. *Korean Journal of Advertising, 16(5),* 249～263.

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위험 제시 형식과 공포 메시지가 위험 인식에 미치는 효과 연구

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이 연구는 위험을 언어 혹은 숫자 형식으로 제시하는 미디어 메시지와 공포 소구 메시지가 각각 사람들의 위험인식과 위험인식 변화에 미치는 주효과 및 상호작용 효과를 살펴보고자 하였다. 한국 성인들을 대상으로 2 (위험제시형식: 숫자 대 언어) x 2 공포소구제시 여부의 피험자간 설계(between-subject design)로 온라인 실험을 실행하였으며, 914명의 실험 참가자들은 위험 주제인 발암물질, 신종인플루엔자(H1N1), 광우병과 관련된 세 가지 조작된 메시지 중 하나에 무작위 할당되었다. 공변량 분석(ANCOVA)결과, 신종플루와 발암물질 맥락에서 숫자로 제시된 위험형식은 언어로 제시된 위험형식보다 통계적으로 유의미하게 큰 위험 인식 변화가 있었으며, 공포가 제시된 광우병 관련 위험 메시지는 공포가 제시되지 않은 위험 메시지에 비해 더 높은 위험인식의 변화를 보여주었다. 또한, 광우병 맥락에서 공포제시 여부와 위험제시 형식의 상호작용 효과가 나타났는데, 공포가 제시되고 언어로 위험이 제시된 메시지에 노출된 실험참가자들이 가장 높은 수준의 위험인식을 보여주었다. 이 연구의 결과를 토대로 다양한 위험 상황에서 어떻게 위험 메시지를 전달해야 하는지 메시지 전략을 논의하였다.

KEYWORDS 위험 제시 형식, 불확실성, 부정적 감정, 공포, 위험인식, 미디어

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