

## Structural Relationships among Public's Risk Characteristics, Trust, Risk Perception and Preventive Behavioral Intention

- The Case of MERS in Korea -

Chan Won Kim<sup>+</sup>, Hae Ryong Song

Department of Journalism and Communication, Sungkyunkwan University, Sungkyunkwan-ro, Jongno-gu, Seoul, Korea

### Abstract

The present study examined a causal relationship among risk characteristics, trust, risk perception and preventive behavioral intention on MERS risk/crisis situation. The baseline survey was conducted for a total of 285 adults living in Seoul, South Korea. A structural equation modelling was used to examine a causal relationship among risk characteristics, trust, risk perception and preventive behavioral intention. Results from the structural equation modelling indicated that risk characteristics were positively associated with risk perception. Trust was negatively associated with risk perception, but positively related to preventive behavioral intention. It is also found that risk perception was positively associated with preventive behavioral intention. The findings indicate that risk characteristics are significant predictors of risk perception, and both trust and risk perceptions are the key factors facilitating preventive behavioral intention.

**Key words:** infectious disease, trust, risk perception, preventive behavioral intention

### 1. Introduction

The government of Korea proclaimed an end to the Middle East Respiratory Syndrome (MERS) health threat on December 23, 2015. It was more than seven months after the first case was confirmed in Korea. According to the Ministry of Health and Welfare, MERS which was first confirmed on May 20, 2015, claimed 38 people, with a total of 187 people

in total being infected.

One of the most serious challenges during the MERS crisis that occurred in May, 2015 was the risk communication. As the Korean government hesitated making an announcement of the names of the hospitals where confirmed to have MERS cases, the MERS happened to spread easily from hospitals to another hospitals, and amplified public fear and anxiety (Kim, 2015). Significant anxiety

<sup>+</sup> Corresponding author: Chan Won Kim, Tel. +82-2-760-0401, e-mail, [ares6357@naver.com](mailto:ares6357@naver.com)

and fear from MERS have increased in Korea even though most of medical experts and also the government reported that risk of the MERS is not so high. Risk in terms of the MERS in Korea has been amplified from complex emotional factors such as fear or anxiety. In particular, the fact that government has hardly paid attention to risk perception of the public led to failure of effective risk communication.

Providing information and communications are essential activities in the prevention and management of risks such as infectious diseases (Dickmann, *et. al.*, 2015). The phobia of MERS appeared in Korea on 2015 as it shows the significance of the risk communication strategy. Therefore, there is a need to understand the risk communication affects publics' risk behavior. According to Wu (2015), the purpose of risk communication is to reassure public of the risk and to guide public to go through the risk.

Risk communication is defined as "the process of conveying to interested parties" (Wu, 2015: 2242) such as individuals, groups, or organizations (Trettin, & Musham, 2000), or the process of providing and exchanging the information and knowledge related to risk issues for building a cultural safety.

Particularly, providing risk information and knowledge for public might bear a positive effect on the publics' decision making (Arvai, 2014; Boholm, 2008; Wardman, 2008) or risk preventive behavior (Boholm, 2008; Cole & Murphy, 2014; Hagemeyer-Klose & Wagner, 2009). For understanding the publics' risk-related behavior, there is still need to explore some variables such as risk characteristics, trust and risk perception which

affects risk preventive behavior.

Consequently, this approach will provide a sustained theoretical framework to expand our knowledge in the field of risk communication (Wu, 2015). Therefore, the relationship among risk characteristics, trust, risk perception and preventive behavioral intention should be further explored.

The purpose of current study was to find out the Korean's MERS risk characteristics and to examine the influence of risk characteristics, trust and risk perception on preventive behavioral intention of public. This study will provide basic understanding on Korean's risk-related behavior and develop a framework including multiple factors that might influence preventive behavioral intention.

## II. Hypothesis

Risk characteristics represented the inherent attributes of risk (Marris, *et. al.*, 1997). According to the psychometric paradigm, publics' risk perceptions is made up of various dimensions and reflect risk characteristics such as familiarity, controllability and dread surrounding the risk. Lay people perceive subjectively risks based on the various qualitative characteristics which determine lay people's risk perception (Fischhoff, *et. al.*, 1978; Marris, *et. al.*, 1997; Siegrist, *et. al.*, 2005; Slovic, 1986, 1987; Slovic, *et. al.*, 1984, 1985). Previous studies related to psychometric paradigm classified risks into two factors broadly defined as unknown risk and dread risk which based on publics' perceived risk characteristics. Unknown risk is concerned about a number of risk characteristics such as familiarity, scientific knowledge, and individual knowledge, while dread risk more related

to risk characteristics such as voluntariness, controllability, and dread (Cha, 2012; Slovic, 2004, 2007; Slovic, *et. al.*, 1984, 1985). Previous studies suggested possible relationship between risk characteristics and risk perception, and risk characteristics have been suggested as significant predictors of risk perception (Slovic, 1992; Slovic, *et. al.*, 1984).

Trust in institutions that is defined as “the willingness to depend on those who have the responsibility for making decisions and taking actions associated with the risk management of public health and safety (p. 849)” (Huurne, & Guteling, 2008; Siegrist, *et. al.*, 2000) was assumed as a factor determining risk perception (Dobbie & Brown, 2014; Siegrist, *et. al.*, 2007; Sjöberg, 1999). It postulates (or assumes) that trust in government or agencies control over risks affect the degree to which public perceive risk perception (Dobbie & Brown, 2014). When people are lack of knowledge about a risk, their risk judgements are based on the degree to which they trust the responsible risk managers (Kellens, *et. al.*, 2013). That is, lack of publics' trust on those who take responsibility for public health and safety is related to the amount of perceived risk (Huurne & Guteling, 2008). Kasperson, *et. al.*(1992) suggest that trust contributes to understand human behavior, and trust was significantly related to behavioral intention.

Meanwhile, many studies have been examined that the relationship between risk perception and preventive behavioral intention. As a result, people's risk preventive behavior is more significantly determined by perceived risk. For example, risk perception was found to be a

significant predictor of intended risk preventive behavior (Huurne & Guteling, 2008; Kasperson, *et. al.*, 1988). Therefore, risk perception is fundamental principle of making behavioral changes (Morowatishaifabad, *et. al.*, 2015). Risk perception is a key component understanding the design of successful risk management and risk communication strategies (Krewski, *et. al.*, 2012). In this study, we focus on the determinants of preventive behavioral intention to actively avoid risks in risk situation such as MERS. Based on theoretical assumptions described above, the following hypotheses and model depicting the relationship among risk characteristics, trust, risk perception and preventive behavioral intention on MERS of Korean were proposed.

Hypothesis 1. Risk characteristics on MERS of Koreans will be positively associated with risk perception.

Hypothesis 2. Trust in government, CDC (Centers for Disease Control and Prevention), hospital and media of Koreans will be negatively associated with risk perception.

Hypothesis 3. Trust in government, CDC (Centers for Disease and Prevention), hospital and media of Koreans will be positively associated with preventive behavioral intention.

Hypothesis 4. Risk perception on MERS will be positively associated with preventive behavioral intention.

### III. Method

#### 1. Participants and procedure

A representative sample of Korean adults was recruited for the online survey after the

proclamation of end to the MERS on December 23, 2015 by the Korean government. We send an online survey announcement to its sample tool and recruited respondents. There are two advantages in online survey. First, online survey based a web can reach a wide audience. Second, online survey can control over participant selection (Page & Ucles, 2014; Wu, 2015). A total of 285 adults who currently live in Seoul of Korea completed the survey questionnaire. Among the 285 participants, 148 (51.9%) were male and 137 (48.1%) were female. Respondents ranged in age from 31.00 to 59.00 (M=44.21, Standard Deviation=7.79). In terms of education level, 34.4% (N=98) have graduated two-year college, 36.8% (N=105) have graduated four-year college and 28.8% (N=82) have finished master degree.

## 2. Instruments

The survey instrument included measures related to MERS risk characteristics, trust in government, CDC (Centers for Disease Control and Prevention), hospital and media, MERS risk perception and preventive behavioral intention. Respondents' levels of risk characteristics, trust, risk perception and preventive behavioral intention were measured by adapting existing scales based on previous studies (Cha, 2012; Knight, 2007; Slovic, 2007; Slovic, *et. al.*, 1984, 1985; Song, 2014).

Risk characteristics. Risk characteristics were measured using Korean version (Cha, 2012) based on the risk characteristics proposed by studies of the psychometric paradigm (Slovic, 2007; Slovic, *et. al.*, 1984, 1985). It consists of 6 items; voluntariness, controllability, dread, familiarity, scientific knowledge and individual knowledge, each of which

is presented by a 5-point Likert scale – voluntariness (1: absolutely voluntary, 5: not absolutely voluntary), controllability (1: absolutely controllable, 5: absolutely uncontrollable), dread (1: not absolutely dreadful, 5: absolutely dreadful), familiarity (1: absolutely familiar, 5: absolutely unfamiliar), scientific knowledge (1 = absolutely scientifically known, 5 = not absolutely scientifically known), and individual knowledge (1: absolutely individually known, 5: not absolutely individually known).

Trust. Trust reflects government, CDC (Centers for Disease Control and Prevention), hospital and media's capabilities to respond to MERS crises in Korea. Trust was measured by the 4-item (government, CDC, hospital and media) based on Knight (2007). In this study, responses were scored on a 5-point Likert scale (1 = not at all trust, 5 = very trust) about each item, and higher scores reflect a higher level of trust.

Risk perception. Risk perception was measured using 2-item proposed by Song (2014). It is designed to measure how risks are perceived risks to the society as a whole (0: no risk, 10: extreme risk) and perceived risks to you and your family (0 = no risk, 10 = extreme risk). Responses were scored on an 11-point Likert scale, and higher scores reflect a higher level of risk perception.

Preventive behavioral intention. Preventive behavioral intention is in this study measured by the 2-item based on previous studies; intention to follow the preventive rules by the government and possibility to follow the preventive rules by the government (Song, *et. al.*, 2014). In Korean version, responses were scored on a 5-point Likert scale (1= strongly disagree, 5 = strongly agree), and higher scores reflect a higher level of

preventive behavioral intention.

### 3. Statistical analysis

The present research conducts exploratory factor analysis (EFA) and confirmatory factor analysis (CFI). Exploratory factor analysis was used to find the structure (factor) of risk characteristics on MERS. Based on the result of exploratory factor analysis, confirmatory factor analysis was performed for evaluate and refine scales (Gerbing & Anderson, 1988). In order to address the five hypotheses, structural equation modelling (SEM) was used in this study. Multiple fit indices were used to evaluate the proposed model, including  $\chi^2$ , root mean square residual (RMR), the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), the normed-fit index (NFI), incremental fit index (IFI), the Tucker Lewis index (TLI), and the comparative fit index (CFI). An adequate fit to the proposed model was determined by a nonsignificant  $\chi^2$  ( $p > .05$ ), values  $\leq 0.06$  for the RMR, values  $\geq 0.90$  for the GFI, AGFI, NFI, IFI, TLI, and CFI (Bentler, 1992; Saris & Satorra, 1993). In case of  $\chi^2$ , which

is sensitive to the sample size, other fit indexes (GFI, AGFI, NFI, IFI, TLI and CFI) were reported to complement the  $\chi^2$  test in evaluating the model fit (Lai, *et. al.*, 2015). All analyses were performed using the Statistical Packages for Social Science (SPSS) and AMOS software.

## IV. Results

### 1. Exploratory factor analysis and Confirmatory factor analysis

〈Table 1〉 presents the result of exploratory factor analysis. The result shows that the risk characteristics were classified as 2 factors; Unknown risk and dread risk. The first factor, Unknown risk, explaining 53.30% of variance, scientific knowledge included individual knowledge and familiarity. The second factor, Dread risk, explaining 21.10% of variance, voluntariness included controllability. The internal reliability for each factor was examined. The unknown risk and dread risk showed Cronbach's scores of .80, and .66, respectively.

Table 1. Results for exploratory factor analysis on risk characteristics of MERS

	Factor	Factor loading	Eigenvalue	Variance
Unknown risk ( $\alpha = .80$ )	Scientific Knowledge	.89	2.66	53.30%
	Individual Knowledge	.87		
	Familiarity	.69		
Dread risk ( $\alpha = .66$ )	Voluntariness	.90	1.05	21.10%
	Controllability	.76		

Note: Extraction method: Principal Component Analysis. Rotation Method: Varimax Rotation.

Table 2. Results for confirmatory factor analysis on risk characteristics of MERS

	Standardized Estimate	S.E.	t
Familiarity $\leftarrow$ Unknown risk	.64	–	–
Individual knowledge $\leftarrow$ Unknown risk	.78	.10	10.27***
Scientific knowledge $\leftarrow$ Unknown risk	.87	.13	10.49***
Controllability $\leftarrow$ Dread risk	.96	–	–
Voluntariness $\leftarrow$ Dread risk	.51	.10	4.60***

\*\*\*  $p < .001$

Table 3. Result for correlation analysis

	M(SD)	1	2	3	4
1. Unknown risk	3.13(.76)	-			
2. Dread risk	3.31(.88)	.43***	-		
3. Trust	2.71(.79)	-.04	-.06	-	
4. Risk perception	8.12(1.63)	.23**	.10	-.18**	-
5. Preventive behavioral intention	2.34(.88)	-.00	-.14*	.39**	.23**

\* p<.05 \*\* p<.001

In the current study Cronbach's coefficients for the trust, risk perception and the preventive behavior intention subscales were .81, .80, and .68, respectively. Based on the result of exploratory factor analysis, confirmatory factor analysis was performed. Model-fit statistics that this measurement model was appropriate.

2. Correlation analysis

The bivariate correlations of each of the variables are presented in <Table 3>.

3. Structural equation modeling analysis

The proposed model in the current study demonstrated a satisfactory fit to the data, with  $\chi^2(30)=67.95$ ,  $p<.001$ ,  $RMR=.05$ ,  $GFI=.95$ ,  $AGFI=.91$ ,  $NFI=.92$ ,  $IFI=.95$ ,  $TLI=.93$ , and  $CFI=.95$ . To measure the effects on preventive behavioral intention of the three predictor variables (risk characteristics, trust and risk perception), a structural equation modelling (SEM) analysis was conducted. As shown in <Table

4> and <Figure 1>. Based on the structural equation modelling (SEM) analysis, H1, H2, H3, and H4 were supported. Risk characteristics on MERS influenced a significant effect on risk perception ( $\beta=.27$ ,  $p<.01$ ), and risk characteristics was positively related to risk perception (H1). Trust influenced a significant effect on risk perception ( $\beta=-.21$ ,  $p<.01$ ), and trust was negatively related to risk perception (H2). Trust influenced a significant effect on preventive behavioral intention ( $\beta=.49$ ,  $p<.001$ ), and trust was positively related to preventive behavioral intention (H3). Last, risk perception influenced a significant effect on preventive behavioral intention ( $\beta=.20$ ,  $p<.01$ ), and risk perception was positively related to preventive behavioral intention (H4). These findings indicate that both risk characteristics and trust play a key role in predicting risk perception, and indicate that both trust and risk perception is a significant predictor of preventive behavioral intention.

Table 4. Structural equation modeling analysis

	Standardized Estimate ( $\beta$ )	S.E.	t	Total Effects	Direct Effects	Indirect Effects
Risk perception←Risk characteristics	.27	.28	3.01***	.27	.27	-
Risk perception←Trust	-.21	.15	-2.69**	-.21	-.21	-
Preventive behavioral intention←Trust	.49	.09	5.83***	.54	.49	.04
Preventive behavioral intention←Risk perception	.20	.04	2.71**	.20	.20	-

\*\* p<.01 \*\*\* p<.001

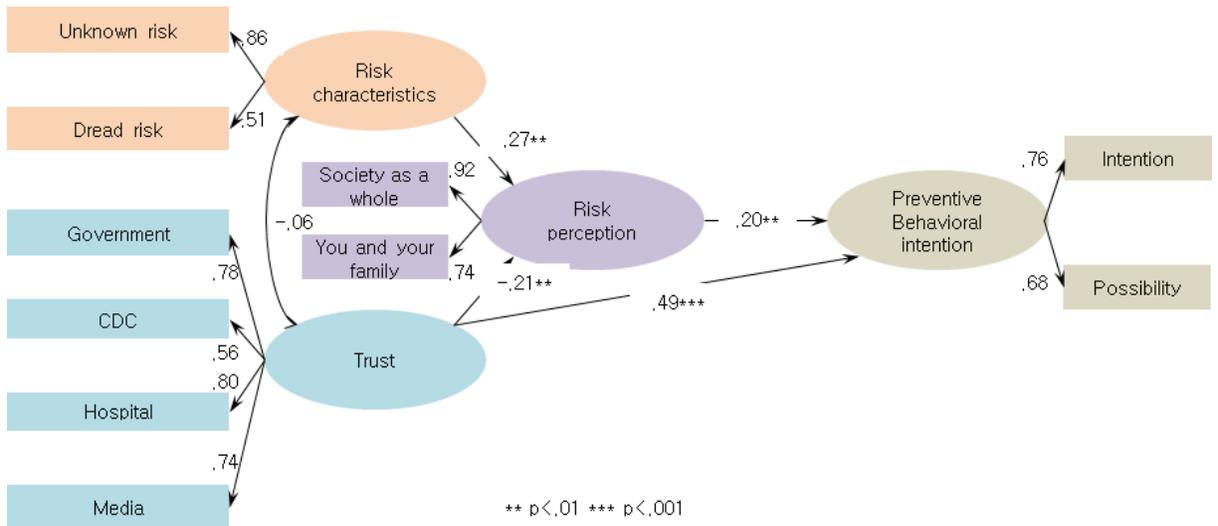


Figure 1. The relationship between risk characteristics, trust, risk perception and preventive behavioral intention

### V. Discussion and Conclusion

The primary goal of the current study was to explore the risk characteristics on MERS of Koreans and to examine the causal relationship among risk characteristics, trust, risk perception and preventive behavioral intention. In the risk/crisis situation such as MERS, risk characteristics and trust in government or agencies control over risks which perceived by public may greatly influence risk perception and preventive behavioral intention. However, the previous study associated with infectious diseases did not consider the public's risk characteristics.

Public gives a subjective judgment over the whole sphere of risks as the likelihood of coming to harm together with the severity of potential consequences (Huurne, 2008). This requires understanding the risk characteristics perceived by the public. In this current result, the risk characteristics on MERS which perceived by Koreans categorized the factors into two dimensions: unknown risk and dread risk. Unknown risk included various risk characteristics as well as scientific knowledge, individual

knowledge and familiarity. Dread risk was characterized as voluntariness and controllability.

Our findings have demonstrated that there are significant relationships between the risk characteristics and risk perception. The results indicated that Korean tended to perceive the risk characteristics on MERS into unknown risk and dread risk. Previous studies suggested that risk characteristics have been identified as significant predictors of risk perception (Slovic, 1992; Slovic, *et. al.*, 1984). The current results support the previous studies.

The current results found that public's trust in government or agencies control over risks including hospital and media was the significant predictor of risk perception and preventive behavioral intention. This demonstrates that trust plays a key role in predicting both risk perception and preventive behavioral intention. Risk scholars have been emphasized the importance of trust in the institutional contexts (Löfstedt, 2005; Slovic, 1993). These findings support the assumption that trust is one of important factors in understanding risk perception and risk-related behavior. Our

findings suggest that trust should be considered to understand the Korean's risk perception and preventive behavioral intention in risk/crisis situation such as infectious disease. Considering the current results, trust is the main concept as one of the key predictors of risk perception and preventive behavioral intention.

Lastly, risk perception was positively related to preventive behavioral intention. The current result indicates that more perceived risks on MERS revealed a greater sense of preventive behavioral intention. This result is in line with the previous study (Morowatishaifabad, *et. al.*, 2015), in which risk perception were the most important variable of preventive behavioral intentions for hepatitis B among healthcare workers. Consistent with previous studies (Huurne, 2008; Morowatishaifabad, *et. al.*, 2015), risk perception of risk/crisis situation influence risk taking behavior. Considering the current results, risk perception plays a key role making people to protect themselves against infectious diseases such as MERS. Consequently, our findings suggest that both trust and risk perception might provoke preventive behavioral intention of Koreans such as infectious diseases like MERS.

Our findings determined that both trust and risk perceptions have the greatest predictive value for preventive behavioral intention, which in turn contributes to facilitate preventive behavior. Specially, enhancing risk-related preventive behavioral intention might facilitate trust in institution.

Several limitations of this study should be noted. First, Due to the small sample size, the present results may be unstable. Second, there may be a bias in this finding which due to rely on self-report data,

Therefore, researchers should be careful of generalizing the present findings. Third, this study designed a cross-sectional survey. However, future empirical work should examine a longitudinal design which considering the changes in trust and risk perception over time impacted preventive behavioral intention. Notwithstanding these limitations, our study may provide evidence indicating that risk characteristics on MERS is a significant predictor of risk perception, and both trust and risk perception is the key factors predicting preventive behavioral intention. Our findings suggest that both trust and risk perception may be a productive avenue to facilitate preventive behavioral intention.

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## 공중의 위험특성, 신뢰, 위험인식과 위험예방행동의 구조적 관계

– 메르스(MERS)를 중심으로 –

국문초록 본 연구는 메르스에 대한 위험특성, 신뢰, 위험인식과 위험예방행동의 구조적 관계를 살펴보았다. 이를 위해 한국의 서울에 거주하고 있는 성인남녀 285명을 대상으로 설문조사를 실시하였으며, 구조모형분석을 통해 위험특성, 신뢰, 위험인식과 위험예방행동의 구조적 관계를 확인하였다. 주요결과를 보면, 우선 위험특성과 위험인식의 관계를 살펴본 결과, 위험특성은 위험인식과 통계적으로 유의한 정적 관계가 있는 것으로 나타났다. 신뢰와 위험인식의 관계를 살펴본 결과, 신뢰는 위험인식과 통계적으로 유의한 부적 관계를 형성하는 것으로 나타났고, 신뢰와 위험예방행동의 관계를 살펴본 결과, 신뢰는 위험예방행동과는 통계적으로 유의한 정적 관계를 형성하는 것으로 나타났다. 또한 위험인식과 위험예방행동의 관계를 살펴본 결과, 위험인식은 위험예방행동과 통계적으로 유의한 정적 관계를 형성하는 것으로 확인되었다. 이상과 같은 결과는 위험특성이 위험인식을 결정하는 중요한 예측요인이며, 신뢰와 위험인식 모두 위험예방행동을 촉진시킬 수 있는 중요한 핵심요인임을 시사한다.

주제어 : 감염병, 신뢰, 위험인식, 위험예방행동

Profiles **Chan Won Kim** : He received the doctor's degree in department of mass communications in graduate school of ChungAng University, Seoul, Korea. He is a chief researcher of the U-plus research center, and adjunct professor in college of social sciences and an full-time researcher in SSK risk communication center, Sungkyunkwan University. His field of research is risk communication, risk acceptability, and risk management. His major writings including research papers are <science and technology, 10 risk of high-tech> (2016), <risk communication strategy learned by successful cases of overseas countries> (2015, co-authority), <risk communication strategy learned by failure cases of Korea> (2015, co-authority) and etc (ares6357@naver.com).

**Hae Ryong Song** : He received the doctor's degree in graduate school of communication science from Westphalian Wilhelms-University of Münster. He is a professor of the department of journalism and mass communication in Sungkyunkwan University. His field of research is risk communication, risk management, risk acceptability and etc. His major writings are <iDisorder> (2015), <risk communication strategy learned by successful cases of overseas countries> (2015, co-authority), <risk communication strategy learned by failure cases of Korea> (2015, co-authority) and etc(imokwg@daum.net).