

Gender Differences in Environmental and Health-Related Risk Perception in Korea

Eunhye Yoo

Soongsil University, South Korea

Kyungmin Baek

Soongsil University, South Korea

Abstract

This study investigates how and why women and men differ in their perceptions of environmental and health-related risk. A substantial body of gender research indicates that the gender difference in the perception of environmental and health-related risk is due to gender differences in the socialization process. Using Korean General Social Survey (KGSS) 2013 data, we analyzed socio-demographic factors that affect gender differences across a varied range of environmental and health-related risks. Our results are not completely consistent with that of previous studies of gender differences in the perception of environmental and health-related risks, and the results vary across environmental and health-related issues as well as between men and women. This calls for an unpacking of each factor involved in gender roles and gender ideology and its impacts on gender differences in perceptions of environmental and health-related risks.

Key words

gender, risk perception, environmental issues, health-related issues, Korea

Introduction

Korea's¹ rapid industrialization is known for its accompanying exponential economic growth, but it has also brought a realization of serious environmental and health-related problems affecting the country. Examples include the toxic humidifier sterilizer scandal from 2001 to 2011, which was responsible for lung ailments in 530 people (including 92 deaths); the 2008 US beef protest spurred by the fear

¹ Throughout this paper, Korea refers to South Korea.

of mad cow disease; the potential risk of GMOs; dangers to respiratory health due to air pollution; and the potential for accidents at the Shin Kori nuclear power plant. These issues have not only been at the center of media attention, but also increase the need for researchers to study the logic of risk distribution in Korean society.

In fact, these issues provide a good opportunity to study how individuals in Korea perceive environmental and health-related risks and what kinds of social factors affect people's perception of them. Korean society with its history of rapid industrialization now faces the presence of a "risk society," where "the social production of wealth is systematically accompanied by the social production of risks" (Beck, 1992, p. 19). However, the discussion around "risks" is more associated with "a society increasingly preoccupied with the future and also with safety" (Giddens, 1999) than the level of economic development. In modern societies, "risk society" is associated with the unpredictable consequences of technology and science, which are mostly unknown to ordinary citizens (Cable, Shriver, & Mix, 2008; Giddens, 1999).

Scholars have suggested that the ways individuals perceive risk varies (Blocker & Eckberg, 1989; Bord & O'Connor, 1997; Davidson & Freudenburg, 1996). Some studies focusing on the Korean context also confirm variations in how individuals perceive risk (Kang, 2011; Kim & Lim, 2016). One of the common factors explaining individual variations in perceiving environmental and health-related risks in previous studies is gender. Previous studies have found that gender difference in attitudes toward risk are mainly caused by 1) gender socialization, 2) gendered ideology and social institutions, and 3) gender differences in scientific knowledge and attitudes. These social factors are understood to encourage women to express more strongly environmental and health-related concerns than men (Chodorow, 1978; Gaard, 1998; Hayes, 2001; Hayes & Tariq, 2000; Kang, 2011; Kim & Lim, 2016; McCright, 2010; Mies & Shiva, 1993; Norgaard & York, 2005; Zelezny, Chua, & Aldrich, 2000).

However, recent analysis of Korea has raised questions as to whether assumptions of gender differences in attitudes toward risk hold true. For example, recent nuclear power plant issues in relation to Shin Kori in Korea are explicitly about environmental issues and should, according to previous research about gender and risk perception, attract much attention from women. However, the issues have mostly been treated as local or governance issues (Kang, 2011; Song & Kim, 2012; Yun, 2018) rather than environmental or family health-related issues in the public sphere. This is because women in the public sphere are marginalized, and dis-

couraged from pro-environmental public behaviors (i.e., activism) (Davidson & Freudenburg, 1996; Hunter, Hatch, & Johnson, 2004; Tindall, Davies, & Mauboules, 2003). Yet, previous studies on women's participation in environmental and health-related issues in Korea tell the opposite story and confirm the findings of previous studies conducted in Western societies. Kim (2010) shows that Korean women energetically participated in mad cow disease and GMO protests as public protesters and activists. In the cases we described above, women displayed more environmental concerns and behaviors than men.

Thus, the research questions that this paper will address are as follows: 1) Do gender differences in the degree of concern regarding environmental and health-related risks in Korea show the same pattern as previous studies conducted in other institutional contexts predict? 2) Is there any gender divide in concern regarding individual and social risk? 3) How do gender socialization, paternalist ideology, and attitudes toward science explain gender differences in the attitudes toward risk in Korea?

Using 2013 Korean General Social Survey data, this study analyzed eight categories of environmental and health-related risks that individuals may perceive in their everyday lives: 1) Mental Health Threats; 2) Geriatric Diseases; 3) Epidemic; 4) Food Risks; 5) Nuclear Power Station Accidents; 6) Storage and Management of Radioactive Waste; 7) Environmental Contamination; and 8) Shortage and Exhaustion of Natural Resources. These eight categories are each sub-divided in two ways: how individuals perceive the possibility of being exposed to those risks (individual risks) and how individuals perceive the extent to which their society is exposed to the risks (social risks). By reviewing previous studies on gender differences in the perception of the risk of environmental and health-related issues, this study will produce meaningful results for policy makers and provide a good opportunity to rethink the coming of a risk society in Korea.

Theory and Hypothesis

Researchers have studied risk perception from geographical, psychological, sociological, and anthropological perspectives (Burton, 1993; Douglas & Wildavsky, 1983). The studies each have their own focus for studying how human perception is formed in a society where environmental, natural, and health-related hazards are possible. For instance, psychological research on risk perception is interested in testing perception of various risks in a laboratory setting, or of cognitive structures of risk perception. This line of research particularly emphasizes a psychometric ap-

proach and has its focus on probability assessment of various risks (Slovic, 1987). For example, risk-taking behavior is considered as an attribute of masculinity, and recent studies show that women take fewer risks than men (e.g., Chen, Baker, Braver, & Li, 2000; Hartog, Ferreri-Carbonell, & Jonker, 2002).

However, sociological and anthropological studies have shown that responses to risk are mediated by institutional and cultural factors such as race, class, and gender ideology (Flynn, Slovic, & Mertz, 1994; Rothstein, 2006; Short, 1984). Women are less likely to take risks in various risk-taking situations such as drug use, risky sexual behavior, and reckless driving in consideration of socialization and gender norms (e.g., Armstrong, England, & Fogarty, 2012). However, recent study also shows that gender differences in risk-taking is gender-biased because the measurement items used in study might cause an underestimation of women's risk-taking behavior (Morgenroth, Fine, Ryan, & Genat, 2017; Nelson, 2014). Thus, this study seeks to examine gender difference in risk perceptions of environmental and health-related issues in a sociological perspective while considering whether there are differences in people's perceptions of individual exposure and societal exposure to environmental and health-related risks. A review of sociological literature on gender differences in attitudes towards environmental and health-related issues will provide a good starting point for our study.

Sociological studies of gender differences in attitudes toward environmental and health-related issues reveal that women are more likely to display environmental and health-related concerns than men (Zelezny et al., 2000). Several studies have found that gender socialization is the one of the main factors that explains the gender difference in attitudes. The traditional social roles of women as caregivers and child bearers are deeply rooted in society (Hochschild & Machung, 1989; McStay & Dunlap, 1983), meaning that women are socialized to be individuals who are sensitive to the needs and feelings of others (Chodorow, 1978; Zelezny et al., 2000).

In addition, researchers have shown that men are more likely to be associated with publicly-oriented environmental behaviors while women tend to perform privately-oriented environmental behaviors (Davidson & Freudenburg, 1996; Hunter et al., 2004). From this perspective, men socialized as breadwinners tend to participate more in the public sphere and marketplace (Hunter et al., 2004; Tindall et al., 2003; Wehrmeyer & McNeil, 2000) as their socialization is toward the objectification and domestication of nature. Extending this line of research, Hunter et al. (2004) proposed the hypothesis that women are more likely to engage in private (household-oriented) environmental behaviors such as recycling or buying organic

produce, while men are more likely to engage in public (community and society-oriented) behaviors such as protests. Using gender socialization thesis and its extension, our first hypothesis is:

- Hypothesis 1: Women will be more sensitive to environmental and health-related risks at the individual level than at the societal level.

As “constructionist” ecofeminists suggest, social institutions are gendered, which influences the relationship between women and the environmental concerns in a gendered way (Gaard, 1998; Mies & Shiva, 1993). Though there is little research on ecofeminism (or feminism) and its relationship with environmental issues at the empirical level, Somma and Tolleson-Rinehart (1997) found that feminism, not biological sex, is positively associated with pro-environmentalism. This is also linked to state environmentalism. For instance, Norgaard and York (2005) show that states with higher rates of women in parliament tend to ratify more environmental treaties than other nations. From this perspective, we can argue that gendered ideology or paternalistic ideology in a society discourages people from having environmental concerns. Thus, we predict the following:

- Hypothesis 2a: Stronger paternalistic ideology is negatively associated with being more concerned about environmental risks.

Not all people are exposed to the same level of gendered and paternalistic ideologies, which require women to accept traditional roles as caregivers and homemakers. Following this social expectation, women with stronger levels of paternalistic ideology can display greater health-related concerns because health-related issues such as epidemic and food risks will be concerns mainly for caregivers and homemakers in a family. Researchers found that homemakers do not show more environmental concern than working women (McCright, 2010; Mohai, 1992), but the theoretical argument predicts that women with strong paternalistic and gendered ideologies perceive more health-related risks. In other words, women whose gender ideologies are more strongly associated with paternalism are likely to show greater concern regarding health-related risks than environmental risks.

- Hypothesis 2b: Women with stronger paternalistic ideology are more likely to have concern for health-related risks than environmental risks.

Finally, studies on gender differences in risk perception consider different levels

of scientific knowledge and attitudes toward sciences to be one of the main causes of difference (Hayes, 2001; Hayes & Tariq, 2000; McCright, 2010). Previous studies on gender differences in scientific knowledge and attitudes toward science show that women are generally less informed and less concerned about scientific matters. Brody (1984) shows that women's attitudes toward nuclear power account for gender differences in support for nuclear power. Fox and Firebaugh (1992) also find that women are less confident in their opinions about science due to their social statuses and political attitudes.

However, differences in understanding of science and attitudes toward science decrease as women become more educated and their interest in science increases (Hayes & Tariq, 2000). Thus, for example, mothers reject the vaccine schedule provided by governments, state laws, and medical organizations based on their senses of embodied knowledge weighing their risk of exposure and the severity of disease (Reich, 2014). As women and mothers, their notion of risks related to safe/unsafe, order/disorder, and life/death are structured as bad/good around various health and environmental issues such as caesarean birth (Bryant, Porter, Tracy, & Sullivan, 2007), breastfeeding (Blum, 2000), prenatal nutrition (Copelton, 2007), and disability treatment/medicalization (Blum, 2007). However, there is a lack in research on the differences in women's attitudes toward science and the gender differences in their perception of environmental and health-related risks. We do not have a strong prediction of the direction of the relationship between attitudes toward science and perception of environmental and health-related risk, but we predict the following:

- Hypothesis 3: Favorable attitudes toward science are positively associated with having lower perceptions of environmental and health related risks.

Data and Method

The data for our analyses came from the 2013 Korean General Social Survey (KGSS), a nationally representative social survey funded by the National Research Foundation of Korea.² The KGSS has been conducted every year since 2003, and its sampling procedure and interviewing methods are modeled on those of the

² <http://www.nrf.re.kr>

General Social Survey (GSS) in the United States. As part of the International Social Survey Programme (ISSP)³ in which 43 countries from all around the world participate, the KGSS aims to collect primary social data that enables researchers to conduct cross-national comparative studies. Most questions in this survey ask for respondents' opinions on some of the political, economic, and social phenomena in their countries. The 2013 survey had 1,218 respondents. However, due to missing values for our variables in survey responses, the number of cases included in each of our statistical models varies.

Dependent Variables

The present study investigates how gender socialization, paternalist ideology, and attitudes toward science affect people's perception of environmental and health-related risks. Possible risks include 1) Mental Health Threats; 2) Geriatric Diseases; 3) Epidemic; 4) Food Risks; 5) Nuclear Power Station Accidents; 6) Storage and Management of Radioactive Waste; 7) Environmental Contamination; and 8) Shortage and Exhaustion of Natural Resources. We categorized 1) through 4) as health-related risks and categorized the others as environmental risks. As noted above, we expected gender socialization, paternalist ideology, and attitudes toward science to work in different ways across these two broad aspects of risk. In order to test the hypotheses suggested above, people's perceptions of environmental and health-related risks were measured in two ways. First, we measured the extent to which each of the possible eight risks (as an individual risk) was likely to occur to a respondent. These questions were answered on a seven-point Likert scale ranging from 1 (Not at all) to 7 (Will certainly occur). Second, we measured a respondent's assessment of the extent to which Korean society was likely to be exposed to these risks (social risk). These questions were also answered on a seven-point Likert scale ranging from 1 (Not exposed at all) to 7 (Certainly exposed). OLS regression technique was applied to analyze the variation in people's perception of environmental and health-related risks in Korea.

Independent Variables

The key variables of interest include respondents' sex, respondents attitude to

³ The ISSP is a cross-national research collaboration program. The organization conducts annual surveys on diverse topics relevant to social sciences. Details can be found at <http://w.issp.org/menu-top/home>.

sexual relations indicating paternalist ideology, and attitudes toward science. For the sex of a respondent, the variable was coded 1 for female and 0 for male. KGSS 2013 data only provides two categories of sex, unlike GSS data, so that we cannot capture the association between various aspects of people's environmental and health-related risk perceptions and non-conventional types of gender (e.g., intersex). The respondent's attitude to sexual relations was measured on the average of responses to 1) pre-marital sex, 2) sex relations outside marriage, and 3) homosexual sex. Each item was answered on a four-point Likert scale ranging from 1 (Sexual relations are always wrong) to 4 (No sexual relations are wrong).⁴ In addition to the two independent variables, we also added an interaction term created by the respondent's gender and their attitude to sexual relations. The respondent's attitude toward science was measured using the extent to which a respondent agreed with the following statement: "Overall, modern science does more harm than good." This question was answered on a five-point Likert scale ranging from 1 (Strongly agree) to 5 (Strongly disagree).

Control Variables: Alternative Explanations

We considered a number of confounding variables in our statistical analyses to control for possible alternative explanations for the variation in people's environmental and health-related risk perceptions. According to previous studies, people's risk perception is correlated to a number of socio-demographic variables, including age, marital status, education, income, and place of residence (Marquart-Pyatt, 2008; Mesch, 2000; Sjöberg, 2000; Van Liere & Dunlap, 1980; Yim & Vaganov, 2003). As expected, younger generations are more likely to show environmental and health-related concerns as society has evolved in a direction putting more emphasis on these issues. Older people, on the other hand, are likely to trust the status quo, so they evaluate the likelihood of environmental and health-related risks in a more conservative way than younger people. Married people are likely to be more conservative with regard to changes in their lives, so they have a higher sensitivity to a range of possible environmental and health-related risks. KGSS data provides various forms of marital information from the survey year. We coded 1 for marital and coded 0 for other.

Level of education is expected to increase the level of environmental and

⁴ The Cronbach's α is .57.

health-related concerns as more knowledge is gained with respect to relevant issues. To rule out this effect, we included respondents' years of education in our statistical models. Previous studies also show that income clearly affects environmental and health-related concerns (Franzen & Meyer, 2010; Gelissen, 2007) and that more affluent people tend to show more concern regarding environmental and health risks. We therefore added respondents' household income to our statistical models.

Those who reside in urban areas have a higher sensitivity to a range of risks than people in rural areas. To control for this confounding variable, we measured whether a respondent resided in an urban or rural area using the following question: "Which of the categories below comes closest to the type of place you are living in now?" We coded 1 for respondents who answered "big city" or "suburbs and outskirts of a big city" and coded 0 for others.

In addition to socio-demographic variables, individual values such as political orientation, trust in others, and household income have significant impacts on people's risk perception. People with liberal and progressive political orientations may have high sensitivity to a variety of environmental and health-related risks, while people with conservative political orientation may not (Franzen & Vogl, 2013; Meyer & Liebe, 2010). To control for this, we included respondents' political orientation in our statistical models. This was measured using the following question: "To what degree do you think yourself politically liberal or conservative?" This question was answered on a five-point Likert scale ranging from 1 (Very liberal) to 5 (Very conservative).

Those who trust others are likely to underestimate the likelihood of environmental and health-related risks (Kim & Lim, 2016) and individuals with higher levels of social trust believe that their fellow citizens share the same environmental and health-related concerns as they do (Franzen & Vogl, 2013; McCright & Dunlap, 2011). We measured the level of trust in others using the question "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" This variable was coded on a Likert scale ranging from 1 (No trust at all) to 5 (Fully trust). The information on household income is available in KGSS 2013 and uses the net number of the variable.

Results

Tables 1 and 2 provide descriptive statistics for dependent and independent variables. The descriptive statistics show that about 50% of the sample were female

and 50% male. The OLS regression findings in Table 3 present the results of our statistical analyses and indicate strong gender differences in the perception of environmental and health-related risks in Korea. However, our results show that gender socialization, paternalist ideology, and attitudes toward science explain the differences in the attitudes toward environmental and health-related risks in Korea in mixed ways.

Table 1
Descriptive Statistics of Dependent Variables

Dependent Variables	Mean (St.D)
Mental Health Threats	3.89 (1.25)
Geriatric Diseases	4.34 (1.30)
Epidemic	4.11 (1.38)
Food Risks	4.29 (1.33)
Nuclear Power Station	3.90 (1.50)
Storage & Management of Radioactive Waste	3.54 (1.35)
Environmental Contamination	3.66 (1.36)
Shortage & Exhaustion of Natural Resources	4.10 (1.47)
Mental Health Threats	4.43 (1.19)
Geriatric Diseases	4.82 (1.19)
Epidemic	4.98 (1.17)
Food Risks	4.96 (1.17)
Nuclear Power Station	3.36 (1.29)
Storage & Management of Radioactive Waste	3.09 (1.16)
Environmental Contamination	3.16 (1.21)
Shortage & Exhaustion of Natural Resources	4.50 (1.34)

Table 2
Descriptive Statistics of Independent Variables

Variables	Mean	St.D	Min.	Max.
Female	.50	.50	0	1
Paternalistic Ideology	3.08	.70	1	4
Attitude toward Science	3.37	1.02	1	5
Age	44.49	16.36	18	88
Education	3.81	1.46	0	8
Marital Status	.63	.48	0	1
Urban Residence	.58	.49	0	1
Political Orientation	2.99	1.00	1	5
Trust in Others	5.56	1.76	0	10
Income	9.10	5.33	0	21

For individual risks (Table 3, Columns 1 through 8), the statistical results show gender differences in three out of the first four individual risks, categorized as health-related risks (mental health threats, geriatric diseases, and food risks). For example, women evaluate the likelihood of a geriatric disease to be 0.81 points higher than do men. Meanwhile, for the second set of four risks, categorized as environmental risks (nuclear power station accident, storage and management of radioactive waste, environmental contamination, and shortage and exhaustion of natural resources), the statistical results do not show any gender differences.

For social risk (columns 9 through 16), statistical results seem to show the opposite of results for individual risk. For the first four areas of risk, categorized as health-related risks, the statistical results do not show any gender differences. Meanwhile, the statistical results show gender differences in the second four social risks, categorized as environmental risks. The results suggest, for example, that women perceive Korean society as being exposed to greater environmental risk than do men. Specifically, the score for women's assessment that Korean society is exposed to risks from nuclear power plants is on average 0.72 points higher than for men.

Interestingly, these results do not seem to be consistent with our prediction in Hypothesis 1. The statistical results do not provide clear evidence that women are more sensitive to environmental and health-related risks at the individual level than at the societal level. They show that women estimate the likelihood of a variety of health-related risks to themselves as higher than do men, and that women are generally more sensitive to environmental risks than men at the societal level.

Unlike our prediction in Hypothesis 2a, the variable indicating gendered and paternalistic ideologies remained insignificant across all perceptions of risk at an individual level. Furthermore, the interaction variable created by a respondent's gender and attitude to sexual relations is only strongly significant in columns 1, 2, and 4. The results indicate that a respondent's attitude to sexual relations affects risk perceptions of mental health, geriatric diseases, and food, but the effect is negatively mediated by gender, which does not support Hypothesis 2b.

From columns 9 through 16, the variable indicating gender and paternalistic ideologies is only statistically significant for the perception of risk of mental health threats and nuclear power station accidents at the societal level. The variable remains insignificant across other areas of risk at the societal level. However, the interaction variable created by a respondent's gender and attitude to sexual relations is strongly significant in columns 13, 14, and 16 (nuclear power station

Table 3
Statistical Results

	Individual Risks								Societal Risks							
	Mental Health Threats	Geriatric Diseases	Epidemic	Food Risks	Nuclear Power Station	Radioactive Waste	Environmental Contamination	Natural Resources	Mental Health Threats	Geriatric Diseases	Epidemic	Food Risks	Nuclear Power Station	Radioactive Waste	Environmental Contamination	Natural Resources
<i>Gender Variables</i>																
Female	0.985** (0.353)	0.812* (0.340)	0.612 (0.322)	1.016** (0.334)	0.324 (0.384)	0.385 (0.377)	0.574 (0.349)	0.568 (0.350)	-0.303 (0.299)	-0.007 (0.303)	0.357 (0.308)	0.468 (0.304)	0.715* (0.332)	0.817* (0.343)	0.679* (0.300)	0.985** (0.353)
Paternalistic Ideology	0.028 (0.086)	0.024 (0.083)	-0.033 (0.078)	0.052 (0.081)	0.038 (0.093)	0.063 (0.092)	0.099 (0.085)	0.079 (0.085)	-0.166* (0.072)	-0.103 (0.074)	0.040 (0.075)	-0.023 (0.074)	0.189* (0.081)	0.125 (0.083)	0.064 (0.073)	0.028 (0.086)
Female*Paternalistic Ideology	-0.277* (0.112)	-0.228* (0.108)	-0.138 (0.102)	-0.241* (0.106)	-0.100 (0.122)	-0.089 (0.120)	-0.139 (0.111)	-0.157 (0.111)	0.140 (0.095)	0.060 (0.096)	-0.046 (0.098)	-0.077 (0.096)	-0.223* (0.105)	-0.227* (0.109)	-0.181 (0.095)	-0.277* (0.112)
Attitude toward Science	-0.109** (0.039)	-0.022 (0.038)	-0.100** (0.036)	-0.080* (0.037)	-0.124** (0.043)	-0.146*** (0.042)	-0.052 (0.039)	-0.116** (0.039)	-0.047 (0.033)	-0.011 (0.034)	-0.031 (0.034)	-0.005 (0.034)	-0.052 (0.037)	-0.080* (0.038)	-0.039 (0.033)	-0.109** (0.039)
<i>Control Variables</i>																
Age	-0.006 (0.003)	0.013*** (0.003)	-0.004 (0.003)	-0.001 (0.003)	0.004 (0.003)	0.003 (0.003)	-0.003 (0.003)	-0.000 (0.003)	-0.001 (0.003)	0.007* (0.003)	-0.001 (0.003)	0.003 (0.003)	0.008** (0.003)	0.006* (0.003)	0.002 (0.003)	0.002 (0.003)
Education	-0.035 (0.035)	-0.043 (0.034)	-0.033 (0.032)	0.045 (0.033)	0.085* (0.038)	0.061 (0.038)	0.024 (0.035)	0.069* (0.035)	0.121*** (0.030)	0.073* (0.030)	0.070* (0.031)	0.123*** (0.030)	0.083* (0.033)	0.112*** (0.034)	0.075* (0.030)	0.114*** (0.031)

Table 3
To be Continued

	Individual Risks								Societal Risks							
	Mental Health Threats	Geriatric Diseases	Epidemic	Food Risks	Nuclear Power Station	Radioactive Waste	Environmental Contamination	Natural Resources	Mental Health Threats	Geriatric Diseases	Epidemic	Food Risks	Nuclear Power Station	Radioactive Waste	Environmental Contamination	Natural Resources
Marital Status	0.121 (0.089)	0.145 (0.086)	0.248** (0.081)	0.102 (0.084)	0.238 [†] (0.097)	0.238 [†] (0.095)	0.118 (0.088)	0.096 (0.088)	-0.049 (0.075)	0.026 (0.076)	0.199 [†] (0.078)	0.120 (0.077)	0.187 [†] (0.084)	0.242** (0.087)	0.176 [†] (0.076)	0.181 [†] (0.079)
Urban Residence	0.002 (0.080)	-0.022 (0.077)	-0.022 (0.073)	-0.001 (0.076)	-0.135 (0.087)	-0.091 (0.086)	-0.095 (0.080)	-0.097 (0.080)	-0.007 (0.068)	0.093 (0.069)	-0.082 (0.070)	0.043 (0.069)	-0.027 (0.076)	-0.065 (0.078)	-0.113 (0.068)	-0.084 (0.071)
Political Orientation	-0.002 (0.040)	0.027 (0.038)	0.020 (0.036)	-0.056 (0.038)	-0.068 (0.043)	-0.069 (0.042)	-0.053 (0.039)	-0.079 [†] (0.039)	-0.030 (0.034)	-0.002 (0.034)	0.010 (0.035)	-0.055 (0.034)	-0.043 (0.037)	-0.057 (0.039)	-0.034 (0.034)	-0.068 (0.035)
Trust in Others	-0.087*** (0.023)	-0.074*** (0.022)	-0.030 (0.021)	-0.059** (0.021)	-0.080** (0.025)	-0.072** (0.024)	-0.053 [†] (0.022)	-0.049 [†] (0.022)	-0.094*** (0.019)	-0.095*** (0.019)	-0.060** (0.020)	-0.064** (0.019)	-0.055** (0.021)	-0.057** (0.022)	-0.064*** (0.019)	-0.029 (0.020)
Income	-0.003 (0.008)	0.002 (0.008)	-0.011 (0.008)	0.001 (0.008)	0.000 (0.009)	0.010 (0.009)	0.006 (0.008)	0.007 (0.008)	0.001 (0.007)	0.005 (0.007)	-0.009 (0.007)	0.000 (0.007)	0.003 (0.008)	0.009 (0.008)	0.003 (0.007)	0.004 (0.007)
Constant	5.170*** (0.365)	4.040*** (0.351)	4.597*** (0.333)	4.613*** (0.345)	4.256*** (0.397)	4.195*** (0.391)	4.685*** (0.362)	4.637*** (0.362)	5.783*** (0.308)	5.055*** (0.313)	4.401*** (0.318)	4.618*** (0.314)	3.844*** (0.343)	3.909*** (0.354)	4.817*** (0.310)	4.283*** (0.322)
Observations	1225	1225	1225	1225	1225	1224	1222	1224	1225	1226	1226	1226	1225	1226	1223	1226

Note. Standard errors in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$

accident, storage and management of radioactive wastes, and shortage and exhaustion of natural resources). The results indicate that a respondent's attitude to sexual relations affects the risk perception of nuclear power station accidents and storage and management of radioactive wastes, but the effect is negatively mediated by gender. The effects of the interaction variable are also not consistent with our prediction in Hypothesis 2b.

The variable indicating attitude toward science produced partial support of Hypothesis 3. On the one hand, the variable has statistically significant effects for all health-related risks at the individual level, except geriatric diseases. On the other hand, the variable has statistically significant effects for the risks of storage and management of radioactive wastes and shortage and exhaustion of natural resources (columns 14 and 16). These results are only partially consistent with the prediction of Hypothesis 3.

Control variables produced mixed effects for all risks at both the individual and societal level. In particular, the variable indicating trust in others remains statistically significant through almost all columns, and the effects are consistent across all risks. It indicates that those who have higher levels of trust in others are more likely to underestimate the likelihood of a range of risks. The effects of other control variables are inconsistent in terms of their statistical significance.

Discussion and Conclusion

Many previous studies have examined how people's perception of a variety of potential risks in Korea is formed in a social psychological perspective (Kim & Lim, 2016). However, only a few studies exist on the risk perception of environmental and health-related problems in Korea. Also, there are only a few studies on how people perceive environmental and health-related risks differently by gender in Korea and previous studies of this issue have treated gender as a mere control variable. These studies found significant gender differences in the perception of risks, but the analyses lacked theoretically informed gender perspectives. In Korea, where women's social status is relatively low and still bounded by a strong traditional gender ideology, women might have different attitudes toward environmental and health-related issues than men. Furthermore, previous studies have not distinguished potential risks to individuals from those to an entire society. People assess the risks that can happen to them and the risks that can affect society differently. Therefore, differences between people's perceptions of individual exposure and societal exposure to environmental and health-related risks are to be

expected.

We found that women are more sensitive to environmental and health-related risks than men. Previous studies based on gender socialization predicted that women's sensitivity to environmental and health-related issues are consistent with the gender socialization process of women. As expected, Korean women are more concerned about individual health-related risks than men and they also show less concern with respect to environmental risks at the societal level. Two explanations might be possible. First, this could suggest that women have more knowledge of individual health, cleanliness, and food products as would be required by their socialized gender roles. Mothers might be more considerate of individual health issues and are responsible for food safety, cleanliness in the home, and even environmental chemicals (MacKendrick, 2014; Maher, Fraser, & Wright, 2010). This could lead women to perceive health-related risks as more of a danger, because they are expected to take strong responsibility for those risks. Second, women tend to show less confidence with respect to science because of the gender stereotyping of women in socialization processes (Fox & Firebaugh, 1992). Thus, it is possible that women show less confidence in science-related environmental issues, which might lead women to feel more risk than men. However, there is no clear evidence that this is the explanation for gender differences in perceptions of community-oriented environmental risks.

Based on previous studies, it is expected that men socialized as breadwinners would tend to participate in the public sphere, while women socialized as caregivers and homemakers tend to be occupied with the private sphere. The results indicate that women are more sensitive to health-related risks than men at the individual level, which is consistent with our prediction. Meanwhile, the results show that women show more awareness of community-oriented environmental risks than men, even though previous research would lead us to expect the opposite. The evidence suggests that the gender roles in the public sphere previously considered as exclusively male are changing in Korea. As many social protests related to environmental issues have shown that women are now at the center of such protests (Kim, 2010; Kim, 2017), we can expect that the role of women in the public sphere is now in transition.

The variables measuring paternalistic ideology and faith in science produced mixed results. We expected that individuals with a strong paternalistic ideology would show less environmental or health-related concerns, for both men and women. However, the results show that paternalistic ideology itself has little or no effect on individuals, with the two exceptions of the social risks of being exposed

to mental health threats and nuclear power plant issues. Rather, the interaction effect between women and paternalistic ideology suggests that women with a strong paternalistic ideology perceive less risk in individual health-related issues (mental health, geriatric diseases, food risks), and this is also true for nuclear power plant issues; women with a strong paternalistic ideology also perceive lower levels of risk with regard to radioactive waste. The contrast in gender risk perceptions in relation to nuclear power plants and radioactive waste is intriguing when assessed within the context of women and nuclear power. We had assumed that the nuclear issue would not be treated the same way as other environmental issues and our results support this assumption. Although the results are not consistent, our analysis shows that a strong paternalistic ideology affects women's perception of risks and this partly supports Hypothesis 2b.

We also found that faith in science does not affect individuals' perception of social risks except with regard to radioactive waste, but, rather, that individuals with less faith in science show more concern for individual risks. Though there are differences between issues, attitudes toward science are relevant in explaining perceptions of individual risks. We also tested the interaction between women and attitudes toward science, but there was no interaction effect.

Overall, our analysis shows that current gender differences in the perception of health-related and environmental risks in South Korea are contrary to what we expected. Our findings are suggestive in terms of redirecting research in environmental and gender studies to include changing gender roles and gender ideology. Previous studies are of value, but their assumptions and findings are inappropriate to predict current societal changes. Although we focus on one particular country, the ideal construction of this research should address cross-national perspectives. In addition to examining a country-specific setting, future research could investigate national variations in gender ideology and cross-cultural variations in traditional gender socialization (Franzen & Meyer, 2010; Hunter et al., 2004).

We are aware that 2013 KGSS data have limited information on gender and paternalistic ideologies and the analysis should include more recent survey responses from the population to fully verify our hypotheses on a more sophisticated level. Also, our measure of risks can be confusing because it touches on a psychological loop of perception; however, one clear lesson from our results is the importance of distinguishing the social and individual levels of environmental and health-related issues when studying gender differences in perceptions of risk. If the dataset allows, our findings can extend the research to figure out how changing gender roles can influence future research into risk perception. Unfortunately, the KGSS

database does not track our population longitudinally and the survey questions used in this paper were only implemented in the 2013 KGSS survey questionnaire. However, we believe that our analysis and its results will provide opportunities to improve and expand future research on gendered aspects of perceptions of environmental and health-related risks.

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Biographical Note: Eunhye Yoo is an Associate Professor of Information Sociology at Soongsil University. Her research focuses on the processes and politics of transnational advocacy network and women's policy issues, and the relationships between women's rights and globalization. She published recent articles on women's rights in *International Journal of Comparative Sociology*, *Law & Social Inquiry*, and *Politics & Gender*. She is working on a manuscript how foreign aid influence women's health policy networks in non-OECD countries. E-mail: eyoo@ssu.ac.kr

Biographical Note: Kyungmin Baek is an Assistant Professor of Information Sociology at Soongsil University. His research include environmental policy, anti-discrimination policy, and data and security policy in East Asian society. He has published articles in *Asian Perspective*, *Law & Social Inquiry*, *Corporate Social Responsibility & Environmental Management*, and *Journal of Business Ethics*. E-mail: kbaek37@ssu.ac.kr