Comprehensive Examination of Heavy Metal Risk Perception: Focusing on Affect, Trust, and Health Literacy

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Abstract

Objectives: Heavy metals represent a substantial health risk in societies of rapid industrialization, such as South Korea. We examined the level of South Korean heavy metal risk perception and factors influencing this level.

Methods: A nationwide online survey of 800 individuals was conducted to measure the respondents' affect, trust, health literacy, and risk perception.

Results: The risk perception ranked third highest out of seven risks compared, with the highest being radiation leakage, followed by hazardous waste dumps. A negative affect and little trust in public institutions were associated with a higher risk perception. Moreover, health literacy and socio-economic status (SES) indirectly fostered risk perception by exerting powerful influence on affect and trust, which in turn impacted the risk perception. In addition, those with the lowest health literacy showed the highest perception of risk, signifying a distorted impression of a risk; increased health literacy tended to heighten risk perception for the rest group.

Conclusion: Affect and trust are considered as heuristics that influence ordinary people's risk perception. This study substantiated the role of those heuristics. Furthermore, we demonstrated that health literacy indirectly influences risk perception by directly influencing affect heuristic.

Keywords: *Affect, Trust, Health Literacy, Heavy Metals, Risk Perception, Risk Communication*

Introduction

Heavy metals, which arise from various sources, have long been a health risk. Dissemination and exposure to these metals is largely connected to industrial processes affecting multiple sources, such as air, water, soil, food, and even tableware. Rapidly industrialized societies are subject to a higher risk of heavy metal toxicity. In South Korea, the illegal discharge of contaminated waste water (Goo, 2012), Dioxin contamination of soil (Park, 2012), and heavy metals in imported salmon (Kim, 2010) and medicinal herbs (Ahn, 2012), among other reports, have become highly salient news.

In terms of coping with risks that affect human health, risk perception is regarded as a source for gauging, understanding, and managing the societal response (Kasperson et al., 1988). Fostering and managing an appropriate level of public risk perception is critical when attempting to control a potential risk. We attempt to examine a structural model that measures the mutual influences of multiple factors on heavy metal risk perception. Using a nationwide online survey (N=800), the direct impact of socio-economic status [SES] (Slimak & Dietz, 2006; McDaniels, Kamlet, & Fischer, 1992), health literacy (Brewer et al., 2009; Reyna et al., 2009; Schapira et al., 2004), trust (Viklund, 2003; Flynn et al., 1992; Bassett Jr, Jenkins-Smith, & Silva, 1996; Siegrist, Gutscher, & Earle, 2005), and affect (Finucane et al., 2000;

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Peters, Burrastone, & Mertz, 2004; Leiserowitz, 2006; Keller, Siegrist, & Gutscher, 2006) are assessed based on previous studies of risk perception. We also investigate how inherent characteristics (i.e., SES and health literacy) are mediated by trust and affect.

Even though there have been increasing interest in examining factors for environmental risk perception (Howel & others, 2003; Wakefield et al., 2006; Faulkner et al., 2001; Brody et al., 2005; Grasmu¨ck & Scholz, 2005; El- Zein et al., 2006), the risk perception of heavy metals has rarely been studied in light of multiple influences. The findings in this study would accumulate knowledge on the dynamics of risk perception regarding environmental risk in general, by providing a comprehensive picture of how heavy metal risk perception is established.

Factors Affecting Risk Perception

Affect

According to the "hot cognition" hypothesis (Abelson, 1963), all socio-political concepts stored in our mind are affectively charged, and is automatically activated upon exposure to the concept. A similar idea was addressed in Bower's (1981) associative network theory, which posits that human memory consists of an associative network of semantic concepts and schemata. A unique aspect of this theory is that emotions are considered to have a node or unit in memory, and are linked to related events to which the emotions causally belong. Zajonc (1980) also recognized the role of affect in information processing. He suggested that affect as a psychological heuristic is evoked automatically, implying the use of little mental effort when responding to a stimulus, and guides subsequent information processing.

Following these psychological perspectives which suggest affect-laden information processing, researchers in social psychology and political science explored the role of affect in information processing in areas such as voting behavior or candidate evaluations (Fazio & Williams, 1986; Lodge & Stroh, 1993; Marcus & MacKuen, 1993) and perception of others (Fiske & Pavelchak, 1986).

Evidence for the critical role of affect in risk perception has also been reported (Keller et al., 2006; Vastfall, Garling, & Slovic, 2006; Peters et al., 2004; Finucane et al., 2000; Terpstra, 2011). For example, reference to an overall affective evaluation of a stimulus could influence judgments of the associated risks and benefits (Finucane et al., 2000). Townsend and Campbell (2004) reported a similar finding, stating that affect was a key predictor of willingness to purchase genetically modified food.

Regarding the general tendency of affective influence, Slovic (2004) suggested that people use their affect pool to make judgments faster and easier, especially when the situation is complex and resources are limited. Slovic calls this "mental shortcut" the *affect heuristic*. Most notably, the automatic activation of an affective charge requires little mental effort and influences subsequent information processing. The present study examines the possibility that the affect heuristic operates in the South Korean perception of heavy metal risk.

Trust

Expecting a certain role of trust in hazard perception is based on the assumptions that people are "cognitive misers" (Fiske and Taylor 1984) and tend to make less mental efforts. In addition to this form of affect, trust can be another mechanism that helps people weigh the risks associated with a hazard without evaluating all of the pertinent information. In general, modern society is characterized by the complexity of its technical and abstract systems (Giddens, 1990). It has been postulated that "ordinary" people have little knowledge about most complex social systems, and one way to resolve this issue is to rely on social trust (Siegrist & Cvetkovich, 2000).

When it comes to risk perception, ordinary people may also rely on trust when faced with various types of risks arising from industrial processes. In fact, there are many studies on how trust affects risk perception of various other hazards (Flynn et al., 1992; Siegrist et al., 2005; Sjöberg & Drottz-Sjöberg, 1991; Cvetkovich, 1999; Greenberg & Williams, 1999; Terpstra, 2011; Hossain *et al.*, 2003; Hossain & Onyango, 2004; Onyango, 2004; Chen & Li, 2007).

Flynn *et al.* (1992), for example, found that those trusting in repository management showed a low level of risk perception regarding a radioactive

waste repository. Also, those with social trust in companies and scientists perceived less risk associated with gene technology than people without this type of trust (Siegrist, 2000). In the case of heavy metal risk perception, it is apparent that people may not know much about toxic metals and their effects on health. Therefore, their trust in those responsible for risk management (i.e., the government, mass media, corporations, etc.) could affect the level of risk perception regarding these hazardous materials.

Health Literacy

Health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Health and Human Services, 2000). It involves an individual's “ability to gain access to, understand and use health information” in ways to promote and maintain good health (WHO, 2007). This implies that those with low literacy would be less likely to access risk information or more likely to misunderstand it, which leads to a distorted risk perception.

Brewer et al. (2009) found that women with lower health literacy gave higher mean estimates of recurrence risk for a hypothetical group of women with early-stage breast cancer than did women with higher health literacy (52% versus 30%, respectively; $p<.001$). Also, Appalachian cancer survivors with low health literacy had more cancer worries than non-Appalachian survivors with higher literacy (Kelly et al., 2011). In the case of risk perception for diabetes, however, those with higher health literacy showed a higher risk perception when they believe that they had a personal health problem of overweight (Darlow, Goodman, Stafford, Lachance, & Kaphingst, 2012).

Notably, affect and trust are similar in that both preclude the need for strong mental efforts regarding risk perception. In contrast, health literacy does not provide such a cognitive shortcut. Rather, it implies a greater likelihood of making a strong mental effort to activate constructs about a risk stored in a well-developed knowledge structure of memory (Higgins, 1996).

In terms of knowledge activation, relying on an automatically activated heuristic (e.g., affect and trust) is based on greater accessibility of said heuristic. Accessibility here refers to its activation potential or pre-stimulus preparedness (Higgins, 1996). When asked about heavy metal risk perception, people may activate affect attached to the concept of heavy metals from memory (Wyer & Srull, 1989) or merely rely on their trust in public institutions responsible for managing the risks posed by heavy metals.

However, knowledge activation is preceded not only by accessibility, but also by applicability (Higgins, 1996). Psychologists suggest that applicability is the extent of similarity or matching between the meaning(s) of stimuli and stored information (Higgins & Brendl, 1995). One can expect that those with a high health literacy score have a well-developed knowledge structure regarding risk. When asked about their perception of a risk, people are capable of activating not only highly accessible affect or trust, but also other applicable constructs relevant to determining the level of risk. The use of applicable constructs or information concerning a wider range of aspects can help people perceive a risk as it actually is. Our study predicts that this is also likely to occur when determining the level of heavy metal risk perception.

SES

A previous study of SES in the UK showed that poorer people expressed greater concern about food risk (Frewer, 1999). Another study in Canada showed that risk perception regarding bacterial, additive, and pesticide in food varied according to income, number of children, age and voting preference (Dosman, Adamowicz, & Hrudey, 2001). Education also significantly influences the level of risk perception, especially for environmental problems (Brody et al., 2004; Turgeon et al., 2004; Lumley & Hercock, 2000; Menegaki et al., 2007). With respect to heavy metals, highly educated people show a stronger belief in the presence of heavy metals (Verbeke et al., 2004) or water pollution (Dogaru et al., 2009). Thus, SES seems to be important for developing a comprehensive view of heavy metal risk perception.

Previous Studies of Heavy Metal Risk Perception

Heavy metal risk perception has been studied with regard to specific sources such as contaminated soil (Weber, Scholz, Bühlmann, & Grasümck, 2001; Grasümck & Scholz, 2005), water (Burger, Staine, & Gochfeld, 1993), and fish (Verbeke, Sioen, Pieniak, Van Camp, & De Henauw, 2004), especially in mining-affected areas (Dogaru et al., 2009) and from a waste incinerator (Lima, 2004). Prior investigation has focused on the general level of risk perception regarding consumption of fish from contaminated water in comparison to other types of risk (Burger et al., 1993), as well as factors influencing the level of risk perception, including proximity to a hazard (Weber et al., 2001; Lima, 2004; Grasümck & Scholz, 2005) and SES (Verbeke et al., 2004; Dogaru et al., 2009).

These studies found that people living in or near contaminated areas (Weber et al., 2001) or waste incinerators (Lima, 2004) had a higher heavy metal risk perception. Also, respondents with a higher education had a significantly stronger belief in the presence of heavy metals (Verbeke et al., 2004) or similar type of water pollution (Dogaru et al., 2009).

Unfortunately, the aforementioned studies of heavy metal risk perception represent a limited view of risk perception since they are region-specific (i.e., contaminated or non-contaminated areas), or source-specific (e.g., water, soil, fish, or incinerator). Without sufficient awareness, people can be exposed to heavy metals everyday via multiple sources, such as air, water, soil, or food. The pervasiveness of these toxic metals makes understanding of general determinants of risk perception more critical. Accordingly, we examined individuals' characteristics of health literacy, SES, trust, and affect in conjunction with previous empirical studies.

Hypotheses and Research Questions

To obtain a more general view of risk perception concerning heavy metals, we investigated the four characteristics of individuals (SES, health literacy, trust, and affect). In the case of trust and affect, there have been much empirical research on their effects (Finucane et al., 2000; Flynn et al., 1992; Siegrist et al., 2005), and it seemed reasonable to expect that those with a negative affect toward heavy metals or those with little trust in public institutions managing relevant risk would have a higher risk perception. Accordingly, two hypotheses were tested:

H1-1: Trust will have a negative impact on South Koreans' heavy metal risk perception.

H1-2: Affect will have a negative impact on South Koreans' heavy metal risk perception.

Regarding SES and health literacy, which showed inconsistent effects on risk perception (Kelly et al., 2011; Darlow et al., 2012), the following research questions were examined:

RQ 1-1: Does any of SES impact South Koreans' heavy metal risk perception?

RQ 1-2: Does health literacy impact South Koreans' heavy metal risk perception?

We also examined whether each factor interacts with other factors. More specifically, we posit that SES and health literacy are individuals' predisposition more than trust and affect are; the latter is heuristic devices influenced by everyday communicative activities, while the former is less changeable than the latter. Taking the different characteristics of the independent factors into account, we especially examine if the association between an individual's inherent features and risk perception is mediated by heuristic devices, investigating another research question:

RQ 2: Do heuristic devices mediate associations between inherent features and risk perception?

Methods

Data Collection

A total of 800 South Korean adults participated in a nationwide survey conducted by a professional survey agent in South Korea.; both online survey (N=504) and person-to-person survey (N=296) were conducted to obtain the sample size. The characteristics of the people surveyed were consistent with those of the general population in terms of sex, age, and region. Among the 800 respondents, 402 (50.3%) were females, and 418

(51.8%) had a college degree or higher. The number of respondents in their 20s, 30s, 40s, 50s, and 60s and above was 146 (18.3%), 182 (22.8%), 188 (23.5%), 154 (19.3%), and 130 (16.3%), respectively.

Measurements

Risk perception was measured by asking respondents how much of a threat heavy metals pose to the population as a whole and to each respondent's health. The likelihood of heavy metals being dangerous to their quality of life was also queried (Brewer et al., 2007). Five-point Likert-type scales were utilized, and the internal consistency of the three items was reliable (Cronbach's alpha=0.82). Measurements for the independent variables are presented in Table 1.

In measuring affect, one question was utilized: "How do you feel about whatever initially arises in your mind regarding heavy metals?" The range between "a very positive feeling" (4 points) and "a very negative feeling" (-4points) was suggested and the respondents were asked to select one of the eight points. This measurement was based on the method of affective imagery (Leiserowitz, 2006; Slovic, Layman, & Flynn, 1991).

Table 1. List of latent variables and indicators.

Latent variable	Indicators	Loading
Risk perception	How much of a threat do you think heavy metals pose to our people's health? (b3)	0.75
	How much of a threat do you think heavy metals pose to your health? (b4)	0.85
	How much of a threat do you think heavy metals post to the quality of your life? (b5)	0.74 (0.82)
Trust	Determining a safe amount of heavy metal in a product should be left to the government or to relevant public institutions. (d2)	0.60
	The government and/or related public institutions' responses and information regarding heavy metals can be trusted. (d5)	0.72
	News media's responses and information regarding heavy metals can be trusted. (d6)	0.73
	Private corporations' responses and information regarding heavy metals can be trusted. (d8)	0.75 (0.79)
Affect	How do you feel about whatever initially arises in your mind regarding heavy metals? (b1_1)	
Health literacy	A question on information regarding real estate. (h2)	0.55
	Two questions on a press release regarding traces of lead and cadmium in octopi. (h3, h4)	0.39, 0.32
	A question on a press release regarding traces of heavy metals in Chinese medical herbs. (h7)	0.50 (0.50)
SES	What is your final level of education? (i3)	0.50
	What is your household income? (i5)	0.66
	How many of your household have income? (i6)	0.51 (0.49)

Note: Values in ( ) are the Cronbach's alpha; SES, socio-economic status.

Analysis

Structural equation modeling was used to examine the complex relationships between the

four factors, testing both their indirect and direct effects. In general, individuals' four characteristics

(i.e., SES, affect, trust, and health literacy) were the major factors for risk perception in the structural equation model. Also, mediation effects of heuristics (affect and trust) on the association between individuals' characteristics (SES and health literacy) and heavy metal risk perception were included in the model.

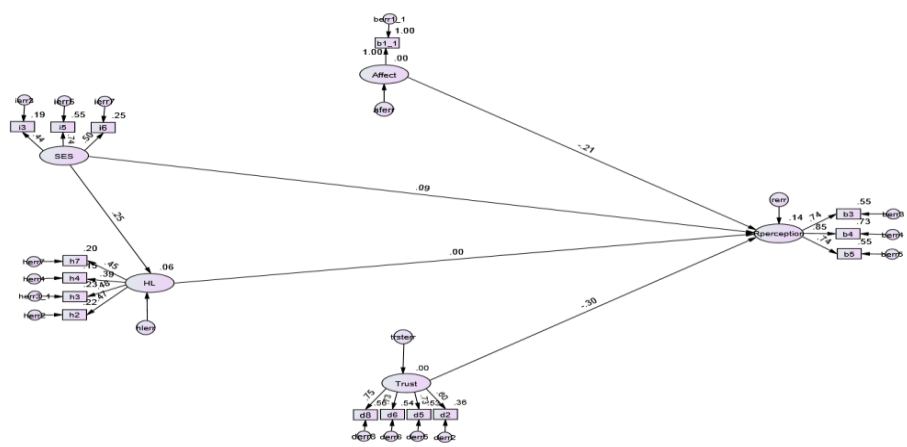
Utilizing the AMOS program for parameter estimation, this study relied on maximum likelihood estimation in conjunction with the common factor model rather than the principal-component model (Anderson & Gerbing, 1988). Data analysis was conducted in two steps. First, the fit of the hypothesized model to the observed data was evaluated. Next, we examined a model which included any indirectly mediating effects and compared it with the original model. Our models were assessed using absolute fits of the Normed Fit Index (NFI), Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and Incremental Fit Index (IFI).

Results

South Koreans' heavy metal risk perception ranks the third highest out of seven risk perceptions compared. Responses coded on the five-point Likert-type scale ranging from 1 (not dangerous) to 5 (highly dangerous) showed that radiation leakage risk perception was highest (M=4.53, SD=.70). Hazardous waste in landfills (M=4.50, SD=.65) showed the second highest risk perception, followed by heavy metals (M=4.40, SD=.64), climate change (M= 4.38, SD=.68), reckless deforestation (M=4.13, SD=.77), GMOs (M=4.08, SD=.74), and population increase (M=3.46).

Estimating Direct Impacts

H1-1 and H1-2 speculated on those from trust and affect. South Koreans' heavy metal risk perception was low when they chose to trust relevant institutions (β=-0.30, p<0.01) and/or when they had a positive affect toward heavy metals (β=-0.21, p<0.01). The RQ1-1 and RQ1-2 questioned the direct influence(s) of SES and health literacy, and the answer was negative. Although the impact of SES almost reached statistical significance (β=0.10, p=0.59), health literacy did not (Figure 1).



χ^2= 320.523; df= 86; p<0.01; NFI=0.877; CFI=0.907; IFI=0.906; RMSEA= 0.058.

Figure 1. Path diagram of the risk perception model with the main effects.

To examine the impact of health literacy more closely, this study divided respondents into four groups according to their health literacy questionnaire scores. Interestingly, the group with the lowest score had the highest level of risk perception, signifying a possible distortion of risk perception (Figure 2). When the four factors were grouped as inherent features (SES and health literacy) and heuristic devices (trust and affect), the two heuristic devices showed the greatest influence (trust: β=-0.30, p<0.01; affect: β=-0.21, p<0.01), while neither inherent feature showed a significant direct influence.

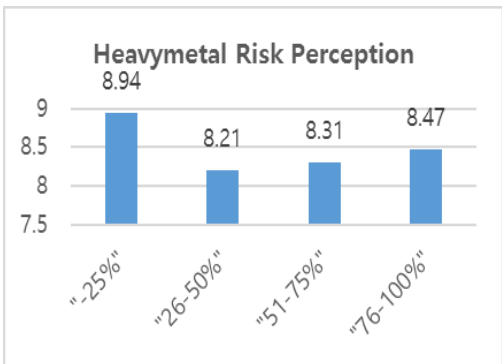


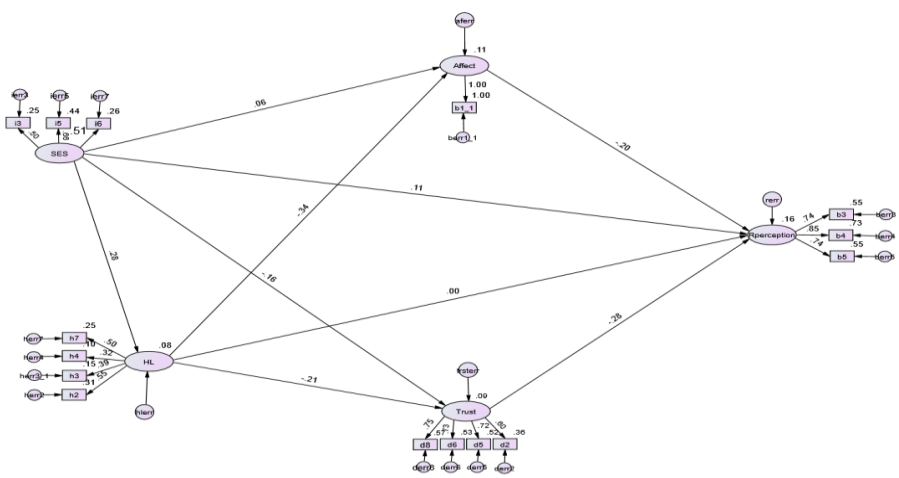
Figure 2. Relationship between the percentage of correct answers measuring health literacy and the level of heavy metal risk perception.

Indirect Effects Mediated by Heuristic Devices

Heavy metal risk perception was indirectly affected by SES and health literacy through trust and affect. In particular, respondent health literacy had an especially negative impact on trust (β=-0.21, p<0.01), which had the greatest impact on risk perception (Figure 3). Interestingly, health literacy influenced affect (β=-0.34, p<0.01) to a greater magnitude than trust, while SES influenced trust (β=-0.16, p<0.01), but not affect (β=0.06, p=ns). The risk perception model that includes mediating effects (NFI=0.91; CFI=0.93; IFI=0.94; RMSEA=0.05) fit the data better than the original model (NFI=0.88; CFI=0.91; IFI=0.91; RMSEA= 0.06), which only included direct impact.

Discussion

In a nationwide online survey of 800 adults, the current study examined the influences on South Korean heavy metal risk perception. Our results demonstrated that South Korean heavy metal risk perception was guided mainly by trust and affect, the heuristic devices examined herein. In contrast, respondents' inherent features were not so much influential as trust and affect were. It was notable, however, that the inherent factors indirectly helped foster risk perception by exerting powerful influence on the heuristic devices.



χ^2=246.667; df= 82; p<0.01; NFI=0.905; CFI=0.934; IFI=0.935; RMSEA= 0.050.

Figure 3. Path diagram of the risk perception model with mediation effects added

This study provides a psychological perspective on general information processing. The finding that those with high levels of literacy had a more intensively negative affect substantiates the hot cognition (Abelson, 1963) and associative network theories (Bower, 1981), both of which suggest affect-laden information processing. Those who can search for, process, and understand health information likely have a well-developed knowledge structure regarding health issues, as well as affective nodes attached to it. This explains why those with high levels of health literacy showed a more intensively negative affect toward heavy metals, which led to higher levels of risk perception. The indirect influence of health literacy on risk perception through affect empirically shows the relationship between health literacy and affect, both of which play important roles in information processing.

In addition, we found that those with lowest health literacy showed the highest risk perception, while the remaining three health literacy levels had higher risk perception with increased literacy. This hints at a possible distortion of risk perception in the group of the lowest literacy. Thus, we believe developing readily accessible government-issued public health messages would help educate individuals with low health literacy, thereby reducing overzealous and/or distorted risk perceptions.

It should be noted that this study is limited in that only four questions were used to examine health literacy. Although the findings in this study are informative to understand the risk perception dynamics regarding heavy metal, developing a more reliable measurement of health literacy for South Koreans is a feasible and necessary agenda considering this construct is a significant resource for various types of policy-making activities related to public health. In the case of SES, the poor correlation between education and income may reflect the current socioeconomic situation in South Korea, as disruption of the middle class in South Korea has recently become salient. The "house-poor" who owns one or more housing units associated with substantial debt represent a typical example of the middle class disruption in the nation. Finally, health behaviors related to heavy metal risk response were not examined in this study. A model combining behavioral responses with risk perception and other factors is an area for future research.

References

1. Abelson RP. Computer simulation of 'hot cognition.' In S. Tomkins & S. Messick (Ed.) Computer simulation and personality: Frontier of psychological theory. New York: Wiley. 1963;277-298.
2. Anderson J C, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin. 1988; 103:411-423.
3. Bower GH. Mood and memory. American Psychologist. 1981; 36:129-148.
4. Brewer NT, Chapman GB, Gibbons FX, Gerrard M, McCaul KD, Weinstein ND. Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination. Health Psychology. 2007; 26:136-145.
5. Brewer NT, Tzeng JP, Lillie SE, Edwards AS, Peppercorn JM, Rimer BK. Health literacy and cancer risk perception: Implications for genomic risk communication. Medical Decision Making. 2009;29: 157-166.
6. Chen MF, Li HL. The consumer's attitude toward genetically modified foods in Taiwan. Food Quality and Preference. 2007; 18:662-674.
7. Cho Y. Billion wons of medicinal herb with heavy metals sold. MBC. 2013. Available at: http://imnews.imbc.com/replay/2013/nwtoday/article/3358342_12391.html [in Korean].
8. Darlow S, Goodman MS, Stafford JD, Lachance CR, Kaphingst KA. Weight perceptions and perceived risk for diabetes and heart disease among overweight and obese women. Preventing Chronic Disease. 2012; 9: 110-185.
9. Dosman DM, Adamowicz WL, Hrudey SE. Socioeconomic determinants of health- and food safety-related risk perceptions. Risk Analysis. 2001; 21: 307-318.
10. Finucane ML, Alhakami A, Slovic P, Johnson SM. The affect heuristic in judgments of risks and benefits. Journal of Behavioral Decision Making. 2000; 13, 1-17.
11. Flynn J, Burns W, Mertz C, Slovic P. Trust as a determinant of opposition to a high-level radioactive waste repository: Analysis of a structural model. Risk Analysis. 1992; 12: 417-

429.

12. Frewer L. Public perception of genetically modified foods in Europe. Journal of Commercial Biotechnology. 1999; 6: 108–115.
13. Goo JW. Freeze, waste water and polluted air! Kyeonggi-Daily, 2012 December 18. Available at: http://www.kyeonggi.com/news/articleView.html?idxno=636575 [in Korean].
14. Kasperson RE, Renn O, Slovic P, Brown HS, Emel J, Goble R, Ratick S. The social amplification of risk: A conceptual framework. Risk Analysis. 1988; 8:177-187.
15. Kim YH. Salmon full of heavy metals?. Kukjae-Sinmun,, 2012 December 17. Available at http:// www. kookje.co.kr/news2011/asp/newsbody.asp?code=0800&key=20121217.22021190 812 [in Korean].
16. Lumley S. Hercock M. Locational and socio-economic variation in public perceptions of economics and the environment. GeoJournal. 2000; 51:235-244.
17. Nielsen-Bohlman L, Panzer AM, Kindig DA. Health literacy: A prescription to end confusion. Washington DC: The National Academies Press. 2004.
18. Onyango B. Consumer acceptance of genetically modified foods: the role of product benefits and perceived risks. Journal of Food Distribution Research. 2004; 35:154-161.
19. Park JC. Detection of Dioxin in the former US army base. Kyunghyang-Shinmun, 2012 September 26. p.16 [in Korean].
20. Siegrist M, Cvetkovich G. Perception of hazards: the role of social trust and Knowledge. Risk Analysis. 2000; 20:713–719.
21. Siegrist M, Gutscher H, Earle TC. Perception of risk: the influence of general trust, and general confidence. Journal of Risk Research. 2005; 8:145-156.
22. Terpstra T. Emotions, trust, and perceived risk: Affective and cognitive routes to flood preparedness behavior. Risk Analysis. 2011; 31:1658-1675.
23. Townsend E, Campbell S. Psychological determinants of willingness to taste and purchase genetically modified food. Risk Analysis. 2004; 24:1385-1393.
24. WHO Commission on the Social Determinants of Health. Achieving health equity: From root causes to fair outcomes. Geneva: World Health Organization. 2007. Available at: from http://www.who.int/social_determinants/resources/interim_statement/en/ index.html.
25. Zajonc RB. Feeling and thinking: Preferences need no inferences. American Psychologist. 1980; 35(2):151-175.