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han, jinseok Ph.D.candidate and Kim, Namjo Ph.D., "Q-methodology analysis of Perceived Risks in Tourists and Local residents towards Natural Disaster: The 2016 Gyeongju Earthquake in Republic of Korea" (2019). *Travel and Tourism Research Association: Advancing Tourism Research Globally*. 46.  
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# **Q-methodology analysis of Perceived Risks in Tourists and Local residents towards Natural Disaster: The 2016 Gyeongju Earthquake in Republic of Korea**

## **Introduction**

Natural disasters, such as earthquakes, storms, tsunamis and heavy snow, are a very difficult phenomena to predict, and once they occur, their physical and social damage is huge. The risk of natural disasters is increasing with urbanization and globalization, and the risk of earthquakes, storms, tsunamis, and snowstorms continuously increases due to climate change (Kim, Choi & Shim 2008). Natural disasters can cause many casualties and economic losses, and have a negative impact on industry (Briere & Elliott, 2000). The tourism industry is one of the industries that is especially sensitive to disasters (Chew & Jahari, 2014), with the increase of disasters considerable confusion is experienced. (Lee, Han & Kim, 2018; Lehto, Douglas, & Park, 2008). The occurrence of natural disasters for tourist attractions can be a huge economic blow to local profit generating residents, and increase uncertainty and anxiety in tourists (Choi, Oh & Lee, 2015).

On September 12th, 2016, an earthquake of magnitude 5.8 occurred 8 km south-southwest of Gyeongju, Gyeongsangbuk-do, South Korea. Gyeongju is Korea's representative cultural heritage tourist attraction. It is the largest earthquake observed in South Korea since records of such occurrences have been recorded. Gyeongju contains UNESCO World Heritage Sites such as Seokguram and Bulguksa, and local residents have tourism-oriented economic income based on site. However, this earthquake destroyed some cultural assets, and reduced the frequency of visitors. It had a great impact on the local economy. Credit card usage patterns within the Gyeongju area have been analyzed before and after the earthquake using big data analysis and it was found that tourists' use of credit cards had decreased 17.6%. This indicates that tourists have plummeted (Lee, Han & Kim, 2018). Statistics also show that tourists to Gyeongju decreased by 47.0% in September and by 58.3% in October compared to the previous year (Bank of Korea, 2016). These examples show that the impact of disasters on the economy, society, and culture as well as tourism industry can be significant (Song, 2017).

The most affected area of any natural disaster is the area of impact where the disaster itself occurred. Natural disasters such as earthquakes are not only difficult to predict in advance, but also may have a residual aftershock. This makes economic, social, and psychological aspects of a society unstable. In Gyeongju, which is highly dependent on cultural tourism, local residents were distraught and not knowing what to do in their given situation. They also feared that another earthquake, or aftershock might occur. These fears caused by the earthquake not only affected the local tourism providers, but they also affected tourists visiting Gyeongju. Tourists cancelled plans to travel to Gyeongju, or changed their travel destination.

Until now, research on disasters has mainly involved perceptions of risks, changes of tourist destination image, or the decision making process for a tourist destination (Park, 2004; Tavitiyaman & Qu, 2013; Oh & Oh, 2013; Chew & Jahari, 2014; Seabra, Abrantes & Kastenholz, 2014). There is no research that analyzes both the tourists' and local residents' risk perceptions regarding disaster. If a natural disaster occurs in a tourist area such as Gyeongju, there will be a difference in perception of this natural disaster between a tourist and a local resident. The purpose of this study is to analyze the risk perception of earthquakes through subjective aspects

of local residents and tourists who experienced directly or indirectly the 2016 Gyeongju earthquake. The results from this study can contribute to suggestions to overcome future tourism crises caused by disasters by analyzing and discussing the perceived social, psychological and economic impact of the 2016 Gyeongju earthquake.

## **Literature Review**

### **1. Disasters**

Disaster can be described as a phenomenon that results in the collapse of social functions due to the occurrence of a wide range of human, material, or environmental losses (Darsini, 2016). Disasters can be classified as natural disasters, or man-made disasters, depending on the cause of the disaster (Asian Disaster Reduction Center, 2017). Man-made disasters represent industrial or chemical disasters caused by human intentional or careless actions such as oil spills, fire, explosions, buildings and bridge collapses. Natural disasters are classified as natural disasters such as hydro-meteorological disasters such as floods, typhoons and droughts, geological disasters such as earthquakes, tsunamis, landslides or volcanic eruptions, and infectious diseases caused by insects or animals (ISDR, 2007).

In general, man-made disasters occur for a short period of time and have a limited impact on the community, whereas natural disasters can have a direct impact on the community over a long period of time (Shaluf, 2007). In addition, man-made disasters cause conflict and anger due to unclear cause identification and determining who will take responsibility (Lee, 2011); natural disasters must deal with resource connection, frustration and actual restoration for victims (Oh, Heo & Woo, 2013). Both man-made disasters and natural disasters are unexpected, and unpredictable and situations which cannot be solved in a short period of time. Such situations are difficult to solve by an individual alone (Cho, 2013). Disasters have physical, economic, and social impacts such as human or animal casualties, property damage, and destruction of settlements (Darsini, 2016; Lindell & Prater, 2003). Also, if a disaster takes too long to amend, it may lead to political collapse in social behavior in a region (Lindell & Prater, 2003).

### **2. Disasters and Tourism**

Tourism is an important part for a country or a community in terms of the economic and social benefits it provides (Becken & Hughey, 2013). Tourism, however, is one of the sensitive and vulnerable industries affected by disasters (Lehto et al., 2008). Disasters are often difficult to predict and countermeasures are often difficult to prepare to prevent them. This leads a tourism industry into crisis (Ghaderi, Mat Som, & Henderson, 2015). Therefore, in order to manage a potential crisis in the tourism industry caused by disasters, research is increasing on man-made disasters, such as terrorism, oil spills, and fires (Gurtner, 2016; Hystad, & Keller, 2008), and natural disasters such as earthquakes, tsunamis, SARS and avian influenza.

Disasters cause havoc to tourist sites by damaging physical infrastructure such as cultural assets and transportation facilities (Lehto et al., 2008). For example, in the United States in 2005, more

than 300 cultural properties were destroyed by Hurricane Katrina and more than 1,200 cultural sites were destroyed (Hassett & Handley, 2006). The occurrence of a disaster not only reduces the number of tourists, but it also has a negative effect on the overall tourism industry, targeting niche tourism industries, such as the hotel industry and/or aviation industry.

In 2011, the Fukushima earthquake in Japan reduced the number of foreign tourists by about 50%. The 1999 earthquake in Taiwan, saw the number of foreign tourists decrease by 15% and the hotel occupancy decline up to 60%. Foreign tourists cancelled flight reservations and a large amount of tourism revenue was lost (Huang & Min 2002). The impact of disasters on tourism cannot be solved in a short time. Park (2004) studied the magnitude and recovery rate of the US international tourist from the “9/11 terrorism incident” using a time series intervention analysis. His research showed that the US inbound market had a sudden drop in the number of tourists by 1.37 million, and the impact continued over time, but the negative impact declined over time, continuing to affect inbound tourism for at least three years.

### 3. Perceived risk

Perceived risk has long been the focus of policymakers and researchers' attention (Schacter, 2000). Perceived risk can occur in a variety of areas such as natural disasters, technological disasters, infectious diseases, war, climate change and terrorism, and tourism activity is heavily influenced by perceived risk. Perceived risk refers to the risk one feels in a given environment through information gathered and interpreted through one's senses. Studies related to perceived risk in tourism are actively conducted either with single factor and/or multidimensional factors (Morakabati & Kapuściński, 2016; Yang, Sharif & Khoo-Lattimore, 2015).

Disasters increase the perceived risk to a tourist destination impacting an individual's physical, mental, financial and health risks (Mansfeld, 2006). Perceived risk from disasters are different depending on the type of disaster (Kozak, Crofts, & Law, 2007), demographic characteristics (Park & Reisinger, 2010), cultural background (Kozak et al., 2007), visiting experience (Chew & Jahari, 2014; Fuchs & Reichel, 2011), personality characteristics (Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001). In general, disasters increase the perceived risk of safety as the tourist destination is impacted, creating emotions such as anxiety and fear (Santana, 2004), and negative images (Chew & Jahari, 2014; Sönmez, Apostolopoulos, & Tarlow, 1999), ultimately impacting the intent to visit. Oh and Oh (2013) analyzed the relationship between perceived risk of a sightseeing spot, tourist destination image, and visit intention for the East Japan tsunami. They reported that the tsunami increased the perceived risk to visit Japan, negatively affecting the image of Japan as a tourist destination, and decreased the intention of tourists to visit Japan. Chew and Jahari (2014) studied the relationship between perceived risk, image, and revisit intention for Malaysian tourists whom had visited Japan. According to this study, social, psychological and financial risks of disasters negatively affect emotional and cognitive images; physical risks did not have such an impact. However, physical risk showed a direct negative impact on revisit intentions. Lehto et al. (2008) studied the tourist's emotional response to a disaster-affected area and their intention to visit. Their research shows the emotional reaction and intention to visit to the tourist sites was negative due to the natural disasters. In addition, disasters not only influence the affected areas themselves, but also can create a negative image of danger and fear for neighboring countries as well (Kozak et al., 2007).

## Methodology

### 1. Research method

Q methodology was used to identify and analyze the difference between risk perception tourists and local residents perceive from the Gyeongju Earthquake. In-depth interviews were conducted based on Q methodology; tourists and local residents were divided into two groups. Q methodology is useful for analyzing individual subjective views, personal attitudes, feelings, and perceptions on a particular subject. Q methodology can deeply analyze an individual's subjectivity such as one's attitudes, beliefs, and values about social phenomenon. It has recently been introduced in the field of tourism and is being used as a tool for analysis (Lee, Kim & Kim, 2014). Q methodology does not infer the whole from the individual responses, nor indicate differences in respondents. It infers how respondents construct a statement of Q samples. Therefore, Q methodology does not follow a general sampling method, and the number of samples is not large. This is because Q methodology examines the intra-individual difference. The number of samples may vary according to the purpose of the study, but it should not exceed over 100 people. The score of each item returns to the average value, and the other factors are biased to one or two factors (Kim, 2008).

For references, Q methodology was applied to 40 people in 'A study on the psychological segmentation of Korean newspaper readers' (Kim, 2001). In 'Self-projection in advertising', Q method was applied to 27 subjects in consideration of gender, age, educational background (Kim & Oh, 2005). Based on the small-sample doctrine of Q methodology, this study was conducted on 30 tourists (Seoul & Gyeonggi-do) and 31 local residents (people from the tourism industry) considering age, gender, and visiting potential.

### 2. Research process and analysis method

The following describes the research process and analysis method, which consisted of 6 stages.

Stage 1 was composed of collecting Q samples for the research tool creation. From analysis of previous research and newspaper articles, more than 80 statements related to perceived risk of tourists and local residents about the 2016 Gyeongju earthquake were derived. Interviews with Gyeongju local residents and Gyeongju tourists (or potential tourists who wanted to visit but had not visited yet) were conducted on their various perceptions, feelings, and reactions.

Stage 2 was the Q sample survey completion. Experts, namely professors who had expertise in Q methodology were consulted. The survey tool was reviewed by civilian, government and industry workers related to the 2016 Gyeongju earthquake. As a result, 34 statements were decided on for the final research tool, with 34 statements for tourists and 34 statements for local residents, see <Table 1>.

Stage 3 was the P sample selection. Thirty tourists who cancelled their visit due to the earthquake were selected, and thirty-one local residents from the tourism industry in Gyeongju.

For Q methodology analysis, it is necessary to have respondents whom are aware of the issue of the 2016 Gyeongju earthquake.

Stage 4 was Q classification. The researcher gave sufficient explanation to the respondents before administering the 9 point Likert scale survey consisting of 34 statements to them.

Stage 5 was a follow-up in-depth interview. An additional in-depth interview was also conducted on the most positive and negative item extremes of the distribution table, and the opinions were analyzed.

Stage 6 was empirical analysis and type classification from the survey results. We used the QUANL program to perform correlation analysis and key analysis. Tourists and local residents were classified into types

P sample questionnaire surveys and in-depth interviews were conducted over a month from May 15, 2018 to June 22, 2018. Interviews lasted about 40 to 50 minutes each. The Q card classification took about 20 minutes per person on average, and the follow-up in-depth interviews took about 20 to 30 minutes focusing on statements and descriptions of both extreme values.

**Table 1.** Q Sample Statement of Tourists and Local Residents

Division		Statements
T	R	
T-1	R-1	I am worried that I can use tourist convenience facilities (information center, restroom, accommodation, restaurants, etc.) properly.
T-2	R-2	I am worried about whether I can enjoy or use tourist attractions and tourism resources.
T-3	R-3	I am worried that public authorities will be able to cope properly in the event of a disaster.
T-4	R-4	I am worried that the tourist workers (tourist guides) will be able to cope appropriately when a disaster strikes.
T-5	R-8	I am worried that the local transportation system will not be well operated.
T-6		I am worried I can get tourist information properly in the local area.
T-7		I am worried about the local residents' looking at the tourist.
T-8		I am worried that I may be a nuisance to local residents recovering from the disaster.
	R-5	I think the central government alternative policies are insufficient.
	R-6	I think the local government alternative policies are insufficient.
	R-7	I am worried that the building's fire alarm system may not work properly.
	R-9	I am worried that tourists may not visit because we are still recovering from the earthquake

	R-10	I am worried that tourists may not visit because of the earthquake.
T-9	R-11	I have been effected mentally due to negative news of Gyeongju area.
T-10	R-12	I am worried that earthquakes may damage human self-esteem.
T-11	R-13	I am worried that I may lose my identity because of the earthquake.
	R-14	I am worried that the recovering time of the damaged facilities may be long.
	R-16	I am worried that the recovering time of tourist sites, tourist facilities and cultural properties may be long
	R-17	I am worried that the earthquake may delay the supply of daily necessities.
T-12	R-18	I am worried that I may meet with misfortune due to the earthquake.
T-13	R-19	I am worried that nuclear power plants may be affected by the earthquake.
T-14	R-20	I am worried that earthquakes may affect radioactive waste repositories.
T-15	R-21	I am worried of being injured by an earthquake.
T-16	R-22	I am worried that the earthquake may cause internal and mental injuries.
T-17	R-23	I am worried that I may die due to the earthquake.
T-18	R-24	I am worried that the tourism resources may be destroyed by the earthquake.
T-19	R-25	I am worried that the earthquake may damage accommodations, restaurants, and travel agencies.
	R-26	I am worried that the earthquake may depress the local economy
	R-27	I am worried that the tourism industry may collapse due to the earthquake.
T-20	R-28	I am worried that the earthquake may damage the passenger transportation industry economically.
	R-29	I am worried that the earthquake may cause various damages.
T-21		I am worried that the travel expenditure used to visit Gyeongju is useless.
T-22		I am worried that the earthquake may cause economic damage to tourist attractions (world cultural heritages, cultural properties, etc.).
T-23	R-15	I am worried that trains and buses may be delayed.
T-24		I am worried that check-in and check-out at the hotel may be late.
T-25		I am worried that the food service in restaurants may not operate on time.
T-26		I am worried that the time spent in Gyeongju may be a waste of time.
T-27		I am worried about misunderstanding or friction with local residents.

T-28	R-32	I am worried that press information may not be accurate.
T-29	R-30	I am worried that the earthquake may destroy the social order of the region.
T-30	R-31	I am worried that Gyeongju's traditional customs may be destroyed by earthquakes.
	R-33	I am worried that the press is over reporting.
	R-34	I am worried that there is too much negative news about the Gyeongju earthquake.
T-31		I am worried about the social prejudice of travelling when I visit the area where the earthquake occurred.
T-32		I will travel to other areas except Gyeongju.
T-33		I will visit Gyeongju in a stable period after the earthquake.
T-34		I think traveling to areas other than Gyeongju is better value.

## Results

### 1. Classification of Types

As a result of analyzing the perceived risk of tourists and local residents in the Gyeongju earthquake, 61 final valid P samples were selected. Of these, 30 were tourists and 31 were local residents. The 30 tourists were classified into 7 types; and the 31 local residents were classified into 7 types. Both of these groups satisfied the criterion of Eigen value 1 or higher.

A total of 7 types were derived from Q methodology for tourists. The seven types are: Satisfaction risk, Physical risk, Psychological risk, Social risk, Time risk, Functional risk, Financial risk. The total cumulative variance is 0.7639, which gives an explanatory power of 76.39% (Table2).

**Table 2.** EIGENVALUES, PERCENTAGE OF TOTAL VARIANCE and CUMULATIVE VALUE FOR TOURISTS

	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
EIGENVALUES	9.9363	4.6273	2.9572	1.8146	1.5715	1.1728	1.09712
PERCENTAGE OF TOTAL VARIANCE	.3312	.1542	.0986	.0605	.0524	.0391	.0279
CUMULATIVE	.3312	.4855	.5840	.6445	.6969	.7360	.7639

Note: Type 1 (Satisfaction risk), Type 2 (Physical risk), Type 3 (Psychological risk), Type 4 (Social risk), Type 5 (Time risk), Type 6 (Functional risk), Type 7 (Financial risk)



A total of 7 types were derived from Q methodology for local residents. The seven types are: Media risk, Financial risk, Physical risk, Psychological risk, Social risk Functional risk, Time risk. The total cumulative variance is 0.7162, which gives an explanatory power of 71.62%. (Table3).

**Table 3.** EIGENVALUES, PERCENTAGE OF TOTAL VARIANCE and CUMULATIVE VALUE FOR LOCAL RESIDENTS

	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
EIGENVALUES	7.9536	6.2431	2.3675	1.9471	1.8171	1.2241	1.0183
PERCENTAGE OF TOTAL VARIANCE	.2566	.2014	.0764	.0628	.0586	.0395	.0210
CUMULATIVE	.2566	.4580	.5343	.5971	.6558	.6952	.7162

Note: Type 1 (Media risk), Type 2 (Financial risk), Type 3 (Physical risk), Type 4 (Psychological risk), Type 5 (Social risk), Type 6 (Functional risk), Type 7 (Time risk)

A demographic analysis of the P sample of tourists is as follows (Table 4): With regard to sex distribution, 53.3% (16 people) were male and 46.6% (14 people) were female; age distribution shows 63.3% (19 people) in the 30s and 23.3% (7 people) in the 40s, with one person in their 50s and one person in their 20s 6.7% (2 people). Therefore those in their 30s were the majority of the respondents. Education level reveals 73.3% (22 people) had obtained a bachelor's degree, and 16.7% (5 people) had obtained graduate school education, with 10.0% (3 people) having graduated from high school. In terms of place of residency, 80.0% (20 people) lived in Seoul and 20.0% (6 people) lived in Gyeonggi Province. In this study, only those who were living in the Seoul metropolitan area who intended to travel to Gyeongju were limited.

The factor weight of respondent is a representative index of each factor, and a sample (respondent) with a high weighting value based on 1.0 or higher of the factor weight of each type is the most strongly representative respondent (Kim, 2008). The first type, 'satisfaction risk', ID 21 (factor weighting 2.3473) was the representative sample. The second type, 'physical risk', ID 16 (factoring weight 2.2885) was the representative sample. The third type, 'psychological risk', ID 17 (factor weighting 1.9860) was the representative sample. The fourth type, 'social risk', ID 09 (factor weighting 1.7296) was the representative sample. The fifth type, 'time risk', ID 26 (factoring weight 1.1017) was the representative sample. The sixth type, 'functional risk', ID 02 (factor weighting 1.4807) was the representative sample. The seventh type, 'financial risk', ID 29 (factoring weight 1.1227) was the representative sample.

The demographic analysis of the P sample of local residents is as follows (Table 4). 54.8% (17 persons) were male and 45.2% (14 persons) were female. The distribution of age was also 32.3% (10 persons) in the 20s, 22.6% (7 persons) in the 30s and 40s, 19.3% (6 persons) in the 50s and 3.2% (1 person) in the 60s.

Education level reveals 61.3% (19 people) had obtained a bachelor's degree, and 22.6% (7 people) from high school graduation, with 16.1% (5 people) having graduated from graduate

school graduation. In terms of Job, 41.9% (13 persons) has worked in lodging business, 25.8% (8 persons) in restaurant business, 19.4% (6 persons) in other businesses, and 12.9% (4 persons) in travel business. The other business consisted of convenience stores and electric bike lenders, etc.

The factor weights are as follows. The first type, 'media risk', ID 10 (factor weighting 3.5858) was the representative sample. The second type, 'financial risk', ID 26 (factoring weight 2.4077) was the representative sample. The third type, 'physical risk', ID 30 (factor weighting 1.9748) was the representative sample. The fourth type, 'psychological risk', ID 14 (factor weighting 2.6704) was the representative sample. The fifth type, 'social risk', ID 24 (factoring weight 1.1896) was the representative sample. The sixth type, 'functional risk', ID 16 (factor weighting 1.5905) was the representative sample. The seventh type, 'time risk', ID 31 (factoring weight 2.6516) was the representative sample.

**Table 4.** Demographic characteristics, factor weights of tourists and local residents

Tourists							Local Residents						
D	ID	G	A	L/E	R	F/W	D	ID	G	A	L/E	J	F/W
Type 1 (N=9)	03	M	40	GG	S	.9544	Type 1 (N=10)	05	F	50	UG	R	2.9031
	06	M	30	H	S	1.5918		07	F	40	GG	R	1.4543
	14	F	30	GG	S	.5631		10	F	30	UG	T	3.5858
	19	M	40	UG	S	1.7513		11	F	30	UR	E	1.2122
	20	F	40	UG	S	.4461		17	F	20	UG	L	.9895
	21	M	40	UG	S	2.3473		19	F	20	UG	L	1.5383
	22	F	30	UG	S	1.0503		20	M	30	UG	L	2.8834
	23	M	20	UG	S	1.1443		23	F	20	UG	R	2.2500
	24	M	30	GG	S	.2443		25	M	20	UG	L	.7579
Type 2 (N=6)	01	F	50	H	S	2.1412		28	M	30	UG	L	.6828
	07	M	30	UG	S	.4717	Type 2 (N=7)	09	F	40	H	L	.6808
	13	F	30	UG	S	.5206		12	M	30	H	E	1.4046
	16	F	40	UG	S	2.2885		13	M	40	UG	E	.6313
	18	F	30	UG	S	1.9249		15	F	20	UG	H	1.2116
	25	F	30	UG	S	.5352		22	F	50	H	E	.8112
Type	15	F	30	UG	G	.2893	26	M	30	UG	L	2.4077	

3 (N=4)	17	M	40	UG	G	1.9860	Type 3 (N=3)	27	M	40	GG	L	2.3925
	28	F	20	UG	S	.5025		04	M	60	UG	T	1.2507
	30	M	30	UG	G	.4191		08	M	50	GG	R	.9237
Type 4 (N=3)	04	M	30	UG	S	.2638	Type 4 (N=3)	30	M	30	H	T	1.9748
	09	F	30	UG	S	1.7296		06	M	40	H	E	1.3553
	10	F	30	UG	G	.2247		14	M	50	UG	E	2.6704
Type 5 (N=3)	08	F	30	GG	S	1.0743	Type 5 (N=2)	29	F	20	GG	R	1.8514
	12	M	30	UG	S	.3866		03	F	40	H	R	.6381
	26	M	40	UG	S	1.1017		24	F	50	H	T	1.1896
Type 6 (N=3)	02	M	30	H	S	1.4807	Type 6 (N=4)	01	M	50	UG	E	1.0397
	05	F	50	UG	S	.2991		16	F	20	UG	L	1.5905
	11	M	30	GG	G	.1449		18	M	20	UG	L	.6005
Type 7 (N=2)	27	M	30	UG	G	.1185	Type 7 (N=2)	21	M	20	UG	L	1.1172
	29	M	30	UG	S	1.1277		02	M	20	GG	R	.7568
						.9544		31	M	40	UG	L	2.6516

Note: D = Division, G = Gender, A = Age, L/E = Level of Education (H = High school graduation, UR = University Registration, UG = University Graduation, GG = Graduate school Graduation), R = Residence (S = Seoul, G = Gyeonggi-do), J = Job (R = Restaurant, T = Travel, L = Lodging, E = Etc.), F/W = Factor Weights,

## 2. Analysis of Perceived Risk by Types

**Table 5.** Comparison of Perceived Risk among Tourists and Local Residents.

Perceived risk of Tourists		Perceived risk of Local Residents	
division	Statements & Standard score	division	Statements and Standard score
Satisfaction risk	T-32(1.80), T-33(1.78), T-34(1.50)	Media risk	R-34(1.81), R-33(1.62), R-32(1.26)
	T-7(-1.37), T-30(-1.51), T-31(-1.54)		R-28(-1.29), R-31(-1.48), R-16(-1.64)
Physical risk,	T-13(2.18), T-14(2.18), T-11(-1.21)	Financial risk	R-25(2.00), R-27(1.63), R-26(1.38)
	T-4(-1.38), T-16(-1.55), T-24(-2.01)		R-7(-1.37), R-31(-1.71), R-12(-2.03)

Psychological risk	T-9(1.84), T-7(1.38), T-8(1.36) T-34(-1.38), T-32(-1.87), T-2(-1.89)	Physical risk	R-19(1.78), R-20(1.71), R-12(-1.04) R-30(-1.54), R-31(-1.61), R-13(-1.72)
Social risk,	T-29(1.96), T-27(1.82), T-26(-1.36) T-33(-1.46), T-21(-1.51), T-34(-1.56)	Psychological risk	R-23(1.97), R-22(1.42), R-27(-1.03) R-1(-1.18), R-15(-1.48), R-28(-1.69)
Time risk	T-23(1.86), T-24(1.41), T-10(-1.13) T-17(-1.46), T-25(-1.54), T-21(-1.57)	Social risk,	R-30(1.84), R-17(1.38), R-29(1.35) R-9(-1.38), R-26(-1.39), R-28(-1.84)
Functional risk	T-1(1.94), T-3(1.91), T-10(-1.23) T-19(-1.36), T-20(-1.57), T-34(-2.17)	Functional risk	R-5(1.72), R-3(1.64), R-4(1.41) R-31(-1.63), R-13(-2.11), R-12(-2.20)
Financial risk	T-21(1.61), T-20(-1.62), T-19(-1.82)	Time risk	R-16(1.85), R-14(1.38), R-23(-1.38), R-21(-1.83), R-22(-1.88)

Note: 1. T-number, R-number are the statement number of the tourist and the local residents respectively; 2. ( ) is standard score (z-score  $\pm 1.00$  more then)

### 1) Perceived Risks of Tourists

The following results are organized according to Q-sample statement statistical results, followed by pertinent statements that support the category which were gleaned from their in-depth interviews with the tourist interviewees to gain more insight and support the Q-methodology statistical results. The types of risks perceived by tourists in the 2016 Gyeongju earthquake were classified into 7 types. The following describes each type in detail.

The first type is a “satisfaction risk”. Tourists wanted to travel to other areas, other than Gyeongju, due to the earthquake (T-32). They also indicated travelling to other areas was safer if they paid the same amount of money (T-33). They thought it was not of great value to travel to Gyeongju after the earthquake (T-34). They did not care about the local resident's looking at them (T-7) and did not care about time they were sightseeing. In-depth interviews revealed that they were not satisfied with travelling, with one interviewee saying that 'paying my money and visiting Gyeongju at such a time will give me only tiredness.' (ID 21)

The second type is a “physical risk”. One of the biggest worries was physical hazards, such as if a nuclear power plant and/or radioactive waste disposal site near Gyeongju might be affected by earthquakes (T-13, 14). Tourists did not feel any loss of personal identity (T-11) or worry about internal or mental injury (T-16). Interviews supported the physical worry, with one interviewee saying “if a nuclear power plant near Gyeongju is damaged by an earthquake ... it's terrible to think. I have no plans to visit Gyeongju for the time being.” (ID 16)

The third type is a “psychological risk”. Tourists were reluctant to travel to Gyeongju because they think local residents are suffering from earthquakes (T-7, 8). Also, they expressed anxiety due to negative media reports (T-9). However, they did not think it was not worth visiting Gyeongju area due to the earthquake (T-34), or express reluctance to visit (T-32). They also felt they still would be able to enjoy the tourism. Interviews revealed that many of the interviewees

were still reluctant to visit because of the local residents having been affected by the natural disaster. (ID 17)

The fourth type is a “social risk”. Tourists indicated suspicion of local security because of the earthquake, and worried about misunderstandings and friction with local residents (T-27). They did not think there was a loss of time, money and value when visiting Gyeongju (T-26, 21, 34). Interviewees revealed that ‘I think most disasters are always accompanied by unstable security. I do not feel the need to visit the city.’ (ID 9)

The fifth type of tourist risk indicated was a “time risk”. Tourists were worried about the delay in transportation such as trains and buses (T-23), and worried about whether the check-in / check-out procedures at hotels would be done properly if the hotel system was paralyzed (T-24). They did not feel any loss of self-esteem (T-10) due to the earthquake, or fear death (T-17). They also did not think the travel expenditure to visit the earthquake area would be useless. Interviewees revealed that ‘the high-speed railway stopped its operation on the day of the earthquake. I do not think the trip may be done according to my plan’. (ID 26)

The sixth type is a “functional risk”. Tourists were worried whether they would be able to use tourist facilities and public institutions appropriately in the event of a disaster (T-3). They did not feel any loss of self-esteem caused from earthquake (T-10), or express any interest in possible economic loss to the tourism industry (T-19, 20), or value-seeking tourist places (T-34). Interviewees revealed that it seems unlikely that the facilities would function properly if they visited Gyeongju in this situation. Also, if the earthquake recurred, it was doubtful whether public institutions would be able to cope properly. (ID 2)

The seventh type was a “financial risk”. Tourists stated that they did not have to travel to the area where the earthquake occurred (T-21). But they did not agree with the concerns about economic damage to the passenger transportation industry and tourism industry (T-19, 20). An interviewee revealed ‘I do not want to go to the Gyeongju by paying travel expenditure during this period. Gyeongju is not the only tourist destination in Korea, so I do not want to go there now.’ (ID 29)

## 2) Perceived Risks of Local Residents

The following results are organized according to Q-sample statement statistical results, followed by pertinent statements that support the category which were gleaned from the in-depth interviews with the local resident interviewees to gain more insight and support the Q-methodology statistical results. The types of risks perceived by tourists in the 2016 Gyeongju earthquake were classified into 7 types. The following describes each type in detail.

The first type was a “media risk”. Local residents felt that the media coverage of the earthquake damage was exaggerated excessively (R-33) and thought there were too many negative reports (R-34). They were also dissatisfied with media reporting unconfirmed facts (R-32). They did not agree with the concerns about the damage of the passenger transportation industry (R-28), the breakdown of traditional customs (R-31), nor the recovery time (R-16). One interviewee stated “even small damage is reported too exaggeratedly. Tourists will not visit anymore.” (ID 10)

The second type is a “financial risk”. Gyeongju is a city based on tourism industry. Local residents were worried that tourism-related industries such as lodging, restaurants, transportation,

and travel agencies would be hit hard by the economic crisis (R-25). They were worried that the local economy would go depressed and the tourism industry would collapse (R-26, 27). However they did not express concern about mal-operation of fire alarm systems of building (R-7), crash of traditional customs (R-31), or losing self-esteem (R-12). An interviewee mentioned that “Gyeongju is ending when the tourism industry is ruined. But now it is too serious. The number of tourists has decreased too abruptly”. (ID 26)

The third type was a “physical risk”. Local residents, like tourists, were concerned about nuclear power plants (R-19, 20). On the other hand, they were not concerned about the loss of self-esteem (R-12), community confusion (R-30), declining traditional customs (R-31) or losing one’s identity (R-13). An interviewee said that “we are helpless even if the nuclear power plant is damaged. I cannot leave even if I’m scared. Here is our economic base. Frankly, we are deeply scared.” (ID 30)

The fourth type of risk factor revealed among local residents was a “psychological risk”. The people who directly experienced the earthquake at the center of the city are Gyeongju residents. They say that ‘fear of death still occurs when you consider the situation at that time’ (R-23). They have suffered from internal stress (R-22). They were not concerned about the mal-operation of tourist facilities (R-1), the destruction of transportation systems (R-15), or the possible economic damage to the passenger transport industry (R-28). An interviewee stated that “there was a trauma. I’m surprised at small vibrations, I react sensitively to small sounds”. (ID 14)

The fifth type revealed was a “social risk”. They thought that the supply of daily necessities would be stopped due to the earthquake (R-17), and that the occurrence of blackout would cause extreme social unrest (R-30). They did not agree with concerns about why tourists would not visit (R-9), the local economic slowdown (R-26), or the economic damage of the passenger transport industry (R-28). An interviewee mentioned that “this place is the base of our lives, so if an earthquake happens again, we will not get the most basic support. We are afraid that earthquake may happen.” (ID 24)

The sixth type was a “functional risk”. Local residents had a great distrust of public institutions (R-3). They had considerable dissatisfaction with the failure of the central and local governments to respond appropriately at the time of the earthquake (R-4, 5). They did not agree with concerns about the damage of the traditional customs (R-31), loss of identity (R-13), or self-esteem (R-12). An interviewee mentioned that “I did not see civil officers responding appropriately at the time of the earthquake. There seems to be no basic manual.” (ID 16)

The seventh type was a “time risk”. Local residents were worried that recovery time for tourist facilities and cultural assets would be long. And they were worried about the long recovery time to damaged facilities (R-14, 16). They did not fear death due to earthquakes (R-23), external injuries (R-21), and internal injuries (R-22). One interviewee states that “Gyeongju is a region for eating and living in sightseeing. Cultural heritage plays a major role here. If these parts cannot be restored quickly, there is no reason for tourists to come. I’m worried it.” (ID 31)

## **Conclusions and Implications**

It is almost impossible to predict natural disasters before they happen. Once they occur, the physical and social damage is great. The tourism industry is especially sensitive to disasters

(Chew & Jahari, 2014). Natural disasters in tourist attractions areas may have a serious economic effect on local residents. This study examined Gyeongju's 2016 earthquake surveying and interviewing both tourists and local residents to determine the perceived risk impact of this natural disaster.

The results for the tourists were classified into 7 types of risk perceived from the natural disaster: satisfaction, physical, psychological, social, time, functional, and economic. Regarding the first type, satisfaction risk indicated tourists were choosing to travel to other areas due to the earthquake, preferring to travel to other areas that were safer if they paid the same amount of money. They thought it was not of great value to travel to Gyeongju after the earthquake. Physical risk perception of tourists indicate most worried the nuclear power plant and the radioactive waste disposal site near Gyeongju may be affected by the earthquake. Psychological risk perception of tourists indicated they are feeling anxiety due to negative media news. However, it was found that the earthquake did not discourage them to visit to Gyeongju or think it was not worth the visit. Social risk indicates tourists had doubts about the security of the area due to the earthquake. They wanted to avoid visiting the city, citing security uncertainties in the Gyeongju area. For time risk, tourists were worried about delays in transportation and hotel systems not functioning properly. Functional risk showed tourists were worried about the operation of tourist facilities and poor handling of public institutions. Financial risk showed tourists do not think to spend their money traveling to earthquake-prone areas. They did not seem to care much about concerns about economic damage to the tourism industry.

The results for the local residents were classified into 7 types of risk perceived from the natural disaster: media, financial, physical, psychological, social, functional and time. Media risk indicated local residents were thinking that the media coverage of the earthquake was exaggerated and there were many negative reports. Financial risk indicated local residents worried that tourism-related industries such as lodging, dining, transportation, and travel agencies would be hurt. They also worried that the local economy would slow down and the tourism industry would collapse. Physical risk perception of local residents indicated concern about nuclear power plants and radioactive waste disposal facilities. Psychological risk showed local residents suffered from fear of death and internal stress. Social risk showed that local residents were worried about basic livelihood security such as suspension of supply of daily necessities, water supply and power failure due to the earthquake. Functional risk showed local residents had a great distrust of public institutions. They had considerable dissatisfaction with the central and local governments to properly respond at the time of the earthquake. Time risk of local residents showed they were worried about the long recovery time for tourist facilities, cultural assets and facilities.

The tourist typology categories of perceived risk from the 2016 Gyeongju earthquake indicate the biggest problem is the satisfaction level for the tourist. On the other hand, the typology categories for local residents in this study reveal the perceived risk as being media coverage. Schroeder, Pennington-Gray, Kim, and Liu-Lastres (2018) pointed out that media exposure influences tourists' opinions. They were also very dissatisfied with reporting unconfirmed facts. The difference in perception between these two groups has influenced the tourism industry in Gyeongju after its 2016 earthquake.

By identifying and discussing the phenomenon caused by the 2016 Gyeongju earthquake in depth, the difference in tourist and local resident perspective in times of natural disaster might better be addressed. This is pertinent when an entire area depends on economy from the area as

the basis for their survival. Especially, as in the present case, when an entire area is a UNESCO World Heritage designated site and their income comes from tourists to the area, they can be particularly vulnerable to differences in perceived risks of the residues of a natural disaster.

Limitations of the study, and future research suggestions are as follows: 1) The distribution of tourist areas was uneven; 2) Sampling came from local residents who were local tourism industry workers; 3) A causal model and a quantitative empirical study using a theoretical model should also be used; 4) Statements about tourists and local residents were structured differently, the classifications are not the same for the same items. Future research in the area of differences in tourist and local area residents in risks involved in natural disasters would need to account for the above limitations.

Remark: This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF- 2017S1A5A01027522)

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