

# Importance-satisfaction analysis of street food sanitation and choice factor in Korea and Taiwan

Nami Joo<sup>1</sup>, Sanghyun Park<sup>1</sup>, Bohee Lee<sup>2</sup> and Jiyoung Yoon<sup>3\*</sup>

<sup>1</sup>Department of Food and Nutrition, Sookmyung Women's University, Seoul 140-742, Korea

<sup>2</sup>Graduate School of Education, Sookmyung Women's University, Seoul 140-742, Korea

<sup>3</sup>Department of LCB Hospitality Management, Sookmyung Women's University, 52 Hyochangwon-gil, Youngsang-gu, Seoul 140-742, Korea

**BACKGROUND/OBJECTIVES:** The present study investigated Korean and Taiwan adults on the importance of and the satisfaction with street food sanitation and street food choice factor, in order to present management and improvement measures for street foods.

**SUBJECTS/METHODS:** The present study conducted a survey on 400 randomly chosen adults (200 Korean, 200 Taiwanese). General characteristics, eating habits, street food intake frequency, and preference by type of street food of respondents were checked. Respondents' importance and satisfaction of street food hygiene and selection attributes were also measured. In order to test for the difference between groups,  $\chi^2$ -test and t-test were performed. ISA was also performed to analyze importance and satisfaction.

**RESULTS:** Results showed that the importance of sanitation was significantly higher than satisfaction on all items in both Korea and Taiwan, and the satisfaction with sanitation was higher in Taiwan than in Korea. According to ISA results with street food sanitation, satisfaction was low while importance was high in both Korea and Taiwan. In terms of street food choice factor, importance scores were significantly higher than satisfaction scores on all items. In addition, satisfaction scores on all items except 'taste' were significantly higher in Taiwan than in Korea.

**CONCLUSIONS:** A manual on sanitation management of street foods should be developed to change the knowledge and attitude toward sanitation by putting into practice a regularly conducted education. Considering the popularity of street foods and its potential as a tourism resource to easily publicize our food culture, thorough management measures should be prepared on sanitation so that safe street food culture should be created.

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## INTRODUCTION

Street foods in these days are an important source of affordable and ready-to-eat food available to everyone [1]. In most Asian countries, the demand for eating out increased with the decrease in eating at home due to urban sprawl as a result of rapid modernization. In particular, economic crisis in Asia in the late 1990s reduced household food spending and expanded the street food industry as a new income source of the laid-off [1].

Since these street foods are affordable yet accessible and approachable by the common people, while being unique and ingenious, they have the added benefit that not only the people from the country of origin but also the foreigners with a variety of nationalities and races can try them easily without reluctance [2]. In addition to its original function, street foods are expanding to function as a tourism resource with the characteristics of a specific region or a country.

In Asia, large hawker centers in Singapore, night markets in

Taiwan, and food stalls in Fukuoka are typical examples of street foods as tourism resources, in which street food culture took its root deep and evolved into a tourism resource, resulting in street food enterprises growing in scale large enough to form a market on its own [3].

Nevertheless, in most countries, street foods have been viewed as simple snack and considered as the subject without merit for study [1]. In fact, it is hard to deny that portable food vendors crowding streets indiscriminately not only hurt the esthetics of a city but also worsen traffic congestion and cause inconvenience to pedestrians. In addition, it is the reality that they are often seen as the target of crackdown and supervision by regulative authorities, rather than being evaluated for the quality of the food and the service they provide because street foods have been treated as non-nutritional and unsanitary food that is illegally made at unlicensed businesses without a sufficient sanitation management system [4]. Consequently, Food and Agriculture Organization of the United Nations (FAO)

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\*Corresponding Author: Ji-young Yoon, Tel. 82-2-2077-7372, Fax. 82-2-2077-7319, Email. [yjy0823@sm.ac.kr](mailto:yjy0823@sm.ac.kr)

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has pointed out the need for efforts to train vendors, improve the conditions of sales environment, and ensure the safety of street food while providing as much service as possible, recognizing the importance and the potential risks of street food, and also recommended that the control and management methods for street regulations, the studies on hygienic sales process of street food, and the appropriate strategies to improve stability should be developed and implemented through expanded roles of international organizations [5,6].

Since street food enterprise has been neglected in research, even though it takes up a part of food service industry, efforts need to be made to ensure food sanitation and safety so that people can eat street foods with confidence. It is also necessary to develop street food culture by minimizing the risk factors associated with street food.

Therefore, the present study aims to provide foundational information to improve the quality of street food by investigating the importance and the satisfaction among adult males and females in Korea and Taiwan regarding street food sanitation and choice factor, and providing the measures for management and improvement of street foods. Korea and Taiwan have been selected specifically in this study regarding the many tourists visiting each country and the brisk day-and-night street foods market. Korean street foods cover a variety of foods from fruits such as bananas or apples to agricultural and fishery products such as crab or squid. Cultural food including *Ddeokbokki* and fish cakes also cover a majority of Korean street food and are provided in diverse types of stands: portable wagon type food stalls, vehicle type street stalls, semifixed food stalls, fixed stalls and conventional market type display stands. A uniqueness of Korean street foods is that each region has a specialized type of street foods. Taiwan on the other hand is famous for its night markets. 11 out of 69 night markets are designated as special tourist zones and street food stalls are set up day and night. Street foods of Taiwan not only include fruits or cultural food but also feature foreign advanced foods adjusted to meet Taiwanese' taste.

## SUBJECTS AND METHODS

### Subjects

The present study conducted a survey on adult males and females at the age of 19 or older with street food experience residing in Seoul in Korea and Taipei in Taiwan. Subjects were randomly selected for each group by approaching people visiting street food clustered areas. In terms of the survey in Seoul, Korea, 200 questionnaires were distributed between May 2nd and 6th and all of them were returned (100% return rate), and in terms of the survey in Taipei, Taiwan, 200 questionnaires were distributed between May 3rd and 6th, and 199 of them were returned (99.5% return rate). All 399 returned questionnaires (200 in Korea and 199 in Taiwan) were used in analysis.

### Questionnaires

This study used the questionnaires that are based on previous studies and have been modified and supplemented to fit the study purpose. The general items consist of questions on gender, age, and occupation. Eating habits [7] were investigated with

the four items on degree of intake per meal type, frequency of breakfast, frequency of overeating and binge eating, and picky eating status. Data on street food usage [8] was collected with items on frequency of street food use and street food preference, and the preference was assessed with a 5-point Likert scale for each street food type. Sanitation of street food [9] and facility was rated on a 5-point Likert scale for importance and satisfaction on 10 categories including kitchen utensils, containers, display counter, cooking utensils, cook's hands and clothes, kitchen towel, drinking water, sauces (soy sauce), frying oil, and food itself. In terms of street food choice factor [8,10], importance and satisfaction on eight categories were assessed including price, taste, quantity, sanitation, nutrition, menu variety, packaging, and proximity, using 5-point Likert scales.

### Statistical analysis

All collected data were statistically analyzed with SPSS 18.0. In order to test for the difference between groups, cross-tabulation analysis ( $\chi^2$ -test) and t-test were performed. In addition, Importance-Satisfaction Analysis (ISA) was conducted for examination. ISA was applied from Importance-Performance Analysis (IPA). IPA has been proven to be an effective analysis tool for measuring importance and performance of consumer attributes to define certain situation [11]. Each component is then illustrated on the ISA grid formed with axes of importance (X axis) and satisfaction (Y axis) degrees, consisting four quadrants. For this research ISA used for investigating the difference between Korea and Taiwan in terms of importance of and satisfaction with street food sanitation and the importance and the satisfaction when choosing street foods.

## RESULTS

### General characteristics of the respondents

Table 1 describes general characteristics of respondents. In

**Table 1.** General characteristics of subjects N (%)

Classification		Korea	Taiwan	Total
Sex	Men	56 (28.0)	96 (48.2)	152 (38.1)
	Women	144 (72.0)	103 (51.8)	247 (61.9)
Age	10 - under 20	6 (3.0)	0 (0.0)	6 (1.5)
	20 - under 30	67 (33.5)	62 (31.2)	129 (32.3)
	30 - under 40	84 (42.0)	96 (48.2)	180 (45.1)
	40 - under 50	24 (12.0)	23 (11.6)	47 (11.8)
	50 - under 60	14 (7.0)	14 (7.0)	28 (7.0)
	60 or more	5 (2.5)	4 (2.0)	9 (2.3)
Occupation	Student	38 (19.0)	6 (3.0)	44 (11.0)
	Self-employ/Sales/Service	42 (21.0)	48 (24.1)	90 (22.6)
	Office worker	51 (25.5)	95 (47.7)	146 (36.6)
	Professional	30 (15.0)	14 (7.0)	44 (11.0)
	Housewife	26 (13.0)	7 (3.5)	33 (8.3)
	Unemployed	11 (5.5)	5 (2.5)	16 (4.0)
	Other	2 (1.0)	24 (12.1)	26 (6.5)
Total		200 (100.0)	199 (100.0)	399 (100.0)

**Table 2.** Eating habits of subjects

	Classification	Korea	Taiwan	Total	P-value
Meal patterns	Breakfast	Often	89 (44.5)	152 (76.4)	48.604***
		Sometimes	83 (41.5)	44 (22.1)	
		Never	28 (14.0)	3 (1.5)	
	Lunch	Often	169 (84.5)	172 (86.4)	.320
		Sometimes	29 (14.5)	25 (12.6)	
		Never	2 (1.0)	4 (1.0)	
	Dinner	Often	141 (70.5)	165 (82.9)	8.902*
		Sometimes	57 (28.5)	32 (16.1)	
		Never	2 (1.0)	4 (1.0)	
Breakfast eating frequency (per week)	0 days	29 (14.5)	8 (4.0)	37 (9.3)	29.459***
	1 - 2 days	49 (24.5)	29 (14.6)	38 (9.5)	
	3 - 4 days	39 (19.5)	30 (15.1)	69 (17.3)	
	5 - 6 days	26 (13.0)	39 (19.6)	65 (16.3)	
	Every day	57 (28.5)	93 (46.7)	150 (37.6)	
Overeating frequency (per week)	1 - 2 times	120 (60.0)	141 (70.9)	261 (65.4)	21.263***
	3 - 4 times	44 (22.0)	45 (22.6)	89 (22.3)	
	5 - 6 times	11 (5.5)	8 (4.0)	19 (4.8)	
	more than 7 times	6 (3.0)	5 (2.5)	11 (2.7)	
	Never	19 (9.5)	0 (0.0)	19 (4.8)	
Unbalanced eating frequency	Never	83 (41.5)	37 (18.6)	120 (30.1)	34.367***
	Almost never	73 (36.5)	74 (37.2)	147 (36.8)	
	Sometimes	30 (15.0)	48 (24.1)	78 (19.5)	
	Almost always	10 (5.0)	27 (13.6)	37 (9.3)	
	Always	4 (2.0)	13 (6.5)	17 (4.3)	

\*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ 

terms of gender, Korean respondents had a higher proportion of women (72.0%) than men (28.0%), whereas Taiwanese respondents had a similar proportion between men (48.2%) and women (51.8%). In terms of age, in both Korea and Taiwan, 'Below the age of 30-40' was most frequent with 42.0% and 8.2% respectively. In terms of occupation, in both Korea and Taiwan, 'White-collar' was most frequent with 25.5% and 47.7% respectively.

#### Eating habits

The results on respondents' eating habits are shown in Table 2. On the question on breakfast eating habit, most Korean respondents responded 'Often' (44.5%) and 'Sometimes' (41.5%), and most Taiwanese respondents responded 'Often' (76.4%) which was significantly higher than Korean respondents ( $P < 0.001$ ), indicating that Taiwanese tended to eat their breakfast more often than Koreans. In term of dinner eating habit, both Korean and Taiwanese respondents responded 'Often' most frequently followed by 'Sometimes'. Regarding eating habits of different types of meals, Taiwanese tended to eat more conscientiously than Koreans. In terms of frequency of breakfast, Koreans' responses were most frequent on 'Daily' followed by 'Once or twice a week', while Taiwanese respondents were most frequent on 'Daily' followed by '5-6 times a week', showing a significant difference between two groups ( $P < 0.001$ ). In terms of overeating and binge eating, both Koreans and Taiwanese responded most frequently 'Once or twice a week' followed by '3-4 times a week'. 'None' was significantly higher among Korean

(9.5%) than Taiwanese (0.0%) ( $P < 0.001$ ). In terms of picky eating, Koreans responded most frequently 'Rarely' followed by 'A little', and Taiwanese responded most frequently 'A little' followed by 'Average', showing a significant difference between two groups ( $P < 0.001$ ).

#### Usage of street foods

Table 3 shows the results of analysis on frequency of street food use. In the case of breakfast, Koreans responded most frequently '0 time a week', while Taiwanese did 'Once or twice a week' followed by '0 time a week'. In the case of lunch, Koreans responded most frequently '0 time a week' followed by 'Once or twice a week', while Taiwanese did 'Once or twice a week' followed by '3-4 times a week'. In the case of dinner, Koreans responded most frequently 'Once or twice a week' followed by '0 time a week', while Taiwanese did 'Once or twice a week' followed by '3-4 times a week'. In the case of snack, Koreans responded most frequently 'Once or twice a week' followed by '0 time a week', while Taiwanese did 'Once or twice a week' followed by '3-4 times a week'. A significant difference existed between Koreans and Taiwanese ( $P < 0.001$ ). In general, results showed that Taiwanese used street foods as a substitute for a meal, and Koreans were markedly lower in the use of street foods for breakfast than Taiwanese. In addition, it was found that both Koreans and Taiwanese used street foods as snack frequently.

The preference for street food types is described in Table 4. Koreans are found to prefer Deep-fries/pancakes most (4.98)

**Table 3.** Street food intake frequency

N (%)

Classification		Korea	Taiwan	Total	$\chi^2$
Breakfast (per week)	0 times	168 (84.0)	67 (33.7)	235 (58.9)	107.853***
	1 - 2 times	25 (12.5)	87 (43.7)	112 (28.1)	
	3 - 4 times	7 (3.5)	25 (12.6)	32 (8.0)	
	5 - 6 times	0 (0.0)	7 (3.5)	7 (1.8)	
	7 times	0 (0.0)	13 (6.5)	13 (3.2)	
Lunch (per week)	0 times	97 (48.5)	34 (17.1)	131 (32.8)	63.567***
	1 - 2 times	81 (40.5)	87 (43.7)	168 (42.1)	
	3 - 4 times	17 (8.5)	46 (23.1)	63 (15.8)	
	5 - 6 times	3 (1.5)	20 (10.1)	23 (5.8)	
	7 times	2 (1.0)	12 (6.0)	14 (3.5)	
Dinner (per week)	0 times	86 (43.0)	23 (11.6)	109 (27.3)	61.925***
	1 - 2 times	88 (44.0)	101 (50.8)	189 (47.4)	
	3 - 4 times	21 (10.5)	53 (26.6)	74 (18.5)	
	5 - 6 times	4 (2.0)	19 (9.5)	23 (5.8)	
	7 times	1 (0.5)	3 (1.5)	4 (1.0)	
Snack (per week)	0 times	33 (16.5)	11 (5.5)	44 (11.0)	17.931**
	1 - 2 times	120 (60.0)	115 (57.8)	235 (58.9)	
	3 - 4 times	32 (16.0)	43 (21.6)	75 (18.8)	
	5 - 6 times	12 (6.0)	22 (11.1)	34 (8.5)	
	7 times	3 (1.5)	8 (4.0)	11 (2.8)	
Total		200 (100.0)	199 (100.0)	399 (100.0)	

\*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ 

followed by Baked goods (4.96), Noodles (4.77), Beverages (4.36), Rice/porridge (3.81), Skewered food (3.81), and Fruits (3.13) in the order. Taiwanese were found to prefer Noodles most (4.48) followed by Rice/porridge (4.39), Skewered food (4.21), Fruits (4.09), Deep-fries/pancakes (3.77), Baked goods

**Table 4.** Preference by type of street food

Classification	Korea (Mean $\pm$ SD)	Taiwan (Mean $\pm$ SD)	t-value
Beverage	4.36 $\pm$ 2.07 <sup>1)</sup>	3.60 $\pm$ 1.84	3.618***
Fried food	4.98 $\pm$ 0.86	3.77 $\pm$ 2.12	5.808***
Noodles	4.77 $\pm$ 1.72	4.48 $\pm$ 1.86	1.467
Bread	4.96 $\pm$ 1.56	3.74 $\pm$ 1.97	6.383***
Rice	3.81 $\pm$ 2.20	4.39 $\pm$ 1.99	-2.531*
Skewer	3.81 $\pm$ 2.01	4.21 $\pm$ 2.08	-1.736
Fruits	3.13 $\pm$ 2.04	4.09 $\pm$ 1.97	-4.272***

<sup>1)</sup> 1: Dislike very much - 5: Like very much\*  $P < 0.05$ , \*\*\*  $P < 0.001$ 

(3.74), and Beverages (3.60) in the order. Koreans and Taiwanese showed a significant difference on all categories except Noodles and Skewered food. In particular, the preference for Beverages and Baked goods was significantly higher in Korea than in Taiwan ( $P < 0.001$ ). On the other hand, the preference for Rice/porridge ( $P < 0.05$ ) and Fruits ( $P < 0.001$ ) was significantly higher in Taiwan than in Korea. As shown in the previous study [12] in which 40.2% of respondents eat street foods as 'snack', it was found that Koreans used street foods as snack, while Taiwanese used street foods as snack and a meal substitute.

#### Importance and satisfaction analysis of street food sanitation

##### Comparison of importance and satisfaction

The results on the difference between the importance of and the satisfaction with street food sanitation are described in Table 5. Koreans showed the largest difference between importance and satisfaction in street food sanitation in the

**Table 5.** Comparison between importance and satisfaction of street food hygiene

Classification		Korea (Mean $\pm$ SD)	t-value	Taiwan (Mean $\pm$ SD)	t-value
Eating utensils (fork, spoon, chopsticks, etc)	Importance <sup>1)</sup>	4.43 $\pm$ 0.80 <sup>1)</sup>	22.804***	4.44 $\pm$ 0.78	17.006***
	Satisfaction <sup>2)</sup>	2.63 $\pm$ 0.75		3.11 $\pm$ 0.66	
Containers (dish, cup, etc)	Importance	4.31 $\pm$ 0.84	21.555***	4.42 $\pm$ 0.77	16.954***
	Satisfaction	2.66 $\pm$ 0.74		3.10 $\pm$ 0.65	
Table, food stand	Importance	4.11 $\pm$ 0.89	18.569***	4.08 $\pm$ 0.88	13.021***
	Satisfaction	2.62 $\pm$ 0.73		3.02 $\pm$ 0.63	
Cooking utensils (Cutting board, knife, etc)	Importance	4.51 $\pm$ 0.74	27.445***	4.53 $\pm$ 0.67	23.969***
	Satisfaction	2.40 $\pm$ 0.73		2.94 $\pm$ 0.66	
Cook's hand and clothing	Importance	4.43 $\pm$ 0.78	26.224***	4.44 $\pm$ 0.76	18.976***
	Satisfaction	2.38 $\pm$ 0.74		2.94 $\pm$ 0.73	
Dishcloth	Importance	4.53 $\pm$ 0.79	26.814***	3.97 $\pm$ 0.98	9.983***
	Satisfaction	2.28 $\pm$ 0.79		3.11 $\pm$ 0.63	
Drinking water	Importance	4.35 $\pm$ 0.99	21.212***	4.35 $\pm$ 0.83	16.641***
	Satisfaction	2.52 $\pm$ 0.80		3.08 $\pm$ 0.62	
Sauce (soy sauce, etc)	Importance	4.22 $\pm$ 0.88	20.692***	4.15 $\pm$ 0.87	13.486***
	Satisfaction	2.44 $\pm$ 0.78		3.04 $\pm$ 0.61	
Frying oil	Importance	4.56 $\pm$ 0.74	28.485***	4.44 $\pm$ 0.77	21.385***
	Satisfaction	2.19 $\pm$ 0.82		2.88 $\pm$ 0.73	
Food itself	Importance	4.50 $\pm$ 0.77	24.491***	4.51 $\pm$ 0.68	19.982***
	Satisfaction	2.58 $\pm$ 0.83		3.16 $\pm$ 0.61	

<sup>1)</sup> 1: Not important at all - 5: Very important<sup>2)</sup> 1: Not satisfied at all - 5: Highly satisfied\*\*\*  $P < 0.001$

**Table 6.** Difference on importance and satisfaction of street food hygiene between groups

Classification		Importance <sup>1)</sup> (Mean $\pm$ SD)	t-value	Satisfaction <sup>2)</sup> (Mean $\pm$ SD)	t-value
Eating utensils (fork, spoon, chopsticks, etc)	Korea	4.43 $\pm$ 0.80	-0.154	2.63 $\pm$ 0.75	-6.795***
	Taiwan	4.44 $\pm$ 0.78		3.11 $\pm$ 0.66	
Containers (dish, cup, etc)	Korea	4.31 $\pm$ 0.84	-1.387	2.66 $\pm$ 0.74	-6.255***
	Taiwan	4.42 $\pm$ 0.77		3.10 $\pm$ 0.65	
Table, food stand	Korea	4.11 $\pm$ 0.89	0.334	2.62 $\pm$ 0.73	-5.925***
	Taiwan	4.08 $\pm$ 0.88		3.02 $\pm$ 0.63	
Cooking utensils (Cutting board, knife, etc)	Korea	4.51 $\pm$ 0.74	-0.250	2.40 $\pm$ 0.73	-7.727***
	Taiwan	4.53 $\pm$ 0.66		2.94 $\pm$ 0.66	
Cook's hand and clothing	Korea	4.43 $\pm$ 0.78	-0.028	2.38 $\pm$ 0.74	-7.691***
	Taiwan	4.44 $\pm$ 0.76		2.94 $\pm$ 0.73	
Dishcloth	Korea	4.53 $\pm$ 0.79	6.187***	2.28 $\pm$ 0.79	-11.581***
	Taiwan	3.97 $\pm$ 0.98		3.11 $\pm$ 0.63	
Drinking water	Korea	4.35 $\pm$ 0.99	-0.019	2.52 $\pm$ 0.80	-7.747***
	Taiwan	4.35 $\pm$ 0.83		3.08 $\pm$ 0.62	
Sauce (soy sauce, etc)	Korea	4.22 $\pm$ 0.88	0.846	2.44 $\pm$ 0.78	-8.486***
	Taiwan	4.15 $\pm$ 0.87		3.04 $\pm$ 0.61	
Frying oil	Korea	4.56 $\pm$ 0.74	1.558	2.19 $\pm$ 0.82	-8.897***
	Taiwan	4.44 $\pm$ 0.77		2.88 $\pm$ 0.73	
Food itself	Korea	4.50 $\pm$ 0.77	-0.173	2.58 $\pm$ 0.83	-7.961***
	Taiwan	4.51 $\pm$ 0.68		3.16 $\pm$ 0.61	

<sup>1)</sup> 1: Not important at all - 5: Very important

<sup>2)</sup> 1: Not satisfied at all - 5: Highly satisfied

\*\*\*  $P < 0.001$

following order: 'Frying oil', 'Cooking utensils, e.g., cutting boards and knives', 'Kitchen towel', and 'Cook's hand and clothes'. Particularly in the case of 'Frying oil', the satisfaction with sanitation was markedly low while the importance of sanitation was high. Frying oil has the risk that its acid value increases over time and steadily increases with more frying although in a varying degree depending on ingredient [13]. As such, it should be necessary to educate street food vendors to change frying oil as often as possible to provide clean food. Taiwanese showed the largest difference between the importance of and the satisfaction with street food sanitation in the following order: 'Cooking utensils, e.g., cutting boards and knives', 'Frying oil', 'Food itself', and 'Cook's hand and clothes'. Particularly in the case of 'Cooking utensils, e.g., cutting boards and knives', the satisfaction with sanitation was markedly low while the importance of sanitation was high. In both Korea and Taiwan, the importance of sanitation was significant higher than the satisfaction with sanitation on every category, indicating that people think sanitation in each category is important but they are not as satisfied for the conditions of sanitation.

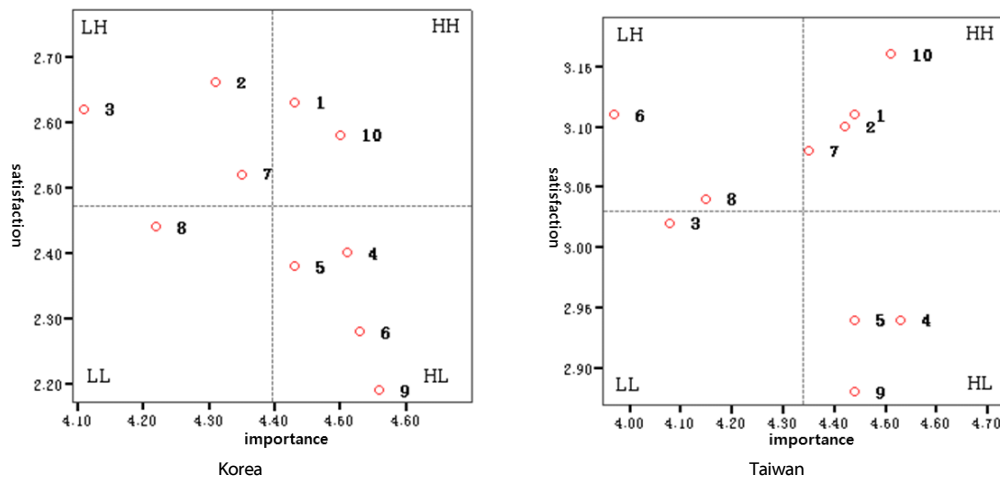
#### *Comparison of importance and satisfaction between Korean and Taiwanese*

Table 6 shows the results of the comparison between Korea and Taiwan on importance and satisfaction regarding street foods and the sanitation of facility. In terms of importance, no category except 'Kitchen towel' showed significant difference between groups. As for 'Kitchen towel', importance was significantly higher for Koreans (4.53) than Taiwanese (3.97) ( $P < 0.001$ ). With regard to the satisfaction with sanitation, Korea and Taiwan showed a statistically significant difference on all

categories ( $P < 0.001$ ). On all categories, Taiwanese were found to be more satisfied with sanitation than Koreans. In particular, Koreans' satisfaction was below the 3 point on all categories, indicating less than 'Average'.

#### *ISA of street food sanitation*

The results of ISA analysis of street foods and the sanitation of facility are shown in Fig. 1. Importance-Satisfaction Analysis (ISA) indicates relative importance and satisfaction of attributes, and can make efficient comparisons by displaying the locations of attributes on the grid with mean scores on axis X and Y. Among Korean respondents, both the importance of and the satisfaction with sanitation of Kitchen utensils, e.g., forks, spoons, and chopsticks (category 1) and Food itself (category 2) were high, but the satisfaction with sanitation was low, whereas the importance of sanitation was high on the categories of Cooking utensils, e.g., cutting boards and knives (category 4), Cook's hands and clothes (category 5), Kitchen towel (category 6), and Frying oil (category 9), but the satisfaction on the categories were low. In terms of sanitation of Containers, e.g., plates and cups (category 2), Table and display stand (category 3), and Drinking water (category 7), importance was high, but satisfaction was low. In terms of the sanitation of Sauces, e.g., soy sauce (category 8), both importance and satisfaction were low. In particular regarding the sanitation of cooking utensils, e.g., cutting boards and knives, cook's hands and clothes, kitchen towels, and frying oil that were high in importance but low in satisfaction, improvement measures should be prepared and education needs to be provided. In addition, regarding sauces, e.g., soy sauce that was low in both importance and satisfaction, the improvement measures should



**Fig. 1.** ISA analysis between importance and satisfaction of street food hygiene. 1, Eating utensils (fork, spoon, chopsticks, etc) 2, Containers (dish, cup, etc) 3, Table, food stand 4, Cooking utensils (Cutting board, knife, etc) 5, Cook's hand and clothing 6, Dishcloth 7, Drinking water 8, Sauce (soy sauce, etc) 9, Frying oil 10, Food itself

be prepared for sanitation such as the use of single-serving package.

In Taiwan, both the importance of and the satisfaction with sanitation were high for Kitchen utensils, e.g., forks, spoons, and chopsticks (category 1), Containers, e.g., plates and cups (category 2), Drinking water (category 7), and Food itself (category 10). In particular, the importance of and the satisfaction with the sanitation of Food itself (category 10) was markedly high. On the other hand, in terms of Cooking utensils, e.g., cutting boards and knives (category 4), Cooks hands and clothes (category 5), and Frying oil (category 9), the satisfaction with sanitation was low, while the importance of sanitation was high. In terms of Kitchen towels (category 6) and Sauces, e.g., soy sauce (category 8), the satisfaction with sanitation was high, while the importance of sanitation was low. In terms of the sanitation of Table and display shelves (category 3), both importance and satisfaction were low.

In both Korea and Taiwan, it was evident that sanitation should be improved for Cooking utensils, e.g., cutting boards and knives (category 4), Cooks hands and clothes (category 5), and Frying oil (category 9) that belonged to the quadrant 4 with high importance but low satisfaction with sanitation.

#### Importance and satisfaction analysis of street food choice factor

##### Comparison of importance and satisfaction

The results on the importance and the satisfaction on street food choice factor are shown in Table 7. In Korea, the difference between importance and satisfaction was greatest on 'Sanitation' followed by 'Taste', 'Nutrition', 'Packaging', 'Proximity', 'Price', 'Menu variety', and 'Quantity', in which satisfaction was low, while importance was high. It was found that the importance scores on all items were significantly lower than satisfaction scores ( $P < 0.001$ ). In particular, the satisfaction scores on 'Nutrition', 'Menu variety', and 'Packaging' were below 3 point, indicating less than 'Average'. In Taiwan, the difference between importance and satisfaction was greatest on 'Sanitation' followed by 'Quantity', 'Taste', 'Price', 'Proximity', 'Nutrition',

**Table 7.** Comparison between importance and satisfaction of selection attributes

Classification		Korea (Mean $\pm$ SD)	t-value	Taiwan (Mean $\pm$ SD)	t-value
Price	Importance <sup>1)</sup>	3.80 $\pm$ 0.78	10.031***	4.10 $\pm$ 0.85	9.278***
	Satisfaction <sup>2)</sup>	3.04 $\pm$ 0.74		3.31 $\pm$ 0.71	
Taste	Importance	4.14 $\pm$ 0.76	14.502***	4.27 $\pm$ 0.76	13.163***
	Satisfaction	3.13 $\pm$ 0.75		3.40 $\pm$ 0.66	
Amount	Importance	3.54 $\pm$ 0.79	7.435***	4.20 $\pm$ 0.76	15.408***
	Satisfaction	3.04 $\pm$ 0.64		3.11 $\pm$ 0.61	
Hygiene	Importance	4.45 $\pm$ 0.73	24.841***	4.41 $\pm$ 0.74	20.512***
	Satisfaction	2.44 $\pm$ 0.74		2.89 $\pm$ 0.65	
Nutrition	Importance	3.75 $\pm$ 0.86	13.852***	3.49 $\pm$ 0.95	6.317***
	Satisfaction	2.64 $\pm$ 0.70		2.95 $\pm$ 0.63	
Menu diversity	Importance	3.63 $\pm$ 0.85	8.972***	3.52 $\pm$ 0.93	3.316**
	Satisfaction	2.91 $\pm$ 0.67		3.28 $\pm$ 0.55	
State of packing	Importance	3.74 $\pm$ 0.82	11.753***	3.32 $\pm$ 0.91	2.391*
	Satisfaction	2.85 $\pm$ 0.64		3.14 $\pm$ 0.51	
Proximity	Importance	3.81 $\pm$ 0.81	10.448***	3.89 $\pm$ 0.86	6.742***
	Satisfaction	3.00 $\pm$ 0.72		3.44 $\pm$ 0.66	

<sup>1)</sup> 1: Not important at all - 5: Very important

<sup>2)</sup> 1: Not satisfied at all - 5: Highly satisfied

\*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$

'Menu variety', and 'Packaging'. Like Korea, importance scores on all items were significantly higher than satisfaction scores. In particular, satisfaction scores on 'Sanitation' and 'Nutrition' were below 3 point, indicating less than 'Average'.

##### Comparison of importance and satisfaction between Korean and Taiwanese

Table 8 describes the difference between Korea and Taiwan in terms of the importance of and the satisfaction with street food choice factor. Korea and Taiwan showed a significant difference in the degree of importance of 'Price' ( $P < 0.001$ ), 'Quantity' ( $P < 0.001$ ), 'Nutrition' ( $P < 0.01$ ), and 'Packaging' ( $P < 0.001$ ) when choosing street foods. Taiwan was higher than Korea in the importance scores on 'Price' and 'Quantity', while

**Table 8.** Difference on importance and satisfaction of selection attributes between groups

	Classification	Importance <sup>1)</sup> (Mean $\pm$ SD)	t-value	Satisfaction <sup>2)</sup> (Mean $\pm$ SD)	t-value
Price	Korea	3.80 $\pm$ 0.78	-3.680***	3.04 $\pm$ 0.74	-3.696***
	Taiwan	4.10 $\pm$ 0.85		3.31 $\pm$ 0.70	
Taste	Korea	4.14 $\pm$ 0.76	-1.657	3.13 $\pm$ 0.75	-3.773***
	Taiwan	4.27 $\pm$ 0.76		3.40 $\pm$ 0.66	
Amount	Korea	3.54 $\pm$ 0.79	-8.443***	3.04 $\pm$ 0.64	-1.127
	Taiwan	4.20 $\pm$ 0.76		3.11 $\pm$ 0.61	
Hygiene	Korea	4.45 $\pm$ 0.73	0.517	2.44 $\pm$ 0.73	-6.402***
	Taiwan	4.41 $\pm$ 0.74		2.89 $\pm$ 0.65	
Nutrition	Korea	3.75 $\pm$ 0.86	2.897**	2.64 $\pm$ 0.70	-4.653***
	Taiwan	3.49 $\pm$ 0.95		2.95 $\pm$ 0.63	
Menu diversity	Korea	3.63 $\pm$ 0.85	1.202	2.91 $\pm$ 0.67	-6.022***
	Taiwan	3.52 $\pm$ 0.93		3.28 $\pm$ 0.55	
State of packing	Korea	3.74 $\pm$ 0.82	4.901***	2.85 $\pm$ 0.63	-5.046***
	Taiwan	3.32 $\pm$ 0.91		3.14 $\pm$ 0.51	
Proximity	Korea	3.81 $\pm$ 0.81	-0.948	3.00 $\pm$ 0.72	-6.386***
	Taiwan	3.89 $\pm$ 0.86		3.44 $\pm$ 0.66	

<sup>1)</sup> 1: Not important at all - 5: Very important

<sup>2)</sup> 1: Not satisfied at all - 5: Highly satisfied

\*\*\*  $P < 0.001$

Korea was higher than Taiwan in the importance scores on 'Nutrition' and 'Packaging'. As for 'Sanitation', Korea and Taiwan showed no significant difference, with the highest importance scores of 4.45 and 4.41 respectively, among all items. In terms of the satisfaction with street food choice factor, two groups showed a significant difference on all items except 'Taste', where Taiwanese' satisfaction scores were higher than those of Koreans. In particular, the importance scores of both Korea and Taiwan were below 3 point, indicating less than 'Average'. In addition, Koreans' satisfaction scores on 'Menu variety' and 'Packaging' were below 3 point, indicating less than 'Average'.

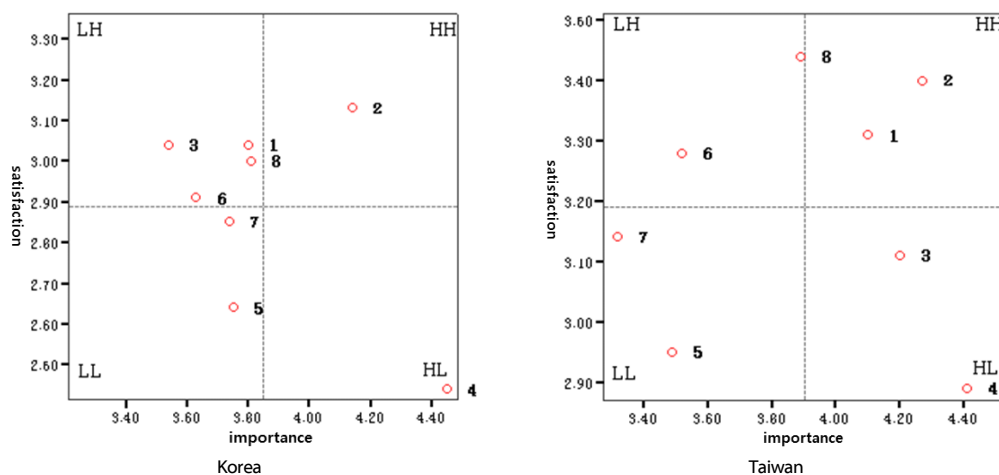
### ISA of street food choice factor

The results of ISA of street food choice factor are shown in Fig. 2. In the results on Koreans, 'Taste' (category 2) was high in both importance and satisfaction, while Price (category 1), Quantity (category 3), Menu variety (category 6), and Proximity (category 8) were low in importance, but high in satisfaction. Nutrition (category 5) and Packaging (category 7) were low in both importance and satisfaction, while Sanitation (category 4) was high in importance, but low in satisfaction. These results are consistent with previous study results that indicated 'Taste' was considered most important when choosing street foods [12,14].

In the results on Taiwanese, Price (category 1) and Taste (category 2) are both high, while Menu variety (category 6) and Proximity (category 8) are low in importance, but high in satisfaction. Nutrition (category 5) and Packaging (category 7) were low in both importance and satisfaction, while Quantity (category 3) and Sanitation (category 4) were high in importance, but low in satisfaction. It was evident that both Koreans and Taiwanese considered 'Sanitation' important, but their satisfaction was low when choosing street foods. Therefore, it is needed to create a manual on street food sanitation management at a national level and educate street food vendors to use it.

### DISCUSSION

Results showed that the importance of sanitation was significantly higher than satisfaction on all items in both Korea and Taiwan, indicating that people think the sanitation of each item important, but their satisfaction with it is not on the par. With regard to the satisfaction with sanitation, Korea and Taiwan showed a statistically significant difference on all items ( $P < 0.001$ ). On all items, it was found that the satisfaction with sanitation was higher in Taiwan than in Korea. In particular, Koreans' satisfaction was below 3 point on all items, indicating less than 'Average'. According to ISA results on the importance of and the satisfaction with street food sanitation, in both Korea



**Fig. 2.** ISA analysis between importance and satisfaction of street food selection. 1, Price 2, Taste 3, Amount 4, Hygiene 5, Nutrition 6, Menu diversity 7, State of packing 8, Proximity

and Taiwan, 'Cooking utensils, e.g., cutting boards and knives', 'Cook's hands and clothes', and 'Frying oil' belonged to the quadrant 4 which indicates satisfaction was low while importance is high, suggesting the need to improve sanitation of the items. In particular, with regard to the improvement of the sanitation of 'Cook's hands and clothes', the education on personal hygiene will be required.

In terms of street food choice factor, importance scores were significantly higher than satisfaction scores on all items. In particular, Koreans' satisfaction scores on 'Sanitation', 'Nutrition', 'Menu variety', and 'Packaging' and Taiwanese' satisfaction scores on 'Sanitation' and 'Nutrition' were below 3 point, indicating less than 'Average'. In addition, satisfaction scores on all items except 'Taste' were significantly higher in Taiwan than in Korea. Results of ISA on street food choice factor showed that both Koreans and Taiwanese considered 'Sanitation' important, but satisfaction with it was low when choosing street foods. This was similar to the results that showed how perception on hygienic risks, environmental risks, physical risks (nutritional risks) disturbs consumers' positive attitude in the study on how perceived risk on street foods affects consumers' purchase behavior [15].

Therefore, a manual on sanitation management of street foods should be developed and the knowledge and the attitude toward sanitation should be changed and put into practice through regularly conducted education on sanitation. In 2007, a study in which microbiological analyses were done on *Gimbab*, fish cakes and fish cake soup sold in food stands of Seoul showed high results of enteric bacteria and colon bacillus in *Gimbab*, and stated the importance of sanitation education and methods for street food sellers and the need for laws to keep street food safe [14]. Proper hygiene management in storing food is required especially for food exposed in the air without being heated and food with heated and not heated ingredients mixed together. Also, proper sanitation management must be done on storage and re-heating considering how street food is normally heated and cooled repeatedly until sold [2].

Furthermore, considering the popularity of street foods and its importance as a future tourism resource to easily publicize our food culture, thorough management measures should be prepared on sanitation so that safe street food culture should be created. As part of these measures, it should be necessary to implement regular health checkups or the education on sanitation, nutrition, and service for street food vendors, and to have laws and regulations in place so that street foods are produced and distributed in a sanitary condition from the point of raw materials to the point of their provision to consumers.

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