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A Study on the Effects of Waiting Time for Airport Security Screening Service on Passengers' Emotional Responses and Airport Image

Mun Hwan Kim [1], Jin Woo Park [2,*] and Yu Jin Choi [3]

[1] Training Management Department, Korea Airports Corporation, Cheongju 28207, Korea; mhkim0521@naver.com
[2] School of Business, Korea Aerospace University, Goyang-si 10540, Korea
[3] Airport Industry Technology Research Institute, Incheon International Airport Corporation, Incheon 22384, Korea; cyj@airport.kr
* Correspondence: jwpark@kau.ac.kr

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Abstract: The ultimate purpose of this study was to analyze the effects of perceived waiting time for airport security screening service had on airport image through the medium of passengers' psychological and emotional responses. For this purpose, a survey was conducted in passengers using Incheon International Airport and Gimpo International Airport. A total of 294 questionnaires were analyzed using structural equation modeling. Perceived waiting time was found to have statistically significant effects on wasted time, boredom, and neglect among the sub-factors for airline passengers' psychological responses. Wasted time had a positive effect on negative emotional response and had a negative influence on acceptability. In addition, acceptability had a positive effect on airport image. The results of this study can be utilized not only as basic data for future airport security screening service research, but also have a positive impact on airport sustainability by increasing airport security and safety.

Keywords: perceived waiting time; psychological response; negative emotional response; perceived justice; acceptability; airport image

1. Introduction

The International Civil Aviation Organization (ICAO) urges its member countries to reinforce airport security screening for passengers and others with the aim of protecting aircraft and passengers from potential terrorist threats, which have increased since the 9/11 attacks in 2001, and recommends member countries to take measures to reinforce aviation security activity in and around airports with the objective of protecting airport facilities and others [1]. With the increase in the risk of national and international terrorism, as demonstrated by the 9/11 attacks and the explosions in Paris, in particular, South Korea is reinforcing its airport security screening service. An airport needs to provide safe security screening service with the aim of protecting airline passengers and airport facilities against possible risk of terrorism. For this reason, the issue of reinforcing security screening service at airports has forced airport managers to undertake the contradictory tasks of making the airport less crowded through more efficient management and of upholding airline security, which often resulted in passengers facing greater inconvenience through a complicated, time-consuming check-in process.

The general increase in the number of airline passengers globally has made airports more crowded and increased the waiting time for check-in at airports. Since security screening is an important factor for waiting times at airports and the experience of such screening has diverse effects on

passengers, airport security screening is increasingly crucial. Airport security screening service has two conflicting functions: the physical examination of passengers and luggage and the serving of passengers with kindness and comfort. Therefore, security screening and cumulative waiting time at airports have a strong impact on airport managers and airlines, as well as on passengers. Despite the importance of airport security screening, however, relatively few studies have been conducted on the topic. These researches have focused on the effect of airport security screening service on passenger satisfaction [1]. Although there are some important variables such as emotional response, perceived justice, acceptability, and airport image for investigating the effect of airport security screening, these variables have been ignored in the previous researches. This lacuna is notable considering how security screening waiting time can affect passengers' psychological and emotional responses and overall airport image formation. In particular, waiting time for security screening can affect airport passengers' psychological responses, such as boredom and wasted time, which can then contribute to airport image formation, the research has neglected this issue. This study aimed to analyze the effects perceived waiting time for airport security screening service had on negative emotions, justice, acceptability, and airport image through the medium of psychological responses with the objective of drawing implications for better security screening service at airports.

2. Theoretical Background

Security screening means any act to detect or search for dangerous articles, such as weapons or explosives, which may be used for disorderly conduct (Article 2 of the Aviation Security Act). Therefore, any kind of security screening service for passengers at airports can be defined as an act of searching for articles which can possibly expose aircraft and passengers to danger by inspecting passengers' bodies and luggage. A few studies have been conducted on the effects of airport security screening service. Gkritza et al. [2] used a multinomial logit model to identify the determinants of the effects of airport security screening service on customer satisfaction, finding that waiting time was the most important. As waiting times became longer, the determinants of customer satisfaction became unstable; ultimately, it was desirable to make fundamental measures for customer satisfaction on the basis of waiting time for security screening service rather than to just focus on the methods of minimizing waiting time. Sindhav et al. [3] conducted research on the effects of perceived justice of airport security screening on passenger satisfaction. They measured such perceived justice using four categories—distributive, procedural, interpersonal, and informational justice—and found a crucial correlation between perceived justice and satisfaction. They also indicated that while security screening service applied to every passenger was irrelevant to distributive justice, consistent and clear procedural justice could reduce what passengers regarded as unjust. Chen et al. [4] who used the means–end theory to conduct research on service innovation contributing to customer satisfaction and customer value reinforcement at airports, found that security screening service was the most important factor in evaluating airport service. Garrick et al. [5] insisted on reducing waiting time for security screening and on making passengers more satisfied with security screening through the introduction of security screening equipment with better performance and through better training for security staff. Sakano et al. [1] conducted research on airport security screening service satisfaction in U.S. cases, found that the more satisfied with security screening, the lower level of safety perception and that those passengers getting the secondary screening for a higher level of security screening were dissatisfied with the security screening procedure. They concluded that security screening satisfaction was rarely affected by race, gender, or education.

Waiting is the part in which a consumer makes the first personal interaction with a service provider and may give the first impression of the service provider and affect service provision and consumer satisfaction; a long waiting time can negatively affect consumers' evaluation of service quality, how to manage the speed of service delivery and waiting can affect consumer satisfaction and corporate image and become a crucial factor for corporate success. Waiting time was divided into actual waiting time and perceived waiting time; waiting perceived by customers can be divided into waiting based on the

idea of time with a measurable, absolute value, and perceived waiting based on customers' subjective, flexible feelings [6]. Actual waiting time means the duration of time for a customer to be served by a service provider, whereas perceived waiting time is subjectively perceived by individual customers and depends on the environment and time use while waiting [7]. In this study, waiting time can be defined as subjective waiting time perceived by individual aviation passengers to receive security screening service [6,7].

Waiting time is basically inevitable to the service industry that is characterized by concurrence of production and consumption. While research on waiting time has been conducted, it is impossible to remove waiting time completely. Taylor and Baker [8] found that a longer waiting time could expose customers to greater stress due to time loss and uncertainty. Larson et al. [9] found that the longer waiting time was, the more likely customers were to express uncertainty, anxiety, anger, annoyance, worry, embarrassment, discomfort, disappointment, demoralization, distress, and stress. Folkes et al. [10] found that the fact that a service provider had control over waiting could make customers angry. Larson [11] indicated that customers having nothing to do during waiting time felt bored. Lee and Lambert [12] found that perceived waiting time had no impact on the quality of service if it was identical to or shorter than a seemingly rational waiting time but had an adverse impact on customer satisfaction as well as on the quality of service if it was longer. Hui and Tse [13] found that the acceptability of waiting and emotional responses to it mediated between information about waiting and service evaluation and that information about waiting time had a stronger impact when waiting time was at the average level and information about a waiting position had a stronger impact when waiting time was long. They also conducted research on how information given to customers in terms of waiting time affected their emotional responses to perceived waiting time and its acceptability, and found that information about expected waiting time had no effect on perception of waiting time but was effective in relieving negative emotions. Davis and Vollman [14] measured actual waiting time customers experienced and the level of customer satisfaction and a found direct correlation between these two factors. They also found that customer satisfaction could depend on time and a day of the week, shop location, and the degree of being busy and that actual waiting time directly affected customer satisfaction, though perceived waiting time was a stronger determinant than actual waiting time. They analyzed the effects of expected waiting time, actual waiting time, and waiting time disconfirmation, which is the gap between expected and perceived waiting time, on customer satisfaction. They found that perceived waiting time had a stronger impact on customer satisfaction than the actual one when customers had no time on their side.

Psychological responses mean subjective feelings customers may have in buying a product or in using service and involve such emotional experiences as fear, hatred, affection, and anger in addition to the affective level. Psychological responses can be divided into four factors: perceived neglect, perceived boredom, perceived waste of time, and perceived control [15]. Perceived neglect can be defined as the level of being guided in terms of waiting time and others while waiting for security screening service. Customers having nothing to do while waiting perceive relatively longer waiting times than those having something to do; the degree to which a company understands and reacts to customers' needs and that to which it gives consideration and attention to individual customers are important constructs of perceived service quality [16]. A feeling of being neglected while waiting can cause customers to be anxious and uncertain and, consequently, have an adverse impact on their experiences [8]. Customers having nothing to do while waiting are relatively more sensitive to the stream of time and perceive longer waiting times [17]. Perceived waste of time can be defined as the degree to which passengers' feel that the duration of security screening time exceeds expected or comparable aviation industry durations. Since the opportunity cost of time, an intangible resource, is on the rapid increase and customers perceive time as a unit of value, they regard waiting time as a form of value loss and such a waste of time can increase negative emotions. Osuna [18] contended that the waste of time could result in a negative experience because it involved financial and psychological

loss. The more likely customers are to value time, the more a negative perception they have of waiting, which wastes time [18,19].

Perceived control can be defined as the degree of believing that an airport manager is capable of controlling the causes of waiting time and reducing it. Control perception is an important variable that affects customers' affective behavioral responses to the physical environment and to the employees that form the service encounter. A sense of control has a significant impact on people's psychological responses to stressful situations, which involve crowdedness or waiting [20]. If customers believe there is a loss of control at the service encounter, they may express diverse types of negative responses. A high level of control perception can impress and please customers, whereas a low level of control perception can create unpleasant, stressful conditions. Customers who believe that external power or a service provider is responsible for control over waiting—for example, a service provider has caused waiting due to poor management of waiting customers or poor customer accommodation—are more likely to get angry, complain, and behave negatively [21]. Folkes et al. [10] found that the fact that a service provider possessed control over waiting affected the level of customers' anger. Perceived boredom can be defined as the degree of feeling bored and weary due to having nothing to do while waiting for security screening service. Customers may pay acute attention to the stream of time while waiting because waiting is unpleasant; the greater attention customers give to the passage of time, the longer the waiting time they perceive. Therefore, good management of waiting time can allow customers to become mentally committed to other things and pay less attention to waiting itself [22]. Maister [23] suggested the principle of feeling a shorter stream of time while being absorbed in something than while having nothing to do. People may feel that time passes more slowly when they perceive the stream of time than when they are committed to something else and he applied such a subjective experience of time to the situation of waiting for service. Customers having nothing to do while waiting may become more sensitive to the stream of time and perceive longer waiting time, whereas those absorbed in doing something else while waiting may be unconscious of the stream of time and perceive shorter waiting times. Klapp [24] noted that individuals might feel bored because they failed to access interesting information. In other words, the fewer stimuli consumers have to interact with, the more likely they are to feel bored [25]. Larson [11] contended that customers having nothing to do while waiting could feel bored and have negative experiences in relation to waiting. Therefore, customers using their own time can not only pay less attention to waiting time itself but also to those senses of anxiety and discomfort [8]. Based on the review of these previous studies, the following hypotheses were established for the effect of perceived waiting time on psychological factors.

Hypotheses 1a (H1a). *Perceived waiting time has an influence on the neglect of psychological factors.*

Hypotheses 1b (H1b). *Perceived waiting time has an influence on the waited time of psychological factors.*

Hypotheses 1c (H1c). *Perceived waiting time has an influence on the control of psychological factors.*

Hypotheses 1d (H1d). *Perceived waiting time has an influence on the boredom of psychological factors.*

Time is perceived as a very scarce economic value for busy modern people, and for this reason, time is an important variable in understanding consumer behavior. Taylor [26] classified negative emotional reactions to waiting time into anger and uncertainty and noted that these negative emotional reactions affect the overall service quality evaluation. Hui and Tse [13] used broad concepts such as annoy, dissatisfaction, unhappy, boredom as emotional responses to waiting time, and stated that these emotions influence the overall service evaluation. Bagozzi et al. [27] noted that emotions are mental states caused by the cognitive evaluation of events or personal ideas and are classified or categorized through a mix of positive and negative feelings. Most people fail to have a positive emotion while waiting for service and waiting time can negatively affect emotional responses. Descriptions of waiting time involve discomfort, uncertainty, disappointment, displeasure, demoralization, distress, tension,

and so on [9]. Osuna [18] noted that the more time-conscious customers, the more negative they become due to waiting time. It is said that it is a negative experience because the waiting time entails economic and psychological loss of the customer. Hui and Tse [13] also argued that perceived wasting time can have a direct effect on negative emotions, and that waiting time information and waiting sequence information can increase the acceptability of waiting time through cognitive reevaluation. Larson [11] argued that the experience of boredom caused by waiting time flows in a negative direction, while Houston et al. [28] noted that the use of waiting time to reduce boredom affects acceptability. Park [29] stated that perceived waiting time lowers the acceptability by giving negative emotions to the customer. Yoon and Kim [30] argued that the perceived waiting time increases the customer's negative emotions, lowering the acceptability. Waiting caused by delayed service can cause several types of negative emotional responses. On the basis of a literature review, negative emotional responses related to security screening service at airports can include those feelings of dissatisfaction, annoyance, and anger that passengers experience in terms of waiting time for security screening service. The longer the waiting time becomes, the larger the amount of stress experienced due to time loss and uncertainty [8] and the more likely customers are to express such negative emotions as uncertainty, anxiety, anger, annoyance, worry, embarrassment, discomfort, disappointment, displeasure, demoralization, distress, and stress [9,31,32]. The first negative emotion caused by failed service can negatively affect consumer satisfaction, cause the negative emotion of anger, and lead to negative behaviors, such as exchange or refund [33]. A wait or delay can be the initial failure in service delivery, which causes consumers to experience negative emotions and reduces their repurchase intention [10].

Perceived justice can be defined as the degree of general justice passengers feel during the legally obligated process of security screening service. Service justice refers to the degree of customers' awareness of justice in a service provider's behaviors; in particular, justice is very important in the area of service because consumers may have difficulty in evaluating unnoticed benefits before or after purchase [34]. Consumers may believe that they have received unjust treatment from a service provider despite successful service, including legally obligated services, such as airport security screening service.

Acceptability can be defined as the degree of feeling that waiting time and inconvenience are acceptable in getting reinforced security screening service. Park [35] (1999) noted that the longer the waiting time was, the more likely customers were to have negative emotional responses, which could affect acceptability. He found that perceived waiting time could damage consumers' emotions and make waiting less acceptable and suggested that when actual waiting time could hardly be controlled, the efforts to distract attention from the stream of time could reduce the negative effects of waiting. He also found that perceived waiting time could cause customers to experience more negative emotions, to regard waiting time as less acceptable, and to undervalue the quality of service. Hui and Tse [13] noted that the greater the benefits customers want from the service, the greater the tendency to accept waiting time. They also found that the higher the emotional and physical costs associated with waiting time, the more customers want to avoid accepting waiting time. Jung [36] found that waiting time had a negative effect on acceptability. Additionally, acceptability had a positive impact on service quality assessment. According to the previous studies, it was confirmed that emotional response during the waiting time influences acceptability, and the longer the waiting time, the lower the acceptability. Acceptability of waiting time had negative effects on customers' service quality evaluation as well as on their emotional responses [30]. Therefore, the acceptability of waiting time refers to the degree of customers' belief that waiting time for service is reasonable and that they can accept a given waiting time.

An airport image can be defined not only as a multilevel response that reflects airport passengers' subjective and emotional aspects on the basis of their understanding of the airport but also as an image specific to the airport, which is differentiated from other airports. An airport image refers to an idea or a feeling that occurs when one sees an airport logo or hears its name and can mean the general understanding of the airport; it also means a differential image from its competitors [37].

In other words, a characteristic specific to each airport is called an airport image; because such a characteristic is closely connected with passengers' personal experiences, they may have different airport images. An airport image is an important element that reflects the goals and plans of the airport and differentiates the airport from its competitors, and can be a brand itself; therefore, it gives airport customers the definition of the airport and differentiates it from its competitors [38]. Richins [39] stated that two-thirds of consumers silently and quietly leave service companies or participate in negative word of mouth due to negative emotions. Therefore, perceived waiting time can increase negative emotional response, reduce acceptability, and negatively affect justice. Based on the results of these previous studies, it can be assumed that the perceived waiting time in the security screening service may cause dissatisfaction with air passengers and negatively affect airport image. On the basis of the previous studies related to negative emotional response, perceived justice, acceptability, and airport image, the following hypotheses were established.

Hypotheses 2a (H2a). *Neglect has an influence on negative emotional response.*

Hypotheses 2b (H2b). *Neglect has an influence on perceived justice.*

Hypotheses 2c (H2c). *Neglect has an influence on accessibility.*

Hypotheses 3a (H3a). *Wasted time has an influence on negative emotional response.*

Hypotheses 3b (H3b). *Wasted time has an influence on perceived justice.*

Hypotheses 3c (H3c). *Wasted time has an influence on accessibility.*

Hypotheses 4a (H4a). *Control has an influence on negative emotional response.*

Hypotheses 4b (H4b). *Control has an influence on perceived justice.*

Hypotheses 4c (H4c). *Control has an influence on accessibility.*

Hypotheses 5a (H5a). *Boredom has an influence on negative emotional response.*

Hypotheses 5b (H5b). *Boredom has an influence on perceived justice.*

Hypotheses 5c (H5c). *Boredom has an influence on accessibility.*

Hypotheses 6 (H6). *Perceived justice has an influence on negative emotional response.*

Hypotheses 7 (H7). *Perceived justice has an influence on accessibility.*

Hypotheses 8 (H8). *Negative emotional response has an influence on airport image.*

Hypotheses 9 (H9). *Perceived justice has an influence on airport image.*

Hypotheses 10 (H10). *Accessibility has an influence on airport image.*

To analyze the effects of perceived waiting time for security screening service on psychological responses, negative emotional responses, perceived justice, acceptability, and airport image, the model shown in Figure 1 was designed, with the hypotheses expressed in arrows.

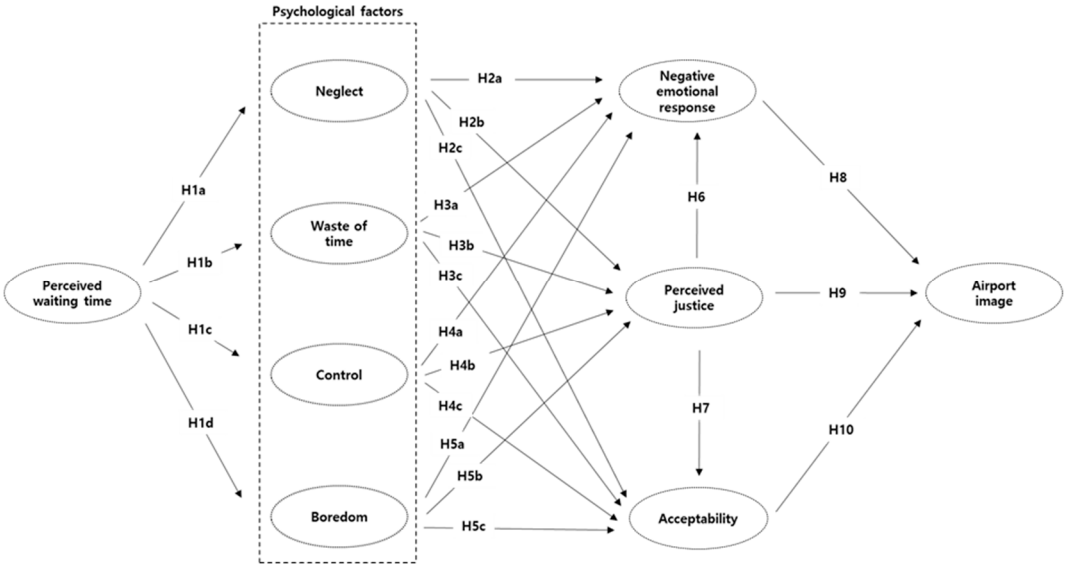


Figure 1. Conceptual model.

3. Methodology

An initial questionnaire was constructed to determine the validity of the items developed by reflecting the experiences of the passengers having used airport security screening service, and a pretest was performed on 50 South Korean passengers having recently used an airport. A preliminary survey was conducted to determine the appropriateness of variables, to revise the items the respondents regarded as ambiguous so that they were easy to understand, and to make each variable more reliable and more valid. The final questionnaire was composed of 34 items in 11 areas: four items concerning the respondents' characteristics, three concerning the general characteristics, three concerning perceived waiting time, 12 concerning the psychological responses (neglect, waste of time, control, and boredom), three concerning the negative emotional responses, three concerning perceived justice, three concerning acceptability, and three concerning airport image. Each item was rated on a five-point Likert scale: from 1 totally disagree to 5 totally agree. The composition of the questionnaire is presented in Table 1.

The survey was conducted in passengers going through security screening and entering the airside at the gates to Gimpo International Airport and Incheon International Airport for about 1 week from April 20 to 28, 2018; the questionnaires were distributed to the respondents, who were then asked to personally complete and return them. The reason why the two airports were selected for the survey was because they have the most advanced security screening service facilities as Korea's representative airports. Since the number of annual passengers at the two airports was different, the number of questionnaires was distributed differently. A total of 330 questionnaires (200 for Incheon International Airport and 130 for Gimpo International Airport) were distributed; of these, 294 copies were returned. A sample made of 280 copies, with the exception of 14 having insincere or missing answers, was finally analyzed (Table 1). Frequency analysis of the demographic characteristics was performed for the respondents' characteristics (Table 2).

Table 1. Measurement items.

Measures	Variables	Related Studies
Perceived waiting time	Before my arrival at the airport, I expected that I would need to wait for security screening service. I felt that I waited for a long time to get security screening service. Waiting time for security screening service was longer than expected.	McGuire et al. [15] Kim [40] Jung [41]
Neglect	I was given guidance about waiting time for security screening service. I was given relevant information while waiting for security screening service. I felt that I was given caring while waiting for security screening service.	
Waste of time	I think that waiting for security screening service wastes time. Waiting for security screening service robbed me of time to do something else. I think that waiting for security screening service reduced time to do my shopping in duty-free shops.	
Control	I think that the causes of waiting time for security screening service can be controlled. I think that waiting time for security screening service can be reduced. I think that the passengers waiting for security screening service were well managed.	
Boredom	It was unpleasant to wait for security screening service. I had nothing to do while waiting for security screening service. I was bored while waiting for security screening service.	
Negative emotional response	I was dissatisfied with waiting for security screening service. I was annoyed at waiting for security screening service. I was angry at waiting for security screening service.	Jung [40] Sun [42] Park [35]
Perceived justice	Waiting for security screening service was based on justice. I think the procedure of security screening service was generally just. I think that the security screening personnel was professional.	
Acceptability	Waiting time for security screening service was acceptable. I can also accept waiting time for security screening service in the future. I accept I need to wait for security screening service.	
Airport image	I regard the airport as positive. The airport is friendly to passengers. I like the airport image in general.	

Table 2. Sample characteristics.

	Division	Frequency (Persons)	Percentage (%)
Gender	Male	143	51.1
	Female	137	48.9
Age (years)	≤19	4	1.4
	20s	93	33.2
	30s	73	26.1
	40s	40	14.3
	50s	45	16.1
	≥60	25	8.9

Table 2. *Cont.*

	Division	Frequency (Persons)	Percentage (%)
Education	≤High school graduate	36	12.9
	College student	63	22.5
	College graduate	154	55.0
	≥Graduate school student	27	9.6
Occupation	Student	36	12.9
	Government official	25	8.9
	Company employee	78	27.9
	Professional	56	20.0
	Self-employed	23	8.2
	Housewife	25	8.9
	Other	37	13.2
Number of air travels	1–2	154	55.0
	3–4	72	25.7
	5–6	20	7.1
	7–8	12	4.3
	9–10	9	3.2
	≥11	13	4.6
Purpose of airport use	Domestic tourism	141	50.4
	Overseas trip	139	49.6
Airline utilized recently	FSC	108	38.6
	LCC	172	61.4

4. Empirical Analysis

Prior to this analysis, it was confirmed that the Shapiro–Wilks normality test for all items followed a normal distribution with $p = 0.000$ (Table 3).

Table 3. Results of Tests of Normality.

Factor	Kolmogorov–Smirnov [a]			Shapiro–Wilk			Mean	Std. Dev
	Statistic	Df	Sig.	Statistic	Df	Sig.		
Perceived waiting time	0.194	280	0.000	0.940	280	0.000	3.511	0.703
Neglect	0.270	280	0.000	0.876	280	0.000	2.500	0.747
Waste of time	0.223	280	0.000	0.924	280	0.000	2.529	0.863
Boredom	0.213	280	0.000	0.917	280	0.000	3.831	0.679
Negative emotional response	0.146	280	0.000	0.954	280	0.000	2.645	0.755
Perceived justice	0.303	280	0.000	0.823	280	0.000	3.582	0.678
Acceptability	0.206	280	0.000	0.883	280	0.000	3.557	0.600
Airport image	0.163	280	0.000	0.926	280	0.000	3.527	0.639

Note: [a] Lilliefors Significance Correction.

Confirmatory factor analysis (CFA), a concept with established conceptual validity and reliability, was performed for structural equation modeling (SEM). CFA is a multivariate statistical procedure that deals with measurement models that are related between observed measures and latent variables [43]. During the process of the confirmatory factor analysis, one item was removed from each of perceived waiting time, perceived neglect and perceived waste of time among the factors for psychological responses; the variable of perceived control itself was removed. This is probably because this study was conducted on the legally obligated security screening service while McGuire et al. [15] and Jung [36] were conducted on perceived emotional responses in restaurant and coffee shop customers. The confirmatory factor analysis found that the models had a desirable goodness-of-fit [CMIN/DF = 1.988, $p = 0.000$; Root Mean Square Residual (RMR) = 0.035; Root Mean Square Error (RMSEA) = 0.060; Goodness-of-Fit Index (GFI) = 0.907; Adjusted Goodness-of-Fit Index (AGFI) = 0.862; Incremental

Fit Index (IFI) = 0.958; Normed Fit Index (NFI) = 0.918; Comparative Fit Index (CFI) = 0.957]. CMIN/DF was at the acceptable level ≤ 3 and most of the other indexes met the criteria. The models were considered appropriate because the squared multiple correlation (SMC) of every item and the standardized regression coefficient of most items met the criteria and goodness-of-fit was mostly acceptable. The standardized regression coefficient of every variable in the models met the criteria ≥ 0.7, securing convergent validity; the SMC of every observed variable, an index for reliability, met the criteria ≥ 0.5. Therefore, the measurement concepts were found to be valid and reliable. For convergent validity, factor loading and standard error were examined. The confirmatory factor analysis obtained the results presented in Table 4.

Table 4. Result of confirmatory factor analysis.

Factor	Variables	Standardized Loadings	Loadings	S.E [a]	C.R [b]	SMC
Perceived waiting time	A1	0.865	1.024	0.092	11.155 ***	0.749
	A2	0.831	1.000	Fix	Fix	0.691
Neglect	B1	0.715	1.000	Fix	Fix	0.511
	B2	0.966	1.336	0.196	6.803 ***	0.933
Waste of time	C1	0.824	1.000	Fix	Fix	0.678
	C2	0.865	1.093	0.095	11.553 ***	0.749
Boredom	D1	0.844	1.024	0.073	14.008 ***	0.713
	D2	0.937	1.176	0.081	14.526 ***	0.877
	D3	0.735	1.000	Fix	Fix	0.540
Negative emotional response	E1	0.871	1.000	Fix	Fix	0.759
	E2	0.931	1.042	0.050	20.751 ***	0.867
	E3	0.795	1.872	0.053	16.542 ***	0.632
Perceived justice	F1	0.937	1.000	Fix	Fix	0.878
	F2	0.899	1.922	0.059	15.569 ***	0.809
Acceptability	G1	0.814	1.015	0.073	13.923 ***	0.814
	G2	0.902	1.107	0.074	15.008 ***	0.690
	G3	0.767	1.000	Fix	Fix	0.589
Airport image	H1	0.816	1.000	Fix	Fix	0.666
	H2	0.777	1.063	0.079	13.417 ***	0.604
	H3	0.846	1.131	0.079	14.332 ***	0.716

Note: *** $p < 0.001$., [a] Standard Error, [b] Critical Ratio.

In general, it can be said that the model has satisfactory reliability and validity with construct reliability ≥ 0.7 and average variance extracted (AVE) ≥ 0.5 [44]. The estimation for each latent variable in Model II found that construct reliability of every construct met the criteria ≥ 0.7, as presented in Table 5. The estimation for each latent variable in the measurement model found AVE of the constructs ≥ 0.5; therefore, convergent validity was secured among the measurement variables in this study. As for accurate evaluation of the measurement model, Cronbach's α was estimated at 0.8, demonstrating internal consistency. Therefore, the measurement tool in this model was considered appropriate [45]. Cronbach's α is the measure to check the internal consistency of measurement items. The discriminant validity is ensured because the AVE values of all the constructs were greater than the values of correlations among the constructs. The analysis of construct validity and reliability obtained the results as presented in Table 5.

Table 5. Results of construct validity and reliability analysis.

Construct	AVE(Fornell)	AVE(Hair)	Cronbach's α
Perceived waiting time	0.779	0.719	0.876
Neglect	0.797	0.722	0.885
Wasted time	0.742	0.714	0.852
Boredom	0.803	0.710	0.924
Negative emotional response	0.817	0.752	0.930
Perceived justice	0.916	0.843	0.956
Acceptability	0.826	0.688	0.934
Airport image	0.787	0.662	0.917

As shown in Tables 4 and 5, since the average variance extraction index (AVE) of all constituent concepts is greater than the square value of the correlation coefficient, discrimination validity is secured. The correlation between the latent factors was 0.006~0.245, confirming the basis for the determination of the latent factors (Table 6).

Table 6. Results of correlation analysis.

Construct	Perceived Waiting Time	Neglect	Wasted Time	Boredom	Negative Emotional Response	Perceived Justice	Acceptability	Airport Image
Perceived waiting time	1							
Neglect	0.003	1						
Wasted time	0.189	0.014	1					
Boredom	0.118	0.094	0.091	1				
Negative emotional response	0.253	0.046	0.383	0.084	1			
Perceived justice	0.016	0.033	0.005	0.000	0.006	1		
Acceptability	0.158	0.010	0.072	0.007	0.182	0.245	1	
Airport image	0.002	0.052	0.002	0.000	0.008	0.235	0.194	1

In this study, SEM was used to test the hypotheses. As a result, the model had goodness-of-fit: X^2 (CMIN) = 545.863, DF = 155, p = 0.000, CMIN/DF = 3.522, RMR = 0.072, GFI = 0.837, AGFI = 0.78, NFI = 0.842, RFI = 0.806, IFI = 0.881, TLI = 0.853, CFI = 0.88, and RMSEA = 0.095. Testing the final model obtained the results as shown in Figure 2. The analysis for model verification was conducted focusing on the X^2 (CMIN), GFI, AGFI, RMR, NFI, and TLI indices that were mainly used in Hair et al. [46]; Segars and Grover [47]; Browne and Cudeck [48]. The CMIN/DF value was analyzed to be suitable for the acceptance level as three or less within the suitability range. Therefore, the model presented in this study was acceptable.

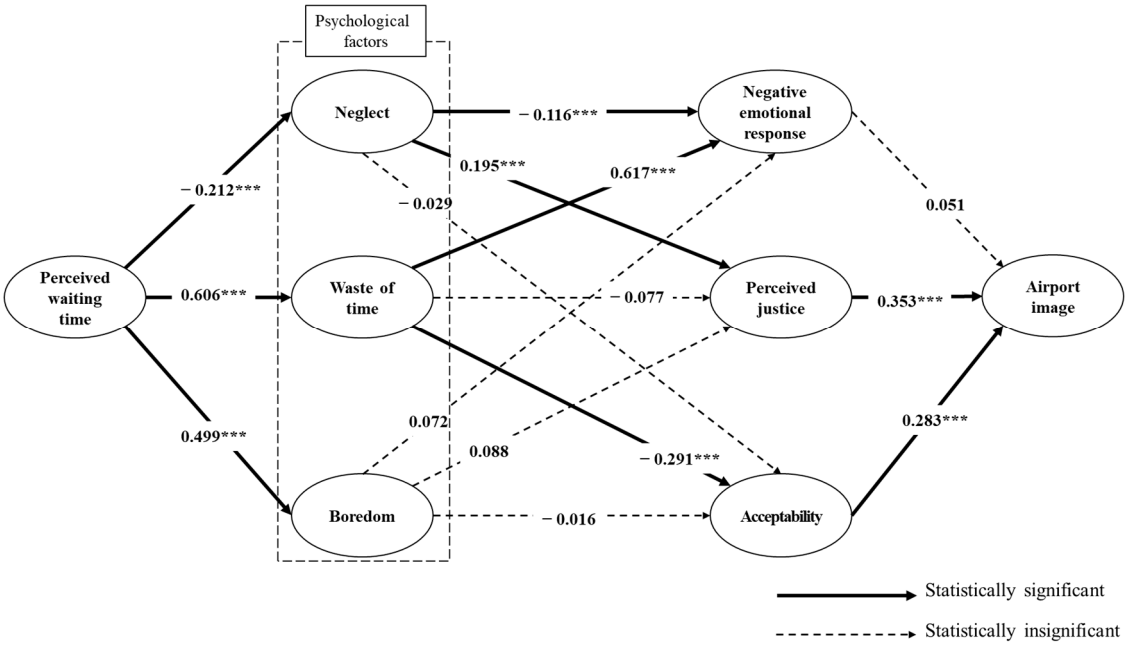


Figure 2. Results of model analysis. Note: *** $p < 0.001$.

Perceived waiting time statistically significantly positively affected waste of time and boredom and statistically significantly negatively affected neglect (Table 7 and Figure 2). This result demonstrates that perceived waiting time for security screening service has the strongest impact on waste of time for passengers and that the longer the waiting time is, the more likely passengers are to feel neglected due to the lack of relevant information provided by airport management. The airport management's neglect felt by passengers statistically significantly affected perceived justice and negative emotional

responses—neglect statistically insignificantly affected acceptability. This result supports the finding of the literature review that, similar to waiting time for other types of service, waiting time for security screening service arouses negative emotions among passengers. Waste of time statistically significantly affected negative emotional responses and acceptability but statistically insignificantly affected perceived justice. Boredom statistically insignificantly affected negative emotional responses, perceived justice, and acceptability. This result suggests the need to promote justice with the aim of improving acceptability of security screening service. Perceived justice statistically significantly affected acceptability but statistically insignificantly affected negative emotional responses. A possible explanation for the statistically insignificant impacts can be seen as the result of the security screening service characteristics that airline passengers have to go through in order to board the aircraft. In other words, the boredom or neglect during the waiting time for security screening service can be seen as a mandatory procedure that passengers must go through, or as a natural acceptance of inconvenience during the waiting time for security check. Airport image was statistically significantly affected by perceived justice and acceptability but was statistically insignificantly affected by negative emotional responses. This result demonstrates that the waiting time for security screening service as perceived by passengers has the strongest impact on perceived wasted time, consequently making security screening service less acceptable and arousing negative emotions. This suggests the need to reduce time-wasting emotions for passengers through a decrease in waiting time for security screening service and make security screening service more acceptable through the provision of information about waiting time and guidance and consideration during waiting time in pursuit of better airport image. Therefore, to increase the acceptability of passengers for security screening service, it is necessary to provide passengers with accurate information on the waiting time for security screening service and provide them useful information such as shopping, sightseeing and weather information during the waiting time.

Table 7. Standardized parameter estimates for structural model.

	Hypothesis Path	Standardized Estimate	C.R. [b]	Result
H1a	Perceived waiting time → Neglect	−0.212	−2.770 ***	Supported
H1b	Perceived waiting time → Waste of time	0.606	6.542 ***	Supported
H1d	Perceived waiting time → Boredom	0.499	5.893 ***	Supported
H2a	Neglect → Negative emotional response	−0.116	−2.178 *	Supported
H2b	Neglect → Perceived justice	0.195	3.070 ***	Supported
H2c	Neglect → Acceptability	−0.029	−0.514	Not Supported
H3a	Waste of time → Negative emotional response	0.617	8.815 ***	Supported
H3b	Waste of time → Perceived justice	−0.077	−1.072	Not Supported
H3c	Waste of time → Acceptability	−0.291	−4.340 ***	Supported
H5a	Boredom → Negative emotional response	0.072	1.251	Not Supported
H5b	Boredom → Perceived justice	0.088	1.294	Not Supported
H5c	Boredom → Acceptability	−0.016	−0.267	Not Supported
H6	Perceived justice → Negative emotional response	−0.022	−0.395	Not Supported
H7	Perceived justice → Acceptability	0.477	7.224 ***	Supported
H8	Negative emotional response → Airport image	0.051	0.842	Not Supported
H9	Perceived justice → Airport image	0.353	4.844 ***	Supported
H10	Acceptability → Airport image	0.283	3.762 ***	Supported

Note: *** $p < 0.001$, * $p < 0.05$, [b] Critical Ratio.

5. Conclusions and Implications

This study aimed to analyze the effects perceived waiting time for airport security screening service, a legally obligated procedure for air travels, had on airport image through the medium of psychological responses, negative emotional responses, perceived justice, and acceptability. The results of this study can be summarized as follows. First, the perceived waiting time experienced by passengers during the procedure of airport security screening service statistically significantly positively affected waste of time and boredom among the sub-factors for their psychological responses but had a negative

impact on neglect. These results are similar to those of McGuire et al. (2010) [15] that perceived waiting time influences on boredom and neglect. Second, among the sub-factors for passengers' psychological responses to perceived waiting time for airport security screening service, neglect statistically significantly affected negative emotional responses, and perceived justice and waste of time positively affected negative emotional responses and negatively affected acceptability. Third, boredom statistically insignificantly affected negative emotional response, perceived justice, and acceptability. Fourth, perceived justice statistically significantly affected acceptability but had no significant impact on negative emotional responses. Fifth, perceived justice and acceptability of waiting time for security screening service statistically significantly affected airport image, whereas negative emotional responses had no significant impact on airport image.

On the basis of these results, this study has the following academic and practical implications: First, this study made the first analysis of the effects waiting time for security screening service on airport image formation through the medium of passengers' psychological and emotional responses. The results of this study may help future understanding of how the waiting time for security screening service affected passengers' psychological and emotional responses and how passengers formed their airport image of the airport. Second, this study is academically significant in that it has subdivided psychological responses and empirically analyzed the effects of these sub-variables on passengers' emotional responses. Third, this study is significant in that it has divided passengers' emotional responses into positive and negative ones and empirically analyzed the effects of these responses on waiting time for security screening service. This study is academically significant in that it has included the positive emotional response of acceptability, while previous research on waiting time focused on the effects of waiting time on negative emotional responses. Fourth, waiting time for security screening service had the strongest impact on the negative emotional responses through the medium of waste of time among the sub-factors for psychological responses but had no impact on airport image. This can be a finding of the empirical analysis that passengers regard waiting time as time-consuming and negative but accept it as inevitable. Fifth, waiting time for security screening service negatively affected acceptability through the medium of waste of time. This result seems to demonstrate that the longer the perceived waiting time is, the less acceptable it is; the shorter it is, the more acceptable it is. Sixth, waiting time for security screening affected airport image through the medium of neglect and perceived justice as well as waste of time and acceptability. Therefore, efforts should be made to improve airport image by reducing waiting time as well as by increasing attention through relevant information during the period of waiting time.

As the number of airline passengers increases rapidly, the number of baggage also increases, creating a bottleneck in implementing airport security screening services. After the 9/11 terrorist attacks, security screening of passengers and baggage is underway due to the risk of terrorism and concerns about in-flight fire. If prohibited items are found, the security screening time increases, and the queues increase as additional procedures proceed. Currently, airport security screening services rely on X-ray and security screening personnel, which can lead to a bottleneck and reduce the effectiveness of security checks. There is also a risk of human error. As a strategy to solve this phenomenon, airports need to actively introduce new technologies to security screening services. If airports introduce a future security screening system that can automatically read, detect, and classify dangerous substances using various new technologies such as biometric information, big data, and artificial intelligence, a faster and more accurate security screening service can be provided. It is also believed that this will increase the acceptability of air passengers.

6. Limitations and Future Research

The limitations of this study and the direction for further tasks are as follows: First, while relatively more studies on aviation security have been conducted in the legal respect, few studies have been conducted on security screening service in terms of business administration; therefore, the literature regarding waiting time for service in the area of general service was reviewed. Since security screening

service, which is mandatory, can differ from the area of general service, it is necessary to conduct more various studies related to security screening service, which is characterized by obligation, with this study as the start. Second, since the survey data collection was confined to the domestic lines of Gimpo International Airport and Terminal 1 of Incheon International Airport, the results can hardly be generalized. Therefore, it seems to be valuable to apply the models and results of this study to many other airports and passengers with different cultures. Third, the number of questionnaires used in this study was not very large. In future research, it will be necessary to conduct a larger number of surveys to generalize the results. Finally, there can be several factors that influence passengers' perception of airport image. Therefore, it is necessary to consider additional significant factors that affect airport image in order to develop a better model to understand the effect of waiting time for security screening service.

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