Female Students' Fear of Crime and It's Correlation with the Environmental Features of the Campus

Kyung-Hoon Lee* and Young-Ho Bang

Department of Architecture, Graduate School of Engineering, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul, 130-701 Korea

Abstract: The purpose of this study is to create safer campus outdoor spaces for female students during the night. For this, a literature review, a mapping survey of criminally vulnerable spots, and a questionnaire were carried out to derive the environmental characteristics affecting the fear of crime and to measure the fear of crime felt by female students at the outdoor spaces of campus. Based on the survey, the correlation between the fear of crime of female students and environmental characteristics of outdoor spaces was analyzed. This study is significant in suggesting ways to alleviate the female students' fear of crime in the college campus.

Keywords: College campus, fear of crime, crime occurrence, environmental characteristics.

1. INTRODUCTION

One of the social issues in Korea is the rapid increase of crime. As the victims are usually vulnerable people such as women, elderly and children, social anxiety is growing higher and higher. According to the National Police Agency [1], crime occurrence in Korea increased about 1.17 times from 1,860,687 in 2001 to 2,020,209 in 2009. In case of violent crimes, its occurrence increased about 1.11 times from 532,243 to 590,087. This tendency of crime increase has been not only a social threat but also a negative factor to degrade the quality of life. The spaces where urban crimes usually happen to threaten the life quality of people include routine physical environments such as road, house, school and park.

Especially, the crime occurrence in college campuses has been growing more rapidly than in any other physical environments since the 1990s. According to the recent survey [2] on campus crime, about 10% of total respondents turned out to have experienced some sexual harassment in the campus. It shows that the campus is no longer a safe place from crime.

Most of Korean college campuses have hills or mountains around them, and those surrounding conditions provide potential offenders with hiding places and easy escape routes after committing crime. Furthermore, lightings are not sufficient enough to provide a good surveillance for entire campus, and it makes Korean college campuses get darker than any other places at night. Because of these inherent characteristics of Korean campuses, the more the students are exposed to the outdoor area of the campus at night, the higher the chance of crime victimization of the students.

Besides physical characteristics of Korean campuses, college campuses are confronting social pressure to open the door of campus for the nearby residents to revitalize the local community in Korea. This policy to open the campus to the local community has a positive contribution to the enhancement of life quality for local community. On the other hand, it causes the problems such as crime by outsiders in that it is hard to restrict the access of outsiders. As diverse crimes such as theft and violence in the classroom, misbehavior of drunk people or the homeless and sexual offense are occurring more and more often in the campus, it seems necessary to reconsider the policy of opening the campus for the nearby community to secure the safety of students. Especially, securing the safety of female who are more vulnerable to the crime is urgent.

The objective of this study is to identify environmental characteristics that arouse female students' fear of crime at night, and then, examine the relationships between the fear of crime and environmental characteristics of college campus such as the intensity of illumination, the number of CCTV installed, the number of passers-by, etc. And based on the results of analysis, the study aims to suggest the guidelines for alleviating the fear of crime on the campus and creating safer campus environment for the female students.

*Address correspondence to this author at the Department of Architecture, College of Engineering, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul, Korea 130-701; Tel: +82-2-3290-3339; Fax: +82-2-921-7947;
E-mail: kh92lee@korea.ac.kr

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2. LITERATURE REVIEW

2.1. Fear of Crime

Though the actual crime victimization is relatively rare event for the ordinary people, the fear of crime is more widely spread affect. It may threaten the mental health of individual people or restrict their activities, causing a negative influence on the overall society. Therefore, the fear of crime may become an index to show 'the quality of life' in the modern society. But, it has not been precisely defined yet what the fear of crime means. The most widely recognized concept of fear of crime is the one defined by Ferraro and Lagrange [3] as the emotional reaction of anxiety or other actions like that. They suppose that people are recognizing the danger to some degree about the latent threats. As the fear of crime means the psychological amount of anxiety about the possibility of crime victimization felt for specific crimes and spaces, it is, unlike the crime occurrence, a subjective concept.

Garofalo [4] divided the dimension of the fear of crime into the actual anxiety felt when facing the crime as a victim of the criminal action and the emotional anxiety felt in the imaginary situation when drawing the criminal action. Furstenburg [5] also divided it into the actual anxiety felt when facing some actually suspicious persons on the street and the general concern felt when facing the reports of mass media about the crime. Among these two dimensions, most of empirical studies measured the fear of crime as the vague and imaginary anxiety or concern on crime or other accidents in the possibility that they themselves could be its victim [6], not the actual anxiety of being a victim of crime.

In summary, the fear of crime is an emotional expression when people fear about the future situation or accident in advance rather than the present one in supposition that they themselves could be its victim to some degree [7]. In this study, the fear of crime is defined as 'the anxious psychological state in fear of the possibility to become a victim while recognizing the environmental features of outdoor spaces in the campus and imagining the dangerous situation and affairs in the near future.'

2.2. Campus Environment and Causes of Fear of Crime

According to Fisher and Nasar [8], as there are many hiding places, blind spots and easy-to-run structures in the campus, the rate of crime occurrence and the fear of crime are fairly high. Many scholars studying the crime in the college campuses tend to pay attention to the characteristics of surrounding areas as well as those inside the campus. McPheters [9] said that the crime rate get higher in the campuses near the urban areas with a high unemployment rate. Fernandez and Lizotte [10] showed the high correlation with the car-theft rate and robbery rate in the campuses and those in their surrounding areas. In the past, mainly college students were the users of the campus. However, Korean college campuses are now changing into centers for local community where many local people are gathering together. This phenomenon is a cause to make college students contact with potential criminals more frequently.

As the factors influencing the fear of crime in the campus, there may be socio-demographical factors such as gender, age and socio-economic status. According to Brantingham and Brantingham [11], the fear of crime in the campus is mainly determined by gender. In their study, the female students who thought themselves as a minority group felt a strong fear of crime, but other factors(commuting means, full-time/part-time students, graduate/undergraduate students, marital status) have little influence on the fear of crime. The research findings by Fisher and Nasar [8] also supported Brantingham and Brantingham's [11] research findings. In their study, they insisted that gender was a main factor influencing the fear of crime, while other factors such as perceived social incivilities, attitude toward the social control, and experience of crime victimization had also effect on the fear of crime of students, faculties.

In general, women have lower physical ability to defend than men. And there are some crime types, such as rapes which women have much far higher probability to be a victim than men. Therefore, female students tend to feel much higher fear of crime than male students. A factor frequently mentioned along with gender is age. Old people and children have lower protective ability and are vulnerable to monetary and physical losses. In addition to gender and age, socio-economic status is a factor influencing the fear of crime. Those who have lower household income feel the fear of crime more frequently, which is because they usually live in the area of high crime rate [12]. This can be directly applied to the campus. It is highly probable for the students living alone to find their residence in the poor regions around the school. They must have felt the disorder in the school vicinity that

had changed to the center for entertainment. In addition, the students who have not seen the security personnel on patrol in their campus will feel higher fear of crime than those who know the patrolling activities.

In his research, Park [13] examined some factors influencing the fear of crime along with the crime incidents in the campus. According to his study, the causes of campus crime were the thick forests in the mountain around campus and the insufficient illumination, due to which the areas get darker at night and can provide a lot of concealments for the potential offenders.

In their study, Ryu *et al*. [2] studied the current state of crime victimization and perceived fear of crime in Korean campuses, and as a result, they suggested some strategies to alleviate the fear of crime. The most frequent crime type in the campus was the theft, and it occurred at the classroom the most, inside of library and outside of library the second and the third. The most fearful places were pedestrian trails and inside of library. They suggested that, to reduce the fear of crime, enhancing natural surveillance and access control by campus design is much more effective means than installing CCTV or improving lightings.

Yoon *et al*. [14] carried out the survey on crime victimization and fear of crime in Korean campuses. Like Ryu *et al*.'s finding [2], they also found that enhancing natural surveillance and access control were the most important for creating safer campus, but they insisted that access control is more effective means than natural surveillance in the individual building and interior spaces, suggesting the introduction of mechanical surveillance and security guard. However, they emphasized the importance of natural surveillance for the outdoor spaces on campus. Yoon *et al*. [14] suggested cutting the branches of trees up to 2 meters from the ground level to secure the natural surveillance, adjusting the position and the numbers of lightings to secure the sufficient and homogeneous intensity of illumination, and eliminating the blind spots as well as strengthening CCTV and security guards.

3. METHODS

3.1. Site Selection

Among the 45 four-year colleges in Seoul Metropolitan City, three campuses have been selected for the sites for the survey. In selecting the campus, exceptional colleges such as women's college, theological college, military academy, etc. were eliminated. 23 colleges remained were carefully compared to select the final sites for survey. While considering the social context of the vicinity of the campus, the gross area of the campus, elapsed years since establishment, and the number of enrolled students were considered in order to control the effects of campus size and the physical condition of the buildings. As the size of the campus gets larger, there tend to be more concealments for potential offenders, and easier to find the escape routes. And also as the elapsed year since establishment gets longer, physical condition of the buildings tends to become deteriorated and therefore cause the fear of crime at night.

Finally, three campuses have been selected for the survey and they have very similar physical environments such as gross area, elapsed year since establishment, and the number of enrolled students. While 'C' college has slightly larger gross area and less student enrollment than other two colleges, the difference is negligible.

Table 1: Survey Settings

Settings	Elapsed Years	Gross Area	Number of Enrollment
'A' college	64 years	403,376 m^2	12,200 students
'B' college	74 years	408,786 m^2	15,517 students
'C' college	95 years	425,566 m^2	9,309 students

3.2. Procedure

This study was carried out through the two phases, mapping survey, and questionnaire survey. A mapping survey was carried out to identify the three most criminally vulnerable spots on the campus. 355 female students in total (118 students from 'A' college; 121 students from 'B' college; and 116 students from 'C' college respectively) were interviewed from February 11 to February 21, 2014. The campus map of each college was provided for the students and the students were asked to mark on the campus map the three most fearful outdoor spots at night. After the mapping survey, the students were asked to answer the open-ended question why they feel the fear of crime at the spots they marked. It was allowed to choose plural answers which cause them to feel the fear.

"In the second phase, questionnaire survey was conducted for 15 days from March 4 to March 19, 2014. 373 female students in total (117 students from 'A' college, 132 students from 'B' college, and 124 students from 'C' college respectively) were randomly selected by visiting each campus 3 times during the weekdays afternoon". Questionnaire was composed of questions regarding personal information such as 'age', 'school year', 'status of use of outdoor spaces at night', etc., general questions about crime victimization experience and fear of crime at night, questions about the degree of fear of crime at night at the three most vulnerable spots on each campus (measured by 5 point Likert scale: from 1, 'very unsafe' to 5, 'very safe'), and the questions about the conditions of environmental characteristics such as 'the intensity of illuminations', 'visibility', etc. (measured by 5 point Likert scale : from 1, 'very bad' to 5, 'very good'). In addition, questions asking the three most essential improvements to be made at the three most vulnerable spots in the campus in order to make it safer were also made.

4. RESULTS

Data were analyzed by using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics such as frequency analysis were used to summarize the data and correlation analysis and analysis of variance were also used to examine the relationships between environmental characteristics of campus and the perceived fear of crime. The average of non-missing data was substituted for any missing cell. The significance level was set at 0.01 to increase the reliability of the results.

4.1. Results of Mapping Survey: Vulnerable Spots and Causes of Fear of Crime

Mapping survey was conducted in three campuses to identify the most vulnerable spots on each campus that the female students feel the most fearful at night. Results of the mapping study revealed some hot spots (vulnerable spots) on campus, that many students marked. From the hot spots, top three spots in priority were selected from each campus and the students were asked to give reasons why they particularly feel the fear of crime at those spots. The results of mapping survey are as following: (Figure **1**).

4.1.1. 'A' Campus

As the vulnerable spots of 'A' campus, 'the slope of entrance' (A-1) was chosen the most by 34 students (28.8%), 'the vicinity of back gate' (A-3) by 23(19.4%), 'the vicinity of student hall' (A-2) by 19(16.1%), 'the vicinity of dormitory' by 13(11.0%), 'the vicinity of medical school' by 11(9.3%), and 'others' by 18(15.4%) in order.

A-1 area selected as the most vulnerable spot is the sloping walkway to enter the campus, where the lightings are rather dark and there are many trees and shrubs around it. In case of A-2, though there are resting places near it, there are many blind spots and the passers-by are rather rare. In case of A-3, the width of walkway is narrow and there are many decrepit facilities around it.

As the causes of evoking fear of crime, among total 173 responses, the most frequent one was 'the darkness' selected by 87 students(50.2%), and the next were 'few passers-by' by 32(17.9%), 'the thick woods' by 18(10.4%), 'the decrepit condition of buildings around' by 12(6.7%), 'the smoking men' by 8(4.6%), 'the scary mood' by 7(4.0%), 'no existence of CCTV' by 5(2.8%), 'the narrow lane' by 2(1.2%), and 'the difficulty to secure the front view' by 2(1.2%). Most of students responded to feel the fear of crime because of darkness, which shows the intensity of illumination of walkway was the most important factor in causing the fear of crime.

4.1.2. 'B' Campus

As the vulnerable spots of 'B' campus, 'the vicinity of engineering school' (B-2) was chosen by 37 students (30.5%), 'the vicinity of medical school' (B-1) by 24(19.8%), 'the vicinity of main playground' (B-3) by 19(15.7%), 'the vicinity of music school' by 13(10.7%), 'the vicinity of liberal arts school stairway' by 10(8.2%) and 'others' by 18(14.8%).

Among the places selected as the vulnerable spot, B-1 area is a walkway made of narrow stairs at the back of medical school. The walkway is rather dark, the passers-by are rare and there are many trees around it. B-2 is a rather secluded place with no passers-by, and there are many students smoking there. And B-3 is the passage between the main playground and the music school, where the walkway is pretty dark, the passers-by are rare and there are many trees and shrubs around it.

As the causes of fear of crime, among total 162 responses, the most frequent one was 'the darkness' selected by 61 students (37.6%), and the next was 'few passers-by' by 37(22.8%), 'the decrepit condition of

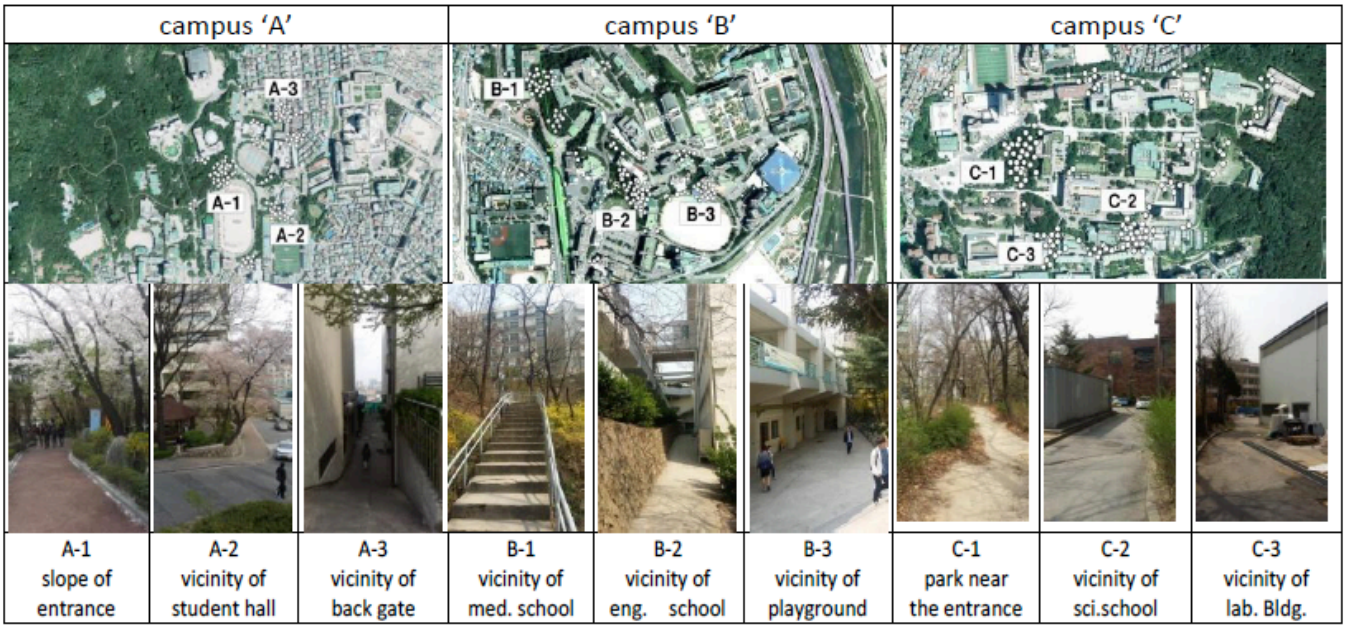

Figure 1: Vulnerable spots on each campus.

buildings around' by 18(11.1%), 'the narrow lane' by 13(8.1%), 'the existence of blind spots' by 11(6.7%), 'the thick woods' by 8(4.9%), 'no existence of CCTV' by 6(3.8%), 'the scary mood' by 5(3.0%), and 'the smoking men around' by 3(1.9%).

4.1.3. 'C' Campus

As the vulnerable spots of 'C' campus, 'the vicinity of science school' (C-2) was chosen by 36 students (31.0%), 'the park near the entrance'(C-1) by 31(26.7%), 'the vicinity of laboratory building'(C-3) by 17(14.6%), 'the vicinity of 1st engineering school' by 12(10.3%) and others by 20(17.4%).

Among the places selected as the vulnerable spots, C-1 area is the sloped park around the entrance, where the width of walkway is narrow, woods are thick and many outsiders appear frequently. C-2 spot has the back gate of the campus and therefore many outsiders pass through it. Furthermore, there are many smoking teenagers hanging around there. C-3 is the area with very few passers-by, where a lot of scrapped materials are stacked, creating a scary atmosphere.

As the reasons for the fear of crime, among total 185 responses, the most frequent one was 'the darkness' selected by 71 students (38.4%), and the next was 'the rare passers-by' by 44(23.8%), 'the appearance of outsiders' by 19(10.3%), 'the difficulty to secure the front view' by 16(8.7%), 'the smokers' by 15(8.1%), 'the scary mood' by 7(3.7%), 'the thick woods' by 6(3.2%), 'the narrow lane' by 3(1.6%), 'no existence of CCTV' by 2(1.1%), and 'the appearance of foreigners' by 2(1.1%).

Overall, 'the darkness' and 'few passers-by' were the two most frequent answers in all of three survey areas. The existence of concealments for potential offenders due to the thick trees and shrubs around', 'physical incivility caused by the decrepit condition of buildings around', and 'the outsiders and teenagers hanging around at night' were the other frequent answers.

4.2.4. Results of Questionnaire: Factors Influencing the Fear of Crime

Based on the results of literature review and mapping survey, the causes evoking the fear of crime at outdoor space in the campus were identified and then classified into personal characteristics and environmental characteristics.

4.2.5. Descriptive Statistics

Results of questionnaire revealed that the personal characteristics of respondents were mostly the twenties (88.0%) in term of age, and freshmen and Junior account for 66% (30.6% and 35.4% respectively) of the respondents. Considerable portion of the respondents reside alone outside campus (38.9%) or are living in dormitory (27.3%). Table **2**.

And for the question asking time period using campus at night, most of the respondents (54.2%)

Table 2: Personal / Environmental Characteristics Influencing the Fear of Crime

Classifications	Factors
Personal Characteristics	Age
	School year
	School attending period
	Present residence
	Status of use of campus facilities at night
Environmental Characteristics	Intensity of illumination
	Number of passers-by
	Visibility
	Frequency of outsiders' visits
	Degree of decrepitude
	Width of walkways
	Existence of CCTV
	Frequency of patrolling security personnel at night
	Slope percentage of walkways
	Existence of resting/sports facilities

answered that they use the campus from 8P.M. to 10P.M. most frequently. None of respondents from three colleges answered they use the campus after 12 A.M. Most of respondents (61.9%) use the campus at night for the purpose of 'studying at the library', and that suggests the most frequently used moving paths at night are the routes from the library to the entrance of campus or to the dormitory. It was found that female students use the campus at night at least three times a week (41.6%) or twice a week (35.1%), and all the respondents except those who never use the campus at night turned out to use the campus at least twice a week at night. In the number of friends accompanying when using the campus at night, the most frequent answer was 'one person' (34.3%), and then 'alone' (28.7%).

4.2.6. Correlation Analysis

A correlation analysis was also conducted to find out the relationship between the fear of crime of female students using campus at night and the environmental factors of the campus. The results showed that most of the factors such as 'intensity of illumination', 'number of passers-by', 'visibility', 'degree of decrepitude', 'walkway width', 'slope percentage', and 'resting facilities in vicinity' had significant positive correlations with the fear of crime, but only 'the frequency of outsiders' had a significant negative correlation with 'the fear of crime'. Surprisingly, 'the existence of CCTV' and 'the frequency of patrolling security personnel' did not show any significant correlation with the fear of crime. Table **3**.

Table 3: Correlations between Fear of Crime and Environmental Characteristics

	A	B	C	D	E	F	G	H	I	J
Intensity of illumination (A)	1									
Number of passers-by (B)	.222**	1								
Visibility (C)	**.559****	.416**	1							
Frequency of outsiders' visits (D)	-.075*	-.323**	-.017	1						
Degree of decrepitude (E)	.463**	.072*	.383**	-.175**	1					
Width of walkways (F)	.376**	.215**	.314**	-.057	.393**	1				
Existence of CCTV (G)	.233**	.143**	.290**	-.046	.111**	.355**	1			
Frequency of patrolling (H)	.173**	-.069*	.249**	.146**	.033	.343**	.314**	1		
Slope percentage (I)	.207**	-.067*	.141**	.029	.322**	**.529****	.131**	.314**	1	
Existence of resting/sports facilities (J)	.235**	.098**	-.003	-.155**	.370**	.325**	.267**	-.022	.450**	1
Fear of crime	**.287****	**.088****	**.197****	**-.082****	**.198****	**.135****	.058	.043	**.121****	**.189****

* P<0.05, ** P<0.01 (two tail).

Environmental factors showed some significant correlations among themselves. 'The intensity of illumination' and 'visibility' had the positive correlation higher than 0.5 (r=0.559), which means that the low intensity of illumination at the outdoor spaces at night makes it harder to secure the visibility, creating the blind spots and therefore increasing the fear of crime. 'Slope percentage of walkway' showed relatively high coefficients of correlation (r=0.529) with 'the width of walkways', indicating that the steeper the walkway is, the narrower the width of walkway. Also there were fairly strong positive correlations between 'the degree of decrepitude of the buildings around' and 'intensity of illumination' (r=0.463), and between 'the existence of resting facilities' and 'slope percentage of walkway' (r=0.450).

Among the environmental factors, 'the intensity of illumination' had the highest coefficient of correlation (r=0.287) with 'the fear of crime', and 'the degree of decrepitude of the buildings around' was the second highest (r=0.198). It can be interpreted that, the female student's fear of crime increases when they perceive the night to be darker. And the worse the physical condition of buildings around is, female students are found to feel greater fear of crime.

Visibility showed a moderate correlation with the fear of crime (r=0.197), which means that, as it gets harder to secure the visibility because of several blind spots while using the outdoor facilities in the campus, female students tend to feel higher fear of crime. On the other hand, female students tend to feel higher fear of crime at the narrow and steep walkways while they feel lower fear of crime at the wide and flat walkways. It is assumed that narrow and steep walkways limits pedestrians' peripheral visual field to some degree and inability of seeing the front and surroundings causes the fear of crime. The existence of resting/sports facilities such as bench or pull-up bar around the walkway or outdoor space also lowered the fear of crime because people using those facilities can provide natural surveillance for the students (r=0.189).

However, the results of analysis indicated that there are more complex relationships among 'the frequency of outsiders', 'the number of passers-by' and 'the fear of crime' than we expected. 'The number of passers-by' was found to have statistically significant positive correlation although the relation was fairly weak (r=0.088), and it supports the hypothesis that the more the number of passers-by, the lower the fear of crime students feel at night. But contradictory to the hypothesis, the results showed that the lower the frequency of outsiders' appearance, the higher the fear of crime female students feel. This contradictory finding is hard to interpret, but the clue for the interpretation can be found from the relationship between 'the number of passers-by' and 'the frequency of outsiders'. 'The number of passers-by' and 'the frequency of outsider' have positive correlation, which means when traffic volume of passers-by gets heavier, female students feel there are less outsiders among the passers-by while when traffic volume of passers-by gets sporadic, students feel there are more outsiders among them. It is difficult or impossible to distinguish outsiders from the passers-by. Therefore, when female students feel safer (when there are number of passers-by around), they tend to think there are few outsiders among the passers-by. However, when they feel unsafe (when the passers-by around are sporadic), they tend to think there are many outsiders among the passers-by.

4.2.7. Analysis of Variance (ANOVA)

In general, 'A' campus has relatively steeper walkways compared to other two campuses, insufficient intensity of illumination at the walkways, and infrequent night patrols by security personnel. Fear of crime on 'A' campus was found to be the highest among three campuses.

Like 'A' campus, 'B' and 'C' campuses have in common insufficient intensity of illumination at walk ways and infrequent night patrols at night. However, the traffic volume of pedestrian passing through the campus was relatively higher in 'B' campus than other campuses. And 'C' campus has fewer steep walkways since the campus site is fairly flat and there were fairly good numbers of resting area around the campus, providing the natural surveillance. The fear of crime on campus 'C' was found to be the lowest among three campuses.

To find out whether the fear of crime and the environmental characteristics of campus have a statistically significant differences among the campuses on the basis of questionnaire result, One-way ANOVA was carried out. As a result of Duncan's post-hoc test, 'A' and 'B' campus showed no significant differences in some factors such as 'the fear of crime', 'intensity of illumination', 'number of passers-by', 'degree of decrepitude' and 'walkway width', but both of them showed a significant difference from 'C' campus. In the 'visibility' and 'patrolling frequency', there was no

significant difference between 'B' and 'C' campuses, but both of them had a significant difference from 'A' campus. In the environmental factors such as 'the number of outsiders', 'existence of CCTV', 'slope percentage of walkways' and 'existence of nearby resting facility', all the three colleges showed some significant differences.

The fear of crime in 'C' campus seems lower than others because campus site is relatively flat and will-maintained resting facilities were distributed around the campus, providing good surveillance on the campus. Table **4**.

4.3. Strategies to Alleviate the Fear of Crime

To identify the environmental factors which need to be improved to lower the fear of crime, the survey was carried out aimed at the vulnerable spots of each campus. The survey asked the respondents to list three environmental factors in order of urgency which needs to be improved in that spot. Priority order was measured by giving weight of 3 points to 1st priority, 2 points to 2nd priority and 1 point to 3rd priority.

The most urgent improvement to reduce the fear of crime turned out to be 'the enhancement of walkway intensity of illumination' with the points of 962 (28.7%), and then 'the additional installation of CCTV and its maintenance' with 679 (20.2%), 'the removal of blind spots' with 492 (14.7%), 'the increase of traffic volume through the space activation' with 273 (8.1%) in order of priority, 'the restriction of outsiders' access' with 267 (8.0%), 'the increasing the frequency of night patrolling' with 220 (6.6%), 'the improvement and maintenance of decrepit facilities' with 139 (4.1%), 'the management

Table 4: Results of ANOVA

	'A' college (N=351)	'B college (N=396)	'C' college (N=372)	F	p
Fear of crime	2.32	2.39	2.70	26.499**	0.000
Intensity of illumination	1.98	1.88	2.20	27.094**	0.000
Number of passers-by	2.98	2.82	2.80	4.404*	0.012
Degree of decrepitude	2.49	2.44	2.89	62.382**	0.000
Width of walkways	2.43	2.53	2.78	21.502**	0.000
Visibility	2.11	2.43	2.38	22.831**	0.000
Frequency of patrolling	2.02	2.17	2.18	10.738**	0.000
Frequency of outsiders' visits	2.68	3.12	2.52	61.139**	0.000
Existence of CCTV	2.27	2.34	2.41	5.572*	0.004
Slope percentage	1.89	2.16	2.83	84.225**	0.000
Existence of resting facilities	2.69	2.42	3.04	47.990**	0.000

Table 5: Priority of Improvements for Lowering the Fear of Crime

Improvements	1st priority	2nd priority	3rd priority	Total	Points	Rank
Improving the intensity of illumination	673(60.1%)	174(15.5%)	115(10.3%)	962(28.7%)	2.482	1
Increasing the intensity of illumination	127(11.3%)	81(7.2%)	65(5.8%)	273(8.1%)	608	5
Maintenance of landscape	4(0.4%)	43(3.8%)	70(6.3%)	117(3.5%)	168	8
Restriction of outsiders' access	110(9.8%)	131(11.7%)	26(2.3%)	267(8.0%)	618	4
Improvement of decrepit facilities	49(4.4%)	86(7.7%)	4(0.4%)	139(4.1%)	323	7
Improvement of narrow walkways	5(0.4%)	47(4.2%)	58(5.2%)	110(3.3%)	167	9
Installation and maintenance of CCTV	94(8.4%)	330(29.5%)	255(22.8%)	679(20.2%)	1.197	2
Improvement of vicinity	1(0.1%)	0(0%)	97(8.7%)	98(2.9%)	100	10
Removal of blind spots	24(2.1%)	156(13.9%)	312(27.9%)	492(14.7%)	696	3
Increasing the frequency of night patrol	32(2.9%)	71(6.3%)	117(10.5%)	220(6.6%)	355	6
Total	1.119	1.119	1.119	3.357		

and maintenance of trees and landscape' with 117 (3.5%), 'the improvement of narrow walkways' with 110 (3.3%), and 'the arrangement of vicinity environment' with 98 (2.9%). Table **5**.

5. DISCUSSION

The purpose of this study is to suggest the guideline to create the safer outdoor environment of campus for the female students. For this, mapping survey, interview, and questionnaire survey were carried out in three campuses to identify the most vulnerable spots on each campus and to find out the causes of fear on that spots. The fear of crime of female students was measured through a questionnaire survey, and the environmental factors identified to presumably affect the fear of crime were examined their relationships with the fear of crime, using correlation analysis. The results of analysis yielded some valuable findings and implication for creating safer campus environment, and findings and implications can be summarized as follows:

First of all, most of the environmental factors in the research were found to have strong to moderate correlations with the fear of crime, and findings generally supported hypotheses and were consistent with the findings of previous empirical research in the field. 'The intensity of illumination', 'degree of decrepitude', 'visibility', 'percentage slopes of walkways', and 'the width of walkways' were the environmental factors that was proven to have positive correlations with the fear of crime. As contrary to common belief of people, 'the existence of CCTV', and 'the frequency of patrolling' were proven to have fairy weak positive correlations with the fear of crime, and they were not statistically significant.

Surprisingly, the finding that the frequency of outsiders was negatively associated with the fear of crime, did not support the hypothesis and also was contradictory to the finding of previous research. Findings of previous research consistently indicated that the large number of outsiders was related to higher fear of crime, but the findings of this study did not confirm those hypotheses. However, it is valuable that this finding raises the possibility of more complex relationships existing among the traffic volume of passers-by, the frequency of outsiders' appearance, and the fear of crime. The relationships among these factors should be examined more rigorously in further researches.

Based on the results of correlation analysis and ANOVA, it turned out that enhancing the natural surveillance is the most important and powerful strategy among other strategies of CPTED (Crime Prevention through Environmental Design). As discussed earlier, respondents consider the most urgent improvements to be made for safer campus environment at night are increasing the intensity of street lightings along the walkways, installing additional CCTV, removal of blind spots in priority. These top three improvements are all concerned with increasing surveillance although installing CCTV is increasing mechanical surveillance. Therefore, in order to alleviate the female students' fear of crime using campus at night, it is critical to identify the most frequently used moving routes and increase the surveillance around those moving routes. Street lightings should illuminate along the walkways without any uncovered parts, and the intensity of illumination should be homogeneous along the walkways. Mirrors are recommended to be installed at the turning points of walkways where the view to the front is not provided due to the rapid change of direction to predict the situation of the front. Landscape along the walkways should be planned from low shrubs to high tree as it step back from the walkways in order to avoid making any hiding places or blind spots for potential offenders. Branches of the trees should be maintained to secure the clear zone under the canopy of foliage. CCTV should be installed where the natural surveillance of passers-by is extremely limited or inevitable blind spots happen. It is necessary to consider the installation of additional lighting beside the CCTV because the images of CCTV are greatly influenced by the condition of lighting.

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