

AcE-Bs 2010 Kuching

ASEAN Conference on Environment-Behaviour Studies, Riverside Majestic Hotel,
Kuching, Sarawak, Malaysia, 7-8 July 2010

Measuring Crime Prevention through Environmental Design in a Gated Residential Area: A Pilot Survey

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Abstract

In gauging the Crime Prevention through Environmental Design elements in residential areas, the observation approach often used as a measurement method. However, these evaluations merely based on observations are seen to be inadequate. This is due to the fact that CPTED is closely tied to the community in order to ensure success of the concept. Therefore, the pilot study was conducted at gated residential areas located at Burmah Road at Bukit Jambul in Penang, Malaysia. The results found the level of reliability and validity using Cronbach Alpha (α) index for all components of CPTED are 0.6 and above.

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Keywords: CPTED; crime; fear of crime; sense of community; gated residential

1. Introduction

In terms of crime prevention methods, there are various approaches that can be adopted, namely: (i) from the aspects of the legal system or the enforcement of the policing system monitoring (Dantzker and Robinson, 2002), (ii) social approach (Welsh and Hoshi, 2002, Syarmila Hany, 2008, Simons, 2002, Bennet et al., 2006), (iii) offender approach (Cozens et al., 2005) and (iv) physical environment approach

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(Brantingham and Brantingham, 2005, Newman, 1972, Blakely and Synder, 1997, Jacobs, 1961). Within all these approaches, the physical environment is considered to be more important than the social environment. This is due to the fact that physical environmental design involves constant elements that may be modified through planning and design in order to reduce the opportunities for crime (Nasar & Fisher, 1993). As discovered by Lamy Rostami and Ali Madanipour (2006), elements such as physical layout, housing typology and the outlook of the surrounding environment are the main focal criteria for the occurrences of crime. Therefore, it can be adduced that poor physical environmental design contributes towards the possibility of crime occurring (Anastasia and John, 2007).

Within the physical environment prevention approach, there are four main theories normally espoused by researchers, namely the theories of 'Eyes on The Street' (Jacobs, 1961), 'Defensible Space' (Newman, 1972), CPTED or 'Crime Prevention Through Environmental Design' (Jeffery, 1974), 'Situational Crime Prevention' introduced by Ronald V. Clarke in the 1980s and 'Broken Windows' (Wilson and Kelling, 1982). Each theory has its own unique components but the most vital theories normally utilized by researchers as points of reference are the 'Defensible Space' and CPTED theories.

CPTED is considered to be a proactive approach in terms of strategy as it is a process that ensures the prevention of crime through the initial stages of planning in trying to eliminate the opportunities for the occurrences of crime. However, crime prevention is truly a complex matter as it relies on the supposition of crime. The modification of physical environmental elements is clearly seen to be able to reduce the possibility of crime happening. Nevertheless, the measurement of the preventive approach components still needs to be more detailed and efficient. As such, the main objective of this pilot study is to identify the measurement level of CPTED components in terms of their correlation in reducing anxiety towards crime.

2. Literature review

Crime has become a major problem faced by a vast majority of countries the world over. Criminal acts are regarded as 'incidents' that involve 'behaviour' and are certainly no mere simple matter but rather are variably and highly complex. Crime is defined as an act that violates legal regulations; an act that is considered to be illegal or prohibited and is punishable by law; immoral or deviant actions and behaviour as well as a serious offence (Oxford, 2004). Meanwhile, from the environmental aspect, crime is considered to be a behavioural action in a real situation. Each act of crime is different in terms of the desired incentive or its etiological process. It involves three environmental factors that occur simultaneously, namely; (i) the targeted victim either an individual, a group or property, (ii) the offender with the motivation to commit the offence, and (iii) the presence of the opportunity to commit crime (Brantingham and Brantingham, 1993).

In Malaysia, the crime rate is seen to be increasing annually for the past 32 years, beginning from 1997 to 2007. This increase in the crime rate is contributed more to crimes against property if compared to violent crimes (P. Sundramoorthy, 2008). This is also the case in the United States of America where the frequency of property crimes is much higher than that of violent crimes. According to the Federal Bureau of Investigation (FBI), property crimes are estimated to occur every 3 seconds compared to violent crimes which are estimated to happen every 22 seconds (Kornblum, 2008). Among the seven types of property crime in Malaysia, night home break-ins register the highest number of occurrences in a period of seven years compared to other forms of property crime (PDRM, 2008). This situation is influenced by the environmental factors, specifically night time conditions that accord a sense of ease to the criminals to act against their intended targets (Birkbeck and Lafree, 1993).

Based on the types of property crime, the crimes that specifically involve residential areas are crimes that entail house break-ins. When other types of crime are analyzed and compared, the exact location for

the occurrences of crime cannot be determined as they may happen almost anywhere and are influenced by a host of factors. Moreover, crimes that normally embroil victims during the incidence of crime are home burglaries and break-ins which also impart a traumatic and frightening experience to the victims and in some cases cause the loss of life (Birkbeck and Lafree, 1993). It is estimated that as much as 78 percent of crime occurrences that involve victims during the incidences are attributed to home break-in crimes (Robertshaw and A.Mtani, 2001).

In terms of crime prevention methods, it cannot be denied that the relationship between communities is vital in ensuring crime rate reduction. This relationship refers to the social interaction within the local community members. A good social interaction can be defined as the capability and ability of the community members to gather together and congregate at least once a year (Villarreal and Silva, 2006). This contributes towards the collective efficacy among the community members based on civic activities within the social control. As an indirect effect, it gives emphasis on the involvement capacity of the residents to act collectively in developing themselves or overcoming local problems (Ferguson and Mindel, 2007). The development of this social connection in turn will be able to reduce the occurrences of crimes such as home break-ins, vehicle theft as well as burglaries in residential areas (Villarreal and Silva, 2006). As such, a higher involvement of residents in community programmes such as neighbourhood watch and community meetings will undoubtedly be indicative that the residents are satisfied with their surrounding neighbourhood (Ferguson and Mindel, 2007).

Therefore, the concept and approach of Crime Prevention Through Environmental Design (CPTED) has been chosen as one of the initiatives of the crime prevention methods in Malaysia. This is due to the fact that CPTED is considered to be one of the approaches that deems social interaction as one of the more important determinant factors of its success (Cozens et al., 2005). The success of CPTED is based on five main components of (i) territoriality, (ii) surveillance, (iii) access control, (iv) maintenance and target hardening and, (v) support activity. Territoriality can be defined as a concept that reinforces the notion of proprietary concern and a 'sense of ownership' in legitimate users of space, thereby reducing opportunities for offending by discouraging illegitimate users. Surveillance is based on the physical design which enables the capacity to promote informal or natural surveillance opportunities for residents and their agents, thus making surveillance a part of capable guardianship. If offenders perceive that they can be observed, they may be less likely to offend, given the increased potential for intervention, apprehension and prosecution.

Access control is a concept that reduces the opportunities for crime by denying access to potential targets as well as creating a heightened perception of risk in offenders. Maintenance and target hardening is to promote a positive image and to routinely maintain the built environment to ensure that the physical environment continues to function effectively and transmits positive signals to all users. Installing elements of target hardening increases the efforts that offenders must expend in the commission of a crime and the last component, support activity, can be defined as the use of design and signage to encourage intended patterns of usage in public spaces.

Nevertheless, the measurement of all these components of CPTED in research is still very limited. This limitation is noted by Minnery and Lim (2005) as well as Hedayati (2009). A majority of the previous research was mainly focused on a single component of CPTED alone, for example, (i) territoriality (Newman, 1972; Newman, 1973; Taylor et al., 1990; Newman, 1996; Crowe and Zahm, 1994; Perkins et al., 1993; Aldrin, A, 1999), (ii) surveillance (Jacobs, 1961; Newman, 1973; Perkins, et al., 1993; Nes and Rueb, 2009), (iii) access control (Brantingham and Brantingham, 1993; Crowe and Zahm, 1994; Shu, 1999; Cozens, 2002; Shu., 2009) and, (iv) maintenance and target hardening (Newman, 1972; Liebermann and Kruger, 2004). Researchers that have measured all five of the CPTED components in their research are Minnery and Lim (2005) and Hedayati (2009), but there were differences in terms of

the CPTED components and the selection of residential areas. Minnery and Lim (2005) conducted an evaluation of four CPTED components, namely, (i) access control, (ii) surveillance, (iii) support activity and (iv) target hardening in two low and medium cost housing areas in Gold Coast, Australia. Hedayati (2009) on the other hand, undertook a research based on four CPTED components, namely, (i) surveillance (ii) access control (iii) territoriality and, (iv) maintenance in three different types of residences involving terrace, detached and semi-detached houses in a residential area located in Penang, Malaysia. Both these research utilized a common approach, namely, observation.

The measurement of CPTED components based on observations alone is found to be lacking and deficient. Measurements on attitude, actions, belief, responsibilities and residents' scrutiny are equally as important. This is because the concept of CPTED requires social interaction in determining its effectiveness towards crime prevention (Cozens et al., 2005). Therefore, this pilot study conducted measurements on the four CPTED components of (i) territoriality, (ii) surveillance, (iii) maintenance and target hardening and, (iv) support activity by incorporating a questionnaire survey form which was used on selected respondents. The area identified for this research involved a gated residential area as according to Blakely and Synder (1997), as close to 70 percent of American residents have moved to gated residential areas due to security concerns against the threat of crime. However, the context of gated residential areas here is different from the definition used by the previous researchers (Blakely and Synder, 1997; Suk, 2006; JPBD, 2009). This research defines gated residential areas as residential areas that are fenced around their individual lots with no ingress and egress control within the larger housing area in concern. Ingress and egress control is only localized within the individual lots, typically using fencing elements and/or combined with additional security systems such as a closed circuit television (CCTV) system, guard dogs and others.

3. Methodology

The main objective of this research paper is to identify the measurement of the CPTED (Crime Prevention Through Environmental Design) components. Towards achieving this objective, 50 respondents were randomly selected from residential areas located in Burmah Road at Bukit Jambul, Penang, Malaysia. The respondents involved in this pilot survey were homeowners or the main breadwinners in a family. As such, either the homeowner or spouse was chosen to become the respondents of this survey. This is vital as the study involves the attitude as well as the sense of responsibility towards the respondents' residential area. A face to face interview approach was used for the purpose of this study to ensure that the respondents fully understood the questions that were forwarded to them. The survey was done for a period of one week, beginning at 9 am until 5 pm, from Monday to Sunday. This enabled respondents that were not available during their working hours to be interviewed on the weekends. A duration of 15 to 20 minutes was required for each respondent to fill the respective questionnaire forms. In order to avoid any confusion or misunderstanding, the researchers introduced themselves as well as explained the purpose of the study undertaken. As the selected residential area was populated by communities from different races, two versions of the questionnaire form incorporating the Malay and English language respectively were used.

The measurement design of the CPTED components was based on the review of previous literature that is relevant to the CPTED components. The identification of the items for each component was based on the comprehension of each CPTED component. This is explained as follows:

- Territoriality: involving the sense of responsibility and the ability to identify strangers within their spaces. Subsequently, among the items used in the questionnaire were such as; (i) *"I am able to recognize strangers that pass by in front of my house"*, and (ii) *"I always make sure that the surrounding compound of my house is always clean to let it be known that this is my area"*.

- Surveillance: the ability of the residents to monitor their surrounding area. Some of the items used were; (i) *“I immediately inspect the external surroundings whenever I overhear loud or suspicious noises”* and (ii) *“I can clearly see the external surrounding areas even when I am inside my house”*.
- Maintenance and target hardening: The state of the house environment which portrays a good image as well as the installation of security systems. Among the items used were; (i) *“I immediately repair the doors and windows of my house when they become defective”*, (ii) *“I have installed alarms in my house for security purposes”*.
- Support activity: programmes or activities that involve the local community and are able to create a secure and safe space. Among the items that were used are; (i) *“Every week, community programmes such as aerobic workouts, competitions involving children are frequently held in this residential area”* and (ii) *“Whenever I am out exercising, I am able to recognize strangers who are exercising in the recreational area”*.

All of these CPTED components were measured using a 5 point Likert Scale of 1 – strongly agree, 2 – agree, 3 – no opinion, 4 – disagree and 5 – strongly disagree. The measurement for fear of crime (FOC) and sense of community (SOC) also utilized a similar 5 point Likert Scale.

4. Results and Discussions

This pilot study involved more female respondents (56%) when compared to male respondents (44%) with a majority of the respondents being in the 20s to 40s age range group (74%). The respondents were constituted from the three main races in Malaysia, namely Malays (48%), Chinese (36%) and Indians (12%). Almost all of the respondents (92%) involved in this survey have never been victims of crime in the past. However, the percentage of respondents who have heard or known about crime cases occurring in the area of study was relatively high (66%). A big majority of the types of crime that have occurred in the study area are house break-ins, recording 96.2%, involving theft of money, jewellery, electrical appliances and equipment as well as home furniture. Only 3.8% of the crimes were those concerning vehicle theft.

From the aspects of validity and reliability, the items for each Crime Prevention Through Environmental Design (CPTED), Fear of Crime (FOC) and Sense of Community (SOC) dimensions were measured using the Cronbach alpha (α) analysis. An item-to-scale value of 0.3 and above was used as the minimum value for a unidimensional scale (de Vaus, 1986), while the scale was considered reliable if the alpha value was 0.6 and above, based on the De Vellis (1991) criteria. The results of the analysis demonstrated that all five items under the territoriality dimension were valid to be used to measure the concerned dimension as the α value =.72. This was found to be similar for the surveillance dimension which involved three items and recorded an α value =.78. For the maintenance and target hardening dimension, from all the 7 items listed and used, three items were omitted as they recorded a corrected item-to-total correlation value of below 0.3, while the total alpha value of the 7 items was α =.49. Those three items were; (i) *“I have installed a closed circuit television system at home for security monitoring”*, (ii) *“When the external paint of my house fades, I immediately repaint it”* and (iii) *“I immediately repair the doors and windows of my house when they become defective”*. After these three items were eliminated and analysis was redone, the resulting α value =.66. This illustrates that the remaining 4 items are valid in measuring the maintenance and target hardening dimension. For the support activity dimension which had four items, the Cronbach alpha (α) analysis conducted resulted in an α value =.59. There were two items under this dimension that had to be omitted in order to obtain an α value =.63. The two items that were excluded were; (i) *“Every week, community programmes such as aerobic workouts, competitions involving children are frequently held in this residential area”* and (ii) *“I frequently*

participate in the community programmes organized in this residential area”. This meant that only 2 items were valid to measure the support activity dimension.

As the dimensions for each CPTED component were comprised of items of dissimilar numbers, it was necessary for a new scoring to be undertaken to ensure a homogeneity in terms of percentages for each dimension. Each dimension was allotted a score value of 25 percent, thus totaling 100 percent when all four CPTED dimensions are combined. This in turn enables a more uniform level for the purposes of correlation analysis for each variable.

The measurement for the level of fear of crime (FOC) involved three dimensions namely anxiety towards the physical environment, social and indirect crime victimization. The results showed that 1 of the 9 items had a corrected item-to-total correlation value of .151, while the total alpha value of the 9 items was .759. Consequently, this item was omitted and the resulting re-analysis recorded an α value =.77. The item that was removed was “I believe that good rapport with my neighbours will reduce the fear of crime”. This shows that 8 out of the 9 items are valid to be used to measure the FOC dimension.

For the measurement of sense of community (SOC), there are four main dimensions, namely; (i) community participation, (ii) influence and beliefs, (iii) need emphasis and (iv) emotional sharing. Each dimension has three items, hence a total of 12 items for the SOC measurement. Analysis findings have illustrated that 4 out of the 12 items show a corrected item-to-total correlation value of below 0.3, while the total alpha value for the 12 items was .742. Re-analysis after these 4 items were eliminated returned an α value =.79. This clearly establishes that the remaining 8 items are valid to be used in measuring SOC. The four items that were removed are; (i) “I feel this residential area is suitable for occupancy”, (ii) “I enjoy being a part of the community in this residential area”, (iii) “I am concerned with the remarks of my neighbours regarding all my actions” and (iv) “I do not have any influence over what happens within this residential area”.

The correlation analysis between CPTED and the Fear of Crime (FOC) as well as the Sense of Community (SOC) levels was conducted using the Spearman’s rho correlation test analysis. The results of the analysis indicate that the correlation between CPTED and SOC is significant at the $p < .01$ level, but with a weak positive correlation of $r = .389$. Meanwhile, the results for the Spearman correlation test analysis between CPTED and FOC was found to be insignificant ($r = .142$, $p > .01$). This demonstrates that there is no correlation between CPTED and FOC. The secondary correlation is weak ($r = .16$), which may be a result of measurement or sampling errors. This is represented in the following Table 1.

Table 1. Correlation Table between CPTED, FOC and SOC

		CPTED	FOC	SOC
Spearman's rho		1.000	.142	.389**
	CPTED			
	Correlation Coefficient	1.000	.142	.389**
	Sig. (2-tailed)	.	.326	.005
	N	50	50	50
	FOC			
	Correlation Coefficient	.142	1.000	.220
	Sig. (2-tailed)	.326	.	.124
	N	50	50	50
SOC				
Correlation Coefficient	.389**	.220	1.000	
Sig. (2-tailed)	.005	.124	.	
N	50	50	50	

** . Correlation is significant at the .01 level (2-tailed)

The correlation between Fear of Crime (FOC) and gender, on the other hand, is significant. This is based on the results of the Mann-Whitney U test analysis which shows that there is a significant difference in terms of feelings of anxiety between the genders. The Mann-Whitney U test demonstrates that ($z=-3.87, p=.000$) it is significant at the $p<.05$ level. The mean rank value for the female sex (32.55) is above that of the male sex (16.52) which proves that the female sex feels more worried when compared to their male counterparts. This is further illustrated in the Boxplot graph (refer Figure 1) which indicates that the median value for the female sex is higher than that of the male sex. This indication in the Boxplot graph is congruent with the findings of the Mann-Whitney U test that shows the female sex being more worried than the male respondents.

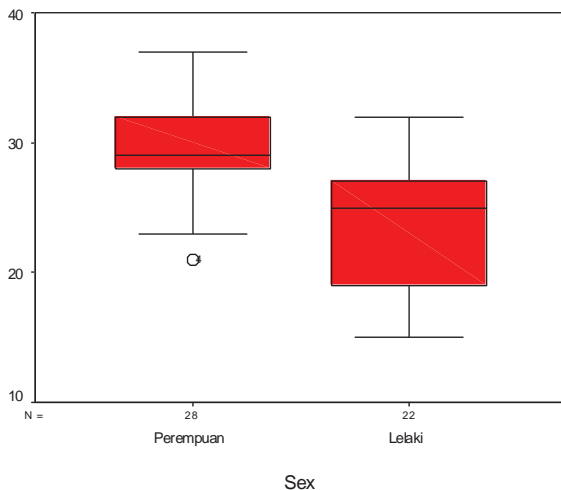


Fig. 1. Boxplot Graph of Fear of Crime and Sex

The correlation analysis between Sense of Community (SOC) and the different genders, meanwhile, is not found to be significant. The results of the data analysis using the Mann-Whitney U test records ($z=-.678, p=.498$) insignificance at the $p<0.5$ level. The mean rank score for the female gender (26.73) is just slight more than the male gender (23.93) which points out that gender does not have a correlation with community relationship ties.

As with the discoveries by previous researchers that there is a significant correlation between Fear of Crime (FOC) and victimization, the findings of this pilot study have come to a similar result. The analysis results of the data using the Mann-Whitney U test show ($z=-.1975, p=.048$) the correlation between FOC and victimization is significant at the $p<0.5$ level. The mean rank score for ‘Yes’ – have been a victim of crime (39.25) is higher than that of ‘No’ – have never been a victim of crime (24.30) which in turn illustrates that a person who has been a victim of crime is naturally more worried than those who have never been a victim of crime previously.

5. Conclusion

A pilot study is intended to gauge the feasibility and credibility of the research that is planned to be undertaken. It is also an approach to identify the validity and reliability of a certain instrument

(questionnaire) before it is utilized in the actual fieldwork aspect of a study (de Vaus, 1986). A pilot study also functions as a means to identify potential problems that may crop up in the actual study as well as to evaluate the suitability of the study questions (Piaw, 2009). In the case of this pilot study that was conducted, several problems were identified regarding the sentence structure as well as the use of the 5 point Likert scale. In terms of the problems with the sentence structure, it was discovered that in the “Anxiety Level Towards Crime” measurement section, items C2 to C10 contained sentence items that were lacking in representing the actual intention of the core inquiry. Therefore, these items will be rephrased by replacing the word “fear” with “worry” as well as the repetitious use of the word “influencing” for each of the items. This is in order to give a more clear emphasis on the actual meaning of each item.

The restructuring of the five point Likert scale usage of 1 (strongly agree), 2 (agree), 3 (no opinion), 4 (disagree) and 5 (strongly disagree) into an eight point scale will be undertaken. This is to enable a more extensive level of analysis to be conducted. The 3rd point of scale (no opinion) will be omitted in the actual study to elicit respondents to give their opinions and feedback. This is based on the observation that with the presence of that option within the scale of answers, there is an inclination on the part of the respondents to choose the 3rd point (no opinion) whenever the respondents either do not want to or avoid from giving their actual opinions.

The Support Activity dimension in the components of CPTED will also be eliminated from the actual study. This is due to the fact that the correlation between item to item was found to show a weak correlation among the items. The affected items are F16 (0.298) and F17 (0.297). Both these items were intended to find out about the implementation of community programmes that were organized as well as the participation from the community members. Through observation, it was found that the weakness of these items were that the statements were vague and unclear in terms of measuring the subject matter. It was found through observation that this weakness is caused by community programmes in the residential area that were less encouraging. Besides this, there are residential areas that share a common open area with other neighbourhoods for recreational purposes. This was compounded by the fact that these open areas were relatively far from one another. This situation causes a form of limitation for the residents to partake in recreational activities.

In general, it was discovered that the use of a questionnaire form to identify the behavior and reaction of the respondents towards the Crime Prevention Through Environmental Design (CPTED) components is effective and sensitive. It has the ability to recognize the relationships between the various variables. The use of this scale needs continuous development to enable it to be suitable for use in any area as well as in any different setting.

Acknowledgements

The researcher would like to express gratitude towards the supervisor in giving guidance and pointers as well as constructive criticism throughout the implementation of this pilot study. The Royal Malaysian Police force (PDRM) is also accorded with thanks for their support and cooperation in furnishing the relevant statistical data for Malaysia. The UiTM education scholarship division is also acknowledged for their sponsorship for the doctoral scheme as well as the Institute of Postgraduate Studies (IPS) in USM for the graduate research grant which has undoubtedly assisted in the undertaking of this research. Finally, the respective residents of the study area are given thanks for all their cooperation.

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