Exploring crime prevention through environmental design (CPTED) and students' fear of crime at an Australian university campus using prospect and refuge theory

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Abstract

Purpose – Crime and fear of crime in and around the university campus can affect enrolments and retention rates as well as compromising the safety, security and well-being of students and staff. The purpose of this paper is to explore user perceptions of personal safety using the "Prospect and Refuge Model" and crime prevention through environmental design (CPTED).

Design/methodology/approach – The study used a fear of crime survey of 88 students at a university in Western Australia. The respondents were asked to identify on a map, three locations perceived to be "safe" and three locations perceived to be "unsafe". The six most commonly identified sites were then visually audited to measure the levels of "prospect" and "refuge" and CPTED features at each location.

Findings – The findings indicate the top three "fear spots" were associated with low levels of "prospect" and high levels of "refuge" – and generally, with poor opportunities for natural surveillance and CPTED qualities. The top three "safe spots" had consistently higher levels of "prospect" and lower levels of "refuge" in the site audits and responses to the surveys. Increased opportunities for surveillance were therefore associated with increased levels of personal safety.

Research limitations/implications – The survey is relatively small (88) and a larger study is certainly required to underpin these findings. The methodology is transferable to other universities and facilities seeking to manage crime and fear of crime. The research develops more finely nuanced measures for the concepts of prospect and refuge.

Practical implications – Interestingly, surveillance opportunities and perceptions of personal safety were perceived to be mediated by distance from buildings and by the construction of new buildings and infrastructure being carried out across the campus. This has implications for the construction of new universities and for those which are expanding. Recommendations are provided for new and existing universities and for those undergoing redevelopment.

Social implications – Improving students' perception of personal safety can enhance their performance and retention at university.

Originality/value – No studies have investigated the campus design and layout and students' perceptions of personal safety in Australia in this way. The approach is more "bottom-up" by first exploring users' perceptions of "unsafe" locations, then assessing these sites in terms of the presence or absence of measures for CPTED and prospect-refuge.

Keywords Australia, University campus, Crime prevention through environmental design (CPTED), Personal safety, Prospect-refuge theory

Paper type Research paper

Introduction

Although crime has existed on university campuses across the world since they were established, researchers have only been investigating crime and fear of crime over the past 25 years. For many years, university campuses were viewed as "sanctuaries", which were

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largely immune to the crimes occurring in the communities surrounding them (Smith, 1988). This began to change when access to universities widened and more universities were established (Smith, 1988). Gradually, the role of universities has expanded to include part-time students, commuter campuses, partnerships with industry and more diverse curricula. Concerns about crime and security on university campuses increased in the 1980s following a number of violent crimes (Department of Education National Center for Education Statistics, 1997), which has challenged the perception of universities as safe havens for students (Smith 1989). Furthermore, Wilcox *et al.* (2007) suggested that historically, university campuses have not been subject to appropriate levels of public scrutiny relating to crime rates. This is in part due to their contained physical contexts and private security and also the downplaying of incidents of crime (Wilcox *et al.*, 2007). More recently, Fisher and Smith (2009, p. 1) observed how campus shootings across the world (e.g. in Finland, Canada and the USA), have promoted the perception that "the ivory tower is no longer an idyllic and safe haven where students pursue intellectual discourse but rather a dangerous place rife with violence and theft". For Fisher and Smith (2009) safety and security on campus is a continuing social and policy concern for current and future students and their parents. Furthermore, Fox *et al.* (2009, p. 37) argued "campus security has perhaps never occupied a more visible place in public discourse". This paper investigates students' perceptions of personal safety and security at a university campus in Western Australia. It also explores the relevance of prospect-refuge theory and crime prevention through environmental design (CPTED). Although the findings from this single case study cannot necessarily be generalised or applied to other university settings, it is argued that the methodological approach can be transferred and applied elsewhere.

Researchers in this area commonly select sites to investigate first, based on assessed levels of prospect and refuge. Once this is achieved, levels of fear or incidents of crime are then measured to test the theory (e.g. Fisher and Nasar, 1992; Petherick, 2000). This research is novel in that it reverses this approach. This study asks respondents to first identify hot spots for fear then assesses these locations for levels of prospect and refuge. Furthermore, levels of prospect and refuge are usually assessed in terms of the whole concept (Fisher and Nasar, 1992; Petherick, 2000), while this research innovatively breaks the concepts down into several more precise and identifiable criteria.

The problem

In the USA, all universities are legally obliged to publish crime statistics, but this is not the case in the UK or Australia. Fisher (1995) highlighted how in the USA, the legal system's response to campus crime was to effectively make universities liable for foreseeable crime on their campuses. Furthermore, Congress and state legislatures now require universities to be more transparent and openly report their crime statistics. It is now a requirement to disclose security policies and campus crimes in annual reports, as stipulated in the Student Right-to-Know and Campus Security Act (1990). These crime statistics must be recorded if they occur "on" campus, in areas, which may not be directly "on" campus but are affiliated with the university (e.g. residential housing), or areas adjacent to campus, such as on public property, sidewalks and streets.

According to Sloan and Fisher (2014) there were over 47,000 violent and property crimes reported on college campuses in the USA in 2009. This included 31 murders and non-negligent manslaughters; more than 3,300 forcible and non-forcible sex offences; in excess of 4,600 robberies; approximately 4,900 aggravated assaults; more than 26,000 burglaries; over 7,200 motor vehicle thefts; and more than 700 incidents of arson. Although the scale of these crimes initially appears disturbing, it needs to be noted that there were more than 20 million students enrolled at 6,883 institutions who filed annual campus crime reports with the federal government (Sloan and Fisher, 2014).

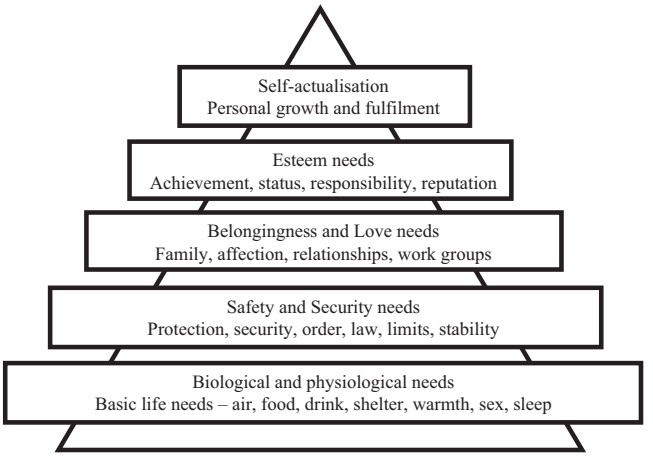
Barberet and Fisher (2009) observed that in contrast to the heightened awareness of safety and security on campuses in the USA, attention to these issues in England and Wales has been relatively recent. Indeed, incidents of crime on campuses in England and Wales indicate that universities and their students are attractive and frequent targets of both personal and property crime (see Fisher and Wilkes, 2003; Barberet *et al.*, 2004). However, crime statistics for university campuses are not as readily available as they are in the USA. In Australia, the availability of crime statistics is also limited. Indeed, in Australia, some have suggested that there is a lack of transparency, if not outright secrecy regarding the crimes on campus (Funnell, 2016).

Significantly, Funnell (2016) has recently reported that internal police documents have revealed numerous crimes, which Australian universities have attempted to keep secret. These include "a sickening number of rapes and sexual assaults reported to police, taking place on university campuses across the country" (Funnell, 2016). Following several refusals from universities to comply with freedom of information requests (FOIs), Channel 7's (an Australian commercial TV station) FOI editor, Alison Sandy obtained more than 500 pages of internal police documents, cataloguing over 150 rape and sexual assault complaints at various Australian universities. Henry (2017) suggested that out of 575 reports of sexual assault and harassment, only 6 have resulted in the expulsion of the perpetrator from the university. Given this secrecy and lack of transparency about crime data at many universities, this research highlights the need to investigate crime and personal safety issues in different, more creative ways.

Literature

Having highlighted the problem, this section discusses some of the key literature on personal safety and crime associated with university campuses.

Maslow (1943) suggested humans aspire to a five-tier model regarding certain needs (see Figure 1). Safety needs include protection from the elements, security, order, law, stability and freedom from fear. He argued that safety overshadows the other basic human needs of "love and belonging", "self-esteem", and "self-actualisation". Crime and fear of crime are clearly personal safety and security issues. Indeed, Kim (2015) has recently highlighted the importance of personal safety in facilitating academic achievement. Kim (2015, p. 13) suggested "safe public outdoor space/paths at campus was a strong predictor for academic achievement – high quality environments are a positive factor on student performance".



Sources: Maslow (1943) and Chapman (2002)

Figure 1.
Maslow's hierarchy of human needs

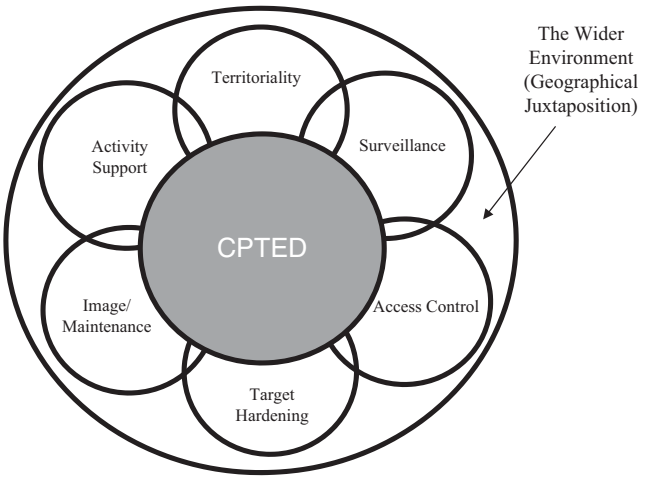
One way to try to understand crime is by analysing official recorded crime data. However, as discussed earlier, such data are simply not available in Australia. An alternative approach is to try to explore the perceptions of safety of campus users and assess the design, management and use of the built form of the university campus. A university campus is commonly comprised of a series of classroom buildings, recreational spaces, gymnasiums, bus stops, car parks, open spaces, pathways, columns, signs, shrubbery, trees and other objects that may compromise lines of sight.

Atlas and Schneider (2008) suggested the use of CPTED can improve safety and security at universities. However, they also noted how many universities throughout the world were designed and built long before CPTED theory became popular.

Crowe (2000, p. 46) asserted CPTED is "the proper design and effective use of the built environment [which] can lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life". It is grounded on research studies conducted from the mid-twentieth century onwards (Lynch, 1960; Jacobs, 1961; Angel, 1968; Jeffery, 1971; Newman, 1973; Gardiner, 1978; Clarke and Mayhew, 1980; Poyner, 1983; Coleman, 1985). The six widely accepted CPTED concepts are: territoriality, surveillance, access control, image/maintenance, activity programme support and target hardening (see Figure 2).

These concepts work in combination to potentially discourage offending by reducing opportunities for crime and the fear of crime. For Crowe (2000, p. 37), CPTED emphasises crime prevention techniques that manipulate the opportunities in the environment "both to naturally and routinely facilitate access control and surveillance, and to reinforce positive behaviour in the use of the environment". Together, the concepts can optimise opportunities for surveillance, clearly define the use, activities and boundaries of space, create and maintain a positive "image", and make targets harder for offenders. A detailed discussion of CPTED is outside the scope of this paper, and this has been reported elsewhere (e.g. Cozens *et al.*, 2005; Armitage, 2013; Cozens and Love, 2015). However, a brief outline of the concepts is provided below.

The concept of territoriality is about reinforcing notions of proprietary concern and sense of ownership in the community to potentially reduce opportunities for offending. Different types include symbolic barriers such as signage and real barriers like fences, walls or designs that define and delineate between private, semi-private and public spaces.



Source: Cozens (2005)

Figure 2.
CPTED – the key concepts

Access control and surveillance will also contribute towards promoting territoriality by promoting legitimate users' informal social control.

Surveillance is the activity of watching and monitoring space for suspicious behaviour and/or the presence of offenders. Surveillance is the capacity of the built environment to afford opportunities for the community to see and identify suspicious behaviour. Design, architecture, urban design and planning can all affect opportunities for surveillance, which can be seen as a form of capable guardianship that can help reduce crime. Generally, if offenders think they can be observed, this may reduce their likelihood to offend, due to the increased potential for intervention, apprehension and prosecution. Several types include natural (e.g. residents' self-surveillance opportunities as facilitated by windows or design) formal or organised (e.g. police or security patrols) and mechanical surveillance (e.g. street lighting and CCTV).

Access control focuses on reducing opportunities for crime by limiting or denying access to crime targets by promoting an increased perception of risk in offenders. Access control can be informal/natural (e.g. spatial definition), formal/organised (e.g. security personnel) and mechanical (e.g. locks and bolts). At the larger scale it includes the use of road closures and street designs to limit pedestrian movement through residential areas. It also includes the use of gates to control access along alleyways, bollards, the removal of overhead walkways, enclosing ground floor entrances to public housing complexes, protective screens on buses and automatic gates in public transport settings. At the smaller scale, some strategies to control access are also target hardening measures (e.g. door and window locks).

Activity support is the use of design and signage to encourage the "legitimate" use of public space. Within reason, activity support places inherently "unsafe" activities in "safe" locations, which have high levels of activity and opportunities for surveillance (Crowe, 2000). Furthermore, "safe" activities can attract more users who may then act to discourage the presence of offenders. This CPTED concept also contains elements of territoriality, access control and surveillance.

Image/Management is a CPTED concept concerned with sending a "positive" message to the community – that an environmental setting is cared for, well-maintained and well-used. It involves the routine maintenance of the built form and the rapid repair of vandalism and graffiti, for example. This can help allay community fears and limit the rewards of the offenders involved. It is important to maintain the environment since it acts as a physical indicator of levels of social cohesion and informal social control (Skogan and Maxfield, 1980; Wilson and Kelling, 1982). Neighbourhood incivilities (physical and social) can also promote increased levels of fear (Lewis and Maxfield, 1980; Covington and Taylor, 1991). For the offender, image and maintenance is also important. Indeed, research suggests "the environmental 'image' offenders have of an area is associated with the extent to which the area is victimised" (Taylor, 1991, p. 970).

Target hardening is a traditional and long-established crime prevention approach designed to increase the effort required for committing a criminal offence. It is concerned with denying or limiting access to targets of crime using physical barriers (e.g. fencing, gates, locks and electronic alarms). Importantly, too much target hardening results in "fortress" environments, which can heighten fears within the community.

Geographical juxtaposition is about the capacity of specific spaces to influence crime in adjacent spaces and vice versa. Essentially, it is the wider, surrounding environment (see Figure 1). Indeed, proximal land-uses may generate crime and influence crime levels at the location where CPTED is being applied. However, the concept of geographical juxtaposition has received very little attention in the CPTED literature (Cozens, 2015a, b, 2016; Cozens and Love, 2015; Cozens and van der Linde, 2015). It has recently been linked with the idea of crime generators and attractors (Cozens, 2016).

Researchers have also highlighted how opportunities for crime change over the life-cycle of buildings/developments (Cozens, 2016; Cozens and Tarca, 2016). The "Cradle to the

Grave" life-cycle of criminal opportunities (Cozens, 2016) highlights how risks at the initial design stage, at build-out and throughout the use and re-use of a building change. Criminal opportunities change when buildings are underused, vacant or derelict and when they are finally demolished. This idea is important, since there is commonly a temporal gap between the design approval stage and when the site is actually built and ready to use. This construction phase can exhibit its own opportunities for crime, which are largely neglected in the literature on CPTED.

CPTED derives largely from Newman's (1973) "Defensible Space" and has a significant perceptual dimension. Indeed, for Newman (1973, p. 50), there are four elements of "Defensible Space" which act individually and in combination to assist in the creation of a safer urban environment:

(1) the capacity of the physical environment to create perceived zones of territorial influence;

(2) the capacity of physical design to provide surveillance opportunities for residents and their agents;

(3) the capacity of design to influence the perception of a project's uniqueness, isolation and stigma; and

(4) the influence of geographical juxtaposition with "safe zones" on the security of adjacent areas.

Territoriality and image management have clear perceptual qualities and offenders' actions are commonly influenced in part, by their perception of immediate opportunities for surveillance.

There is a long history in theorizing about perceptions and inhabited spaces (Kruft, 1994). Indeed, according to Dosen and Ostwald (2016, p1) "theories about the way in which people perceive and respond to the spaces they inhabit can be found in the oldest architectural treatises and the earliest utopian works". Several researchers (e.g. Austin and Sanders, 2007; Nasar and Fisher, 1992; Pain, 2000; Skogan and Maxfield, 1981; Wilson and Kelling, 1982) suggest environmental cues send signals to individuals about the potential for personal danger, and thus can affect perceptions of personal safety. Goffman (1971) has argued that when entering any environmental setting, people search for cues associated with danger.

In *The Experience of Landscape* Appleton (1975) examines the questions, "what we like about landscapes and why do we like it?" one answer he puts forward is the theory of prospect and refuge. For Appleton (1975) human perceptions of a landscape are influenced by the spatial arrangement of various components that support seeing and hiding, opportunities for movement and exploration and the impact of shadow and sun. Appleton's (1975) prospect-refuge theory refers to the behavioural and psychological need for places that allow a person to see, but without being seen. This is purportedly a universal human need. The theory has been widely applied in architecture, urban design and environmental psychology since the early 1990s (Dosen and Ostwald, 2013). Prospect-refuge theory has also been used in the fields of interior architecture, environmental preferences and research investigating personal safety and perceptions of crime. Appleton (1975) posited that people prefer spaces that provide an open view (prospect), and options to find protection from potential danger (refuge). Simply, prospect "is associated with the perceptual properties of outlook, depth of view, spaciousness and openness", while refuge "is associated with perceptual properties of enclosure and safety" (Dosen and Ostwald, 2016, p. 3). In general terms refuge is associated with environmental setting, which enhance feelings of safety and well-being.

Regarding the physical environments on a college campus, Fisher and Nasar (1992) suggested prospect, refuge or escape can affect perceptions of safety on campuses.

Research by Nasar and Fisher (1992) found that locations with low levels of prospect and limited escape routes for victims were all associated with high levels of fear of crime.

Nasar *et al.* (1993) argued specific physical features enhance fear on campus. This is partly explained by the diversity of the population on campus, the largely unlimited access and problematic physical features such as poor lighting, obscured sightlines and isolated buildings and car parks.

Siegel and Raymond (1992) investigated violent crime at 400 US institutions found a correlation with the ecological features of the campuses and students' characteristics. Fernandez (2005) explored students' perceptions of safe and unsafe exterior locations at Louisiana State University campus. The findings supported CPTED, whereby visibility, clean and well-maintained areas and proper landscaping increased students' perception of safety (Fernandez, 2005). Clearly, the features of prospect, refuge and escape are linked to the CPTED concept of surveillance (Fisher and Nasar, 1992) and research confirms that fear of crime is commonly higher in locations that optimise refuge for the potential offender but provides low levels of prospect and escape for the user (Taylor and Harrell, 1996).

Petherick (2000) studied fear and levels of prospect and refuge at a university in Canada. They selected various locations across campus, with varying levels of prospect and refuge and then measured users' levels of fear. They found that perceptions of safety fluctuated accordingly to the amount of prospect and refuge afforded within each area of the campus studied. The highest levels of fear were exhibited in locations of low prospect for the victim and high refuge (hiding places) for the offender. The locations perceived to be safe were characterised by high prospect for the victim and low refuge (hiding spaces) for the offender (see Table I). Following Nasar and Fisher's (1992) research, the findings confirmed the connection between the built form and perceptions of safety.

Fisher and May (2009) investigated perceptions of fear reported by staff and students, finding that poor lighting levels, places of concealment, dark hallways, bushes/shrubs obscuring visibility and a lack of escape routes were correlated with increased levels of fear.

Dosen and Ostwald (2016) reviewed a number of studies on the prospect-refuge theory. In 30 studies, where prospect was measured, the concept was supported in 19, found to be neutral in 10 and rejected in 1 of the studies. In 27 studies where refuge was measured, it was supported in 8, found to be neutral in 14 was found to be contrary in 5 of the studies. Although there was clearly some support for the theory, they concluded; "there are not enough supportive findings to emphatically substantiate prospect-refuge theory" (Dosen and Ostwald, 2016, p. 9).

Research derived from this theory has ascertained that prospect is a vital factor in determining preference and has been supported by a substantial body of evidence (Fisher and Shrout, 2006; Galindo and Hidalgo, 2005; Nasar *et al.*, 1988; Hagerhall, 2000, 2001; Luymes, 1992). Evidence for refuge is variable. Whereas some research (Galindo, Hidalgo, 2005; Hagerhall, 2000, 2001) has produced supporting evidence for refuge, other studies show opposite results (Fisher and Shrout, 2006; Herzog, 1988; Luymes, 1992; Nasar *et al.*, 1988).

This research therefore seeks to contribute to this debate by investigating perceptions of personal safety and prospect and refuge theory in an Australian context. The university campus being studied is in Perth, Western Australia (see Figure 3). There were

	PROSPECT (victim)	
Refuge (offender)	High (Open Prospect)	Low (Blocked Prospect)
Low (no hiding places)	Most safe	Moderately unsafe
High (many hiding places)	Moderately unsafe	Most safe

Source: Adapted from Fisher and Nasar (1992)

Table I.
The prospect-refuge model

Figure 3.
The location of the campus, in Perth, Western Australia

approximately 43,960 students studying on campus in 2016 (Curtin University, 2017) and the campus is located on around 116 hectares of land, 6 km from the city centre of Perth. The campus is effectively a multi-functional space made up of a series of open spaces, student housing, recreation/sports facilities, a hockey stadium, lecture theatres, administrative buildings, a licensed premise (bar), staff and student restaurants, coffee shops and eateries, food vans, an art gallery, bicycle paths, pedestrian walkways and roads for vehicles.

Methodology and findings

This research is based on a single case study of one university and the findings are not transferrable to other universities. However, it is argued that the methodological approach is very transferrable to other campuses and environmental settings and contexts. It represents a useful model for measuring perceptions of crime and developing appropriate and targeted responses. The survey is relatively small (88) and a larger study is certainly required to underpin these findings.

Crime data were not available for this research project in Australia. The focus is therefore on perceptions of personal safety on campus. This study investigated students' perceptions and fear of crime at specific locations identified as "hot spots". It also explores the characteristics of these sites in terms of prospect-refuge theory and CPTED.

The survey sample was designed to target the users of the campus and a total of 88 respondents (39 females and 49 males) participated in the study. Table II highlights the basic demographic characteristics of the respondents. Most ($n = 72$, 82 per cent) were aged 18–25 and in terms of gender, 56 per cent ($n = 49$) were males and 44 per cent ($n = 39$) were females.

All respondents identified themselves to be students and most (58 per cent, $n = 51$) stated they felt safe on campus. However, 42 per cent ($n = 37$) stated that they did not feel safe on campus. In terms of gender, 64 per cent ($n = 25$) of female respondents reported that they experienced fear on campus compared to only 27 per cent ($n = 13$) of males. However, the rest of the data revealed no significant differences between the responses of male and female participants.

Respondents completed intercept surveys while on campus where they highlighted three "safe" and three "unsafe" locations on an A3 sized map. A site analysis was then conducted on the six most commonly identified sites (three "safe" and three "unsafe"). One objective was to test the hypothesis that "unsafe" sites are likely to exhibit low levels of prospect and high levels of refuge (places of concealment). Furthermore, these locations were expected to exhibit low levels of CPTED features.

Three most common locations highlighted by the respondents as "unsafe" in the open-ended questionnaire, were the bus station (34 per cent), the pedestrian walkway (34 per cent) and one of the car parks (32 per cent). These are represented by the three darkest red circles in Figure 4.

The bus station (Plate 1) has narrow footpaths, which border a busy road and bus lane. It is moderately isolated due to the distance from other university buildings. It is not integrated with the rest of the campus and is dominated by the presence of fencing. There are large advertising panels, which obscure views and provide concealment opportunities.

This part of the questionnaire was open-ended and respondents were asked to identify their own reasons why a specific location was perceived to be unsafe. Figure 5 illustrates reasons why respondents felt the bus station was "unsafe". Clearly being accessible to non-students (30 per cent), people loitering (22 per cent), the previous occurrence of crime (11 per cent) and being exposed to dangerous behaviours (8 per cent) were the main concerns. However, being open to the public, lack of security, lack of passive surveillance and a lack of people were all concerns for 6 per cent of the respondents.

The pedestrian walkway (Plate 2) was identified as being "unsafe" by 34 per cent of respondents. The pedestrian walkway is a temporary route, which has opened up due to extensive construction work on campus. The walkway has some foliage obscuring views along portions of the route and hoarding and fencing obscures visibility in some sections. Furthermore, the path is not straight and there are numerous sharp corners which obscure visibility. In terms of reason why the location was seen to be "unsafe" (see Figure 6), 30 per cent stated "construction". Lots of hidden spots/corners and turns (22.5 per cent) and blocked views (15 per cent) were also seen to influence the perception of this locations as being "unsafe". This also resonates with the idea of "lurk lines" (Goffman, 1971), referring to areas where lines of sight are broken, where there are blind spots with limited levels of prospect.

Narrow and enclosed space (12 per cent), difficulties associated with navigating (7 per cent), lack of visual permeability (6 per cent), lack of security (4 per cent), lack of passive surveillance (2 per cent) and worn down area (2 per cent) were also reasons associated with the location being identified as "unsafe". Significantly, together, lots of hidden spots/corners and turns (22.5 per cent) and blocked views (15 per cent), lack of visual permeability (6 per cent), lack of passive surveillance (2 per cent) represents a significant proportion of responses related to the concept of prospect and views (46 per cent).

Table II. Age and gender of the respondents

	Age				
Gender	18–25	26–35	36–50	51+	Total
Male	39 (80%)	7 (14%)	1 (2%)	2 (4%)	49 (56%)
Female	33 (85%)	4 (10%)	2 (5%)	0	39 (44%)

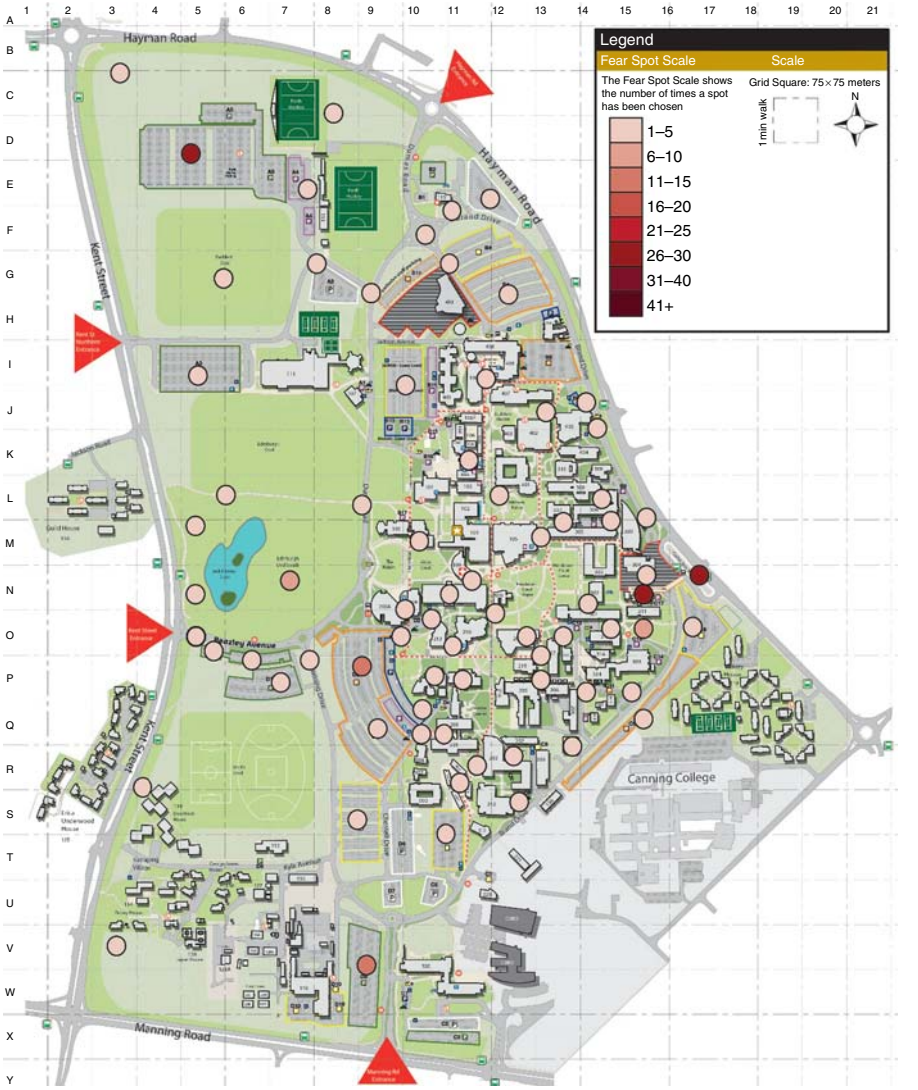


Figure 4.
"Unsafe" Spots identified by the respondents

One of the campus car parks was identified by 32 per cent of respondents as "Unsafe" spot 3 (see Plate 3). This car park's elevation is lower than the rest of campus. It is a very isolated place and the closest building is over 50 m away. There are medium levels of foliage (mainly tall thin trees) and overgrown weeds, which are not maintained and are around 0.5 m–1 m tall. However, there are not many places of concealment at the centre of the car park, other than behind vehicles (when it is full). However, there are numerous such locations at the edges of the car park.

There were various reasons cited to explain why this car park was considered to be "unsafe" (see Figure 7). These were dominated by the observation that the car park was isolated (58 per cent). Poor visibility (15 per cent), lack of security/surveillance (9 per cent)

Plate 1.
Unsafe Spot 1 – the bus station

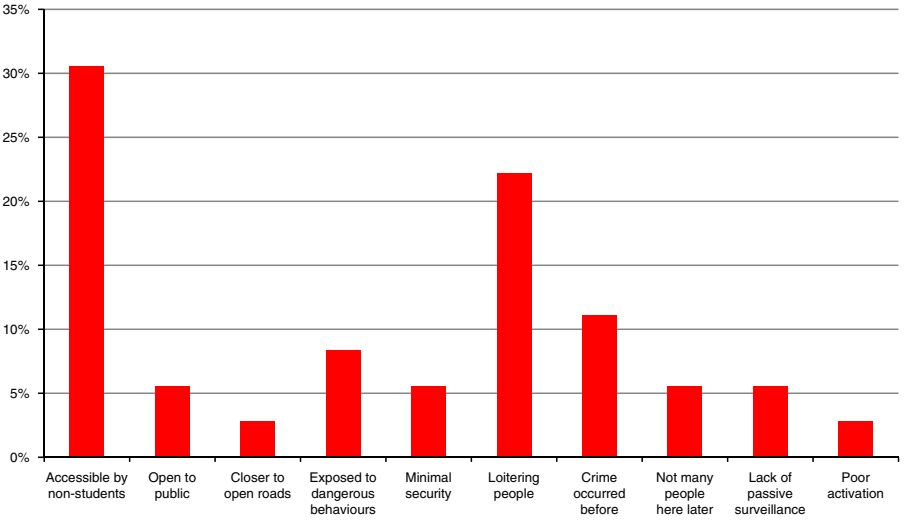


Figure 5.
Reasons why the bus station was considered "unsafe"

and the fact it is empty later in the day (9 per cent) were all mentioned by respondents. Also, some respondents highlighted sightlines blocked by trees (3 per cent), a lack of direct pedestrian access (3 per cent) and more opportunities for crime (3 per cent) as reasons for selecting the location as an "unsafe" site.

The three locations most commonly identified by respondents as being "safe" were the library (59 per cent), an area of open space (39 per cent) and a walkway (25 per cent) (see Figure 8). The library is a centrally located, busy and vibrant location, which is open 24 hours and has security guards and CCTV inside the building and at its entrances. The open space identified as being "safe" by 39 per cent of respondents is adjacent to the library, is very central and well-used by students and staff. A specific walkway was also identified

Plate 2.
Unsafe Spot 2 – pedestrian walkway

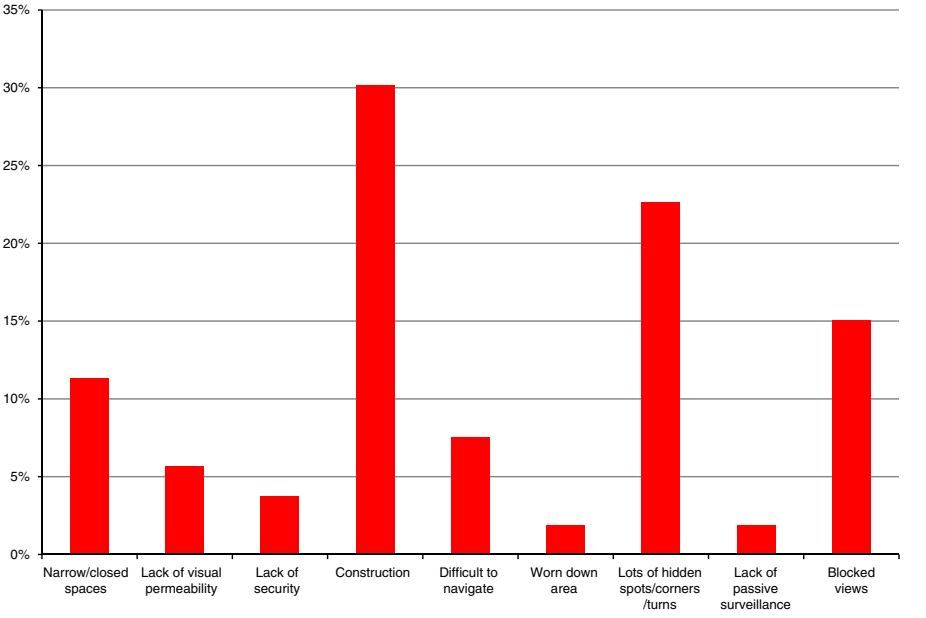


Figure 6.
Reasons why the pedestrian walkway was considered "unsafe"

as being "safe" by 25 per cent of respondents. It is a busy, well-used walkway, near a small retail strip and a coffee shop.

The "safe" and "unsafe" locations were then assessed in terms of levels of prospect and refuge and for the general presence or absence of CPTED qualities. Previous research has assessed levels of prospect and refuge as distinct concepts (e.g. Fisher and Nasar, 1992;

Plate 3.
Unsafe Spot 3 – car park

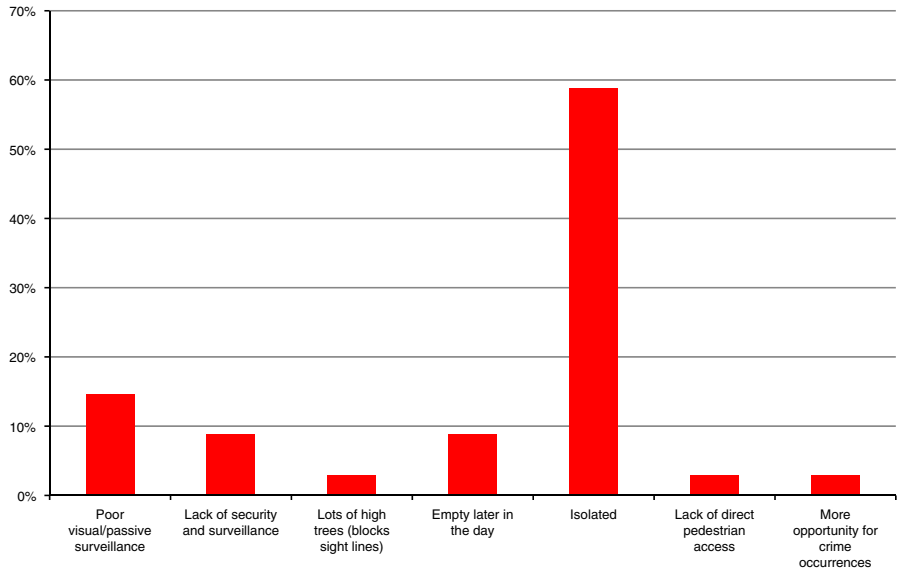


Figure 7.
Reasons why the car park was considered "unsafe"

Petherick, 2000). This study breaks the concepts down into several measurable criteria. Prospect was measured using the three criteria of elevation, openness and isolation, since all three can affect levels of prospect. Refuge was measured according to the amount of foliage and hiding places, since both of these measures are linked to levels of refuge. A simple points system was used to assess the levels of each respective criterion (see Table III). A location with a score of five is therefore more elevated on higher ground, open, less isolated with few places to hide. Conversely, a location with a score of 15 would be at

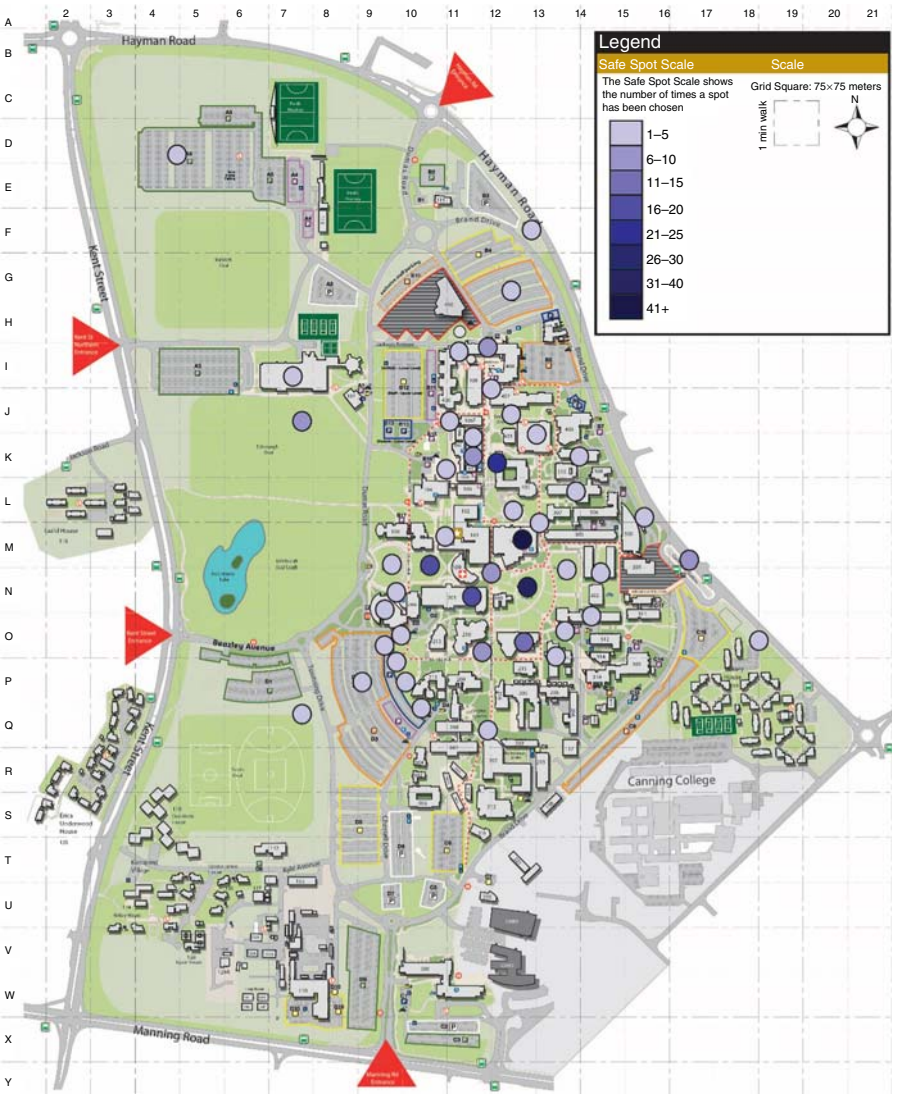


Figure 8.
Top 3 Safe Spots

level/below ground elevation with restricted views, hidden by foliage with numerous places to hide, more than 50 m away from other buildings.

Each score out of 15 was expressed as a percentage to create a low prospect/high refuge index, where a higher percentage score represents low levels of prospect and high levels of refuge. A lower percentage score indicates a location with high prospect and low refuge. Each of the three unsafe' and three "safe" locations were audited using this points system and are presented below.

The three "unsafe" locations (see Table IV) were all assessed to have much lower levels of prospect and higher levels of refuge (hiding space) than the three "safe" locations (see Table V).

With regards to the three "safe" spots, these were generally busier, vibrant places with more people using the spaces over longer time periods. They exhibited higher levels of prospect and

Criteria	1 Point	2 Points	3 Points
Prospect Elevation (higher/low ground)	High elevation	Medium elevation	Low elevation
Prospect Openness and views	Open (6 m+)	Medium (3–6 m width)	Restricted (0–3 m width)
Prospect Isolation (distance from other buildings)	Not isolated (−10 m away)	Moderately isolated (10–50 m away)	Highly isolated (+50 m away)
Refuge Foliage	Low/no foliage	Medium foliage	High foliage
Refuge Hiding places	Low/no hiding places	Some hiding places	Lots of hiding places

Table III.
The prospect-refuge assessment criteria

"Unsafe" locations	Prospect Score/9	Refuge Score/6	Total Score/15	Low prospect/high refuge % index
Bus station (34%)	8/9	4/6	12/15	80
Pedestrian walkway (34%)	6/9	5/6	11/15	73
Car Park (32%)	7/9	3/6	10/15	66

Table IV.
Audit of the three "unsafe" locations

"Safe" locations	Prospect Score/9	Refuge Score/6	Total Score/15	Low prospect/high refuge % index
Library (59%)	4/9	3/6	7/15	47
Open Space (39%)	3/9	3/6	6/15	40
Pedestrian walkway (25%)	6/9	2/6	8/15	53

Table V.
Audit of the three "unsafe" locations

open views than in the locations perceived to be "unsafe". There were some examples of refuge in the "safe" spots, but the presence of people appeared to reassure respondents. In addition to providing good surveillance, "safe" spots generally exhibited other CPTED features, such as activity support, space management and territoriality. They were more open, clearly defined and visible. They were also well-maintained, accessible and less isolated.

For the three "unsafe" spots, these were mostly isolated with blocked views (prospect) and with many hiding places (refuge). The bus station was perceived to lack integration with the rest of the campus and was fenced off – but at certain times it was busy. The presence of more people failed to reassure respondents – they were assumed to be non-students and potentially, threatening "others". "Unsafe" spots generally provided low levels of surveillance and did not exhibit CPTED features like activity support, image management and territoriality to the same extent. Indeed, the "unsafe" pedestrian walkway and car park were poorly defined, lacked signage and way-finding information as well as exhibiting lower levels of activity and maintenance.

The findings largely support previous work (e.g. Fisher and Nasar, 1992; Nasar and Fisher, 1992; Petherick, 2000; Fisher and May, 2009) in that perceptions of safety varied accordingly to the amount of prospect and refuge afforded within each setting. "Unsafe" locations exhibited low levels of prospect and high levels of refuge. "Safe" locations exhibited high levels of prospect and low levels of refuge.

Conclusions

The prospect-refuge theory is supported in this single case study. Here we expanded the two concepts into more transparent and identifiable measures, which are arguably easier to assess. Prospect was measured using elevation, openness/views and isolation (distance from buildings), while refuge was measured using levels of obstructing foliage and hiding places.

This research confirms higher levels of fear are associated with low levels of CPTED and opportunities for surveillance. In particular, locations with low levels of prospect and high levels of refuge were identified as being the most problematic. Indeed, CPTED assessments and particularly the concept of surveillance could be measured and assessed more accurately using the prospect-refuge criteria discussed in this paper. Clearly, the theories of CPTED and prospect-refuge share some commonalities and this relationship could certainly be the subject of further exploration.

Interestingly, for the concept of activity support, the presence of more people seemed to reduce or increase the impact of low levels of prospect and high levels of refuge depending on who the people are perceived to be. Indeed, the busy library and the busy bus station were perceived differently. In relation to the large isolated car park, the respondents reported that the assumed benefits of openness can be undermined by distance and scale. To some extent, the often-ignored concept of geographical juxtaposition seems to play some role in influencing perceptions of respondent – particularly in relation to the size and scale of the car park – and what was around it – and the location of the bus station within the broader community.

Crucially, areas of construction on campus were unfamiliar to the respondents and associated with high levels of refuge and low levels of prospect. This provides some support for the "Cradle to the Grave" life-cycle of criminal opportunities (Cozens, 2016) in that the temporary routes created by ongoing construction were seen to be problematic. This is clearly something universities carrying out new developments on campus could focus on, in order to better manage personal safety concerns. Further research is certainly necessary to test these findings using a larger sample size and it could also be useful to conduct similar research across different university campuses. If the availability of crime statistics on the campuses of Australia universities improves, it would be intriguing to explore to what extent different types of crimes may or may not be associated with perceived locations of fear/safety and levels of different CPTED concepts, and levels of prospect and refuge.

Finally, this research has provided useful insights into users' perceptions of personal safety, CPTED and prospect-refuge theory at an Australian university, largely confirming previous research. Many universities throughout the world continue to grow and expand their campuses and new universities are also emerging. Although it is unlikely they will ever become "safe havens" and "sanctuaries", the use of CPTED strategies and the promotion of high levels of prospect and low levels of refuge may help improve personal safety concerns and ultimately, reduce crime and anti-social behaviour on campus.

Recommendations

The findings from this research can inform university design principles, security and safety in several ways. Recommendations for those responsible for managing universities (and other) facilities include:

- conduct CPTED reviews of the plans and layout of new universities, ensuring the principles underpin the design, management and use of the new facility;
- consider mapping users' fears/crime risks and conduct CPTED assessments on existing campuses in order to develop and implement appropriate, targeted and practicable solutions;

- university security services could target and monitor locations highlighted as being problematic in CPTED assessments and/or user perception surveys;
- improved lighting and/or temporary CCTV could be used to monitor locations highlighted as being problematic in CPTED assessments and/or user perception surveys;
- conduct CPTED reviews and install interim measures to maintain the principles when major construction and building works are implemented on existing university campuses; and
- integrate student/staff perception/crime risk surveys as part of university risk management strategies.

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