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Original Citation

Armitage, Rachel (2017) Design, crime and the built environment. In: Handbook of Crime Prevention and Community Safety (2nd Edition). Routledge, pp. 234-253. ISBN 9781138851054

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Design, Crime and the Built Environment

Professor Rachel Armitage

Abstract

Crime Prevention through Environmental Design (CPTED) is a method of reducing crime through the design and manipulation of the built environment. Based upon the Opportunity Theories of crime, CPTED focuses upon blocking opportunities for criminal behaviour through subtle techniques to maximise informal surveillance, guardianship and maintenance, to minimise through movement and to set standards of physical security that are proportionate to crime risk. This chapter will discuss the principles of CPTED and the theories from which it evolved. It will explore the effectiveness of these principles, both individually and combined, in reducing crime, before exploring how CPTED is applied in practice.

Introduction

Crime takes many forms and occurs in many places, and whilst theories of crime causation are often generalised across different crime types, there is little empirical evidence to suggest that the prevention of child sexual exploitation, homicide or human trafficking (to give extreme examples) could be prevented using the measures outlined within this chapter. The focus here is largely upon the prevention or reduction of acquisitive crimes such as burglary in a dwelling, theft of and from vehicles and associated offences. By the nature of the targets of these offences, the focus is on residential housing and the areas surrounding those properties – the wider housing estate.

The risk of becoming a victim of crime varies dramatically, based on a person's age, gender, socio-economic and marital status to name just a few. Whilst the average risk of becoming a victim of crime in England and Wales in 2014-2015 was 15.9% (ONS, 2015) for all adults, this increased to 22.1% for those aged 16-24, to 27.9% for mixed/multiple race adults, to 20% for single adults, to 22.7% for the unemployed and to 20.1% for private renters. Alternatively, those aged 75 and over have a risk of just 5.9%, white adults 15.7%, employed 18%, and for those who own their own home the risk is 14.1%. Whilst awareness of these enhanced risks can help to tailor interventions, to alert individuals and even to allocate crime reduction resources, to state the obvious, it is beyond the control of any agency tasked with the reduction of crime, to alter an individual's age, race, gender or marital status.

Yet whilst we can do little to alter risk associated with personal characteristics of victims, there is a vast amount that agencies can do to alter risk associated with the location in which a crime takes place, be that a house, a car park or open space. For example, the average risk of household crime in England and Wales in 2014-2015 was 12.1%. For a detached house this decreased to 9.1%, for a terraced property this increased to 15%. We also know that risk of crime varies according to a property's position on a development – corner plots experiencing more crime (Groff and La Vigne, 2001; Armitage *et al*, 2010) and being perceived by burglars as more attractive as a target for burglary (Taylor and Nee, 1988; Cromwell and Olson, 1991; Armitage and Joyce, in press). Properties visible from footpaths experience higher levels of crime (Armitage, 2006a; Armitage *et al*, 2010) and properties designed to be overlooked by others experience less crime (Winchester and Jackson, 1982;

Armitage, 2006a; Armitage *et al*, 2010), being judged by burglars to be undesirable as a target for burglary (Brown and Bentley, 1993; Reppetto, 1974; Nee and Meenaghan, 2006 and Armitage and Joyce, in press). These variables are all within the control of agencies tasked with the reduction of crime in England and Wales. Local authority Planning Departments receive planning applications for housing developments. Building/Development Control assess compliance with Building Regulations (for housing standards) and Police Architectural Liaison Officers/Crime Prevention Design Advisors/Designing out Crime Officers (ALO/CPDA/DOCOs) are consulted on the crime risk associated with proposed developments. All of these agencies are required by Section 17 of the Crime and Disorder Act (1998) to do all that they reasonably can to prevent crime; all are required by national planning policy and guidance to build safe communities and to consider crime prevention and security within planning, and all, to some extent, will be required by their Local Plan to design safe and sustainable communities.

Research tells us that crime is “*a risk to be calculated...or an accident to be avoided, rather than a moral aberration which needs to be explained*” (Garland, 1996, p. 450-451), and that many of those risks, particularly relating to burglary and vehicle crime, relate, to a large extent, to the design and layout of housing developments. These findings support a group of theories, known collectively as Opportunity Theories, that contend that opportunity plays a major role in influencing where and when crime will take place. These theories include Routine Activity Theory (Cohen and Felson, 1979), Rational Choice Theory (Cornish and Clarke, 1986) and Crime Pattern Theory (Brantingham and Brantingham, 1981). A full account of these theories is included in Part One of this book, but to recap, the basic assertions are that for a crime to occur, there has to be a suitable target - in the case of burglary, a vulnerable property. There has to be a likely offender - someone motivated to commit this offence, and the absence of a capable guardian – a resident, neighbour or passer-by who would challenge the offender, call the police and draw attention to the potential event (Routine Activity Theory). Opportunity Theories also argue that offenders select targets based upon what they become aware of as they go about their day-to-day activities and move between the places that they frequent (Crime Pattern Theory), and that offenders will seek to maximise the benefits and minimise the risks when making decisions about their offending choices (Rational Choice Theory).

What is Crime Prevention through Environmental Design (CPTED)?

Approaches to crime reduction that adopt this theoretical perspective would therefore aim to block these opportunities, and in the case of Crime Prevention through Environmental Design (CPTED), this is achieved through the design and manipulation of the built environment. Housing estates are designed to limit the likelihood that potential offenders will pass by, and therefore become aware of, properties as suitable targets for offending. This is achieved through limiting unnecessary through movement in the form of connecting footpaths. The layout of housing within a residential area is also designed to maximise the likelihood that offenders will be observed (or that they perceive they are being observed), by residents, neighbours and/or passers-by. Opportunities for surveillance are thus maximised through the orientation of buildings, the size and positioning of windows and the absence of visual obstructions. Should these measures fail to deter potential

offenders, and they do become aware of a vulnerable property and are not deterred by the risk of surveillance, the standards of physical security (including doors, windows, locks) incorporated within the design of each property will make it very difficult for them to successfully break-in and enter.

A commonly used formal definition of CPTED is that used by Tim Crowe who characterised it as: *'The proper design and effective use of the built environment, that can lead to a reduction in the fear or incidence of crime and an improvement in quality of life...The goal of CPTED is to reduce opportunities for crime that may be inherent in the design of structures or in the design of neighbourhoods'* (Crowe, 2000, p. 46). Ekblom (2011) proposes a redefinition and presents the following alternative, which introduces several points not included within Crowe's definition - including the balance between security and contextually appropriate design and the possibility of intervening at different stages between pre-planning and post construction. Ekblom states that CPTED is: *'Reducing the possibility, probability and harm from criminal and related events, and enhancing the quality of life through community safety; through the processes of planning and design of the environment; on a range of scales and types of place, from individual buildings and interiors to wider landscapes, neighbourhoods and cities; to produce designs that are 'fit for purpose', contextually appropriate in all other respects and not 'vulnerability led'; whilst achieving a balance between the efficiency of avoiding crime problems before construction and the adaptability of tackling them through subsequent management and maintenance'* (Ekblom, 2011, p. 4). More recently, research within the field of CPTED has focused upon the *effectiveness* of both the individual and collectively applied principles of CPTED measures in reducing crime and the fear of crime (by authors such as Armitage, 2000; 2006a; Cozens, 2008; Cozens *et al*, 2005; Hillier and Sahbaz, 2009; Pascoe, 1999), the *process* of applying CPTED principles within police and planning environments (by authors such as Monchuk, 2011), the development of CPTED based *risk assessment tools* to predict (and prevent) risk (by authors such as Armitage, 2006; Armitage *et al*, 2010; Van der Voordt and Van Wegen, 1990; Winchester and Jackson, 1982), and a wider approach to the potential benefits of such interventions including the impact upon environmental and social *sustainability* (by authors such as Armitage and Monchuk, 2011; Cozens, 2007; Dewberry, 2003). Given a widening of the focus to include the process of application and consideration of benefits beyond crime reduction, such as social and environmental sustainability, a more appropriate definition of CPTED might be: *The design, manipulation and management of the built environment to reduce crime and the fear of crime and to enhance sustainability through the process and application of measures at the micro (individual building/structure) and macro (neighbourhood) level.*

The principles of Crime Prevention through Environmental Design (CPTED)

Explaining CPTED as a crime reduction method requires some discussion of the principles (or elements) that form this approach. Conscious that these principles are often presented as a given, with little discussion regarding their origins, definition, relevance to different countries, climates and cultures or their impact (individual or combined) upon the reduction of crime, the following section will attempt to tackle these oft omitted debates.

The principles of CPTED have been presented by several authors, including, but not exclusively, Poyner (1983), Cozens *et al* (2005) and Armitage (2013) and these have been adopted to form the basis of planning policy and guidance as well as CPTED based interventions such as Secured by Design (SBD) in England and Wales and Police Label Secure Housing in the Netherlands. Poyner (1983) outlined the principles as surveillance, movement control, activity support and motivational reinforcement. Cozens *et al* (2005) extended this to include the seven principles of defensible space, access control, territoriality, surveillance, target hardening, image and activity support. Armitage (2013) offered yet another combination of physical security, surveillance, movement control, management and maintenance and defensible space. This chapter will focus upon the principles of CPTED as defined by Armitage (2013).

Defensible space and territoriality

The term defensible space was coined by Oscar Newman (1973) who suggested that the physical design of a neighbourhood can either increase or inhibit people's sense of control over the spaces in which they reside. Newman categorised space into public (for example, the road in front of a property), semi-public (for example, the front garden), semi-private (for example, the back garden) and private (inside the property). He argued that if space is defensible, it will be clear to the owner/user of that space, and to non-legitimate users, who should and who should not be in this space. CPTED interventions ensure that space is clearly demarcated, that it is obvious who has ownership of that space and that potential offenders have no excuse to be in that space. This would rarely be achieved through the installation of physical barriers; rather, interventions would include subtle measures such as a change in road colour and texture or a narrowing of the entrance to the development to mark the area as private. This is often referred to as a symbolic (as opposed to a physical) barrier. Offenders are not physically blocked from entering the area; the aim is to convince them that in entering an area they are crossing a boundary into private space and in doing so are more likely to be observed or challenged by those with ownership of that space.

Brown and Altman (1983) and Armitage (2006) found that, compared with non-burgled houses, properties that had experienced a burglary had fewer symbolic (as well as actual) barriers. In their study of 851 properties in Enschede (The Netherlands), Montoya *et al* (2014) found that houses with a front garden had a burglary risk 0.46 times lower than those without.

Defensible space should, if working effectively, create territorial responses amongst the owners or managers of a space. This might take the form of challenging a stranger, calling the police, or simply making their presence known as a means of assuring the stranger that they are being observed. Brown and Bentley (1993) interviewed offenders, asking them to judge (from pictures) which properties would be more vulnerable to burglary. The results revealed that properties showing signs of territorial behavior (such as the installation of a gateway at the front of the property or a sign on the gate/door marking the area as private) were perceived by offenders to be less vulnerable to burglary. Montoya *et al* (2014) also found a significant relationship between signs of territorial responses and burglary risk, but only for daytime (as opposed to night time) burglary offences. Recent research (Armitage and Joyce, in

press) conducted with twenty convicted prolific adult burglars, currently serving a prison sentence for burglary offences, found that, whilst images depicting defensible space or territorial responses (such as a change in road colour or texture, a ‘private’ sign or a narrowing of the road entrance) did not elicit the greatest concern as a burglary deterrent, several expressed the view that they would avoid these areas. On being shown an image of a cul-de-sac with a narrowing at the entrance, a change in road colour and texture to mark the entrance and ‘Private Road’ written on the road, Offender Three stated:

“People living here will have a bee in their bonnet! This is a private road for private people. I would feel awkward here. It’s all about the bluff and I couldn’t pull it off here” (Offender Three).

Limiting through movement

The principle of limiting through movement is based upon the theoretical underpinnings of both Crime Pattern and Rational Choice approaches (discussed earlier within this chapter). If offenders select targets based upon what they become aware of as they conduct their day-to-day activities, all things being equal, properties located on or close to popular travel paths will experience more crime. If offenders select targets that increase their likelihood of reward and reduce the risk of being caught, then they will select targets with easy access and escape routes. Thus, limiting the through movement into, through and out of a housing development will reduce the likelihood that an offender will become aware of a vulnerable property (suitable target). It will also reduce the likelihood that an offender will make a rational choice that the target will offer more reward than risk. In the case of CPTED and housing design, *through movement* refers to the presence of formal or informal footpaths – sometimes referred to as alleys, ginnels or alleyways. These are pedestrian paths, not accessible by motor vehicle. In most cases these footpaths link a housing estate to another residential area, to shops, to a park or school. However, in some cases these are simply access paths that run at the side or rear of houses (usually terraced housing) to allow residents to access the rear of the property without entering the house.

Research studies have utilised a variety of methods to establish the extent to which crime risk varies according to levels of through movement within a housing development. These include analysis of police recorded crime as well as interviews with convicted burglars. The key research findings are summarised in Table 1, with the most recent studies discussed in detail below.

Study Revealed that:	Study Reference
Being located on a development with high levels of permeability/connectivity/through-movement <u>increases</u> the risk of crime	Bevis and Nutter (1977) Rubenstein et al (1980) Taylor and Gottfredson (1987) Van der Voordt and Van Wegen (1990) White (1990) Poyner and Webb (1991) Beavon et al (1994)

	Mirlees-Black et al (1998) Rengert and Hakim (1998) Hakim et al (2001) Taylor (2002) Nubani and Wineman (2005) Yang (2006) Armitage (2006) Armitage et al (2010)
Being located on a travel path <u>increases</u> the risk of crime	Letkemann (1973) Brantingham and Brantingham (1984) Feeney (1986) Gabor et al (1987) Poyner and Webb (1991) Wiles and Costello (2000) Rengert and Wasilchick (2000)
Being located on a culs-de-sac, or a development with low connectivity, <u>reduces</u> the risk of crime	Bevis and Nutter (1977) Johnson and Bowers (2010) Armitage et al (2010)
Closing off streets <u>reduces</u> crime	Matthews (1992) Atlas and LeBlanc (1994) Newman (1995,1996) Donnelly and Kimble (1997) Wagner (1997) Lasley (1998) Zavoski et al (1999) Eck (2002) Farrington and Welsh (2009)
Being located on a leaky culs-de-sac <u>increases</u> the risk of crime	Hillier (2004) Armitage (2006) Armitage et al (2010)
Being located on a development with high levels of permeability/connectivity/through-movement <u>reduces</u> the risk of crime	Hillier and Shu (1998) Shu (2000) Hillier (2004) Hillier and Sahbaz (2009)

Table One: Key Research Findings - Through Movement and Crime Risk

In their study of the impact of through movement on burglary risk in Merseyside, England, Johnson and Bowers (2010) test three hypotheses: 1) Risk of burglary will be greater on major roads and those intended to be used more frequently: 2) Risk of burglary will be higher on street segments that are connected to other segments, particularly where those to which they are connected have higher intended usage, and 3) risk of burglary will be lower in *culs-de-sac*, particularly those that are non-linear and not integrated into the wider network of roads. Their sample included 118,161 homes and used both GIS (Geographic Information System) software and manual identification to establish road networks and police recorded crime data to measure burglary levels. The results, which controlled for socio-economic influences, revealed that if a street segment is part of a major roadⁱ, all other things being equal, compared to a local roadⁱⁱ there is an expected increase in the volume of residential burglaries on that segment of 22%. In contrast, for street segments classed as private roadsⁱⁱⁱ,

compared to a local road, there would be a 43% decrease in burglary. In terms of road network, the study suggested that for each additional link to other roads, the predicted burglary count would increase by a factor of 3%. If a street segment had five more connections than another, there would be an expected increase in burglaries at that segment of 16%. In terms of connectivity, the results revealed that being linked to one other major road increases the expected count of burglary by 8%. In contrast, being linked to a private road decreases the estimated burglary levels by 8%. The study concludes that *culs-de-sac* are safer than through roads and that sinuous (as opposed to linear) *culs-de-sac* are safer still – a sinuous cul-de-sac is curved so that, when standing at the entrance, you cannot see all the way to the end. Unfortunately, although *culs-de-sac* were manually identified within this study, there was no distinction between true (no connecting footpaths) and leaky (with connecting footpaths) *culs-de-sac*. Research conducted by Hillier (2004), Armitage (2006) and Armitage *et al* (2010) suggests that leaky culs-de-sac are the road layout most vulnerable to burglary.

Armitage *et al* (2010) analysed the design features of over 6,000 properties on 44 housing developments within the three police forces of Greater Manchester, Kent and West Midlands (England). Individual properties, their boundaries and the layout of the development on which they were located were meticulously and manually analysed and compared with prior victimisation (at property and development level). The results revealed that, compared to true *culs-de-sac* (those with no connecting paths), through roads experienced 93% more crime and leaky *culs-de-sac* (those with connecting paths) experiencing 110% more crime. The analysis also identified that crime risk was lower on sinuous compared to linear *culs-de-sac* - confirming the findings from Johnson and Bowers (2010).

Several studies have also highlighted through-movement as a criminogenic feature in their production of crime risk-assessment mechanisms. Armitage's (2006a) Burgess Checklist (derived from Simon's Burgess Points System, 1971) allows the user to predict a property's crime risk based upon its design features. The Burgess score is derived from the difference between the mean rate of crime suffered generally (by the whole sample) and the rate of crime suffered by houses with a particular design feature. Armitage identified through movement as a key factor associated with both burglary and crime-prone homes. Six of the 13 environmental factors which were associated with risk of burglary (at a statistically significant level), and eight of the 17 factors which were associated with total crime (at a statistically significant level) were related to permeability and through-movement. In their Delft Checklist, Van der Voordt and Van (1990) also identified several factors relating to access and through movement which increased a property's vulnerability to crime, these were: Number of entrances and escape routes, the ease of access to entrance and escape routes, the physical accessibility of entrance and escape routes and the absence of symbolic barriers.

In addition to the analysis of police recorded crime data, Wiles and Costello (2000) used interviews with offenders and forensic data from the police DNA database as a means of investigating the decision making of offenders and the distance that they will travel to offend. The dominant reason given by offenders for selecting a target was chance (63% of offenders). Thirty-one per cent of the sample stated their reason for target selection as '*passing and security looked poor*', 26% stated that they

selected a target because they were *'passing and it looked unoccupied'* and 26% stated that they were *'passing and the property looked isolated'*. This confirms the premise that offenders will make target selections based on what they become aware of as they go about their daily activities and pass potential targets - each of these responses stating that the offender *'was passing'* when making that judgement. Limiting through movement would reduce the likelihood of an offender *'passing by'* a property.

Additional research findings which support the premise that offenders select properties as they take part in day to day activities include Letkemann (1973) who found that burglars interviewed in British Columbia stated that they generally kept their eyes open for targets all of the time. Rengert and Wasilchick (2000) also found that convicted Philadelphia area burglars usually picked their targets within a limited distance of their normal travel paths, primarily along the axis of their usual home-to-work travel path. Research conducted by Armitage and Joyce (in press) found that convicted prolific burglars favour developments with high levels of through movement for three major reasons. The first relates to the ease of access/egress this allows – primarily giving them an advantage over police who will be less aware of the area. The second rationale relates to the extent to which footpaths enable search behaviour, and finally, linked to the second, the belief that footpaths legitimise the search behaviour – a footpath is a public space and offenders are entitled to use that space. On being shown an image of a footpath running through a housing estate, Offender Two stated:

“Yes, this is perfect! Easy pickings. I would first walk up and down this footpath. No-one would give me a second glance. Even if I was a tramp walking up and down I wouldn't look out of place – it's a footpath, no-one can question you” (Offender Two).

Offenders confirmed the findings from Johnson and Bowers (2010) and Armitage *et al* (2010) that true culs-de-sac are a less attractive target. The reasons given were that you are likely to stand out as a stranger because *“everyone knows each other”* (Offender Two) and because, on a true cul-de-sac you have to exit the estate the way that you went it – increasing the chances of detection. Offender Five summarised these suggestions:

I wouldn't go further into the cul-de-sac. There is no reason to be on a cul-de-sac unless you live there. You aren't going anywhere so you are a stranger. If it's a through road you can just keep walking through. I feel like people know each other and they will see me as a stranger (Offender Five).

In a review of the evidence relating to the impact of through movement on crime, Taylor (2002) concludes that: *“Neighbourhood permeability is ... one of the community level design features most reliably linked to crime rates, and the connections operate consistently in the same direction across studies: more permeability, more crime”* (Taylor, 2002 p. 419). This assertion is over generalised. Whilst the vast majority of literature (see Table One) confirms that through-movement within residential housing increases the risk of crime, there are a small number of studies (usually conducted using Space Syntax techniques) that argue that, based upon the premise that more people equates to more surveillance – what Jane

Jacobs (1961) refers to as eyes on the street, increased through movement reduces the risk of crime (Jones and Fanek, 1997; Hillier and Shu, 1998; Hillier and Shu, 2000 and Shu and Huang, 2003; Hillier, 2004). The premise being that an increased presence of individuals will deter potential offenders or increase the chances of detection should they commit a crime. As can be seen in Table One, whilst there is some disparity amongst research studies regarding the impact of through movement on crime, there is little doubt from the research that increased through movement enhances crime risk.

Surveillance

Surveillance refers to the way that an area is designed to maximise the ability of formal (security guards, police, employees) or informal (residents, passers-by, shoppers) users of the space to observe suspicious behaviour. Within CPTED, surveillance rarely relates to formal measures but refers more to the informal surveillance created through, say, ensuring that dwelling entrances face the street, that rooms facing the street are active (such as the kitchen or living room) and that sightlines are not obstructed by shrubbery or high walls. Linked with territoriality, the principle of surveillance requires users of that space to recognise that an individual is behaving in a suspicious manner (be that through their behaviour or simply their presence within a private/semi-private area) and to have the confidence to challenge them or intervene. Therefore, the term surveillance includes the operational tasks of active (formal) and passive (informal) surveillance, the surveillability (Ekblom, 2011) of that space and the creation of the perception amongst offenders that they are being observed.

Research suggests that surveillance and visibility play a major part in offenders' decision-making processes when selecting properties to offend against. Offenders prefer to avoid confrontation and, where possible, select targets which are unoccupied. Reppetto (1974) interviewed 97 convicted burglars and found that the most common reason for avoiding a target was that there were too many people around. Offenders stated that the possibility of neighbours watching them deterred them from selecting a property and that they would select targets where they felt less conspicuous and where there was less visual access to neighbouring properties. In interviews with a sample of 30 active burglars, Cromwell and Olson (1991) found that over ninety per cent of the sample stated that they would never enter a residence which they suspected to be occupied.

Brown and Bentley (1993) asked 72 incarcerated burglars to assess, from photographs, whether or not properties had been burgled. Across all ten homes, the houses judged to be occupied were perceived by the burglars as being those which had not been burgled.

Nee and Meenaghan (2006) interviewed fifty residential burglars in the UK. The findings confirm those presented above, that offenders prefer to select unoccupied properties, and properties with little or no surveillance from neighbouring houses. The most commonly referred to feature of attractive targets was the degree of cover (47 respondents). Three-quarters (38) of the sample preferred a property to be unoccupied, with two-thirds of that number checking this by knocking on the door or ringing the bell.

When assessing the design characteristics of victimised properties, several studies identified a lack of surveillance or poor levels of visibility as key features of crime-prone homes (for example, Armitage, 2006; Armitage *et al*, 2010; Winchester and Jackson, 1982; Van der Voordt and Van Wegen, 19990). Armitage (2006) found that there was a complex relationship between surveillance and crime risk. Surveillance from neighbouring properties appeared to reduce crime risk, yet surveillance from a nearby road or footpath enhanced a property's risk of crime (linked to Crime Pattern Theory and the importance of awareness space). Armitage's research found that being overlooked at the front by neighbouring properties produced a Burgess risk score of -0.6 (suggesting a less than average crime risk). Not being overlooked at the front produced a Burgess risk score of +5.7 (an above average crime risk). This is clearly related to the benefit of informal surveillance from neighbours who are able, and likely, to act as Capable Guardians. Where a property was visible from a nearby footpath, crime risk increased (Burgess score of +6.3), as did risk for properties located within viewing distance of traffic lights (Burgess risk score of +46.6 - the second highest score).

Research conducted across three police forces in the UK revealed findings to support those presented above. Armitage *et al* (2010) found that properties overlooked by between three and five other properties experienced 38% less crime than those not overlooked.

Winchester and Jackson (1982) found that, of the 14 design variables linked to heightened risk of burglary, eight relate to a lack of surveillance from neighbouring properties. These variables include: property is isolated, property is set in a location with less than five other houses in sight, property is set at a distance from the road on which it stands, property is not overlooked at the front by other houses, property is not overlooked on either side by other houses, the majority of the sides of the house are not visible from a public area, the property is set at a distance from the nearest house and the property frontage is obscured from roadside view.

Brown and Altman (1983) studied 306 burgled and non-burgled properties and found that burgled houses showed fewer indications of the probable presence of residents than non-burgled properties. These signs or traces included toys strewn across the yard or sprinklers operating in the garden. Brown and Altman also found that burgled properties had less visual access to neighbouring properties.

As was referred to above, Van der Voordt and Van Wegen (1990) also developed a checklist for measuring the risk of crime – the Delft Checklist. Of the factors which they identified as predictors of crime risk, several related to surveillance and visibility. These were: visual contact between buildings, amenities and outside spaces, sightlines between buildings and adequate levels of lighting.

Authors such as Jane Jacobs (1961) highlight the importance of informal surveillance from those living and working within an area and from those users of the space who are simply passing by. Jacobs refers to this as 'eyes on the street', commenting:

'...there must be eyes on the street, eyes belonging to those we might call the natural proprietors of the street...the sidewalk must have users

on it fairly continuously, both to add to the number of effective eyes on the street and to induce a sufficient number of people in buildings along the street to watch the sidewalks’ (Jacobs, 1961, p.35).

Of course this argument has many weaknesses, the most notable being that, whilst a street may be surveyed by many people, those people do not always notice crimes taking place (Gelfand *et al*, 1973; Mayhew, 1979) and if they do, they do not always intervene (Rosenthal, 1964; Latane and Darley, 1970). This concept of self policing, which may apply in busy cities (which were the focus of Jacobs’ work) is also weakened when transferred to suburban residential developments which are less densely populated. As Cozens (2011) highlights, many social as well as design factors make this concept less likely to apply within residential settings. In many cultures, it is common for both adults within a household to work full-time and developments have few or no community facilities, making surveillance from those living, working and passing through the area, less likely to take place.

Recognising the difference between predicted/potential surveillance and that which actually takes place, Reynald (2009) conducted a study which measured the relationship between guardianship intensity and surveillance opportunities on a sample of 814 residential properties in The Hague. Reynald measured guardianship intensity using a four-stage model which moves from stage one – invisible guardian stage (no evidence that the property is occupied), to stage two – available guardian stage (evidence that the property is occupied), to stage three – the capable guardian stage (fieldworkers are observed by residents), to stage four – intervening guardian stage (fieldworkers are challenged by residents). Surveillance opportunities were measured by observing the extent to which the view of a property’s windows was obstructed by physical features such as trees and walls. The results revealed a positive statistically significant correlation between surveillance opportunities and guardianship intensity (0.45), suggesting that guardianship intensity increases as opportunities for surveillance increase. When assessing the relationship between crime and guardianship intensity, the results were positive and statistically significant. The analysis revealed that crime decreases consistently at each stage of the four-stage model. Crime drops significantly between the invisible and available guardian stages, decreasing even more at the capable guardian stage and slightly more at the intervening stage.

Study Revealed	Study Reference
Offenders avoid properties with visual access to neighbouring houses.	Repetto (1974)
Offenders select targets with less visual access to neighbouring properties.	Repetto (1974) Nee and Meenaghan (2006)
Offenders select targets which are unoccupied.	Cromwell et al (1991) Nee and Meenaghan (2006)
Offenders avoid targets which are occupied (or perceived to be occupied).	Brown and Bentley (1973)
Increasing levels of surveillance enhances guardianship activity.	Reynald (2009)
Properties overlooked by neighbouring properties experience less crime.	Armitage (2006) Armitage et al (2010)

	Winchester and Jackson (1982) Van der Voordt and Van Wegen (1990)
Properties not overlooked by neighbouring properties experience more crime.	Armitage (2006) Armitage et al (2010) Winchester and Jackson (1982) Van der Voordt and Van Wegen (1990)
Properties with less visual signs of presence of residents experience more crime.	Brown and Altman (1983)
Properties with front door facing away from the street experience more physical and social decay.	Coleman (1986)
Properties with view from roadside obscured/obstructed experience more crime.	Winchester and Jackson (1982)
Properties visible from nearby footpaths experience more crime.	Armitage (2006) Armitage et al (2010)
Property located within close proximity of stop sign, traffic lights, commercial business establishment, park, church or busy road are more attractive to offenders.	Cromwell et al (1991)
Properties located within viewing distance of traffic lights experience more crime.	Armitage (2006)
Properties located on a main road experience more crime.	Winchester and Jackson (1982) Groff and La Vigne (2001)
Increased levels of street activity reduces crime.	Jacobs (1961)
Properties in areas less illuminated by street lighting experience more crime.	Groff and La Vigne (2001) Van der Voordt and Van Wegen (1990) Welsh and Farrington (2009)

Table Two: Key research findings - Surveillance and Visibility

Physical security

Physical security (or target hardening) refers to the standards of windows, doors, locks, fences, or other physical structures of a property and its boundary, that increase the difficulty for offenders in entering a building or space. Research on security measures as a means of preventing burglary suggests that, all other factors being equal, burglars prefer to offend against properties with lower levels of physical security (Cromwell and Olson, 1991). Budd's (1999) analysis of the British Crime Survey found that security devices are extremely effective in reducing the risk of burglary victimization. Budd found that, in England and Wales in 1997, 15% of households without security measures were burgled, compared to just 4% of households with basic measures in place and 3% with higher levels of security.

Vollaard and Ours (2011) report the findings of an extensive assessment of built-in security in the Netherlands. This study utilises the introduction of changes in building regulations introduced in 1999 which required all windows and doors (for new build properties) to be made from material certified and approved by the European ENV 1627:1994 Class 2 standard, or the Dutch NEN 5096, Class 2 standard. Using data from four waves of the annual National Victimization Survey (VMR), the results reveal that the regulatory change resulted in a reduction in burglary (within the

sample) from 1.1 to 0.8 per cent annually – a reduction of 26 per cent. The results also reveal that the enhancement in security within new homes resulted in increased protection for older, less-protected homes within close proximity of the new homes – thus suggesting a diffusion of crime control benefits (see Clarke and Weisburd, 1994). The analysis also suggests that burglary offences are not being displaced to other property crimes such as bicycle or vehicle theft. These regulations relate specifically to the physical security of property, and not the wider CPTED measures required by the Police Label Secure Housing scheme (discussed in more detail below). To ensure that the effect being measured was independent of the scheme, these properties were excluded from the sample. Research conducted by Montoya, Junger and Ongena (2014) in the Netherlands confirm these findings.

In interviews with convicted prolific burglars in the UK, Armitage and Joyce (in press) found that, with the exception of one brand of monitored burglar alarms, offenders were not deterred by the presence of an alarm, suggesting that: a) only one brand of alarm continues to sound when the internal box is ripped off the wall, b) the majority of neighbours would simply view that noise as an annoyance and not respond, c) they would cover the external box in sealant foam the night before to dumb the alarm, or d) they would simply allow the alarm to go off and come back when it had finished.

Tseloni *et al* (2014) conducted an in-depth analysis of the relationship between physical security measures and burglary risk in England and Wales. Using data from four sweeps of the Crime Survey for England and Wales (CSEW) - formerly the British Crime Survey, they presented the crime reduction benefits of individual and combined security features reported to be present by those taking part in the survey. The research found that certain combinations of security features confer a crime reduction advantage, but that the protection conferred against burglary does not consistently increase with the number of devices installed. The analysis suggested that if only one security device was to be installed, the most effective device would be external lights on a sensor. If one further device was to be added, the most effective pair of security devices would be window locks and external lights. The ultimate choice for balancing out the number of devices and protection against burglary was window and door locks together with either external lights or a security chain. The study concluded that individual security devices confer up to three times greater protection against burglary than no security and that combinations of security devices in general afford up to fifty times more protection than no security.

The same study looked at the protection afforded by burglar alarms on properties covered by multiple sweeps of the CSEW. The results (published in Tilley *et al*, 2015) revealed that for the majority of CSEW sweeps, burglar alarms were associated with either no change or, more often, a substantial *increase* in the risk of burglary with entry. The results also suggested that the presence of a burglar alarm seems to be diminishing as a protective factor with earlier sweeps showing a positive impact on burglary with entry. This is despite the technical advances in the quality of burglar alarm systems. Tilley *et al* (2015) propose seven possible hypotheses to explain this counterintuitive finding. These include: i) dodgy data, ii) respondent error - that the respondent has reported that the alarm was installed at the time of the burglary when in actual fact it was installed as a consequence of the burglary (and therefore post-victimisation), iii) latent repeat victims – that the alarm was installed as a response to

a previous burglary and it is that burglary that boosts the likelihood of repeat victimization, iv) adaptive offenders, v) flags for target attractiveness – that the presence of an alarm suggests rich pickings, vi) dilution/discredit/drowned out – that the mass availability of alarms has meant that their deterrent effect is diluted, vii) heterogeneity in systems and effects – that the CSEW only measures the presence of an alarm, not the standard or quality of each device.

Image/management and maintenance

Cozens *et al* (2005) use the term image, while others have used management and maintenance to cover the principle of creating buildings/spaces which are physically free from litter, graffiti, vandalism and damage but are also areas without stigma or a poor social reputation.

Several studies have suggested that if low-level disorder such as vandalism and litter are not addressed, they can act as a catalyst for more serious crimes. Skogan (1990) refers to this as the contagion theory, suggesting that the “*presence of vandalism stimulates more vandalism*” (p.39). Wilson and Kelling (1982) refer to this contagious effect as the “*broken windows theory*” (p.16). This suggests that an area with existing deterioration such as graffiti and vandalism conveys the impression that a) nobody cares so apprehension is less likely and b) the area is already untidy so one more act will go unnoticed. This is supported by Taylor and Gottfredson (1987), and later tested by Keizer *et al* (2008), who found that physical incivilities indirectly influence offenders’ perception of risk in that they portray a resident’s level of care or concern for the area in which they live, thus acting as an indicator for the likelihood that they will intervene if they detect an offence taking place.

In her study of the link between environmental design features and crime within West Yorkshire, Armitage (2006) found evidence of brief and long-term desertion to be statistically significantly associated with prior burglary in a sample of 1058 properties. Forty two per cent of the properties which showed signs of brief desertion had been burgled at least once; this was compared to just 15.8% of properties which did not show signs of brief desertion. Additionally, 45.5% of the properties which showed signs of lengthy desertion had been burgled at least once. This was compared to a figure of just 15.8% for houses without signs of lengthy desertion.

In a series of papers, Cozens *et al* (2001, 2002a and 2002b) revealed photographs of two contrasting versions, one being well maintained, the other poorly maintained, of five housing designs – detached, semi-detached, terraced, low-rise flats and high rise flats. Participants were asked to judge each property’s vulnerability to burglary. The results revealed that elderly residents, convicted burglars, planning professionals, police and young adults consistently selected the ‘well maintained’ option as the safest for all five design types.

In recent research, Armitage and Joyce (in press) have refuted the importance of this principle, with none of the offenders interviewed suggesting that an un-maintained property would attract them (based on the premise that the residents are unlikely to challenge them). When shown images of untidy properties, almost all offenders stated that they would not be attracted to the property because “*there would be nothing to take*” (Offender 2). More worrying, a number of offenders stated the opposite, that a

tidy property would attract them as it suggests that there would be financial rewards: “*You want a nice tidy garden, if you mow your lawn, you care for your house and will have nice things*” (Offender 13).

Crime Prevention through Environmental Design (CPTED) in practice

There are examples, England and Wales and the Netherlands being the most notable, of interventions that bring these CPTED principles together as award schemes. In England and Wales, the Secured by Design (SBD) scheme is managed by the Association of Chief Police Officers Crime Prevention Initiatives (ACPO CPI)^{iv} and is run on a day-to-day basis by local police ALOs, CPDAs or DOCOs whose role is to ensure that developments are designed and built to certain specifications. Within England and Wales, these roles have traditionally been performed by warranted police, although cuts in police budgets have led, not only to a dramatic reduction in numbers (from 347 in January 2009 to 125 in November 2014), but also towards moves to civilianise this role. SBD is based upon the key principles of CPTED and sets standards for properties and the wider development based upon physical security, surveillance, through movement, territoriality and management and maintenance. There have been five published evaluations of the effectiveness of the SBD scheme (Brown, 1999; Pascoe, 1999; Armitage, 2000, Teedon *et al*, 2009 and 2010; Armitage and Monchuk, 2011) each concluding that SBD confers a crime reduction advantage.

Several studies have also concluded that the SBD scheme is a cost-effective measure (Armitage, 2000; Association of British Insurers, 2006; Teedon *et al*, 2009). The Association of British Insurers (2006) estimate that the over-costs of building to the SBD standard are £200 for a four-bedroom detached house, £170 for a three or two-bedroom detached house, £240 for a ground floor apartment and £70 for an upper floor apartment. Pease and Gill (2011) re-analysed the findings from Armitage and Monchuk’s (2011) study of the effectiveness of SBD, and established that, taking the Davis Langdon (2010) figures for the cost of SBD and setting these against the crimes saved, SBD pays for itself in just under two years considering only burglary and criminal damage offences. The inclusion of other offences, they state, would reduce this period.

The Netherlands has a similar award scheme – Police Label Secure Housing. Unlike the SBD scheme, this award (which was originally owned and managed by the police) is managed by the Dutch government who adopted the police label into their planning policy guidelines and since 2004 it has been required that every new estate or dwelling be built in accordance with the police label or an equivalent label. Although the award was modelled on SBD, there are several distinctions which mark the two schemes apart. The first is that the label is split into three different certificates – Secured Dwelling, Secured Building and Secured Neighbourhood. These can be issued separately but together they form the Police Label Secure Housing award. The label is also less prescriptive than SBD with more flexibility for developers aiming to achieve a secure development. The requirements are set out under five categories (urban planning and design, public areas, layout, building, dwelling) and these include performance requirements (what) and specifications which indicate the way in which those requirements will be met (how). As a means of encouraging creativity and avoiding the risk of developers ‘designing down’ to specific requirements, where a developer offers a solution which differs from that set out in the ‘how’, but can still

demonstrate the same preventative effect, then this will be considered. The scheme also differs in that it is valid for ten years only and after this period, a re-assessment is required. In terms of the delivery of the scheme, the system is very similar to that within England and Wales. Until 2009, each police region had a number of Building Plan Advisors (Bouwplanadviseur) whose role was very similar to the ALO/CPDA/DOCO role. As a response to budget cuts, the role has been civilianised and is run by the municipalities either through the employment of external consultants or civilian Building Plan Advisors located in-house.

Conclusion

This chapter has briefly outlined the theories upon which CPTED is based; it has presented a discussion of the five principles that form this approach alongside evidence of their effectiveness, alone or combined, in reducing crime. The chapter has also briefly introduced the approaches to implementing CPTED in England and Wales and the Netherlands – two countries in which crime reduction has been given particular consideration within the planning system. CPTED has received criticism as a crime reduction approach – some argue that it focuses too heavily upon the event as opposed to the offender, ignoring the root causes of crime; it places too much responsibility on victims to take preventative action, and it is too simplistic. One of the central difficulties in convincing senior practitioners and policy makers of the benefits of this approach is the length of time it takes for any crime reduction benefits to become apparent. Think of the time it takes for a planning application to be submitted, considered (and possibly rejected, re-submitted and reconsidered), for the development to be built, sold, occupied and then for a crime problem to emerge. This is not a quick win! In many cases the crime reduction benefits of applying CPTED principles may never become apparent. Take for example a field with no houses, and therefore no burglary or acquisitive crime problems. If a housing estate is built on that field and it meets the SBD criteria, crime is likely to be low, but within the life of that development, there will be some crime and disorder incidents. Where are the crime reduction benefits of building to SBD? Where is the praise for senior police or planners making local policy decisions? Whilst there are limitations and areas for improvement, there is a growing body of evidence to suggest that CPTED is a cost-effective crime reduction measure. That the individual principles upon which it is based show crime reduction benefits, as do the combined implementation of these principles. It is an approach that requires multi-agency working. Partners as diverse as police, planners, architects, developers and social housing providers must work together – meeting requirements such as those set out in Section 17 of the Crime and Disorder Act (1998) in England and Wales. If implemented at the planning or pre-planning stage, consideration for the principles of CPTED add very low extra costs to a housing development, and the benefits outweigh these costs and last for decades. To the criticism of simplicity, CPTED may not be rocket science, but as Ekblom (2011) highlights, rocket science itself is actually *‘dead simple – feed fuel and oxidant into a chamber, stand well back, ignite, apply Newton’s laws of motion, and whoosh’* (p. 279). Whilst this approach may not produce those much sought after ‘quick wins’, the benefits (once they materialise) are likely to last for decades, or to make the counterpoint, the failure to address vulnerabilities of design could leave a legacy of increased crime risk for just as long a period. With CPTED we have a simple technique that allows the opportunities for crime to be designed out of residential housing before the problems emerge. It creates an environment in which key agencies

must work together to demonstrate and deliver their requirement to consider crime prevention, and it creates environments where people want to live and work, both now and in the future – the very definition of sustainable housing.

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ⁱ Major roads connect cities, towns and the larger areas between them.

ⁱⁱ Local roads form the urban backcloth on which residential estates are built, and they facilitate easy travel between one local road to another. They are unlikely to be used for vehicular travel for anything other than local trips, but do connect neighbourhoods and allow travel within and between them.

ⁱⁱⁱ Private roads are intended for use by residents alone and not for connecting places. Some of these will be culs-de-sac, some will be through roads.

^{iv} The Association of Chief Police Officers has been replaced by the National Police Chiefs Council and, at the time of writing, the ownership of SBD had not been confirmed.